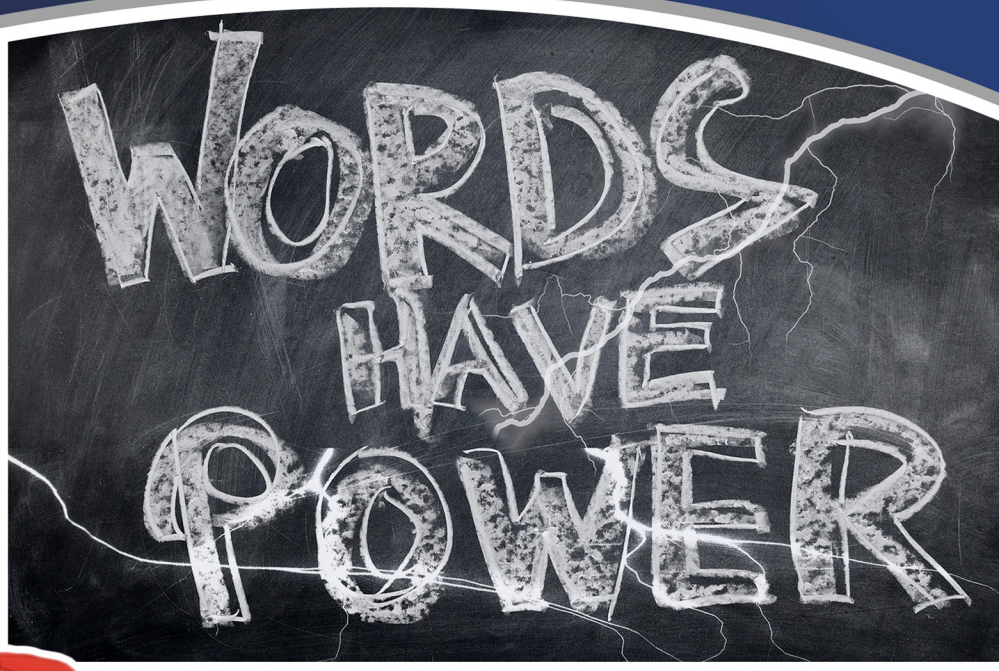
ARMY JROTC

LEADERSHIP 5
Education and Training

UNIT 5: Electives - CONTINUING EDUCATION FOR LEADERS



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ARMY JROTC

LEADERSHIP
Education and Training

UNIT 5: Electives Continuing Education for Leaders

U.S. Army Cadet Command – Fort Knox, Kentucky

HEADQUARTERS, DEPARTMENT OF THE ARMY

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Preface

The Unit 5 - Leadership Education and Training (Electives): Continuing Education for Leaders textbook offers a variety of content to further support JROTC core skills and abilities. There are six chapters, some to support and enhance existing program content and some to introduce you to brand new topics and content.

The knowledge, skills, and abilities presented in this elective unit's chapters include:

Chapter 1: Team Building exposes you to the standards and criteria for additional and unique drill procedures. In this chapter, you'll learn about stationary movements while performing rifle drill, and executing the manual of arms with the saber and scabbard.

Chapter 2: National Endowment for Financial Education® (NEFE®) High School Financial Planning Program® (HSFPP) exposes you to valuable topics pertaining to planning and implementing sound financial practices as a high school student. NEFE® provides the HSFPP® curriculum materials, which can be ordered directly from their website free of charge. Lessons addressed in this chapter include planning for personal financial goals, budgets, savings and investments, credit, and insurance.

Chapter 3: First Aid supports the LET core curriculum by expanding on first aid treatment for a variety of injuries. In this chapter, you'll learn basic treatment for shock and fractures, burns, poisons, wounds, bruises, heat and cold injuries, and bites, stings, and poisonous hazards. Additionally, the chapter identifies the types of bleeding, and treatment protocol for bleeding victims.

Chapter 4: Geography explores maps! You'll start with an introduction to basic map reading to exploring the tools for calculating location and direction on topographic maps. You'll also relate map reading to orienteering.

Chapter 5: Citizenship and Government exposes you to the challenges that face fundamental principles of society today. Topics in this chapter will encourage you, as a citizen, to think about citizenship and citizen rights as they relate to the United States Constitution. Content is this chapter was provided by The Center for Civic Education's *We the People: The Citizen & the Constitution*.

Chapter 6: Cadet Safety and Civilian Marksmanship Program introduces you to the basic skills necessary for target rifle shooting. Objectives of this program are to teach you how to handle guns safely and develop skills of sport target shooting and competition as a member of the JROTC rifle team. Content in this chapter is used with permission granted by the *Civilian Marksmanship Program*.

Textbook Organization

Chapters are divided into several lessons, which correlate with Student Learning Plans. Each lesson identifies a lesson competency called ***What You Will Learn to Do*** and the lesson's ***Learning Objectives***. Section headings and sub-headings throughout the lesson text clearly point to each learning objective in the lesson.

Key Words are vocabulary identified on the lesson cover page. These are highlighted and defined throughout the lesson text.

Every lesson asks an ***Essential Question*** requiring a thoughtful written response about the purpose of the lesson. Answer the question at the beginning of the lesson and then check your response again at the lesson conclusion. It may change as you build your knowledge and skills!

Content Enhancements and ***Content Highlights*** are bonus text sections that support the lesson, and are there to provide additional information of interest about the lesson topic.

At the end of each lesson text is a ***Conclusion***, which serves as a concise wrap up and stepping stone to the next lesson in the text. Within the conclusion is the ***Lesson Check-up***, which includes a few questions to check your knowledge of content presented, and consider how you will apply what you learned to your own life.

Acknowledgements

The Unit 5 - Leadership and Education Training (Electives): Continuing Education for Leaders textbook serves to support and enhance existing Unit 1-4 Leadership and Education Training (LET) core curriculum. Other topics such as Geography, Citizenship and Government, and Marksmanship provide content to help craft a customized JROTC elective leadership course.

A project of this magnitude and quality cannot be developed without the subject matter expertise of AJROTC instructors, third party content providers, and contracted education consultants.

A special thanks to the following content experts for their valuable contribution:

- 1SG (retired) David C. Myers, MacArthur High School, Houston, TX for his role as a subject matter expert for the Geography chapter
- Center for Civic Education for permission to use content from the *We the People: The Citizen & The Constitution*, Level 3 Student Edition, copyright 2016
- Civilian Marksmanship Program (CMP) for their content pertaining to marksmanship safety, responsibility, leadership, and competition standards

CHAPTER 1

Figure 1.0

TEAM BUILDING

Chapter Outline

Stationary Movements with the M-1903 Rifle

What You Will Learn to Do

Demonstrate the manual of arms with the M-1903 rifle

Linked Core Abilities

- Communicate using verbal, non-verbal, visual, and written techniques
- Take responsibility for your actions and choices

Learning Objectives

- **Describe** the correct response to the commands for *Order Arms* and the *Rest* positions using the M-1903 rifle
- **Describe** the correct response to the commands for *Port Arms* and *Present Arms* using the M-1903 rifle
- **Describe** the correct response to the commands for *Inspection Arms* using the M-1903 rifle
- **Describe** the correct response to the commands for *Right* and *Left Shoulder Arms* using the M-1903 rifle
- **Describe** the correct response to the commands for *Sling* and *Unsling Arms* using the M-1903 rifle

Key words

- **balance**
- **barrel**
- **bolt**
- **bolt handle**
- **butt**
- **chamber**
- **hand guard**
- **keeper**
- **lower band**
- **muzzle**
- **port arms**
- **sight**

Essential Question

What are the correct procedures for executing the manual of arms with the M-1903 rifles?

Learning Objectives (cont'd)

- **Define** key words: balance, barrel, bolt, bolt handle, butt, chamber, hand guard, keeper, lower band, muzzle, port arms, sight, sling, sling swivel, stock, trigger guard, upper band

Key words (cont'd)

- sling
- sling swivel
- stock
- trigger guard
- upper band

This lesson uses content from "U.S. Army TC 3-21.5" dated 20 January 2012. Refer to this Training Circular for more information on Rifle Drill.

Introduction

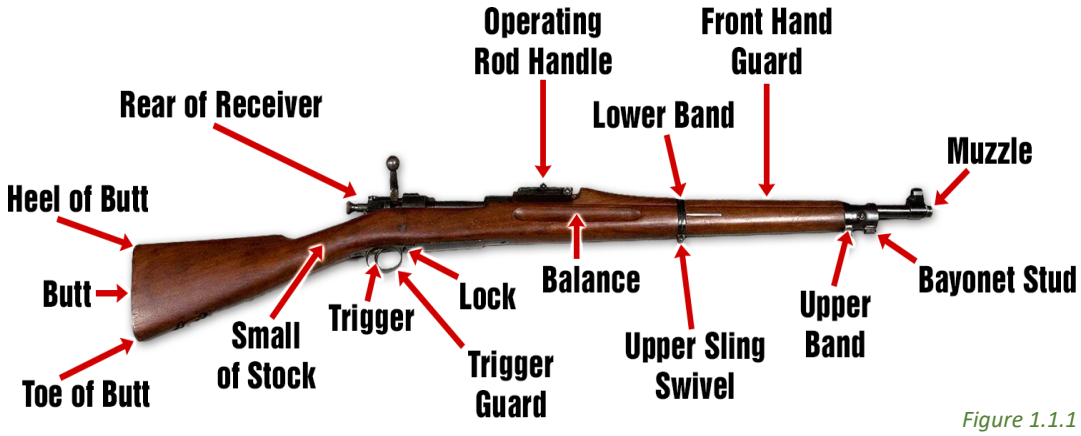


Figure 1.1.1

Executing drill with arms builds upon the same basic skills you learned in drill without arms. These drills and movements with arms, such as the M-1903 rifle, are important to master for use in ceremonies, reviews, and drill competitions. Correct execution with arms, combined with a lot of pride and practice on your part, can lead to a precision drill team.

This lesson introduces you to the procedures for executing the manual of arms with M-1903 rifle *(see Figure 1.1.1).* It will highlight the correct responses to commands for

Key words

port arms:
Movement to position rifle diagonally across body with right forearm horizontal and elbows at sides

sling:
Strap for carrying rifle over back and shoulder

butt:
Bottom end of the rifle stock designed to rest against shoulder

sight:
Front and rear plates used to align rifle with target

hand guard:
Protective grip forward of the rifle stock

lower band:
Metal band located halfway along rifle barrel

barrel:
Metal tube for aiming and firing ballistic projectile

Order Arms and *Rest, Present* and ***Port Arms****, Inspection Arms, Right* and *Left Shoulder Arms,* and ***Sling*** and *Unsling Arms.*

Content Enhancement:

DRILL TIPS

Use the following drill tips when executing drill with arms:

- At the *Halt*, your leader initiates all movements from *Order Arms*, which is the position at attention.
- Execute all precision movements in the cadence of *Quick Time*.
- The command "Port, ARMS" must be given prior to the command for double time.
- Execute facings, alignments, and short distance marching movements from *Order Arms*. When the leader commands these movements while you are at *Order Arms*, automatically raise your rifle about one inch off the ground on the command of execution. When you complete them, automatically return the weapon to *Order Arms.*
- Execute facing movements at *Order Arms* only. When you execute facings to establish the direction of march, do so before the command for the manual of arms. After you complete a marching movement, the leader commands "Order, ARMS" prior to the command for the facing movement.

Order Arms and Rest

ORDER ARMS POSITION WITH M-1903

Order Arms is the position of attention with the rifle *(see Figure 1.1.2).* Assume the position of *Order Arms* on the command of execution "ATTENTION" from any of the *Rest* positions, and from the commands "FALL IN" or "Order, ARMS," except from *Inspection Arms* or *Sling Arms*.

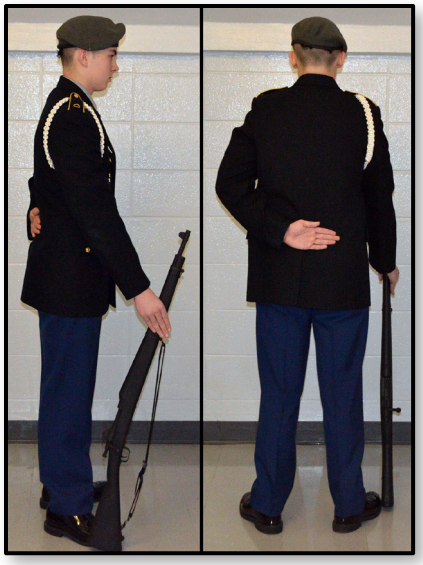
At "Order, ARMS," place the **butt** of the rifle on the ground, with the toe of the butt on line with the toe of your right shoe and touching it. Keep the rear **sight** to the rear. Secure the weapon with your right hand in a "U" formed by your fingers (extended and joined) and thumb. Hold the rifle by the **hand guard** just above the **lower band** of the **barrel**. Keep your right hand and arm behind the rifle so that your thumb is along the seam of your trousers.

Order Arms Figure 1.1.2

REST POSITION WITH M-1903

Your leaders command the *Rest* positions with the rifle and you execute them much the same as individual drill, with the following additions:

- On the command "Parade, REST," grasp the hand guard below the **upper band** and thrust the **muzzle** forward, keeping your right arm straight *(see Figure 1.1.3).*
- Execute *Stand at Ease* in the same manner as *Parade Rest* with the rifle, except turn your head and eyes toward the unit leader.
- On the commands of "AT EASE" or "REST," keep the butt of the rifle in place.



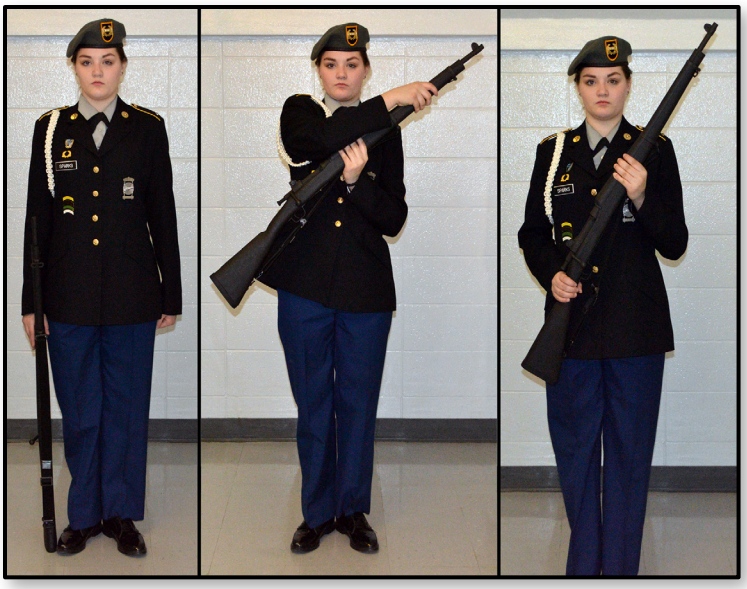
Parade Rest
Figure 1.1.3

Port and Present Arms

PORT ARMS FROM ORDER ARMS

Port Arms from Order Arms, is a two-count movement *(see Figure 1.1.4).* The command is "Port, ARMS."

- On the command of execution, grasp the hand guard of the weapon with your right hand and raise the weapon diagonally across your body. With the left hand, grasp the **balance** so that the rifle is approximately four inches from your belt. Hold your right elbow down without strain.
- On the second count, grasp the rifle again with the right hand at the small of the **stock**. Hold the rifle diagonally across your body with your right forearm horizontal and your elbows at your sides.



Port Arms from Order Arms
Figure 1.1.4

Key words

upper band:
Metal band located close to the muzzle of the barrel

muzzle:
The open end of the rifle barrel from which the bullet exits

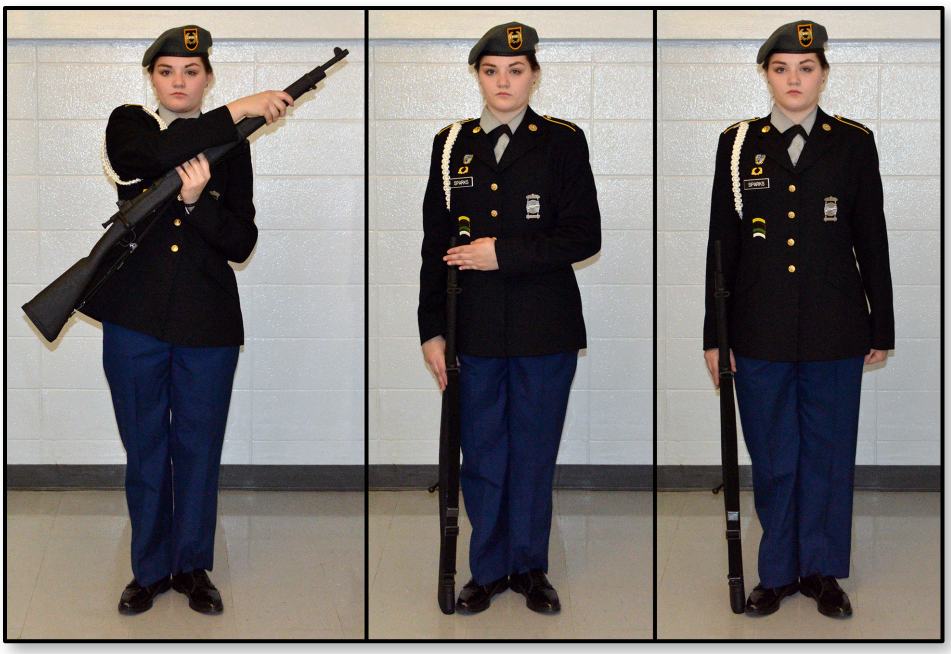
balance:
Position just forward of the magazine floor plate on the underside of the rifle stock

stock:
Part of a firearm where the barrel and lock are attached

ORDER ARMS FROM PORT ARMS

Execute *Order Arms from Port Arms* in three counts *(see Figure 1.1.5).* The command is "Order, ARMS."

- On the command of execution "ARMS", move your right hand up and across your body and grasp the hand guard firmly just above the lower band, without moving the weapon.
- On the second count, release the hand guard with your left hand and lower the rifle to your right side until it is approximately one inch from the ground. Guide the weapon to your side by placing the left hand at the upper band, fingers and thumb extended and joined, palm to the rear.
- On the third count, cut the left hand sharply to your side and lower the rifle gently to the ground, resuming the position of *Order Arms*.

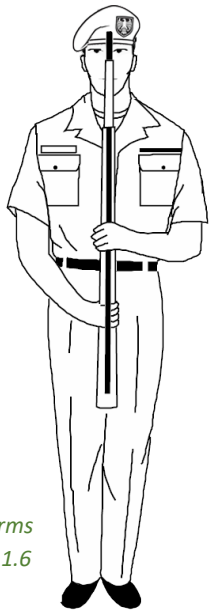


Order Arms from Port Arms
Figure 1.1.5

PRESENT ARMS FROM ORDER ARMS

Present Arms from Order Arms is a three-count movement. The command is "Present, ARMS."

- On the command of execution "ARMS", execute both movements of Port Arms for counts one and two.
- On the third count, twist the weapon with the right hand and move the weapon to a vertical position approximately four inches in front of and centered on your body. Lower the weapon until the left forearm is horizontal, keeping your elbows at your sides, as shown in *Figure 1.1.6.*



Present Arms from Order Arms
Figure 1.1.6

ORDER ARMS FROM PRESENT ARMS

Order Arms from Present Arms is a four-count movement. The command is "Order, ARMS."

- On the command of execution, return the weapon to *Port Arms*.
- Counts two, three, and four are the same as *Port Arms* to *Order Arms*.

You may also assume *Port Arms* on the way to or from *Present Arms from Right or Left Shoulder Arms*. *Present Arms*, from or to, *Port Arms*, is a one-count movement.

PRESENT ARMS RIFLE SALUTE

When rendering reports or courtesy to an individual from *Order Arms*, execute *Present Arms* as just mentioned, except turn your head and eyes toward the individual. Execute *Order Arms* automatically upon acknowledgment of the salute.

When rendering courtesy to an individual while marching with the weapon at *Right Shoulder Arms, Left Shoulder Arms*, or *Port Arms*, and not in formation, execute *Present Arms* and continue marching. Upon acknowledgment of the salute, automatically return to the original position.

Key words

bolt handle:
Lever mechanism for moving rifle bolt to open and close cartridge chamber

bolt:
Breeching mechanism for loading, locking, and removing cartridges from rear of barrel

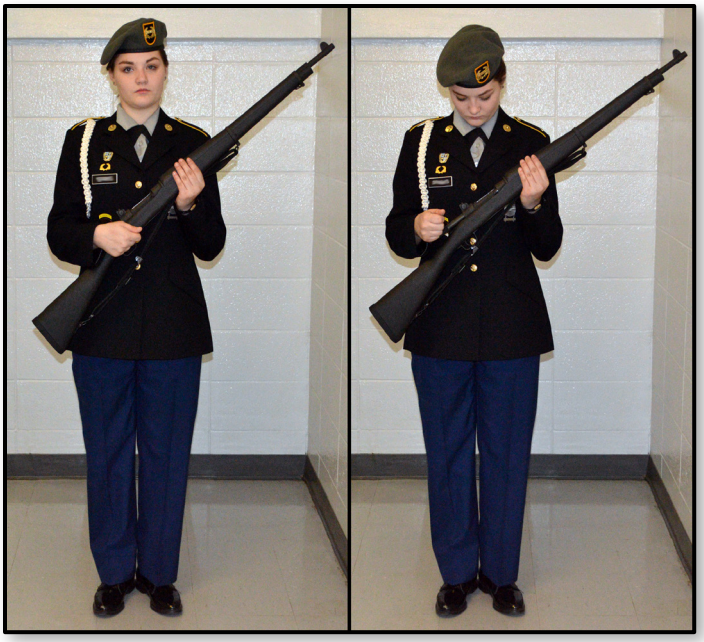
chamber:
Opening towards rear of barrel for inserting and removing cartridges

Inspection Arms

INSPECTION ARMS FROM ORDER ARMS

Inspection Arms from Order Arms is a three-count movement *(see Figure 1.1.7).* The command is "Inspection, ARMS."

- On the command of execution, execute *Port Arms* in two counts.
- On count three, release the small of the stock with your right hand and move the right hand forward, grasping the **bolt handle** with your thumb and forefinger. Turn the bolt handle up, draw the **bolt** back to the rear, and glance into the **chamber**. Raise your head and eyes back to the front. Continue to hold the bolt handle with your right hand.



Inspection Arms
Figure 1.1.7

Key words

trigger guard:
Metal strip surrounding trigger mechanism to prevent accidental firing

PORT ARMS FROM INSPECTION ARMS

The only command your leader may give from *Inspection Arms* is “Port, ARMS.”

- On the command “Port,” push the bolt forward, turn the bolt handle down, and grasp the rifle at the small of the stock, placing the index finger of the right hand on the **trigger guard**.
- On the command “ARMS,” pull the trigger and resume *Port Arms*.

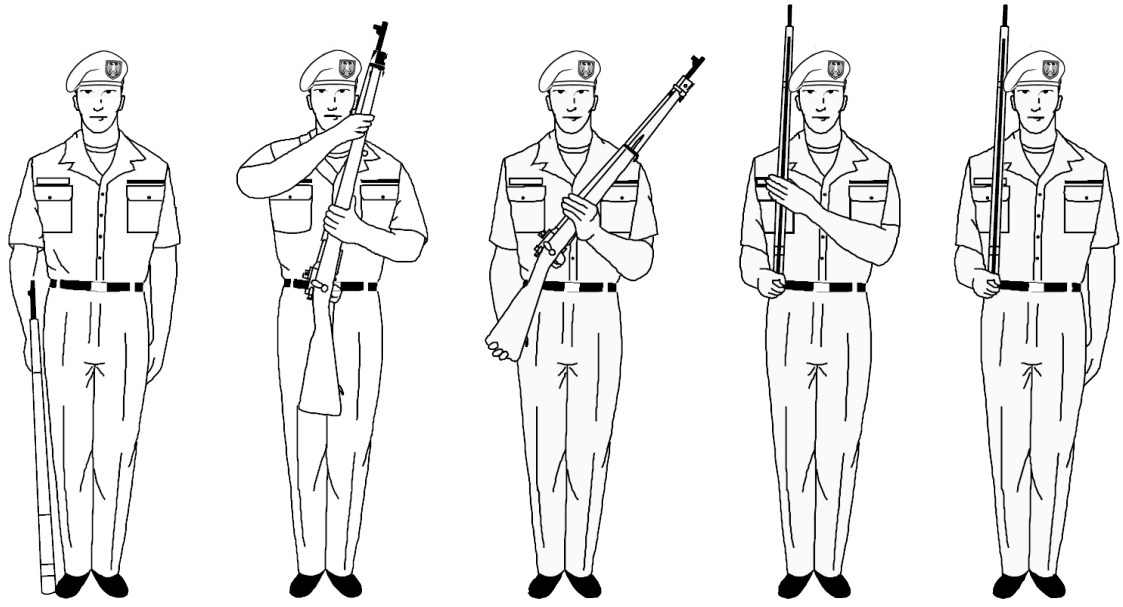
Right and Left Shoulder Arms

Shoulder Arms on the command "Right (Left) Shoulder, ARMS."

RIGHT SHOULDER ARMS FROM ORDER ARMS

Right Shoulder Arms from Order Arms, is a four-count movement *(see Figure 1.1.8).*

- On the command of execution, execute the same movements as for the first count of *Port Arms from Order Arms*.
- On the second count, release your right hand and grasp the heel of the butt of the rifle between your first two fingers, with your thumb and index finger touching.
- On the third count, twist the rifle with your right hand and place it on your right shoulder, not changing the grasp of your right hand. At the same time, move your left hand to the small of the stock and guide the rifle to your shoulder. Keep your fingers and thumb extended and joined, with your palm turned toward your body. The first joint of your left forefinger should touch the rear of the receiver. Keep your wrist straight and your left elbow down.
- On the fourth count, move your left hand back to your side as in the position of attention. Keep your right forearm horizontal with your right upper arm against your side and on line with your back.

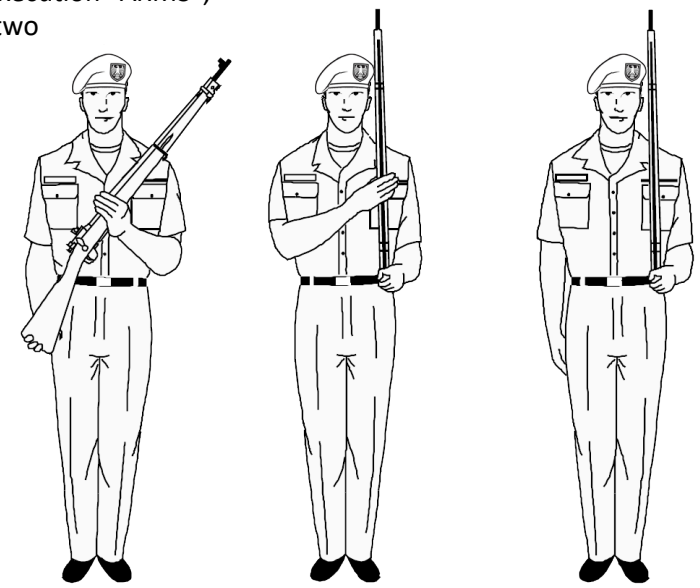


Right Shoulder Arms from Order Arms
Figure 1.1.8

LEFT SHOULDER ARMS FROM ORDER ARMS

Left Shoulder Arms from Order Arms is a four-count movement *(see Figure 1.1.9).*

- On the command of execution "ARMS", execute *Port Arms* in two counts.
- On the third count, release the grasp of your left hand and place the weapon on your left shoulder with your right hand, keeping your right elbow down. At the same time, grasp the butt with your left hand in the same manner as for *Right Shoulder Arms*.
- On the fourth count, lower your right hand smartly to your side to the position of attention.



Left Shoulder Arms from Order Arms
Figure 1.1.9

ORDER ARMS FROM LEFT SHOULDER ARMS

Order Arms from Left Shoulder Arms is a five-count movement.

- On the command of execution, move your right hand up and across your body and grasp the small of the stock, keeping your right elbow down.
- On the second count, release your left hand and carry the rifle diagonally across your body with your right hand. At the same time, grasp the rifle at the balance with your left hand, resuming *Port Arms*.
- Counts three to five are the same as *Order Arms from Port Arms*.

PORT ARMS TO RIGHT SHOULDER ARMS

Port Arms to Right Shoulder Arms is a three-count movement. The command is "Right Shoulder, ARMS." When marching, the leader gives the command as the right foot strikes the ground.

- On the command of execution, slide the right hand to the right and grasp the butt.
- Counts two and three are the same as counts three and four of *Right Shoulder Arms from Order Arms*.

PORT ARMS TO LEFT SHOULDER ARMS

Port Arms to Left Shoulder Arms is a two-count movement. The command is "Left Shoulder, ARMS." When marching, the leader gives the command as the left foot strikes the ground.

- On the command of execution, execute *Left Shoulder Arms* in the same manner as counts three and four from *Order Arms*.

RIGHT SHOULDER ARMS TO LEFT SHOULDER ARMS

Right Shoulder Arms to Left Shoulder Arms is a four-count movement. The command is "Left Shoulder, ARMS." When marching, give the command as the left foot strikes the ground.

- On the command of execution, execute the first count the same as in *Order Arms*.
- On count two, release the butt of the weapon with the right hand and grasp the small of the stock as in *Port Arms*.
- Counts three and four are the same as *Left Shoulder Arms from Port Arms*.

LEFT SHOULDER ARMS TO RIGHT SHOULDER ARMS

Left Shoulder Arms to Right Shoulder Arms is a five-count movement. The command is "Right Shoulder, ARMS." When marching, the leader gives the command as the right foot strikes the ground.

- On the command of execution, execute *Port Arms* in two counts.
- Counts three, four, and five are the same as *Right Shoulder Arms from Port Arms*.

PRESENT ARMS FROM RIGHT (LEFT) SHOULDER ARMS

You execute *Present Arms from Right (Left) Shoulder Arms* while in formation from the *Halt* only.

- On the command of execution, assume *Port Arms* from either shoulder.
- Next, execute *Present Arms* in one count from *Port Arms*.

RIGHT (LEFT) SHOULDER ARMS FROM PRESENT ARMS

To resume *Right (Left) Shoulder Arms from Present Arms*:

- On the command of execution, execute *Port Arms* in one count.
- Next, execute the counts as prescribed from *Port Arms*.

Figure 1.1.10

Sling and Unsling Arms

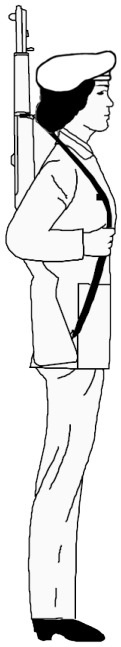
Figure 1.1.11

Performing drill with a rifle takes practice and coordination. Many of the positions and movements you just learned with the sling of your M-1903 rifle can be done with the sling loose. Knowing how to drill with your rifle when the sling is loose is equally important in being a sharp drill unit.

SLING ARMS

From the *Order Arms* position with the rifle slings tight, the command for *Sling Arms* is "Sling, ARMS."

- On the command of execution, raise the weapon vertically and place the rifle butt on your right hip.
- Cradle the weapon with your right arm, and with both hands loosen the **keeper** and adjust the sling.
- After the sling is adjusted, sling the weapon on your right shoulder in the most convenient manner. Assume the position of attention by grasping the sling with your right hand, and by keeping your right forearm horizontal and the weapon vertical. If the sling is already loose, sling the weapon in the most convenient manner *(see Figure 1.1.12).*



Sling Arms
Figure 1.1.12

UNSLING ARMS

To return the weapon to the *Order Arms* position, the command is "Unsling, ARMS."

- On the command of execution, reach across the body with the left hand and grasp the sling at the shoulder. Unsling the weapon in the most convenient manner.
- Assume the *Order Arms* position.

If the leader desires the sling to be tightened, they command "Adjust, SLINGS."

- On the command of execution, unsling and cradle the weapon.
- Adjust the sling.
- Assume the *Order Arms* position.

If you are already at *Order Arms* with a loose sling when the leader commands "Adjust, SLINGS," immediately cradle the rifle, adjust the sling, and return to *Order Arms*.

Key words

keeper:
Slide for adjusting slack in the rifle sling

SALUTING WHILE AT SLING ARMS

To salute while at *Sling Arms*, the command is "Present, ARMS."

- On the command of execution, reach across your body with your left hand and grasp the sling just above the right hand.
- Release your right hand and execute the hand salute *(see Figure 1.1.13).*

To end the hand salute, the leader commands "Order, ARMS."

- On the command of execution, lower your right hand sharply to your side and grasp the sling at the original position.
- After grasping the sling with your right hand, release it with your left hand, returning it smartly to your left side as in the position of attention.

Figure 1.1.13

Content Enhancement:

DRILL TIPS FOR THE SLING

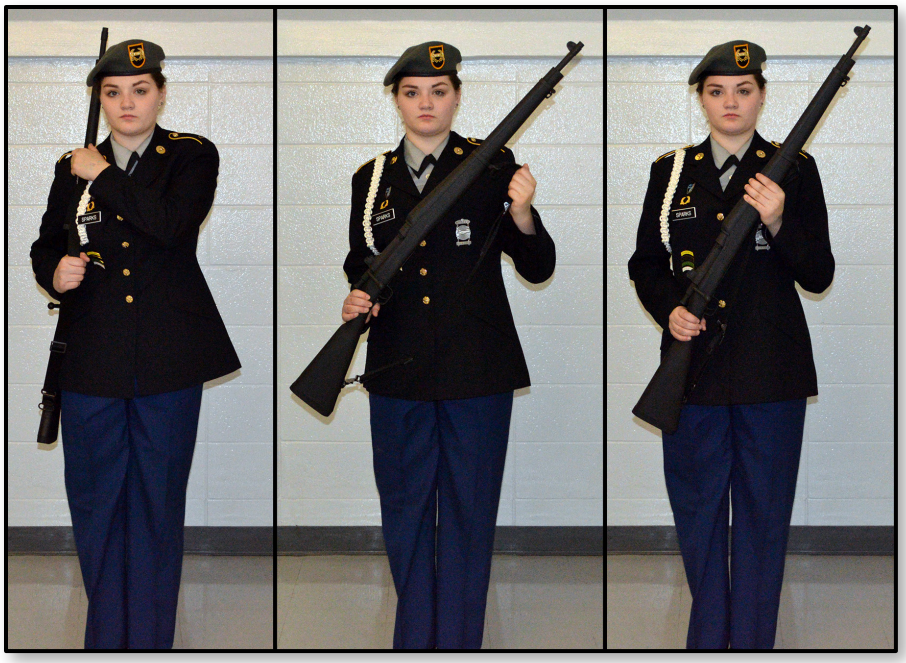
- All individual or unit drill movements can be executed while at *Sling Arms*.
- Remain at *Sling Arms* during all *Rest* movements.
- When in formation at *Sling Arms*, execute the hand salute on the command "Present, ARMS."
- When acting as a platoon leader or platoon sergeant, carry your weapon at *Sling Arms* during all drills and ceremonies. This also applies to acting squad leaders when their squads drill as separate units.
- When all members of a unit are carrying their weapons at *Sling Arms*, only the platoon leaders and platoon sergeants execute *Present Arms*. They do not execute *Unsling Arms*.
- When rendering reports or courtesy to an individual while at *Sling Arms*, use the same rules that apply to the hand salute in stationary drill.

Figure 1.1.14

EXECUTING PORT ARMS FROM SLING ARMS

The command for this movement is "Port, ARMS."

- On the command of execution, reach across the body with your left hand and grasp the sling at the shoulder.
- Lift the weapon by the sling, swing it to the front of your body, and grasp the small of the stock with your right hand.
- Release the sling and grasp the weapon at the balance with your left hand, keeping your elbows at your sides with the right forearm horizontal *(see Figure 1.1.15).*



Port Arms from Sling Arms
Figure 1.1.15

SLING ARMS FROM PORT ARMS

Resume *Sling Arms* on the command of "Sling, ARMS."

- On the command of execution, grasp the sling near the upper **sling swivel** with your left hand.
- Release the right hand and swing the weapon back onto your shoulder by inserting the right arm through the sling, immediately resuming the position of *Sling Arms*.

EXECUTING INSPECTION ARMS FROM SLING ARMS

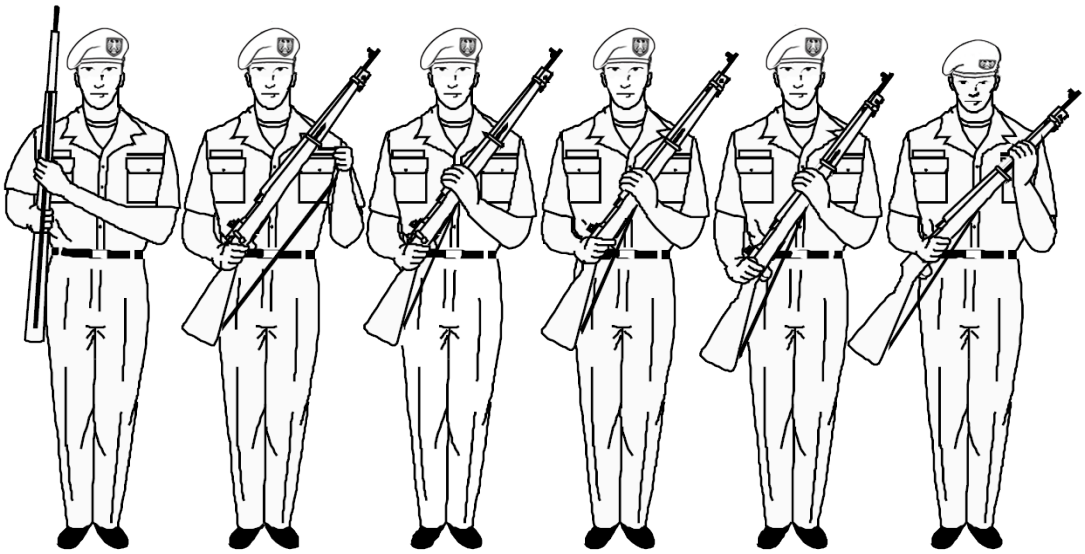
The command for this movement is "Inspection, ARMS."

- On the command of execution, first execute *Port Arms* (in the same manner as you did with the sling tight).
- Then, execute count three in the same manner as *Inspection Arms from Order Arms (see Figure 1.1.16 on next page).*

To resume *Sling Arms*, use the same procedures as described above for *Port Arms*.

Key words

sling swivel:
Metal loop for connecting sling to stock



Inspection Arms from Sling Arms
Figure 1.1.16

15-Count Manual of Arms

Experienced Cadets should be able to execute the 15-count manual of arms in unison: from *Order Arms*, to *Right Shoulder Arms*, to *Left Shoulder Arms*, to *Present Arms*, to *Order Arms*. The command is "Fifteen-Count Manual, ARMS."

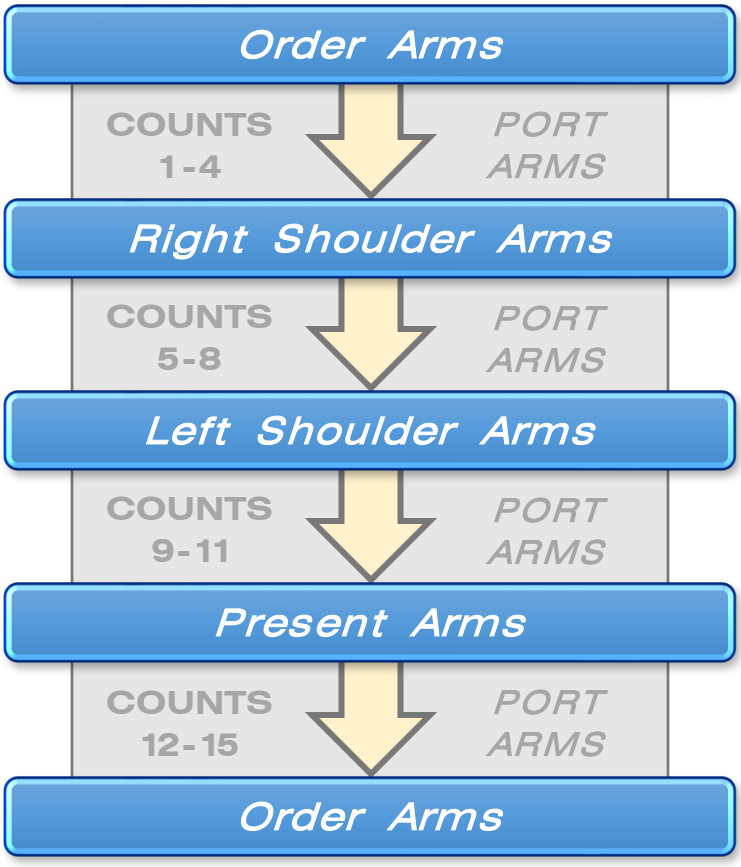


Figure 1.1.17

Conclusion

This lesson covered the procedures for executing the manual of arms with the M-1903 rifle while at *Sling Arms* and when carrying it with the sling tight. Precise drill movements with a weapon require a lot of practice and hard work, but the outcome may be rewarding for you and your Cadet Battalion: winning local, state, and/or national drill competitions. Take a moment to look at a video of the national drill competitions held at Daytona Beach, a news video of the "Old Guard" as members from that unit guard the Tomb of the Unknown Soldier, or the opening of the movie "A Few Good Men" to see firsthand examples of just how good precision drill can be.

Lesson Check-up

- **What are the correct movements for *Order Arms*?**
- **What are the correct movements for *Present Arms*?**
- **What are the correct movements for *Inspection Arms*?**
- **What are the correct movements for *Right Shoulder Arms*?**

LESSON 2

The Saber and the Scabbard

Key words

- **cant**
- **guard**
- **pistol belt**
- **port**
- **saber**
- **scabbard**

What You Will Learn to Do

Execute the manual of arms with the saber

Linked Core Abilities

- Communicate using verbal, non-verbal, visual, and written techniques
- Take responsibility for your actions and choices

Learning Objectives

- **Describe** the parts of a saber and a scabbard
- **Explain** the proper way to wear the saber
- **Describe** the correct responses to commands for the standing manual of arms
- **Describe** the correct responses to commands for the marching manual of arms
- **Define** key words: cant, guard, pistol belt, port, saber, scabbard

Essential Question

What are the correct procedures for executing the manual of arms for the saber?

This lesson uses content from "U.S. Army TC 3-21.5" dated 20 January 2012. Refer to this Training Circular for more information on Saber Drill.

Introduction

This lesson introduces you to the manual of arms for the **saber**. After you have mastered these procedures, you will have added another important skill to your knowledge as a drill leader and as a Cadet officer in JROTC. You will be able to demonstrate this skill during ceremonies or competitions for your Cadet Battalion.

Figure 1.2.1

Key words

saber:
A heavy cavalry sword with a one-edged, slightly curved blade

pistol belt:
Heavy duty belt for attaching weapons and ammunition at the waist

scabbard:
Sheath for a sword, dagger, or bayonet

guard:
Protective handle cover

The Saber and Scabbard

Cadet officers who participate in ceremonies with Cadets under arms may be able to wear the saber. The saber, shown in *Figure 1.2.2*, is carried on the left side of the body and attached to the **pistol belt** by the **scabbard** chain with the **guard** of the saber to the rear. When removed from the protective scabbard, the saber should be handled carefully to avoid injury. While using a saber, remember that precise execution of it enhances the status of the wearer. Poor or inexact execution, however, is particularly obvious at ceremonies.

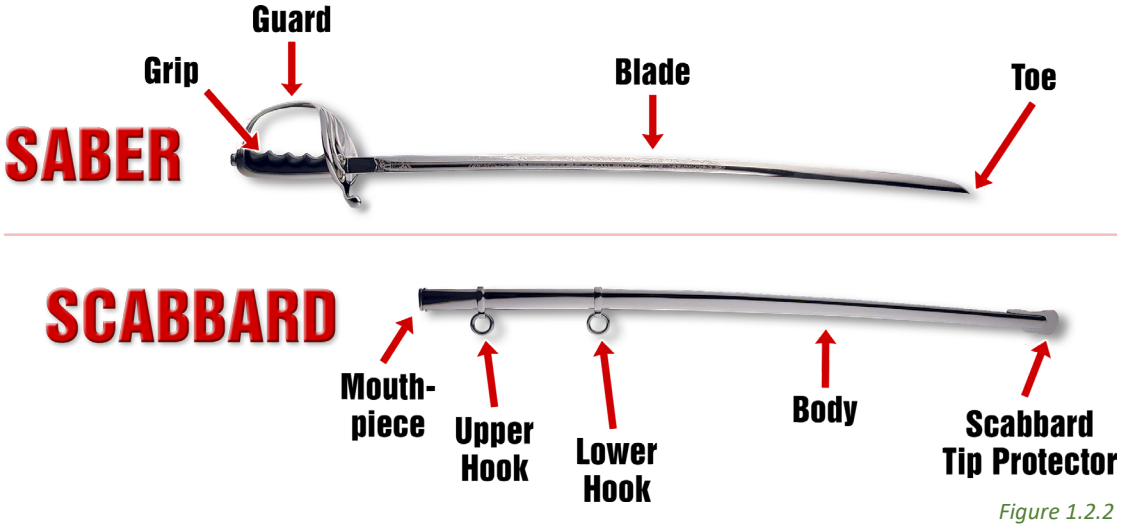


Figure 1.2.2

The infantry, revolutionary saber is slightly different than the infantry sword *(Figure 1.2.3)*. The infantry sword is carried by platoon sergeants and first sergeants during ceremonies with Cadets under arms. Although the manual of arms for the saber and sword are the same, we will refer only to the saber for the remainder of this lesson.

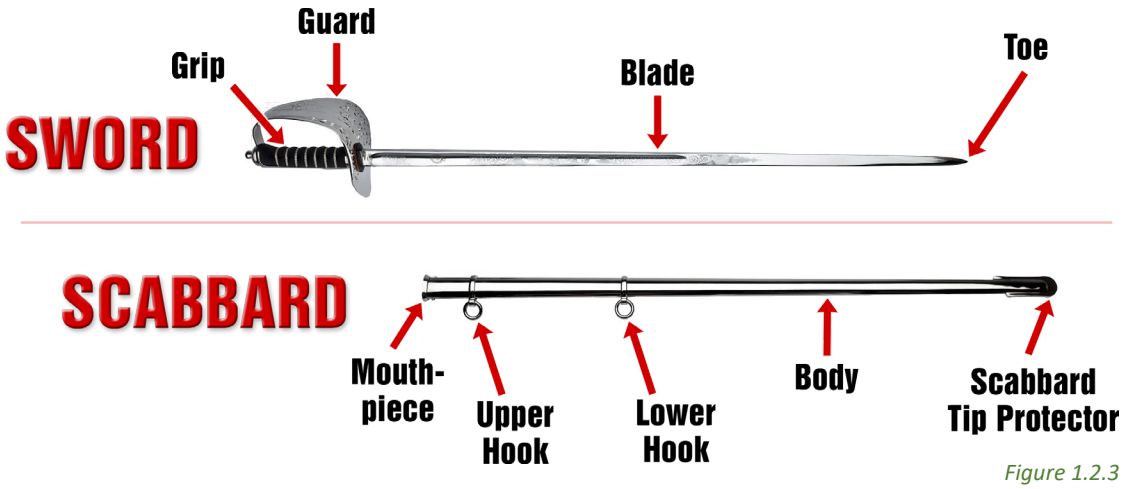


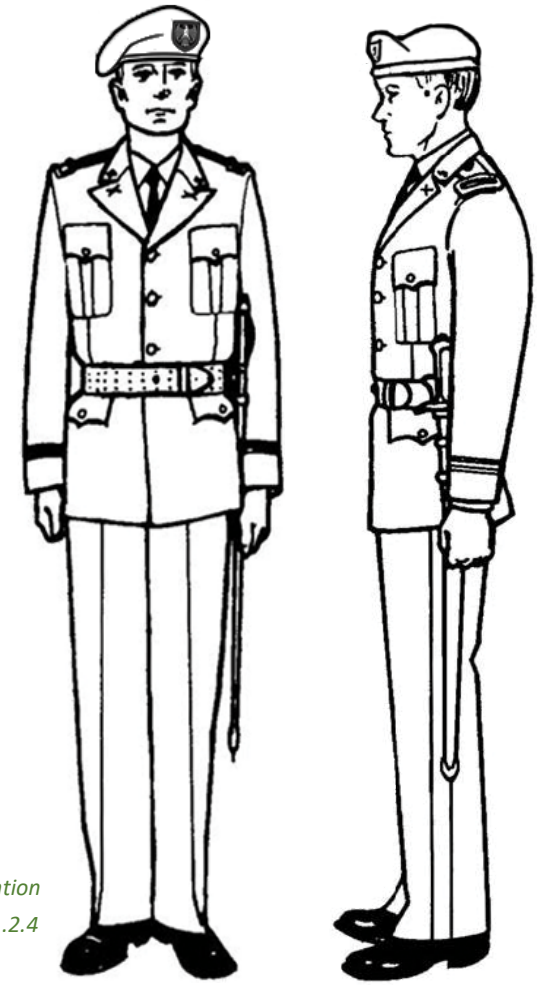
Figure 1.2.3

Standing Manual of Arms

Execute standing with the saber using the procedures described in the following sections.

ATTENTION

When in formation, assume the *Position of Attention* before the command "Draw, SABER" and after the command "Return, SABER." Place your hands behind the trouser seams with the thumbs touching the first joint of the forefingers *(see Figure 1.2.4).*



Standing at Attention

Figure 1.2.4

DRAW SABER

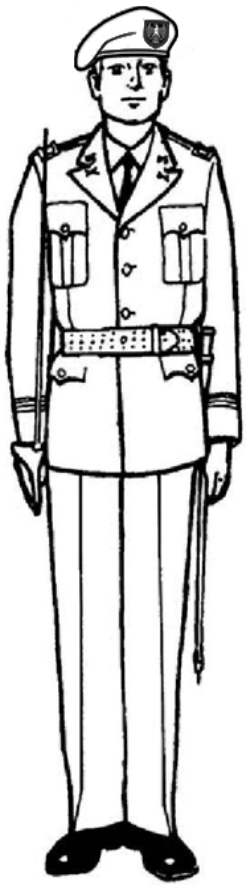
On the preparatory command "Draw," grasp the scabbard with the left hand and turn it clockwise 180 degrees, tilting it forward to form an angle of 45 degrees with the ground. Take the saber grip in the right hand and pull the saber about six inches from the scabbard. The right forearm should now be roughly parallel to the ground *(see Figure 1.2.5)*.

On the command of execution "SABER," pull the saber out of the scabbard and hold it in a *Carry Saber* position. Hold the saber with the inner blade-edge riding in a vertical position along the forward tip of the right shoulder *(see Figure 1.2.6 below)*.

Draw Saber
Figure 1.2.5

CARRY SABER

To execute *Carry Saber*, the Cadet officer must first be at the *Position of Attention*. Hold the saber in the right hand keeping the wrist as straight as possible with the thumb along the seam of the trouser leg. Ensure that the point of the blade rests inside the point of the right shoulder and not along the arm. Hold the saber in this position with the thumb and forefinger grasping the grip. Steady the saber with the second finger behind the grip.



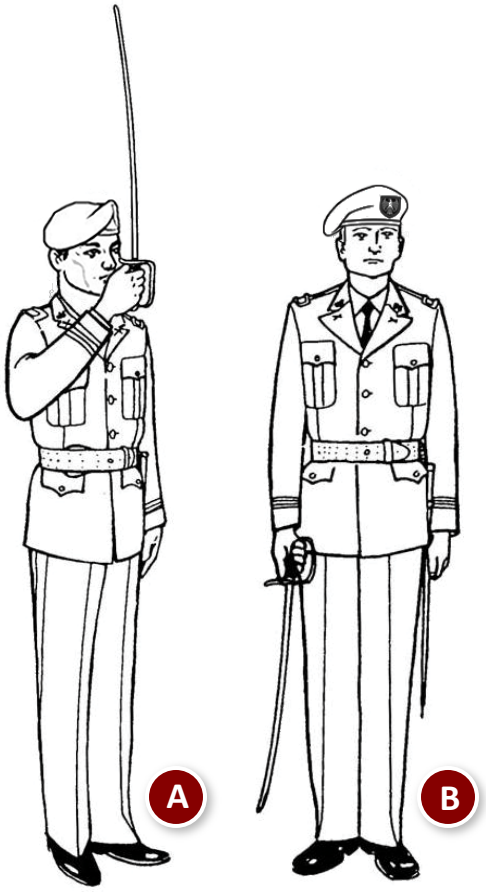
Carry Saber
Figure 1.2.6

Content Enhancement:

CARRY SABER POSITION

You will want to assume the *Carry Saber* position:

1. When giving commands
2. When changing positions
3. When officially addressing (or when officially addressed by) another officer, if the saber is drawn
4. Before returning the saber to the scabbard
5. When giving the preparatory command for—and while marching at—*Quick Time*



Present Saber (Present Arms)

Figure 1.2.7

PRESENT SABER (PRESENT ARMS)

Execute *Present Saber* from the carry position when serving in the capacity of commander-of-troops or in a command that is not a part of a larger unit. On the preparatory command of "Present," of the command "Present, ARMS," bring the grip of the saber to a position approximately four inches from the nose (at the rate of two counts). Hold the saber outward so that the toe is approximately six inches from the vertical *(Figure 1.2.7a)*.

On the command of execution "ARMS," lower the right hand (at the rate of two counts) with the flat of the blade upward, the thumb extended on the left side of the grip, and the toe of the saber about six inches from the marching surface *(Figure 1.2.7b)*.

Note: When *not* in formation, keep the saber in its scabbard and use the hand salute.

ORDER ARMS

On the command "Order, ARMS," return the saber to the *Carry Saber* position *(see Figure 1.2.6 on previous page).* Ensure that whenever the saber is at the *Order Arms* position, it is straight and not at an angle inward or outward in relationship to the body.

PARADE REST

Assume this position without moving the saber from the *Order Arms* position. At the command of execution, move the left foot about 10 inches to the left of the right foot, and place the left hand in the small of the back, fingers extended and joined, palm to the rear *(see Figure 1.2.8)*. On the command of execution "ATTENTION," return the left hand and foot to the *Position of Attention*.

Parade Rest

Figure 1.2.8

RETURN SABER

Execute *Return Saber* from *Carry Saber* in three counts.

1. On the preparatory command "Return" of the command "Officers, Return, SABER," bring the saber to a vertical position along the left shoulder. Hold the forearm (wrist) parallel to the marching surface about three inches from the body with the guard pointed to the left *(see Figure 1.2.9a on next page)*.

2. On the command of execution "SABER," three actions take place simultaneously:
   - Pivot the saber downward toward the guard.
   - At the same time, grasp the scabbard with the left hand just above the upper hook.
   - Tilt it forward and turn it clockwise 180 degrees.
   - The scabbard should form a 45-degree angle with the ground, and the saber bearer turns their head to the left and looks down to observe the mouthpiece of the scabbard (the shoulders remain squared to the front and level). As smoothly and as quickly as possible, insert the saber in the scabbard and stop so that about 12 inches of the blade is showing. The right forearm (wrist) should be horizontal to the marching surface and three inches from the body *(Figure 1.2.9b)*.

Return Saber
Figure 1.2.9

3. At the command of execution "CUT" of the command "Ready, CUT," thrust the saber smartly into the scabbard. Rotate the scabbard so that its tip protector is forward; then come to *Attention (Figure 1.2.9c)*.

Marching Manual of Arms

While marching, carry the saber with the inner blade-edge riding in a vertical position along the forward tip of the right shoulder, as shown in *Figure 1.2.11 on the following page*.

EYES RIGHT WHILE MARCHING

Execute *Eyes Right* while marching at *Carry Saber (see Figure 1.2.10).* Give the command "Ready" as the right foot strikes the marching surface (no action is taken).

> **Note:** You only use the initial preparatory command "Ready" when marching with a guidon bearer.

The second time the right foot strikes the marching surface, give the command "Eyes" and bring the saber to the count one position of *Present Arms* (or *Present Saber*). No action is taken the third time the right foot strikes the marching surface. The fourth time the right foot strikes the marching surface, give the

Eyes Right While Marching
Figure 1.2.10

command “RIGHT.” As that foot strikes the surface, turn your head sharply to the right at a 45-degree angle and bring the saber downward.

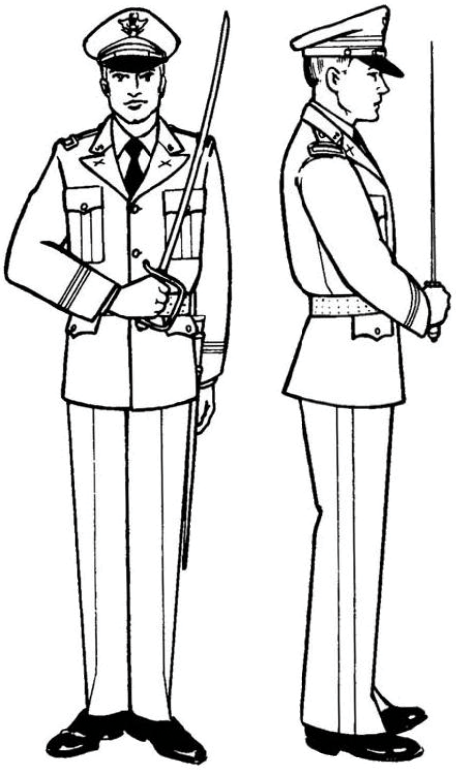
While marching at *Present Saber*, swing the right arm naturally (nine inches to the front and six inches to the rear) in a vertical plane, flexing the wrist to keep the toe of the blade level (about six inches) above the marching surface. This requires extending the wrist on the forward movement and elevating the wrist on the rearward movement.

READY FRONT WHILE MARCHING

Execute *Ready Front* by first giving the command “Ready.” As the right foot strikes the marching surface (no action is taken). The second time the right foot strikes the marching surface, give the command “Ready” a second time (again, no action is taken). Return the saber to the *Order* position while maintaining a natural arm swing as the right foot strikes the marching surface the third time. The fourth time the right foot strikes the marching surface, give the command “FRONT.” Turn your head sharply to the front as the right foot strikes the surface, and return the saber to the *Carry* position the next time the left foot strikes the marching surface.

Carry Saber Position While Marching

Figure 1.2.11



Port Arms

Figure 1.2.12

PORT ARMS

Execute ***Port*** *Arms* on the preparatory command “Double Time” of the command “Double Time, MARCH.” Assume this position only from the *Carry Saber* position. Swing the right arm naturally across and six inches in front of the body. **Cant** the saber 45 degrees from the vertical with the guard pointed to the left. The left hand grasps the scabbard *(see Figure 1.2.12).*

Exercise extreme caution when double timing with the saber in the *Port Arms* position. To end the double-time cadence, command “Quick Time, MARCH,” and return the saber to the *Carry* position.

Key words

port:
To turn or put to the left

cant:
Tilt or angle

Conclusion

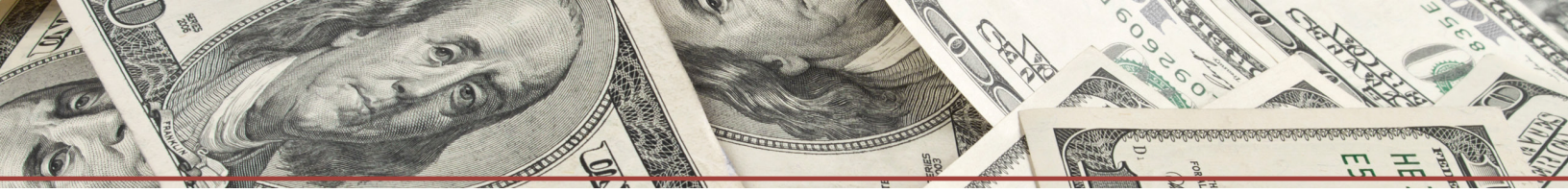
Saber drill distinguishes the key positions within a formation, enhances the leadership status of the saber bearer, and increases the showmanship of drill. It is important to correctly drill with the saber since poor or inexact execution is particularly obvious at ceremonies.

Lesson Check-up

- **What are the correct movements to "Draw, SABER?"**
- **What are the correct movements for "Present, ARMS?"**
- **What are the correct movements to "Return, SABER?"**
- **What is the correct position to carry a saber while marching?**

CHAPTER 2

Figure 2.0



NEFE® HIGH SCHOOL FINANCIAL PLANNING PROGRAM

Chapter Outline

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NEFE® – Introduction: Setting Financial Goals

Key words

- delayed gratification
- goal
- needs
- SMART goals
- values
- wants

What You Will Learn to Do

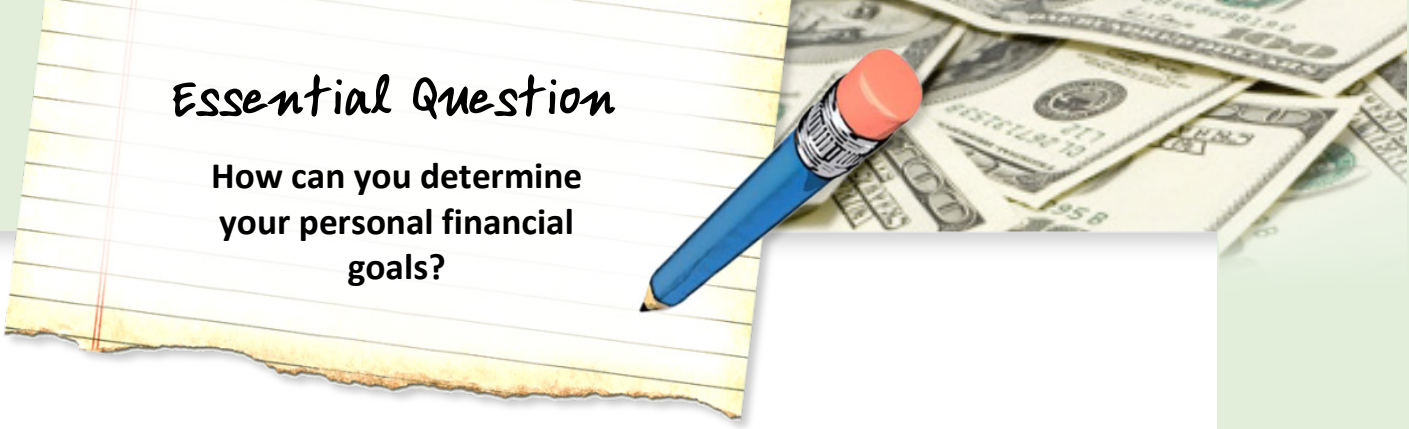
Determine personal financial goals

Linked Core Abilities

- Take responsibility for your actions and choices

Learning Objectives

- **Differentiate** between Wants vs. Needs
- **Describe** how values can influence decisions
- **Compare** SMART (Specific, Measurable, Attainable, Relevant & Time-bound) goals
- **Discuss** how goals impact actions
- **Define** key words: delayed gratification, goal, needs, SMART goals, values, wants



Introduction

Do you ever find that you don't have enough money to buy something or participate in an activity? You may have already found that you need to make choices because your cash supply is limited. In this lesson, you will compare your wants and needs. You will also set personal financial goals as the first step in creating your own financial plan.

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NEFE® – Your Financial Plan: Where It All Begins

Key words

- **cash flow**
- **decision-making**
- **opportunity cost**
- **restraint**

What You Will Learn to Do

Plan personal financial goals

Linked Core Abilities

- Take responsibility for your actions and choices

Learning Objectives

- **List** SMART goal elements
- **Explain** the purpose of a tracking your expenses
- **Discuss** what influences financial decisions
- **Describe** the DECIDE method
- **Define** key words: cash flow, decision-making, opportunity cost, restraint

Essential Question

How can you plan to meet future financial goals?

Introduction

Many people find worrying about money to be very stressful. However, with planning, you can reduce your money worries. Financial planning will help you have cash available to see a movie when you want to, buy new tires for your car, or someday buy furniture for your apartment. In this lesson, you will review your personal financial goals and create a plan to reach those goals.

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LESSON 3

NEFE® – Budgeting: Making the Most of Your Money

Key words

- budget
- expenses
- federal income tax
- fixed expenses
- gross income
- income
- Medicare tax
- net income
- payroll deductions
- P.Y.F.
- Social Security tax
- state income tax
- taxes
- variable expense

What You Will Learn to Do

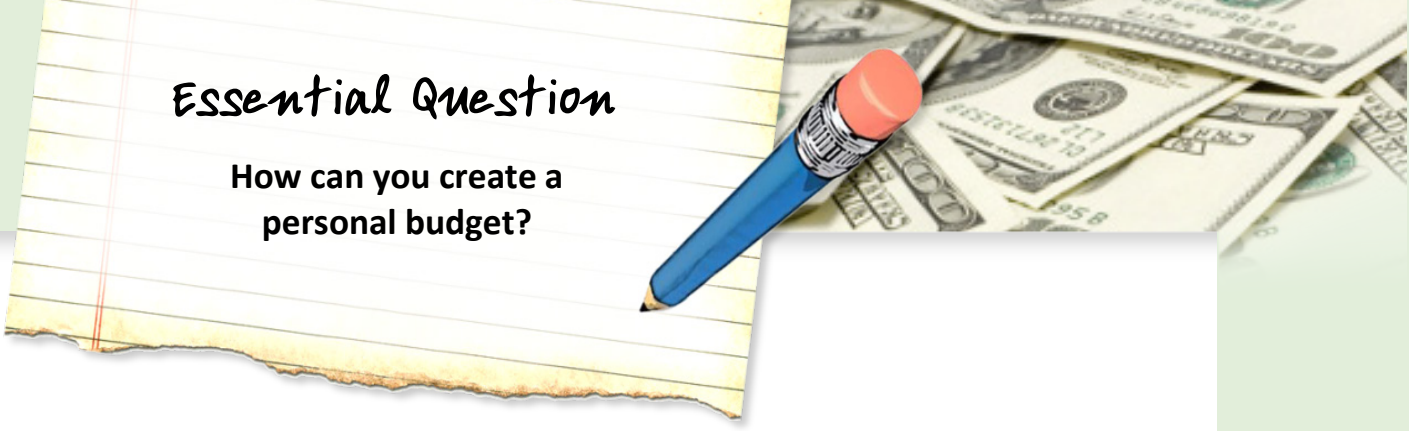
Outline a personal budget

Linked Core Abilities

- Take responsibility for your actions and choices

Learning Objectives

- **Identify** the purpose of a budget
- **Determine** resources available for financial objectives
- **Explain** how to construct a simple budget
- **Define** key words: budget, expenses, federal income tax, fixed expenses, gross income, income, Medicare tax, net income, payroll deductions, P.Y.F., Social Security tax, state income tax, taxes, variable expense



Introduction

What do you spend your money on? Do you take in more money than you spend, or do you find yourself needing to borrow money to make purchases? A budget is a useful way to help you identify where your money goes and figure out how to make the most of it. When you are in control of your spending, you are able to make your money work for you. In this lesson, you will create a personal budget that will match your financial goals.

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NEFE® – Investing: Making Your Money Work for You

Key words

- bond
- compounding
- dividend
- inflation rate
- investing
- mutual fund
- stock
- time value of money

What You Will Learn to Do

Forecast personal savings and investments

Linked Core Abilities

- Take responsibility for your actions and choices

Learning Objectives

- **Describe** reasons for saving and investing
- **Describe** how time, money, and rate of interest relate to meeting specific financial goals
- **Describe** basic investment principles
- **Describe** various savings and investment alternatives
- **Define** key words: bond, compounding, dividend, inflation rate, investing, mutual fund, stock, time value of money

Introduction

You can earn money by working or receiving it as a gift. Another way to earn money is to make your money work for you. You can earn interest on savings or receive earnings from investments. In this lesson, you will examine different ways to put your money to work by saving and investing. You will also consider saving and investing habits that will help you meet your financial goals.

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NEFE® – Good Debt, Bad Debt: Using Credit Wisely

What You Will Learn to Do

Appraise personal credit worthiness

Linked Core Abilities

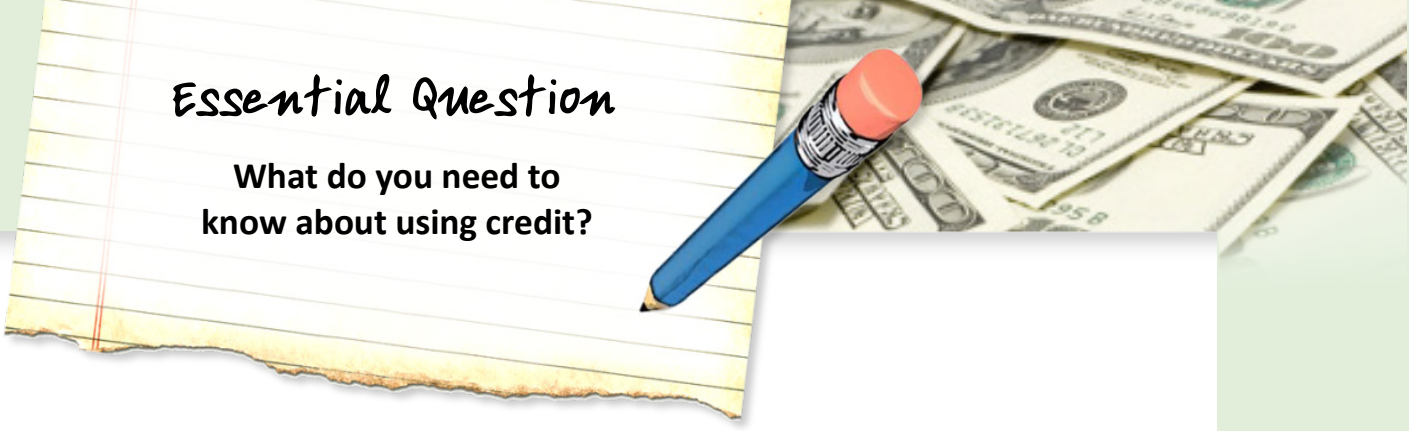
- Take responsibility for your actions and choices

Learning Objectives

- **Identify** the advantages of using credit
- **Identify** the various costs related to credit
- **Compare** common sources for building credit
- **Discuss** the factors to consider to establish credit
- **Define** key words: annual fee, annual percentage rate (APR), bankruptcy, credit, credit history, credit report, debt, finance charge, grace period, interest, loan term

Key words

- **annual fee**
- **annual percentage rate (APR)**
- **bankruptcy**
- **credit**
- **credit history**
- **credit report**
- **debt**
- **finance charge**
- **grace period**
- **interest**
- **loan term**



Introduction

Think of a time you borrowed money from a friend or family member. Were you able to build a good borrowing reputation by promptly repaying the money? Were the terms to repay the money fair? When you are in a situation where you need to make a large purchase such as a car, you might need to borrow money from a bank or other financial institution. To use this type of credit wisely and avoid problems, you need to know what is involved. In this lesson, you will explore ways to use credit. You will also consider the rights and responsibilities of using credit.

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NEFE® – Insurance: Protecting What You Have

When you're young and healthy, owning insurance doesn't seem like it should be a high priority. The chances of something bad happening seem remote, and you'd rather not think about that anyway. But misfortune does happen - to expensive things. So everybody needs to think about insurance.

Key words

- **deductible**
- **insurance**
- **insurance premium**
- **risk management**

What You Will Learn to Do

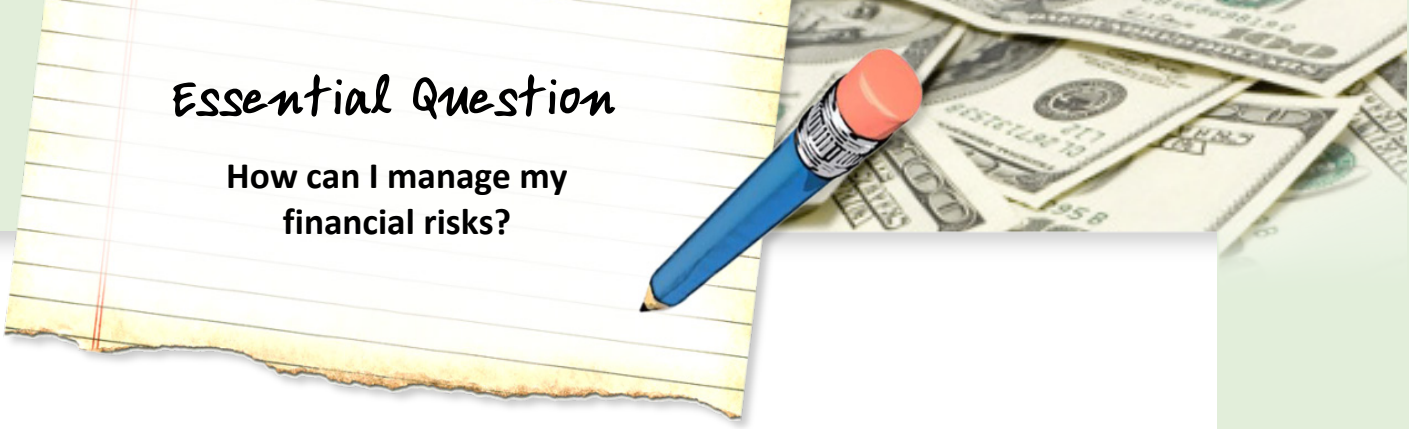
Relate insurance to current and future personal needs

Linked Core Abilities

- Take responsibility for your actions and choices

Learning Objectives

- **Determine** ways that teens face risks which can lead to costly consequences
- **Describe** how to get insurance coverage
- **Give** examples of information provided in the insurance policy
- **Define** key words: deductible, insurance, insurance premium, risk management



Essential Question

How can I manage my financial risks?

Introduction

Have you ever been injured, in an accident, or had property damaged? Chances are someone had to pay for those unexpected medical bills or costs for repairs. People use insurance as a way to protect themselves from unexpected losses. In this lesson, you will explore how different types of insurance protect you from losses.

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CHAPTER 3

Figure 3.0

FIRST AID

FIRST AID KIT

Chapter Outline

Hygiene and Sanitation in the Field

Key words

- ampule
- bivouac
- chlorine
- disinfect
- dysentery
- galvanized
- hygiene
- iodine
- lice
- personal hygiene
- purified
- sanitation

What You Will Learn to Do

Analyze the impact sanitation and hygiene has on health when camping

Linked Core Abilities

- Communicate using verbal, non-verbal, visual, and written techniques
- Do your share as a good citizen in your school, community, country, and the world

Learning Objectives

- **Recognize** the benefits of maintaining good hygiene habits
- **Explain** how to keep clean in field conditions
- **Explain** the correlation between physical fitness and hygiene
- **Identify** possible results of poor sanitation
- **Detail** procedures for disinfecting water
- **Explain** how to guard against food poisoning and the spread of germs through waste

Essential Question

How can JROTC Cadets maintain good hygiene and sanitation habits in the field?

Learning Objectives (cont'd)

- **Define** key words: ampule, bivouac, chlorine, disinfect, dysentery, galvanized, hygiene, iodine, lice, personal hygiene, purified, sanitation

Introduction

Exercise, rest, good **hygiene**, and adequate nutrition can help you stay healthy and avoid many illnesses and infections. In other words, you can prevent disease and injury by taking good care of yourself. You learned about the importance of nutrition and exercise to your health in a previous lesson. This section covers the importance of good hygiene habits. In particular, it discusses hygiene and **sanitation** when attending JROTC summer camp or camping on your own.

In these cases, you may not have the modern conveniences of clean, running water, or indoor plumbing. However, you must still know how to take care of yourself to help prevent illness and maintain good health.

Figure 3.1.1

Key words

hygiene:
Practices or conditions that aid in good health; the science that deals with maintenance of good health and the prevention of infection and disease

sanitation:
The promotion of hygiene and prevention of disease by working to keep a clean and healthy environment

Personal Hygiene

Most likely, there are certain habits you perform routinely at the start of each day. You are probably so accustomed to doing them that you do not give them a second thought. First, you wake up after resting your body during the night. Then, you shower if you did not shower the night before, wash your face, and comb your hair. You then eat breakfast—some toast and cereal perhaps. And, finally, you brush your teeth and leave for school.

All of the above activities involve rest, nutrition, and cleanliness—the three elements important to maintaining good health and **personal hygiene**.

It is easy for most of us to practice personal hygiene in our homes where there are sinks, showers, toilets, and clean water, all of which help with sanitation. In some situations, however, practicing personal hygiene and maintaining sanitary conditions take more effort and require greater care. For example, if you are camping, you may have to work harder at hygiene and sanitation depending on conditions at your campsite. Also, when you are staying in close quarters with several other people, like at JROTC summer camp, hygiene and sanitation become extremely important. The poor sanitation or hygiene habits of one person can lead to a disease or illness that affects an entire group.

Key words

personal hygiene:
An individual's practice of taking care of him or herself in order to maintain good health

Content Enhancement:

FIELD SANITATION EXAMPLE

The following story illustrates the importance of maintaining all aspects of health and sanitation when out in the field.

> *On Togatabu Island in 1942, the 14th Artillery and the 404th Engineer Battalions were part of a task force preparing to attack Guadalcanal. Fifty-five percent of the engineers and sixty-five percent of the artillerymen contracted a disease called "Filariasis," transmitted by mosquitoes. Both units had to be medically evacuated without seeing any enemy action because they were not combat ready. The use of insect repellent and insecticides and the elimination of standing water would have prevented the spread of this disease.*

Often in military history, the health of the troops influenced the course of battle more than strategy or tactics. "Historically, in every conflict in which the United States has been involved, only 20 percent of all hospital admissions have been from combat injuries. The other 80 percent have been from diseases and non-battle injuries." (Field Hygiene and Sanitation, FM 21-10)

Personal hygiene is important to maintain your health and establish your health image to other people. A neat, clean, physically fit person illustrates a healthy image and a positive leadership posture.

Principles of Hygiene

It is not always simple to apply the basic principles of personal hygiene. It takes a conscience effort to follow these principles and stay healthy.

Figure 3.1.2

HAND HYGIENE

Hand washing needs to be second nature. It is important to wash your hands after contact with an animal, after using the toilet, before eating or touching a person at risk from infection. A good routine should include removing jewelry, washing hands with soap and water vigorously for at least 30 seconds, rinsing hands, and drying hands on a clean towel or using a hand drying machine.

Figure 3.1.3

ORAL HYGIENE

After each meal or at least twice a day, you need to eliminate food particles and dental plaque as well as clean your gums. Visiting the dentist twice a year is also recommended. Use fluoride toothpaste and brush up and down in a light circular motion, in front, behind, and across the top of the teeth for at least three minutes. Avoid putting objects and fingers in your mouth as well as sugar and sweets that encourage germ proliferation.

PERSONAL HYGIENE

Figure 3.1.4

A dirty body is a hotbed for developing germs. Dust, sweat, other secretions, and warmth are all factors that encourage germs to multiply. A shower with effective soap and shampoo should follow any physical activity. Showering daily is necessary to maintain good personal health. Clean clothes should be worn and underwear changed daily; the fabric in clothes is a breeding ground for many germs. Imagine how you would feel if you did not bathe for a week. Now imagine how others would feel about having to be around you during that time. Uncleanliness or disagreeable odors affect the morale of others, so the solution is for everyone to take personal responsibility for their own hygiene.

NASAL HYGIENE

Nasal secretions are highly contagious. Runny noses and sneezing are sources of germ dissemination. Frequent nose blowing using a disposable paper tissue clears the nostrils and limits the spread of germs. Repeated blowing of the nose can cause irritation, so use a soft tissue and blow softly.

Figure 3.1.5

FOOD HYGIENE

Figure 3.1.6

Food poisoning is on the rise. Some of these cases can be linked to the food processing industry and centralized distribution of food. You can reduce your risk of food poisoning by following simple yet effective hygiene practices. High-risk foods include eggs and egg products, poultry, (particularly chicken), and food eaten raw. It is estimated that 50 percent of domestic food poisoning cases are due to poor hygiene in the home.

Refrigeration is a means of reducing the spread of germs and not the elimination of germs. Refrigerators need to be cleaned on a regular basis. Food that needs refrigeration should be kept at the recommended temperature; food that does not need refrigeration should be stored as indicated on the packaging. Follow the expiration dates on food packaging.

Cooking food is an excellent way of keeping germs from spreading. Cooking food at sufficiently high temperature will eliminate many germs. Rigorous hygiene is also required when working with food—especially raw meat or eggs. Always wash hands before handling food. Frequently wash any cloths and towels used in the kitchen. Avoid using wooden chopping blocks, salad bowls, and spoons because nicks or cracks can create an ideal place for germs.

Figure 3.1.7

Kitchen utensils should not be used to prepare different dishes unless they have been cleaned in between. Tables and worktops should be cleaned with an anti-bacterial product between preparing different types of food. Note the “best before” dates on food labels and use the most effective practices in food preparation.

Stay Physically Fit

People who are physically fit are less likely to get sick or injured, so participate regularly in a fitness program. Physical fitness training will also help you become adjusted to a field environment. Remember to use caution when exercising in extremely hot or cold weather.

Figure 3.1.8

Get Enough Sleep

Figure 3.1.9

The average person needs eight hours of sleep a night. Make sure you get enough sleep so you have the energy to effectively complete the required tasks of your day. You may have a harder time sleeping when you are away from home, bunking with others, or camping. Follow these suggestions to get as much rest as possible:

- Sleep as much as you can before going someplace where you may not be able to sleep comfortably or as much as you should.
- Take catnaps whenever you can, but expect to need a few minutes to wake up fully.
- When in the field, follow your leader's instructions and share tasks with other Cadets so everyone gets time to sleep.
- After going without sleep, catch up as soon as possible.
- Learn and practice techniques to relax yourself quickly.

If you have not gotten enough sleep in the field and are required to remain awake and alert, try to follow the suggestions listed below:

- Play mental games or talk with other Cadets to stay alert during dull watches or critical jobs such as driving at night.
- Take short stretch breaks or do light exercises in place.
- Do not trust your memory—write things down. Double check your communications and calculations.
- Watch out for your mind playing tricks (like seeing things that are not there) when you are very tired. Check strange observations before acting.

Learn to Reduce Stress

Figure 3.1.10

Stress begins in the mind but causes physical reactions in the body. Although stress can be beneficial in small doses by supplying you with bursts of energy to complete a project on time or compete in an important game, stress that continues over long periods of time can weaken your immune system and lead to exhaustion and illness. People under too much stress may not care for themselves properly or be able to complete tasks effectively.

To keep yourself healthy and efficient, you must learn to relax and reduce stress. The following hints may help.

- Maintain a positive attitude.
- Do not try to do more than is possible or take on tasks for which you are not prepared.
- Talk with friends or family when you encounter difficulties.
- Take time each day to do something that you enjoy, even if it is only for 15 minutes.
- Do not worry about things that are out of your control, but concentrate on what you can do.

To help reduce stress in a group or among friends or fellow Cadets, give each other moral support if things are tough at home, school, or in the unit. Welcome new replacements into your group and be active in establishing friendships. By building a feeling of esprit de corps, you can minimize stressful feelings of loneliness and isolation. When in the field, attempt to care for other Cadets and work together to provide everyone with food, water, sleep, shelter, and protection from heat, cold, and poor sanitation.

Basic Principles of Sanitation

Poor sanitation can contribute to conditions that may result in diarrhea and **dysentery**. Intestinal diseases are usually spread through contact with bacteria and germs in human waste, by flies and other insects, or in improperly prepared food and water supplies.

Figure 3.1.11

USE PURIFIED WATER

When you are staying outdoors, in the field,

Key words

dysentery:
Any of several intestinal disorders usually caused by infection and characterized by stomach pain and diarrhea with passage of mucous and blood

or traveling in foreign countries with questionable water supplies, use only **purified** water. Fill your canteen from a clean water source at every chance.

To treat or **disinfect** water, bring it to a hard rolling boil for 5 - 10 minutes. If you are at a high elevation, boil water for an additional minute for every 1,000 feet above sea level. Boiling water is the best method for purification. The exception is if you are at an altitude of 18,000 feet or more; boiling is not effective at these heights.

When heated water is not available, disinfect water using one of the following methods:

- Disinfecting Water with the Preferred Method: **Iodine** Tablets
  - Fill a one-quart canteen with the cleanest water available.
  - Put one iodine tablet in the water; two in cold or cloudy water. Double these amounts in a two-quart canteen.
  - Place the cap on the canteen, wait five minutes, then shake. Loosen the cap and tip the canteen over to allow leakage around the canteen threads. Tighten the cap and wait an additional 25 minutes before drinking.
- Disinfecting Water with Chlorine
  - Fill a one-quart canteen with the cleanest water available.
  - Mix one **ampule** of **chlorine** with one-half canteen cup of water. Stir the mixture with a clean device until the contents dissolve. Take care not to cut your hands when breaking open the glass ampule.
  - Pour one canteen capful of the chlorine solution into your quart of water.
  - Replace the cap on your canteen and shake. Slightly loosen the cap and tip the canteen over to allow leakage around the threads. Tighten the cap and wait 30 minutes before drinking.
- Disinfecting Water with Iodine
  - Fill a one-quart canteen with the cleanest water available.
  - Add five drops of two percent Tincture of Iodine to the water. If the water is cold or cloudy, add 10 drops.
  - Mix thoroughly by shaking the canteen. Slightly loosen the cap and tip the canteen over to allow leakage around the threads. Tighten the cap and wait 30 minutes before drinking.
  - Very cloudy or cold water may require prolonged contact time. Let it stand several hours or overnight if possible.

Figure 3.1.12

Key words

purified:
Free from undesirable elements or impurities; cleaned

disinfect:
To destroy harmful germs; to purify

iodine:
A nonmetallic element having important medical uses

ampule:
A small, sealed glass container that holds one dose of a solution, usually a medicine, to be administered by injection

chlorine:
A gaseous greenish-yellow element used as a bleach and disinfectant in water purification

Key words

galvanized:
Coated with zinc

bivouac:
A temporary camp or shelter

lice:
Small, wingless, parasitic insects that live on warm-blooded animals, especially in hair, and suck the animal's blood

GUARD AGAINST FOOD POISONING

Wash your hands for at least 30 seconds after using the bathroom or before touching food. Inspect all cans and food packages prior to using them, and throw away any cans with leaks, bulges, or holes. Do not eat foods or drink beverages that have been prepared in **galvanized** containers, which may result in zinc poisoning. When camping or in the field, wash your mess kit in a mess kit laundry or with treated water or disinfectant solution.

BURY YOUR WASTE

On a march or at camp, personal disposal bags should be used if available. If not, then use a personal 'cat hole.' Always bury your waste immediately to prevent flies from spreading germs from waste to your food. Burying your waste also helps keep unwanted animals out of your **bivouac** area.

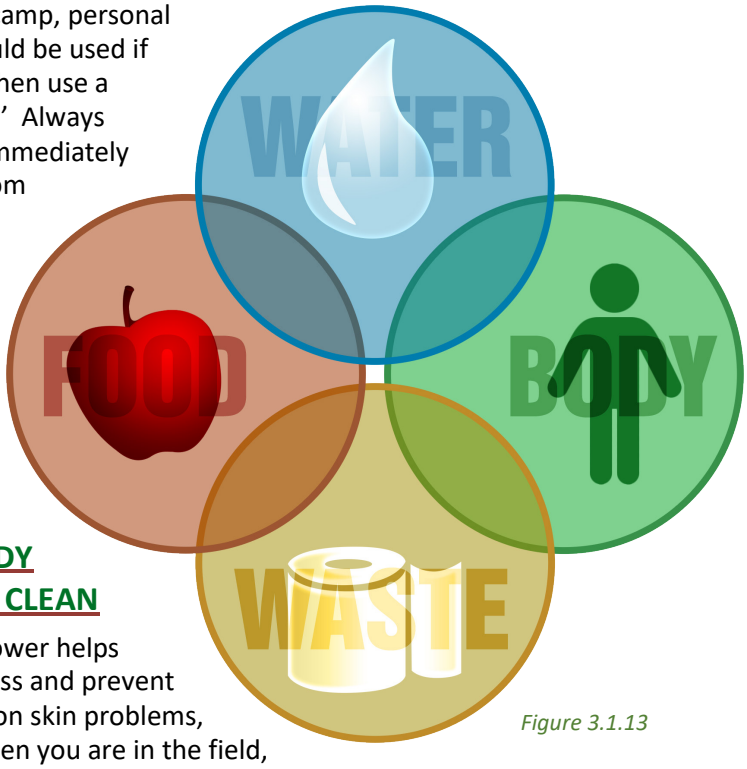


Figure 3.1.13

KEEP YOUR BODY AND UNIFORM CLEAN

A daily bath or shower helps maintain cleanliness and prevent body odor, common skin problems, and infection. When you are in the field, however, bathing daily may not be possible. In this case, make sure you take a full shower at least once a week (or at the earliest opportunity) and use a washcloth daily to wash:

- Your face
- Your armpits
- Your genital area
- Your feet
- Other areas where you sweat or that become wet, such as between your thighs or, for females, under the breasts

Powders, such as talcum powder, help to keep your skin dry when in the field. Apply it to places where you tend to sweat, and to your feet and inside your socks each morning, especially if you have had prior foot infections. Change to clean clothing regularly. When you are outdoors, changing your clothes regularly aids in the control of **lice**. Make sure the clothing you wear in the field is loose and does not restrict circulation. Avoid wearing nylon undergarments. Wear cotton, which is more absorbent and allows the skin to dry.

Conclusion

Practicing good personal hygiene and sanitation are common sense actions everyone should perform. They are particularly important in the field where Cadets have a responsibility to both themselves and others, and leaders must plan and enforce preventative measures.

Remember, correct cleanliness habits, regular exercise, good nutrition, and adequate amounts of rest and relaxation can directly affect a person's well-being. By practicing these preventative measures, you can significantly reduce time lost due to illness and injuries.

Lesson Check-up

- **How do you keep clean in the field?**
- **What is the correlation between physical fitness and hygiene?**
- **What are some results of poor hygiene?**
- **Describe when and how to disinfect water.**

Treating for Shock and Immobilizing Fractures

Key words

- clammy
- closed fracture
- dislocation
- fainting
- ligament
- open fracture
- splint
- sprain
- strain
- trauma

What You Will Learn to Do

Determine first aid treatment for shock, fractures, sprains, and strains

Linked Core Abilities

- Do your share as a good citizen in your school, community, country, and the world

Learning Objectives

- **Explain** how to identify and treat shock
- **Distinguish** between closed and open fractures
- **Identify** procedures for treating fractures
- **Distinguish** between dislocations, strains, and sprains
- **Identify** procedures for treating dislocations, strains, and sprains
- **Define** key words: clammy, closed fracture, dislocation, fainting, ligament, open fracture, splint, sprain, strain, trauma

Essential Question

How can you treat shock and fractures?

Introduction

Suppose you and your friend are rock climbing at a nearby park. She loses her grip and tumbles to the ground. She is clearly injured and you've kicked your "lifesaving steps" into gear. First, you check her level of consciousness, then her breathing and heart rate, then whether or not she is bleeding, and/or presenting any signs of shock. Next, you'll check for fractures. In this lesson, you'll continue building on your emergency and first aid response skills by learning to help people in shock or who have suffered possible fractures.

Checking for Signs of Shock

Shock is a life-threatening condition that occurs when the body is not getting enough blood flow. Lack of blood flow means that the cells and organs do not get enough oxygen and nutrients to function properly. As a result, many organs can be damaged. Shock requires immediate treatment and can get worse very rapidly. As many as one in five people who suffer shock will die from it.

When a victim is in shock, the skin is pale or bluish and cold to the touch. For a victim with dark skin, check the color of the mucous membranes on the inside of the mouth or under the eyelids, or check under the nail beds. The skin may be **clammy** from perspiration.

Key words

clammy:
Damp, soft, sticky, and unusually cool

Content Highlight:
SIGNS OF SHOCK

Signs of shock include:

- Pale/bluish/cold skin
- Blueness around the mouth, lips, tongue, nail beds
- Perspiration
- Restlessness or nervousness
- Thirst
- Bleeding
- Confusion or loss of awareness
- Breathing rapidly
- Nausea and/or vomiting

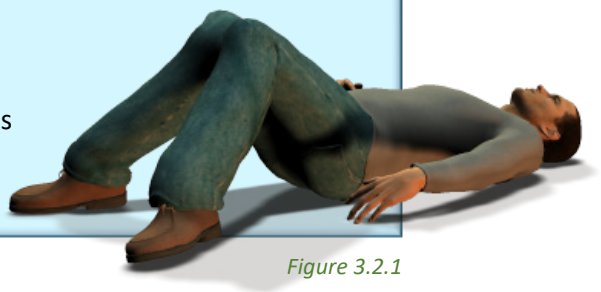


Figure 3.2.1

Key words

fainting:
To lose consciousness briefly because of temporary decrease in the amount of blood that flows to the brain

trauma:
A behavioral state resulting from mental or emotional stress or physical injury that has a lasting effect on the mind; a physical wound or injury

Fainting, or "blacking out," is a mild form of shock caused by a lack of blood to the brain. Fright, bad news, **trauma**, breathing polluted air, or standing too long can result in fainting. Before fainting occurs, a shock victim may turn pale, shake, or suddenly fall to the ground.

Treating Shock

If someone is in shock, call for emergency help. Do NOT wait for mild shock symptoms to worsen before calling for help. Always check the victim's airway, breathing and circulation. If necessary, rescue breathing and CPR may be the first step in this case. Even if the victim is breathing, continue to check the rate of breathing every five minutes until help arrives.

Procedures for treating shock include improving circulation of the blood, ensuring an adequate supply of oxygen, and maintaining normal body temperature.

To treat a victim for shock, follow these steps:

1. If the victim is conscious and does NOT have an injury to the head, leg, neck, or spine, place him in the shock position. Lay them on their back. If the victim is vomiting, position them on their side to let fluid drain from their mouth.
2. Elevate the victim's legs about 12 inches. Do NOT elevate the head. If raising the legs will cause pain or potential harm, leave them lying flat.

Figure 3.2.2

3. Loosen clothing that may bind around the person's neck and waist.
4. Keep the victim from becoming cold or overheating.
5. Reassure the victim, and do NOT give them anything to eat or drink. However, if you know that help is not going to arrive for over an hour, give the victim small amounts of fluids, at room temperature, every 15 minutes. Add an eighth of a teaspoon of salt, if available, to each half glass of fluid. This will help the victim retain more fluids in their system.
6. Stay with the shock victim until medical help arrives.

Fractures

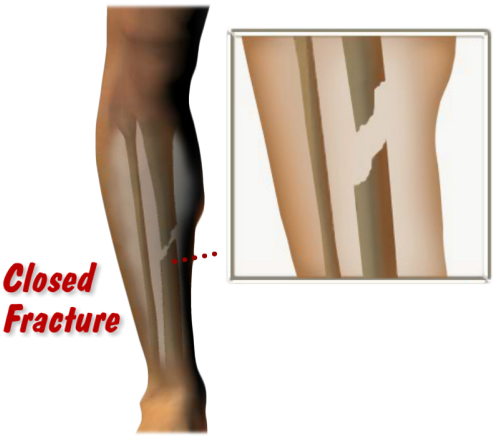


Figure 3.2.3

Bone fractures resulting from falls are common injuries. The most common type of fracture is a **closed fracture** or simple fracture. It is a break in the bone that does not penetrate the skin. In the case of a closed fracture, as seen in *Figure 3.2.3*, indications of a broken bone include swelling, discoloration, and unusual positioning of the limb in question.

An **open fracture** or compound fracture occurs when the sharp edges of a splintered bone has cut through the skin. In the case of an open fracture, it is obvious the bone is broken, as seen in *Figure 3.2.4*. Open fractures are often accompanied with bleeding, which increases the risk of infection.

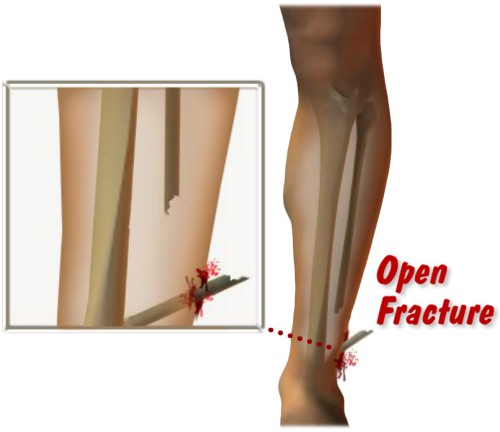


Figure 3.2.4

Key words

closed fracture:
A fracture in which the broken bone does not push through the skin's surface

open fracture:
A fracture in which the broken end of a bone pierces the skin

splint:
To support and immobilize a body part with a stiff material

Treating Fractures

When treating fractures, it is important to know what to do and what not to do!

THE DO'S AND DON'TS FOR TREATING FRACTURES

- Do NOT set or realign the bone.
- DO **splint** the injured limb in the position you find it. This will immobilize it until professional help can assist the victim.
- DO splint the bone above or below the injury.
- DO check the circulation regularly and adjust the splint or sling if it becomes too tight.

Figure 3.2.5

THE USE OF SPLINTS

The most important action to take when dealing with a fracture is to immobilize the injured bone to prevent further damage. The best way to immobilize bones is with a splint.

For open fractures, control the bleeding before splinting. Keep the exposed bone moist by covering it with a moist, sterile dressing.

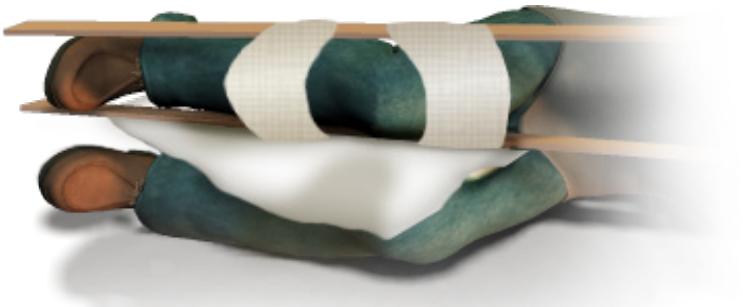


Figure 3.2.6

The rules of splinting are as follows:

1. Pad all splinting material. Make splints from sticks, boards, cardboard, rolled newspaper, or any other unbendable material.
2. Splint the broken leg or arm in the position in which you found it. Do NOT try to straighten or reposition the fracture. In most cases, support an arm from above and below and a leg from the sides.
3. Use splinting material that is long enough to immobilize the joint above and below the break. For example, immobilize the ankle and the knee for a fracture in the vicinity of the calf.
4. Tie the splints above and below the suspected fracture. Make two ties above and two below the break. NEVER make a tie directly over the break.
5. Tie all knots on the outside of the splints.
6. Check that circulation is not restricted by splints that are too tight.

Content Highlight:

IMPROVISING TO MAKE A SPLINT

If no splinting material is available, immobilize a leg fracture by placing padding between the injured leg and the uninjured leg and tying them together. Using the uninjured leg as the splint, draw two ties above and two below the suspected break.

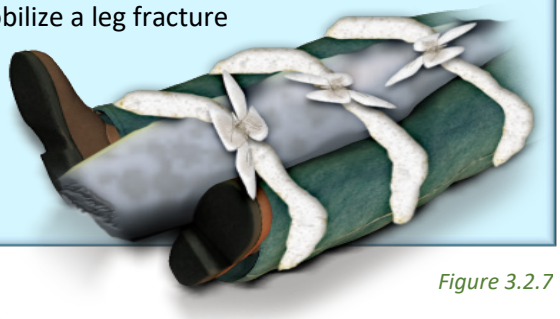


Figure 3.2.7

Figure 3.2.8

USING SLINGS

For arm fractures in which the entire arm is not splinted, use a sling to support the weight of the arm. If necessary, pin the victim's shirttail up to serve as a field expedient sling.

Joint Injuries

Joint injuries occur when excess stress or **strain** is placed on the joint. This can happen during normal activities such as walking or running and is common in sports activities. **Dislocation**s and **sprain**s are the most common joint injuries.

DISLOCATIONS

A dislocation occurs when a joint comes apart and stays apart with the bone ends no longer in contact. The shoulders, elbows, fingers, hips, kneecaps, and ankles are the joints most frequently affected.

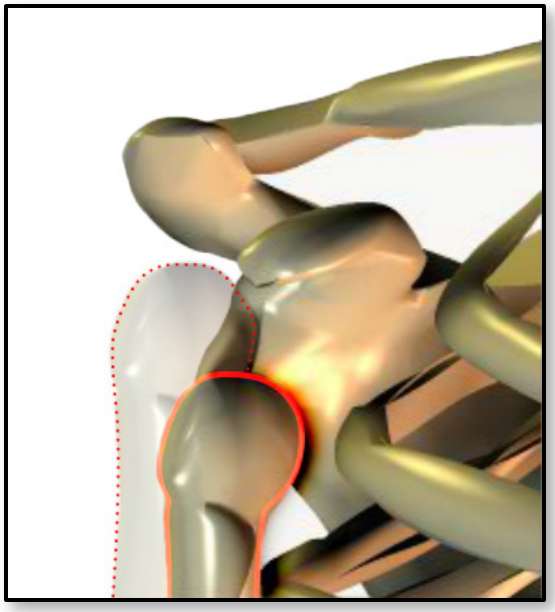


Figure 3.2.9

Dislocations have signs and symptoms similar to those of a fracture—severe pain, swelling, and the inability of the victim to move the injured joint. The main sign of a dislocation is deformity—its appearance will be different from that of a comparable uninjured joint. The procedures for treating a dislocation include the following:

1. Do NOT delay medical attention. Get help immediately.
2. Do NOT move the joint or try to force it back in place. If possible, splint the joint until help arrives. Immobilize and support the injured joint as if treating for a fracture.
3. Put ice on the dislocated joint. This can help reduce swelling and internal bleeding. Do NOT put ice directly on the skin.

SPRAIN

A sprain is an injury to a joint in which the **ligament**s and other tissues are damaged by violent stretching or twisting.

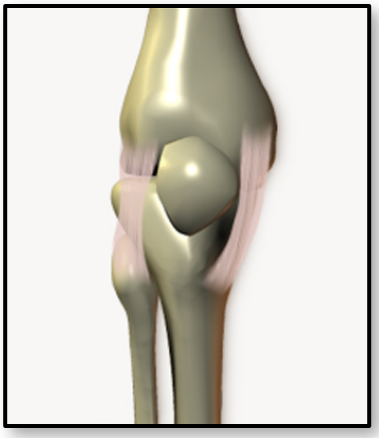


Figure 3.2.10

Attempts to move or use the joint increase the pain. The skin around the joint may be discolored because of bleeding from torn tissues. It is often difficult to distinguish between a severe sprain and a fracture, because their signs and symptoms are similar. If you are not sure whether an injury is a sprain or a fracture, treat it like a

Key words

strain:
An injury caused when a muscle or tendon is overstretched

dislocation:
The separation of a bone from its joint

sprain:
An injury caused by twisting a ligament or tendon around a joint

ligament:
A fibrous band of tissue that holds bones together at a joint

fracture. It is better to immobilize a sprain than to take the chance of a victim sustaining further damage from an un-splinted closed fracture. Use RICE procedures to treat the sprain and seek medical attention.

RICE – Procedures for Bone, Joint, and Muscle Injuries

RICE is the acronym for the first aid procedures—***R****est,* ***I****ce,* ***C****ompression, and* ***E****levation*. Most often, the RICE procedures are used to treat bone, joint, and muscle injuries. By performing RICE within the first 48–72 hours following such an injury, people will often recover from the injury more quickly.

- ***Rest***. Injuries heal faster if rested. Rest means the victim stays off the injured part. Do not attempt to move or set the injured area.
- ***Ice*** the area. Use a cold pack, a slush bath or a compression sleeve filled with cold water to help limit swelling after an injury. Try to ice the area as soon as possible after the injury and continue to ice it for 15 to 20 minutes, four to eight times a day, for the first 48 hours or until swelling improves. If you use ice, be careful not to use it too long, as this could cause tissue damage. Do not put ice packs on bare skin.
- ***Compress*** the area with an elastic wrap or bandage. Compressive wraps or sleeves made from elastic or neoprene are best.
- ***Elevate*** the injury above the heart when possible. Gravity has an important effect on swelling. The force of gravity pulls blood and other tissue to the lower parts of the body. After fluids get to your hands or feet, they have nowhere else to go; therefore, those parts of the body tend to swell the most. Elevating the injured areas, in combination with ice and compression, limits circulation to that area, which in turn helps limit internal bleeding and minimize swelling. Whenever possible, elevate the injured part above the level of the heart for the first 24 hours after an injury.

Figure 3.2.11

Muscle Injuries

Muscle injuries are as common as joint injuries. These can be very painful and need treatment as soon as possible after the injury occurs. The most common muscle injury is a strain.

STRAIN

A muscle strain, or muscle pull, occurs when a muscle is stretched beyond its normal range of motion, resulting in the muscle tearing. Signs and symptoms include:

- Sharp pain
- Extreme tenderness when the area is touched
- Slight swelling and difficulty moving or using the affected part

When treating a strain, use RICE procedures.

Conclusion

This lesson reinforced the first aid procedures for treating shock and fractures. Remember that shock can follow severe injuries and can be life threatening if left untreated. Treating a victim for shock involves improving circulation, ensuring an adequate oxygen supply, and maintaining normal body temperature. Additionally, the lesson reviewed how to properly treat fractures, joint injuries, sprains, and strains. By following these first aid procedures, you can lessen the severity of shock caused by an injury and ensure that no further damage occurs to a victim because of a broken bone, sprain, or strain.

Lesson Check-up

- **Why is it important to check for shock before treating a fractured bone?**
- **What can cause a victim to faint and what is the emergency response for someone who has fainted?**
- **What should you do when you suspect or know that a bone is broken?**
- **Distinguish between the characteristics of a strain and sprain?**

First Aid for Burns

Key words

- acids
- bases
- caustic
- compresses
- flush
- mottled
- neutralize
- scalding
- systemic

What You Will Learn to Do

Determine first aid treatment for burns

Linked Core Abilities

- Do your share as a good citizen in your school, community, country, and the world

Learning Objectives

- **Characterize** degrees of burns
- **Describe** how to treat first-, second-, and third-degree heat burns
- **Describe** how to treat electrical burns
- **Describe** how to treat chemical burns to the eyes and skin
- **Identify** eight things that should not be done in treating burns
- **Define** key words: acids, bases, caustic, compresses, flush, mottled, neutralize, scalding, systemic

Essential Question

How do you treat heat, electrical, and chemical burns?

Introduction

Burns can result from sources of heat, electricity, and chemicals. In situations where people are injured by these sources, your first aid knowledge should include how to treat them. This lesson covers different types of burns, how to treat them, and ways to prevent them.

Types of Burns

There are several types and degrees of burns that require different treatments. Heat, electricity, and chemicals can produce burn injuries with their severity depending on the burn's depth, size, and location. Burns can be painful and may result in shock and infection. They can be very serious if they are spread over a large area of the body, if there are other injuries involved, or if the victim is very young or very old.

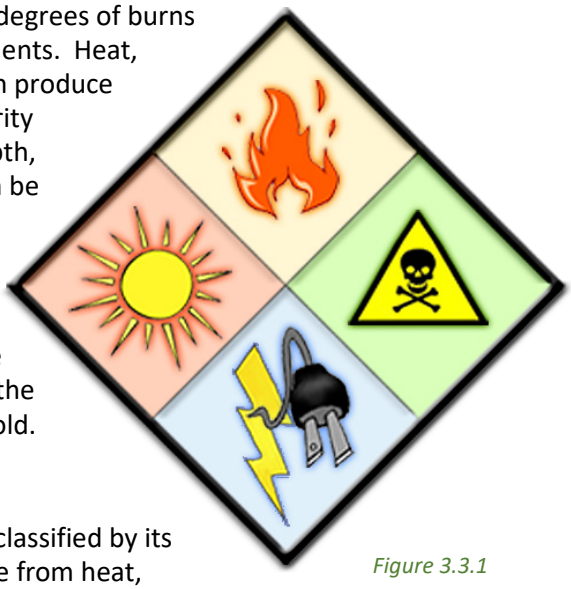


Figure 3.3.1

BURN SOURCES

The type of burn is typically classified by its heat source. Burns can come from heat, chemicals, electricity, radiation, or sun.

DEGREES OF BURNS

For burns caused by heat sources, there are different degrees (first, second, or third) based on the burn's depth. The deeper a burn reaches into the skin, the more severe it is. Deeper burns are rated at a higher degree.

CHARACTERISTICS OF FIRST-DEGREE BURNS

First-degree burns, the least serious type, are superficial, where the top layer of skin has been burned slightly. These burns produce pain and redness of the skin. First-degree burns are usually caused by: overexposure to the sun, brief contact with a hot object, such as an iron or skillet, minor **scalding** by hot water or steam, or brief contact with harsh chemicals.

Key words

scalding:
Burning of the skin by a substance that is hot in temperature

First-degree burns:

- Injure only the top layer of skin
- Redden the skin
- Produce mild swelling
- Cause pain due to irritated nerve endings
- Heal quickly and completely if properly treated
- Are caused by brief contact with hot objects, brief exposure to hot water or steam, and overexposure to sun (light sunburn) or wind

FIRST-DEGREE BURNS

Signs:

- Skin is red, dry, and painful
- Skin may have swelling
- Skin not broken

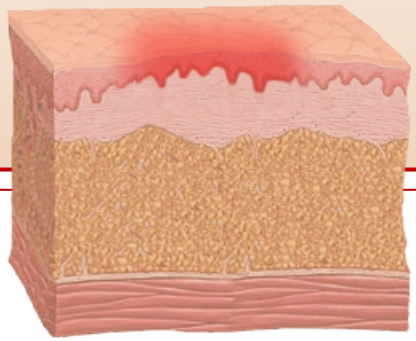


Figure 3.3.2

CHARACTERISTICS OF SECOND-DEGREE BURNS

Second-degree burns are more serious than first-degree burns because a deeper layer of skin is burned. They can more easily become infected. Also, if the burn affects more than 10 percent of your skin, you may go into shock because large quantities of fluid are lost from the burned area. A medical professional should treat all second-degree burns greater than two to three inches in diameter. Second-degree burns are usually caused by: deep sunburn, exposure to flames, contact with hot liquids, burning gasoline or kerosene, or contact with chemicals.

Second-degree burns:

- Involve deeper layers of skin
- Cause skin to turn red and/or **mottled**
- Appear moist and oozing from the loss of fluid through damaged skin layers
- Produce blisters and swelling
- Are usually the most painful type of burn because nerve endings are still intact even though tissue damage is severe

Key words

mottled:
Marked with irregular spots or splotches of different colors or shades of color

Second-degree burns *(cont'd):*

- May cause shock due to extensive loss of fluid from the burned skin if the burn covers a large area
- Should heal within two weeks with little or no scarring if the burn is small and it was property treated
- Are caused by a deep sunburn, prolonged contact with hot objects, scalding, and flash burns from flammable liquids suddenly bursting into flame

SECOND-DEGREE BURNS

Signs:

- Skin is swollen and red, may be blotchy or streaked
- Blisters may be weeping clear fluid
- Signs of significant pain

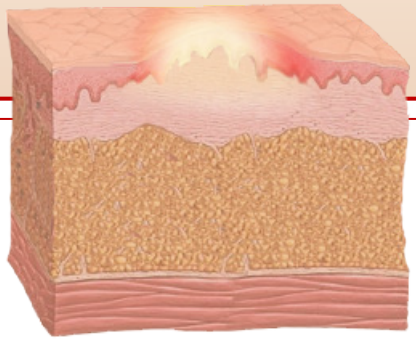


Figure 3.3.3

CHARACTERISTICS OF THIRD-DEGREE BURNS

Third-degree burns, the most serious, involve all layers of skin. They are so deep that only the edges will heal. Scars will eventually cover the rest of the burned area if skin grafting is not done. Third-degree burns are usually caused by: clothing on fire, immersion in hot water, contact with flames, hot objects, electricity, or corrosive chemicals.

Third-degree burns:

- Are the deepest and most severe type of burn
- May look white or charred (may appear to be a second-degree burn at first)
- Result in deep tissue destruction, reaching all layers of the skin and sometimes structures below the skin
- Often cause little or no pain since nerve endings are destroyed
- Often cause shock
- Will be covered by scar tissue when healed
- Are caused by immersion in extremely hot water, prolonged contact with flames, or electric shock

THIRD-DEGREE BURNS

Signs:

- Skin damage, charred skin, or white leathery skin
- May have signs and symptoms of shock

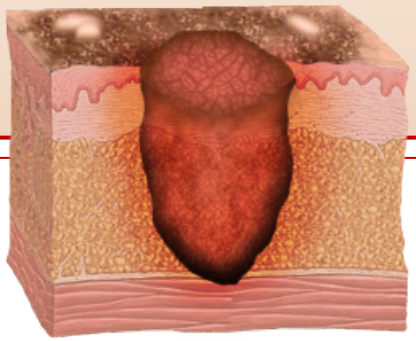


Figure 3.3.4

Treating Heat Burns

Treat heat burns based on their degree; therefore, before treating a burn, determine its degree and treat accordingly. When deciding the degree of a burn, in addition to the above descriptions, it may help to know the source of the burn and/or how hot the source was, as well as how long the victim was exposed to it.

If a victim appears to have a combination of burns of different degrees, determine the degree of the most burned part—usually in the middle of the burned area—and treat for that degree. If you are not sure about the degree of a burn, treat it as a third-degree burn.

Keep in mind that the goal of burn treatment is to relieve the victim's pain, prevent them from going into shock, and prevent infection of the burned area.

TREATING FIRST-DEGREE BURNS

1. Loosen tight clothing and remove jewelry from the burned area before it swells. Have the victim put their jewelry in a safe place after removal.
2. Cool the burned part with water by holding it under cool running water, pouring cold water over it, immersing it in cold water, or applying cold, wet **compresses** to it. Cooling

Figure 3.3.5

Key words

compresses:
Folded cloths or pads applied so as to press upon a body part to stop bleeding or cool a burn

the burn with water helps remove heat from the skin, relieves pain and swelling, and cleans the injury. Continue this **neutralizing** treatment for 5 - 15 minutes until the pain subsides.

3. Gently pat the burned area dry with a clean cloth.
4. Cover the injury loosely with a sterile bandage or clean cloth to keep air off of it, thereby reducing pain, and protecting against infection. Keep the bandage loose to keep pressure off of the injury.
5. Once a first-degree burn is completely cooled, especially a sunburn, use a lotion or moisturizer to relieve pain and prevent drying of the skin.

TREATING SECOND-DEGREE BURNS

1. Rinse the burn gently with cool water until the pain subsides. For burns on arms, hands, legs, or feet, soak the injured part in cool water. For burns on the face or body, use a clean, cool, wet cloth to cool the burned skin. Do NOT use ice or ice water.
2. Clean the burn gently with mild soap and water. Make sure your hands are clean. Do NOT break the blisters—this can increase the risk of infection. Use an antibiotic ointment each time you clean the burn. You can use a loose bandage to cover the burn and help keep it clean.

Figure 3.3.6

3. Check the burn every day for signs of infection, such as redness, increases in swelling or pus.
4. Seek medical treatment for second-degree burns to the face, hands, feet, or genitals, or burns that are more than two to three inches in diameter. Ensure the victim drinks plenty of liquids to avoid dehydration.

Key words

neutralize:
Counteract the activity or effect of something

Content Enhancement:

SECOND DEGREE BURNS

1) For extensive second-degree burns, monitor the victim for signs of shock and treat accordingly until the person receives medical treatment.
2) For second-degree burns to the face, especially if accompanied by smoke inhalation, the victim may have respiratory burns that can lead to swelling and blockage of the airway. Monitor the victim's breathing and treat accordingly until the person receives medical treatment.

TREATING THIRD-DEGREE BURNS

1. Remove the victim from the source of heat if they are still in contact with it. If the victim's clothes are on fire, attempt to smother the fire by getting the person to stop-drop-and-roll. Rolling on the ground should smother the burning clothes because it deprives the fire of oxygen. If needed, wrap the person in thick material, such as a coat, rug, or blanket. This will also help put out the flames. Pour water on the person.
2. Call for Emergency Medical Services (EMS). All third-degree burns require medical treatment regardless of their size. Until the victim receives treatment, follow steps three through seven.
3. Ensure that the victim is breathing. If not, begin mouth-to-mouth resuscitation. If the victim is breathing, continue with steps four through seven.
4. Do not remove any clothing that is stuck to the burn. Do NOT soak the burn in water nor apply ointment. If possible, raise the burned area above the level of the heart.
5. Cover the burned area loosely with cool, moist compresses, sterile bandages, or clean cloth.

   NOTE: Unlike treatment for first- and second-degree burns, DO NOT cool a third-degree burn with water, since this can increase the risk of shock.
6. Check the victim for shock. Pay special attention to the victim's body temperature, which can change rapidly due to the skin being burned.
7. Monitor breathing of victims with burns to the face and burns resulting from fire accompanied by smoke inhalation. Treat accordingly.

Content Enhancement:

"DON'TS" WHEN TREATING BURNS

- Do not put butter, oil, or grease on a burn; they can keep heat in the burn and cause more damage, as well as increase the chance of infection.
- Do not use cotton or cottony bandages on burns as they may stick to the injury.
- Do not put ice or ice water on a burn; this can result in frostbite and cause more damage to the skin.
- Do not break any blisters that have formed; blisters help protect against infection.
- Do not put pressure on a burn.
- Do not try to remove stuck clothing, debris, or loosened skin from a burn.
- Do not try to clean a wound with soap, alcohol, or any other antiseptic product; only water should be used and only on first- and second-degree burns.
- Do not let a victim walk on burned feet even if they tell you it does not hurt; third-degree burns can cause little pain since nerved endings are destroyed, but damage is severe and pressure from walking will only increase it.

Figure 3.3.7

Treating Electrical Burns

While an electrical shock will often produce only a minor mark on the skin, the injury can be a serious, deep-tissue burn. The current from an electrical shock passing through a victim's body can also result in unconsciousness and may slow or stop their breathing and/or heartbeat. Therefore, treat electrical shock as a potentially life-threatening injury.

ELECTRICAL BURN

- Occurs when you receive an electrical shock
- Must be examined by a doctor
- If you encounter a victim of an electrical shock, first make sure you turn off the power at its source and then care for any life-threatening conditions

Figure 3.3.8

If you believe a person has been electrocuted, assess the situation first before touching the victim. They may still be in contact with the electrical current, and if you touch them, you could become a victim of electrical shock as well. Follow these steps to avoid a double accident and provide first aid treatment:

1. Call for emergency help. If the victim is still in contact with the source of electricity, stop the current.
   - Shut off the electrical current by unplugging a cord, removing a fuse from the fuse box, or turning off the circuit breaker, as appropriate.

     NOTE: In many cases, just turning off a wall or appliance switch does not stop the electrical flow. Even though you have shut off the electrical current, to be completely safe, move the victim away from the electrical source before continuing. Proceed to step three.

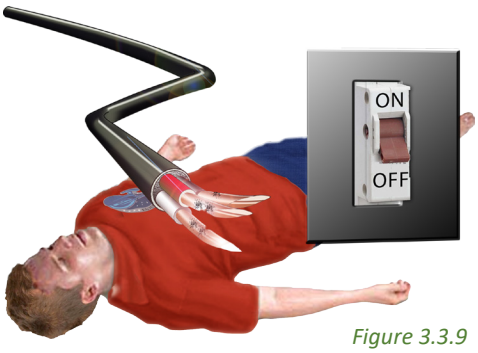


Figure 3.3.9

   - If you cannot turn off the electricity or you are outside and the shock is due to a downed power line, either call the power company yourself if you have a phone near you, or if there are other people around, have someone else call the power company. Meanwhile, since it may take you less time to separate the victim from the current than to wait for the power to be cut off, proceed to step two. Or, if you are alone and/or there is no phone readily available in this situation, proceed to step two.

2. Separate the victim from the source of electrical current.
    - Push the victim off of or away from the source of electricity—or push the source of electricity off of or away from the victim—using a dry non-conducting material (wood, plastic, cardboard) like a broom, stick, or chair. If available, also stand on something dry and non-conducting, like newspaper or a rubber mat, as you disengage the victim. If pushing does not work, use a dry rope or dry clothing to lift or drag the victim off of or away from the source of electricity. This method works better if there are two rescuers: one to lift the victim off and the other to push the electrical source away.

SPECIAL PRECAUTION

If the ground is wet, **do not attempt to move a victim in contact with an electrical current.** Water conducts electricity, and you can be electrocuted as well. In this case, the current must be stopped before you can administer first aid.

Figure 3.3.10

3. Check the victim's breathing and pulse. Be prepared to administer mouth-to-mouth resuscitation or cardiopulmonary resuscitation (CPR) if the victim's breathing is shallow or nonexistent or their pulse is dangerously slow or nonexistent. Prevent the person from becoming chilled.
4. Check the victim for two burn sites—one where the electricity entered the body and one where it exited the body. If the burns appear to be serious, treat them as third-degree burns. If they are less serious, rinse with water and apply a loose sterile bandage. Skin burned by electricity can be first-, second-, or third-degree burns.

Treating Chemical Burns

Chemical burns occur when the skin or eyes come in contact with liquid or dry chemicals that are **caustic** or irritating. Around your house, you may have products like rust and paint removers and drain and cement cleaners that contain **acids** designed to eat away certain materials and **bases** (also called alkalis) used to cut through grease. If used carelessly or improperly, these products may also do the same to your clothes and skin.

The seriousness of a chemical burn depends on the:

- Length of time the chemical is in contact with the skin or eyes
- Concentration of the chemical—the more concentrated, the more damaging
- Temperature of the product containing the chemical—the higher the temperature, the quicker the damage

Key words

caustic:
Capable of destroying or eating away something by chemical action

acids:
Chemicals designed to eat away certain material

bases:
Chemicals used to cut through grease; also called alkalis

CHEMICAL BURN

Chemical burns may result when skin or eyes come into contact with liquid or dry chemicals, such as:

- Rust and paint removers
- Drain and concrete cleaners

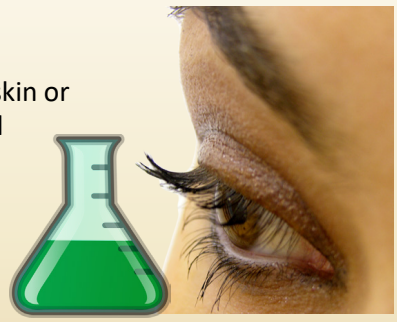


Figure 3.3.11

Treatment of chemical burns involves stopping the chemical action immediately by removing the chemical from the skin or eyes and by removing contaminated clothing that can transmit absorbed chemicals to the skin. Treatment will vary depending on the type of chemical involved, so if there are first aid instructions on the label of the chemical product causing the burn, follow those instructions. If not, use the following basic guidelines for treatment.

TREATMENT FOR CHEMICAL BURNS TO THE SKIN

1. Depending on the extent of chemical coverage on the victim or in the area, consider wearing gloves and/or safety goggles, if available, to protect yourself from chemical injuries while assisting the victim.
2. Remove any contaminated jewelry or clothing from the victim, including shoes and socks where chemicals can collect.
3. Remove the chemical from the skin.

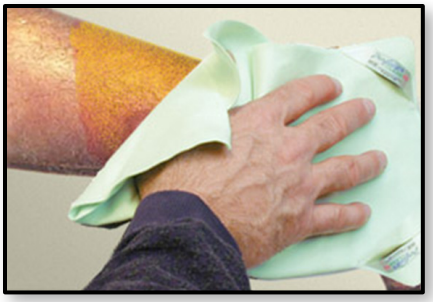


Figure 3.3.12

NOTE: ***Some chemical burns should NOT be flushed with water!*** When water interacts with some chemicals, it can make the burn worse.

LIQUID CHEMICALS: For liquid chemicals, **flush** them from the contaminated skin with large amounts of cool running water for at least 15 minutes.

- Carbolic acid or phenol is not water soluble, so use isopropyl (rubbing) alcohol first to flush the chemical off the skin and then flush with water.
- Sulfuric acid burns should be rinsed with a mild, soapy solution if the burns are not severe. Sulfuric acid feels hot when water is added to the acid, but you want to rinse the acid off the skin as soon as possible.
- Hydrofluoric acid burns should be rinsed with a mixture of water and baking soda. Then flush with a large amount of water. Burns from hydrofluoric acid don't always appear immediately, so rinse the exposed skin even if a burn isn't seen.

Key words

flush:
To cleanse or wash out with running water or another liquid

DRY CHEMICALS: For dry chemicals, brush them off the skin using a clean, dry cloth. Take care to keep the chemicals from blowing into your eyes or the victim's eyes, and avoid brushing the chemicals onto your own skin. Then, if large amounts of water are available, flush the contaminated area for at least 15 minutes. If large amounts of water are not available, do not apply any water to the contaminated area, since small amounts of water can react with dry chemicals causing more burning.

4. Cover the burned area loosely with dry, clean bandages or cloth.

   NOTE: If the victim says they feel the burning has intensified after you have finished flushing the contaminated area, flush for several more minutes, or longer, as necessary.

5. Minor chemical burns generally heal without further treatment; however, call for Emergency Medical Services for:

   - Any chemical burn to the face, hands, feet, genitalia, or joints
   - Second-degree chemical burns over two to three inches in diameter
   - All third-degree chemical burns
   - If there is a **systemic** reaction to the chemical burn and/or chemical exposure

Key words

systemic:
Something that acts throughout the body after absorption or ingestion

Content Enhancement:

NOTES FOR CHEMICAL BURNS

(1) For extensive or severe chemical burns, monitor the victim for signs of shock and treat accordingly until the person receives medical treatment.

(2) For a victim with chemical burns to the face or who may have inhaled chemicals, monitor their breathing in case of possible respiratory burns and swelling. Treat accordingly until medical help arrives.

TREATMENT FOR CHEMICAL BURNS TO THE EYES

1. Position the victim's head so that the injured eye is lower than the uninjured eye. This will prevent the chemical from getting into the uninjured eye.
2. If there is only one injured eye, hold the eyelids of the injured eye open and flush with water from the inner corner of the eye (closest to the nose) to the outer corner (closest to the ear). Flush with lukewarm water for at least fifteen minutes. If both eyes are injured, flush both at the same time. The person should keep the eye open as wide as possible. Flushing the eye should also help remove contact lenses. If the contacts don't come out try to remove them gently after flushing with water.
3. Make sure the victim does not have any chemical on their hands or another part of the body. To keep the victim from moving their

injured eye(s), have the victim close both eyes, then cover them with cloth pads or gauze taped loosely into place. Since eyes move together, both eyes must be closed and covered to keep the injured eye still. Do not put any pressure on the eyes. Do NOT rub the eyes or allow the victim to rub their eyes.

4. Call for emergency help for severe burns. Be aware that some alkali chemicals (like ammonia and oven cleaner) may not cause eye pain, but can seriously injure the eye.

Content Enhancement:

"DON'TS" WHEN TREATING CHEMICAL BURNS

Follow the "don'ts" listed previously in "Don'ts When Treating Burns" Content Enhancement. In addition, do not put any other chemicals on a chemical burn in an attempt to neutralize the chemical causing the burn—for example, putting an acid on an alkali and vice versa. This may cause more damage.

Figure 3.3.13

Conclusion

You have just learned important procedures for treating burns, as well as when to apply basic first aid and life-saving skills in these situations. Remember that while it is important to administer first aid treatment as quickly as possible in most situations, some rescue situations require careful assessment before you jump in to save someone, so that you do not become a victim yourself. Remaining calm, thinking logically and clearly, and knowing what steps to take and when to take them, will help you successfully perform first aid.

Lesson Check-up

- **What are some of the characteristics of first-, second-, and third-degree burns?**
- **What first aid would you provide someone with a first-degree burn?**
- **What first aid would you provide someone with a second-degree burn?**
- **Before treating a person who may be a victim of an electrical burn, what should you do first and why?**

First Aid for Poisons, Wounds, and Bruises

Key words

- **abrasions**
- **amputation**
- **avulsion**
- **incisions**
- **lacerations**
- **solvents**

What You Will Learn to Do

Determine first aid for poisonings, wounds, and bruises

Linked Core Abilities

- Do your share as a good citizen in your school, community, country, and the world

Learning Objectives

- **Identify** the causes and symptoms of poisoning
- **Describe** how to treat a poison victim
- **Distinguish** among the four types of open wounds
- **Describe** how to treat wounds and bruises
- **Define** key words: abrasions, amputation, avulsion, incisions, lacerations, solvents

Essential Question

How do you give first aid for poisoning, wounds, and bruises?

Introduction

Whenever there are small children left alone in the kitchen, accidents can happen, especially when cleaning products are left out in the open. But, poisonings can accidentally happen to people of any age. As such, the first section of this lesson introduces the treatment and prevention of injury from poisons. As an addition to your first aid skills, the lesson ends with a discussion of different types of wounds and their treatment, as well as the treatment of bruises.

Poisons

As consumers, we buy more than a quarter of a million different household products—materials used in and around the house for medication, cleaning, cosmetic purposes, exterminating insects, and killing weeds. These items are valuable in the house and for yard maintenance, but misuse, especially when products are used in inappropriate applications or quantities, can cause illness, injury, and even death.

Figure 3.4.1

Each year more than 6,000 people die and an estimated 300,000 suffer disabling illnesses as a result of unintentional poisoning by solid and liquid substances.

Poisonings at home can be prevented. While child-resistant packaging has greatly reduced the number of fatalities among children under five years of age, parents, grandparents, and other caregivers must still be cautious. Following label directions for all products, including medication dosages and proper storage of potentially toxic products are important precautions to heed.

Content Enhancement:

POISON CONTROL CENTER

Because there are so many substances that can cause poisoning, and so many different treatments, the vast majority of poisonings should be treated immediately by contacting 911 or a poison control center.

The number for the National Poison Center is:
1-800-222-1222

Figure 3.4.2

Inhaled Poisoning

Inhaled poisoning occurs when a person breathes a poisonous substance into their lungs. Inhaled poisons include:

- Smoke
- Gas used in outdoor cooking equipment and appliances in homes and recreational vehicles
- Hazardous fumes from household products such as paint and paint thinners, gasoline, **solvents**, and glues, as well as from chemicals used in industrial processes
- Carbon monoxide, which is always produced by wood, coal, and charcoal fires, and by gasoline engines. It can also be produced by gas, oil, and kerosene appliances, such as furnaces, space heaters, water heaters, and stoves

Key words

solvents:
Types of chemicals that are used to dissolve other substances, such as paint, grease, or plastic

INHALED POISON COULD BE FUMES FROM…

- Ammonia
  (some uses include household cleaners, fertilizers, and freon)
- Chlorine
  (some uses include household bleaches and disinfectants, and swimming pool disinfectants and algaecides)
- Gases
  (carbon monoxide)
- Glue
- Paint
- Pesticides
- Petrol / Turpentine
- Smoke

Figure 3.4.3

Carbon monoxide, in particular, is a very dangerous poisonous substance, because it is odorless, colorless, and tasteless, making it difficult to detect.

When a person inhales carbon monoxide, it replaces oxygen in the blood, which results in oxygen starvation throughout the body. Exposure to low amounts of carbon monoxide can cause flu-like symptoms; continued exposure can cause permanent brain, nerve, and heart damage; exposure to very high concentrations can kill a person in a few minutes.

Running a car engine in a closed garage, using a charcoal grill indoors, and burning a fire in a fireplace with a blocked chimney can all result in carbon monoxide poisoning. In addition, since carbon monoxide forms when there is a lack of oxygen resulting in incomplete fuel combustion, operating fuel-burning equipment without an adequate supply of oxygen (proper ventilation) can result in carbon monoxide poisoning. For example, hundreds of people in the United States each year suffer carbon monoxide injuries from using portable heaters, lanterns, and camping stoves inside tents, campers, and vehicles.

Content Enhancement:

SYMPTOMS OF INHALED POISONING

Symptoms of inhaled poisoning may not show up immediately. If you suspect inhalation poisoning, keep the victim under observation. If you know the victim has inhaled a poisonous chemical, get medical help whether or not symptoms are present. Symptoms will vary depending on the type and amount of poison inhaled, but can include any of the following:

- Dizziness
- Weakness
- Drowsiness
- Headache
- Mental confusion
- Breathing difficulties
- Heartbeat irregularities
- Unusual breath odor
- Discoloration of the lips and mucous membranes
- Nausea
- Vomiting
- Rashes or burns on the skin
- Unconsciousness

Figure 3.4.4

TREATMENT FOR INHALED POISONS

Before rushing in to rescue a victim in a smoke-, gas-, or fume-filled environment, quickly assess the situation so that you do not end up a victim as well. If the poisonous substance is overwhelming and the danger to you is too great, do not attempt to rescue the victim unless you have been trained for rescue in this type of situation. Immediately call EMS and stay clear of danger.

However, if after assessing the situation you believe you can safely remove the victim from the poisonous environment, do so by following these guidelines:

1. If you are alone, call for help first before attempting the rescue. This will notify others of the situation—a precaution that will ensure help is on its way in case you are also overcome by the poison. Open doors and windows to remove fumes.
2. Take several deep breaths of fresh air, then take a final deep breath and hold it as you go in. If available, a damp cloth held over your nose and mouth is a good safety precaution. **NOTE:** Do not use light switches, light a match, or use any other equipment or appliance that produces flames or sparks while you are in a gas- or fume-filled area.
3. If you can see fumes or smoke, keep your head out of them. For example, fumes from car exhaust are heavy and settle near the floor, so keep your head above them; but in the case of smoke, which rises, keep your head below it.

4. Move the victim out into the fresh air. If for some reason this is not possible, open doors and windows to ventilate the area, returning out into the fresh air as necessary to ensure your safety. Do not administer first aid until you and the victim are out of the hazardous environment or the area is ventilated. If the person vomits, wrap a cloth around your fingers and clear the airway.

   Check the victim's airway, breathing, and circulation (ABC), and perform mouth-to-mouth resuscitation and CPR as necessary. Once you are sure the victim is breathing, call EMS if you or someone else has not already done so. Even if the victim seems fine once they are in fresh air, call for medical help as symptoms may show up later. While you are waiting for medical help, treat the victim for any burns or other injuries they may have suffered and monitor for shock.

Oral Poisoning

Oral poisoning occurs when a harmful substance, such as a common household cleaning product, is swallowed. First aid for oral poisoning depends on the substance swallowed.

Content Enhancement:

SYMPTOMS OF ORAL POISONING

Symptoms will vary depending on the type and amount of poison inhaled but can include any of the following:

- Abdominal pain and cramping
- Nausea or vomiting
- Diarrhea
- Burns, odor, and stains around and in the mouth
- Drowsiness or unconsciousness
- Poison containers nearby

TREATMENT FOR ORAL POISONS

Procedures for treating oral poisoning:

1. Determine critical information:
   a. Age and size of victim
   b. What was swallowed
   c. How much was swallowed
   d. When was it swallowed
2. Remove any poisons remaining from the mouth. If a household cleaner was swallowed, read the product label for instructions about poisoning. Do not attempt to neutralize the poison unless the instructions or a poison control center list a neutralizing substance as a remedy.
3. For a responsive victim, call a poison control center immediately. More than 70 percent of poisonings can be treated through instructions taken over the telephone from a poison control center or 911.

Figure 3.4.5

4. For an unresponsive victim, or if the poison control center number is unknown, call EMS and monitor the ABCs—airway, breathing, and circulation.
5. Place the victim on their left side to position the end of the stomach where it enters the small intestine straight up. Gravity will delay advancement of the poison into the small intestine, where absorption into the victim's circulatory system is faster. If the poison has spilled on the victim's clothes, remove the clothes and flush the skin with water.
6. Induce vomiting only if a poison control center or physician advises it. Inducing must be done within 30 minutes of swallowing. If the victim was poisoned by eating a plant, save a vomit sample. It could help doctors identify and reverse the poison.
7. Save poison containers, plants, or any other source of ingested poison to help medical personnel identify the poison.

Wounds

Wounds are soft tissue injuries that break the skin. They are typically classified into four categories—abrasions, lacerations, punctures, and avulsions—and depending on their severity, can be painful and invite infection if not properly treated.

ABRASIONS

Abrasions are a result of the top layer of skin being scraped away. Most often, abrasions are caused by a sliding impact between a rough surface and the skin. Abrasions are generally shallow injuries with little bleeding. *See Figure 3.4.6.*

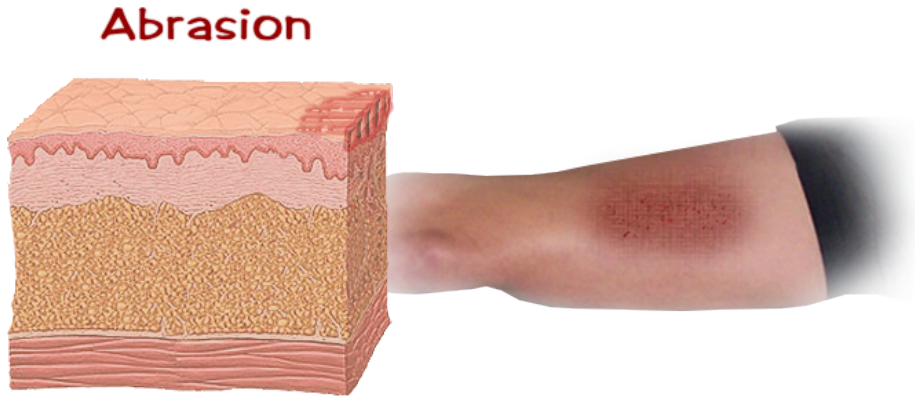


Figure 3.4.6

LACERATIONS

Lacerations are wounds in which the soft tissue in the body is torn. As a result, they are often jagged or irregular in size and shape. They are usually produced by some kind of blunt trauma to the skin. **Incisions** are straight, clean cuts made with sharp objects like knives, glass, or razor blades. *See Figure 3.4.7.*

Key words

abrasions:
Wounds where the top layer of skin has been scraped away

lacerations:
Wounds in which the soft tissue in the body is torn, often in a jagged or irregular in size and shape

incisions:
Straight cuts, usually made with a sharp object like a knife or piece of glass

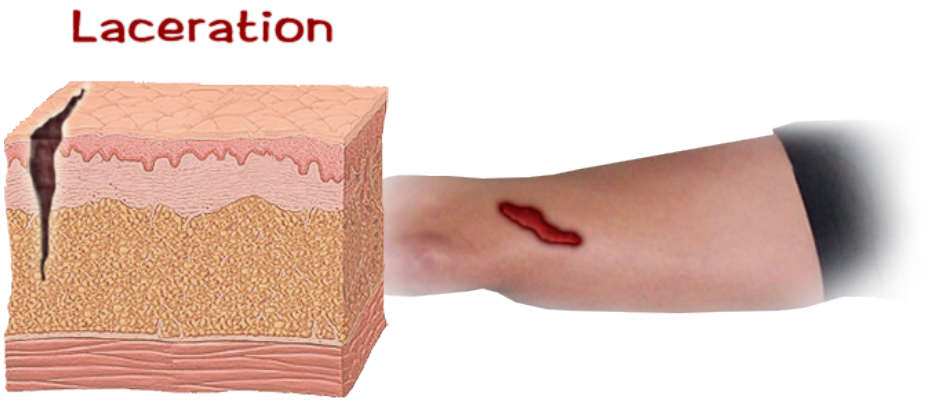


Figure 3.4.7

PUNCTURES

Punctures are caused by pointed objects such as pins and nails that make small holes into deeper tissue, often with little bleeding. Bites from animals also result in puncture wounds. *See Figure 3.4.8.*

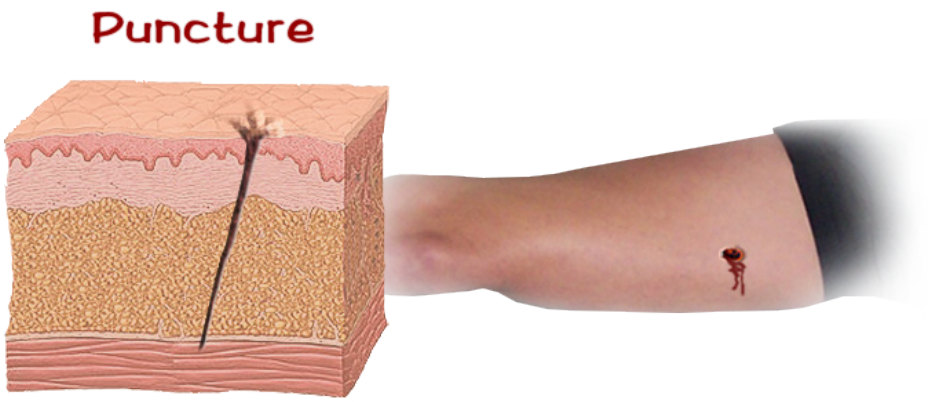


Figure 3.4.8

Key words

avulsion:
A wound where tissue is torn from, or pulled away from and hanging off of, the body

AVULSIONS

An **avulsion** is tissue torn from, or pulled away from and hanging off of, the body. This type of injury may also result from an animal bite. *See Figure 3.4.9.*

Figure 3.4.9

When Does a Wound Require Care?

Wounds can be minor or serious depending on their size, depth, location, and source. Minor wounds involve only the outer skin layer. They stop bleeding in a few minutes on their own or with gentle pressure and can be treated with just first aid. Serious wounds require first aid followed by medical treatment. Consider a wound serious, if:

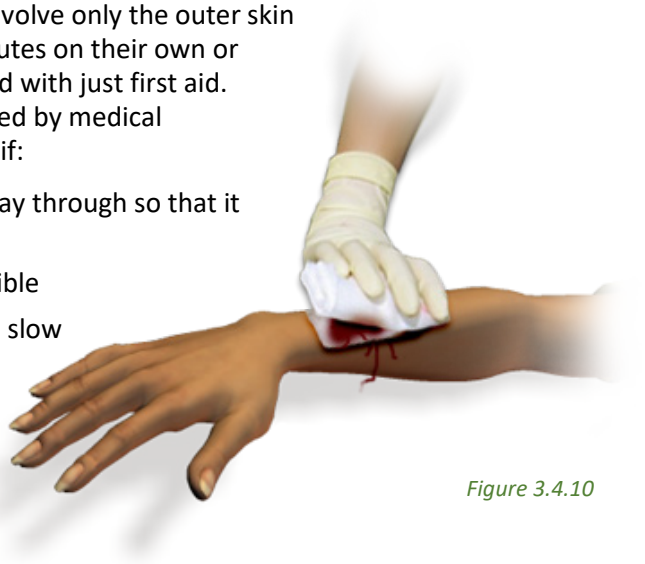


Figure 3.4.10

- The skin is cut or torn all the way through so that it gapes open
- Fat, muscle, or tendons are visible
- Bleeding is heavy and does not slow or stop after applying pressure for 15 to 20 minutes
- Soil or other debris cannot be washed from the wound
- There is loss of function like the inability to move a cut finger
- It is on the face, since even a small wound may leave a scar
- It is on the bottom of the foot
- Its source is a rusty or dirty object or an animal or human bite

Some extremely serious injuries that generally contain a combination of the four kinds of wounds, and always require immediate medical attention, are amputations, avulsions, and crushing injuries. They are generally the result of motor vehicle or industrial machinery accidents or explosions.

- An **amputation** is the complete removal of an extremity, such as a finger or leg.
- Crushing injuries occur when parts of the body are caught between heavy objects or when the body is thrown against a heavy object or vice versa. In addition to wounds, crushing injuries include bone fractures, as well as possible injuries to internal organs and internal bleeding.

Key words

amputation:
The complete removal of an extremity, such as a finger or leg

Treatment of Wounds

Before beginning treatment of any injured victim, remember to always use the Universal Precautions, wear a facemask and rubber gloves, and any other protective gear. Doing so can prevent contraction of diseases that can be spread through blood-borne pathogens.

Figure 3.4.11

MINOR WOUND CARE

Clean a minor wound by flushing it with cool water and washing it with mild soap. Dry it thoroughly with a clean cloth, apply a thin layer of antibiotic ointment to keep the wound moist and protect against infection, and cover it with a bandage to keep it clean.

Change the bandage whenever it gets wet or dirty, and consider leaving the bandage off at night when sleeping since exposure to air also helps the healing process. Contact a doctor if the wound does not appear to be healing after several days or shows signs of infection like redness, draining, or swelling.

SERIOUS WOUND CARE

In the case of serious wounds, follow the steps for controlling bleeding which include applying direct pressure, elevating the wounded part, cleaning and bandaging the wound, and seeking medical treatment. For any wound caused by a dirty object or animal bite, ask if the victim has had a tetanus shot or booster shot within the last 10 years. If not, their doctor may order one to guard against tetanus infection.

Figure 3.4.12

AMPUTATION, AVULSION, AND CRUSHING INJURY CARE

For extremely serious injuries such as amputations, avulsions, or crushing injuries, call EMS, control bleeding, monitor breathing, treat for shock, and provide comfort to the victim until medical help arrives. Remember that tourniquets should only be used in extreme, life-threatening situations, and pressure points should only be used if you are trained to do so.

Bruises

Bruises are injuries that discolor but do not break the skin tissue. They can be caused by a fall, a blow, or bumping into something. Though sometimes very ugly and lasting for several weeks, they are usually not very serious.

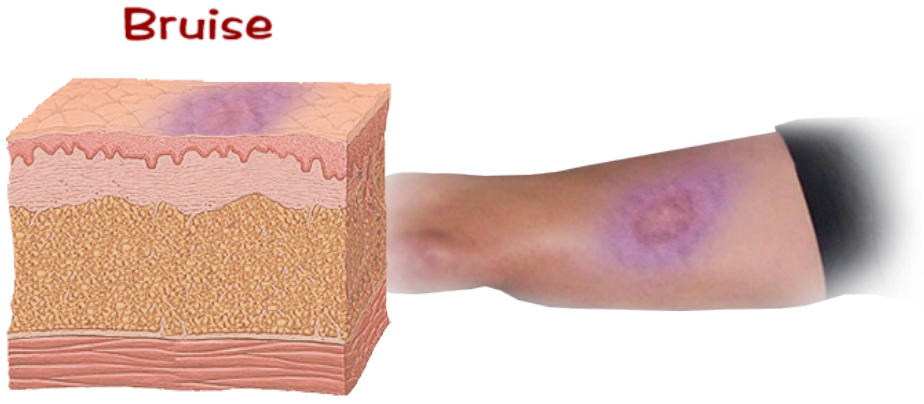


Figure 3.4.13

Treatment of Bruises

Wrap ice or an ice pack in a clean towel and apply it to the bruise. To reduce swelling, elevate the bruised part for 20 to 30 minutes if the injury is mild or for a few hours if it is severe. Seek medical attention if swelling increases unusually, pain increases, the bruise site appears deformed, or there is an inability to move a body part associated with the bruise.

Conclusion

You have just learned important procedures for treating poisons, wounds, and bruises, as well as when to apply basic first aid and life-saving skills in these situations. Remember that while it is important to administer first aid treatment as quickly as possible in most situations, some rescue situations require careful assessment before you proceed, so that you do not become a victim yourself. Remaining calm, thinking logically and clearly, and knowing what steps to take and when to take them will help you successfully perform first aid.

Lesson Check-up

- **Describe the characteristics of the four types of skin wounds.**
- **What are some demonstrated symptoms of someone who has inhaled poison?**
- **Describe some poisons that may be unfamiliar to most people.**
- **How would you treat someone who has been bruised?**

Heat Injuries

Key words

- **dehydration**
- **fatigue**
- **heat cramps**
- **heat exhaustion**
- **heat stroke**
- **perspiring**
- **ventilation**

What You Will Learn to Do

Determine first aid for heat injuries

Linked Core Abilities

- Do your share as a good citizen in your school, community, country, and the world

Learning Objectives

- **Explain** the cause of heat injuries
- **Describe** the symptoms of the three types of heat injuries
- **Explain** how to treat heat cramps
- **Explain** how to treat heat exhaustion
- **Explain** how to treat heat stroke
- **Describe** how to prevent heat injuries
- **Define** key words: dehydration, fatigue, heat cramps, heat exhaustion, heat stroke, perspiring, ventilation

Essential Question

How can heat injuries be treated and prevented?

Introduction

Participating in any vigorous outdoor exercise or activity on an extremely hot day can lead to serious injuries if you are not prepared. Knowing how to recognize the signs and symptoms of heat-related injuries can help you prevent a life-threatening situation.

Causes of Heat Injuries

For your body to work properly, its temperature must be normal, which is around 98° Fahrenheit. You risk health problems, and even death, if your body gets too cold or too hot.

Heat injuries can occur when people are exposed to high temperatures and high humidity. When it is hot, your body cools itself by **perspiring**. During perspiration, sweat evaporates and carries heat away from your body. However, you risk heat injuries when you lose large amounts of water, salt, or both, through perspiring, and do not replace the lost fluid quickly enough. This results in **dehydration**. You also risk injury in high humidity when sweat does not evaporate as rapidly as needed to keep the body cool, causing heat to build up. The body will then perspire even more in an attempt to cool itself, losing dangerous amounts of fluids in the process.

Key words

perspiring:
Giving off moisture through pores of the skin

dehydration:
The condition that results when fluids are lost from the body and are not replaced

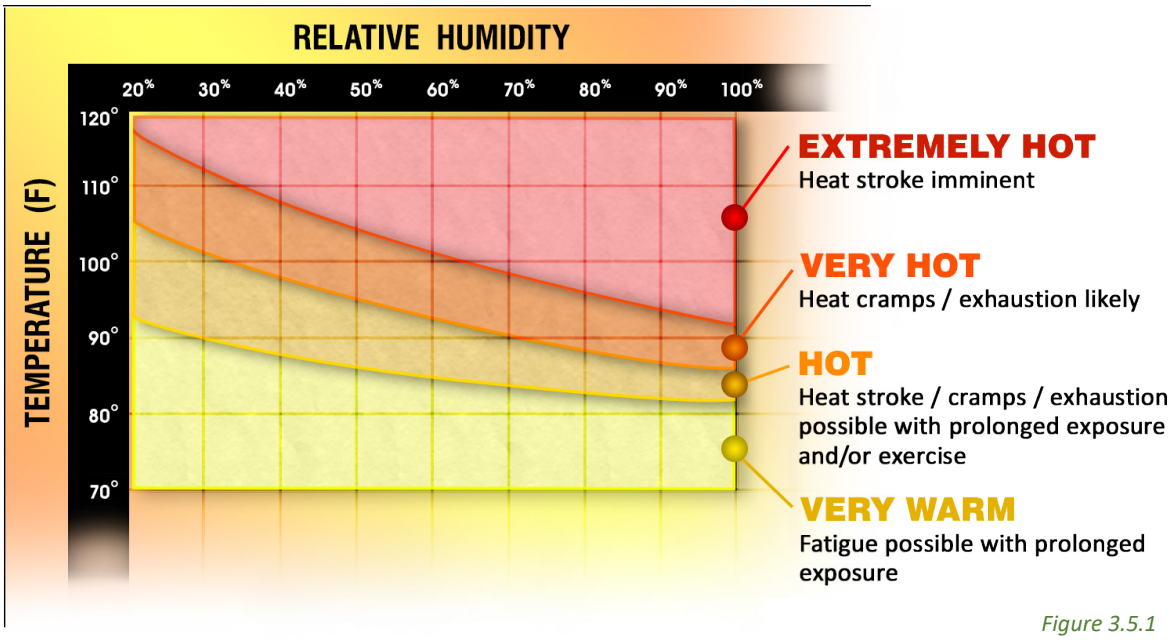


Figure 3.5.1

People who may be at risk of heat injuries include those who exercise or work outside in high temperatures and high humidity, or those whose bodies do not regulate heat well, such as older people, overweight people, or babies.

Factors to Consider

Figure 3.5.2

When perspiring, the body can lose more than a quart of water per hour. Therefore, since the body depends on water to cool itself, you should drink plenty of water when working or playing in hot weather. In most cases, however, you do not need to consume extra salt because you obtain adequate amounts through a balanced diet. In fact, consuming salt during hot weather activities may pull water away from muscles and other tissues where it is needed and into your digestive tract. You can also drink too much water and become overhydrated. Symptoms of overhydration can include:

- Nausea and vomiting
- Headache
- Confusion or disorientation

In general, do not consume more than one quart or liter of water per hour.

Figure 3.5.3

In addition to water intake and diet, consider the type of clothing you wear in hot weather. Wear lightweight clothes that fit loosely but also protect the body from sunburn. Many synthetic fabrics are better than cotton in hot, humid weather because they allow perspiration to evaporate quickly. Some activities require extra clothing or equipment, such as football or hiking with full camping gear. Cadets may have problems acclimating to hot weather because of the type and amount of clothing and equipment they must wear. In all of these cases, protective gear and equipment may reduce **ventilation** needed to cool the body. So, ensure clothing or uniforms fit well but are not tight, and remove extra pieces of clothing and equipment as soon as they are no longer needed.

Key words

ventilation:
The circulation of air as a system or means of providing fresh air

Types of Heat Injuries

Overheating of the body progresses in stages. At first, a person may suffer **heat cramps**. If the person ignores the symptoms and continues exercising, working, or playing in the heat, they may experience **heat exhaustion**. (However, heat cramps do not always precede heat exhaustion.) If heat exhaustion is left untreated, **heat stroke** may follow and can be fatal.

HEAT CRAMPS

Heat cramps are muscular pains and spasms caused by the loss of salt from the body through heavy perspiring. Heat cramps usually involve muscles that are **fatigue**d such as legs, abdominals, and shoulders. Other symptoms may include stomach cramps, wet skin, and extreme thirst.

Treatment of Heat Cramps

Heat cramp victims should rest for several hours after the cramps go away. Seek medical aid if cramps continue for more than an hour or if the person is unable to drink because of nausea or vomiting.

TREATING HEAT CRAMPS

1. Get the victim to a cooler location
2. Lightly stretch and gently massage affected muscles to relieve spasms
3. Give sips of up to a half glass of cool water every 15 minutes
4. Discontinue liquids if the victim is nauseated

Figure 3.5.4

HEAT EXHAUSTION

When people work or exercise heavily in high temperatures or in a hot, humid place, the body loses fluids through heavy sweating. Heat exhaustion occurs when fluids are not adequately replaced or when sweat does not evaporate because of high humidity or too many layers of clothing, causing the body to sweat even more. When the body loses a great amount of fluid, less blood flows to vital organs, resulting in a form of shock.

Heat Exhaustion Symptoms

- Heavy sweating
- Weakness or faintness
- Dizziness or drowsiness
- Cool, pale, moist skin
- Headaches
- Loss of appetite
- Nausea with or without vomiting
- Confusion
- Chills
- Rapid breathing and pulse
- Body temperature above normal but below 102°F

Key words

heat cramps:
A condition marked by the sudden development of cramps caused by the loss of salt from the body through heavy perspiration in hot or humid conditions

heat exhaustion:
A heat injury that occurs when fluids are not adequately replaced or when sweat does not evaporate because of high humidity or too many layers of clothing

heat stroke:
A life-threatening condition caused by prolonged exposure to heat

fatigue:
Weariness or exhaustion

Treatment of Heat Exhaustion

Heat exhaustion victims should be monitored carefully. Call for emergency help if the person's condition worsens or if the person experiences fainting, confusion, seizures, or a fever over 104° F.

TREATING HEAT EXHAUSTION

1. Get the victim to lie down in a cool place
2. Loosen or remove clothing
3. Apply cool, wet cloths
4. Fan or move victim to air-conditioned place
5. If victim is conscious, give sips of up to a half glass of cool water every 15 minutes *
6. Discontinue water if victim is nauseated
7. Seek immediate medical attention if vomiting occurs

* Be sure water is consumed slowly

Figure 3.5.5

HEAT STROKE

Heat stroke, also known as sun stroke, is a medical emergency that can be fatal if not treated as soon as possible. The victim's cooling mechanism stops working when the body perspires so much that no fluids remain to produce sweat. Since the body can no longer sweat and sweating is its defense against overheating, body temperature rises and skin becomes red and flushed. The body is unable to regulate its core temperature. If body temperature rises high enough, brain damage and death can occur. Therefore, when you encounter a heat stroke victim, you must cool the victim as fast as possible. If you suspect heat stroke, call for emergency medical assistance. Heat stroke is life-threatening.

Heat Stroke Symptoms

- No sweating
- Hot, dry, red skin
- Headache, dizziness, nausea, and vomiting
- Fast, weak pulse, and shallow respiration
- Seizures and mental confusion
- Unconsciousness or sudden collapse
- Very high body temperature

Treatment of Heat Stroke

If a heat stroke victim is able to drink without vomiting, give the person small sips of water. Monitor the person for danger signs such as loss of consciousness, no signs of circulation and so on.

TREATING HEAT STROKE

1. Call 9-1-1 or emergency medical services
2. Move victim to a cooler environment; use fans and air conditioner
3. Remove or loosen clothing
4. Use a cool bath, sponging, or wet sheet to reduce body temperature
5. Watch for breathing problems

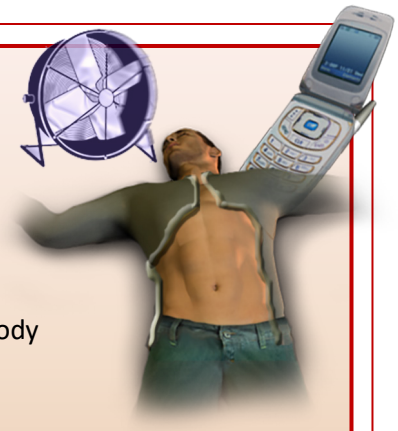


Figure 3.5.6

Prevention of Heat Injuries

You can prevent heat injuries by taking a few simple precautions and exercising a little common sense. If possible, limit your exposure to high temperatures and avoid working or exercising outside in hot, humid weather. During work or training periods, or in extremely hot climates, drink at least one quart of water every hour, but not more than that. Drinking too much water can cause overhydration. Also, remember to dress for the hot weather and the activity being performed.

In the military or in the field, prevention of heat injuries is both an individual and leadership responsibility. Leaders should identify people who have a high risk of injury—basic trainees, overweight individuals, and individuals who have symptoms of fatigue or a previous history of heat injury. If possible, leaders should schedule heavy or strenuous activities during cooler morning or evening hours.

Conclusion

Vigorous exercise in hot weather can lead to heat cramps, heat exhaustion, or heat stroke. Familiarize yourself with the symptoms of these injuries, which can be serious or even fatal if left untreated. By knowing the signs of heat injuries, and taking precautions, you should be able to enjoy exercising outdoors, even in hot weather.

Lesson Check-up

- **What are the types of heat injuries?**
- **What symptoms would a victim present if suffering heat exhaustion? What first aid would you administer?**
- **What symptoms would a victim present if suffering from a heat stroke? What first aid would you administer?**

LESSON 6

Cold Weather Injuries

Key words

- **frostbite**
- **hypothermia**
- **insulate**
- **precipitation**
- **subcutaneous**
- **superficial**

What You Will Learn to Do

Determine first aid for cold weather injuries

Linked Core Abilities

- Do your share as a good citizen in your school, community, country, and the world

Learning Objectives

- **Explain** the causes of cold weather injuries
- **Identify** symptoms of cold weather injuries
- **Explain** how to treat frostbite, immersion foot/trench foot, hypothermia, and snow blindness
- **Describe** how to prevent cold weather injuries
- **Define** key words: frostbite, hypothermia, insulate, precipitation, subcutaneous, superficial

Essential Question

How can cold weather injuries be treated and prevented?

Introduction

It is common to think that only in areas where snow and frost are present, people are susceptible to cold weather injuries. Prolonged exposure to low temperatures, wind, or moisture—whether it is on a ski slope or in a stranded car—can result in cold-related injuries such as **frostbite** and **hypothermia**. It doesn't matter where you live, cold weather injuries can occur, especially if you are not prepared.

Figure 3.6.1

Key words

frostbite:
An injury caused to body tissue by frost or extreme cold

hypothermia:
An injury where there is too little body heat with abnormally low internal body temperature

precipitation:
Any form of water, such as rain, snow, sleet, or hail that falls to the earth's surface

Factors to Consider

WEATHER

Low temperatures, high humidity, **precipitation**, and high winds may affect the loss of body heat. Wind chill (the temperature of both the wind speed and air temperature combined) increases loss of body heat and may aggravate cold injuries. By studying the Wind Chill Chart in *Figure 3.6.2*, you can determine the chilling effect of wind speed on temperature.

WIND CHILL CHART and FROSTBITE TIMES

How to use the chart:

Find the wind speed in the left-hand column, then read across to the column under the actual temperature. This number is the equivalent temperature that would be acting on any exposed skin.

For example, if the wind is blowing at 20*mph*, and the actual temperature is 10°F, the effect on bare skin would be the same as a temperature reading of -9°F under calm conditions.

Any movement has the same cooling effect as wind. Running, skiing, or riding in an open vehicle must be considered in using the wind chill chart.

Temperature (°F)

Wind (mph)	Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5		36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10		34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15		32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20		30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25		29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30		28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35		28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40		27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45		26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50		26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55		25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60		25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times — 30 minutes — 10 minutes — 5 minutes

Effective 11/01/01

Figure 3.6.2

STRESS

When in a stressful situation, people are more likely to experience fear, fatigue, dehydration, and lack of nutrition. These factors increase the possibility of a cold-weather injury.

CLOTHING

When in cold weather, you should wear several layers of loose clothing and dress as lightly as the weather permits. This reduces the danger of excessive perspiration followed by chilling. It is better if the body is slightly cold and producing heat than overly warm and sweltering toward dehydration. Wet clothing adds to the possibility of cold injury.

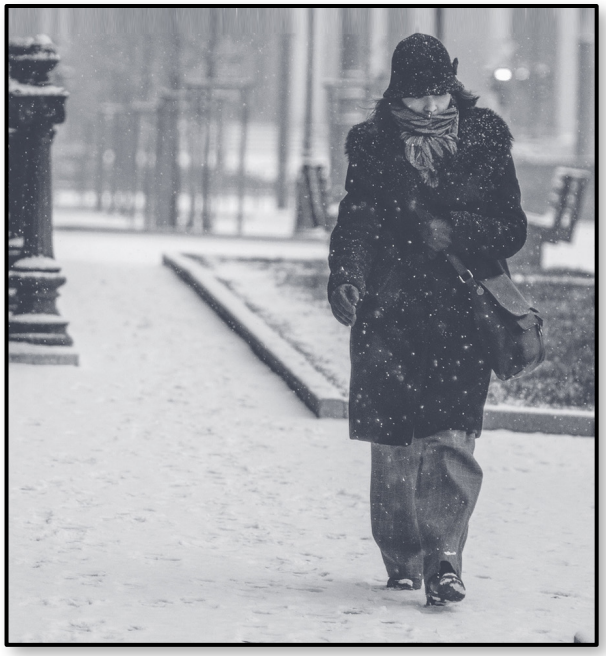


Figure 3.6.3

PHYSICAL MAKEUP

Physical fatigue leads to inactivity, personal neglect, carelessness, and less heat production. These, in turn, increase the risk of cold injury. Individuals who have had a cold injury before have a higher risk of being injured again.

PSYCHOLOGICAL FACTORS

Mental fatigue and fear lessen the body's ability to warm itself and increase the possibility of a cold injury. Depressed or unresponsive individuals are also at a higher risk of cold injury because they are less active and tend to be careless about protecting themselves.

Figure 3.6.4

OTHER FACTORS

Individuals are also at risk of cold injury if they are:

- Often in contact with the ground
- Immobile for long periods of time, such as while riding in a vehicle
- Standing in water
- Out in the cold for days without being warmed
- Deprived of an adequate diet and rest
- Careless about personal hygiene

People exposed to severe cold can suffer from the following conditions: frostbite, immersion foot/trench foot, hypothermia, snow blindness, and dehydration.

Frostbite

Frostbite is the most common injury resulting from exposure to the cold. Ice crystals form in body tissues exposed to temperatures below freezing. The crystals restrict blood flow to the injured parts and are like daggers that puncture cell membranes as they grow larger. Body parts most easily frostbitten are the cheeks, nose, ears, chin, forehead, wrists, hands, and feet. People suffering from frostbite may not realize it, since the injured part may be numb from the cold.

There are different degrees of frostbite depending on the extent of tissue damage.

- A **superficial** cold injury can usually be characterized by numbness and tingling or "pins and needles" sensations. It involves the skin and the tissue just beneath the skin. *(See Figure 3.6.5)*

Figure 3.6.5

- Deep (severe) frostbite, on the other hand, involves freezing of the **subcutaneous** tissue, and possibly even muscle and bone. With a deep cold injury, victims are often unaware of a problem until the affected part feels like a stump or block of wood. Severe frostbite may result in infection or gangrene and may require surgical removal of the injured part. *(See Figure 3.6.6)*

Figure 3.6.6

Key words

superficial:
Injuries that are not very serious and only affect the surface of the body

subcutaneous:
Beneath the top layer of skin

SIGNS OF FROSTBITE

Signs of superficial frostbite include:

- Redness of the skin on light-skinned individuals; grayish coloring of the skin on dark-skinned individuals
- Blisters in 24 to 36 hours
- Sloughing of the skin

Signs of deep frostbite include:

- Signs of superficial frostbite
- Painless or numb unthawed skin that is pale-yellowish and waxy looking
- Frozen, swollen tissue that is like wood to the touch
- Blisters in 12 to 36 hours

Frostbite victims may also experience pain in the affected area after warming.

TREATMENT OF FROSTBITE

Frostbite may be accompanied by a more serious condition—hypothermia. Symptoms include intense shivering, slurred speech, and drowsiness. Always check frostbite victims for hypothermia and call for emergency help if you suspect it.

If possible, bring a frostbite victim indoors. You can gently rewarm frostbitten areas by soaking in warm—not hot—water. As the frozen tissue thaws, it may burn and become painful. Use over-the-counter medications such as ibuprofen to reduce pain and inflammation. Seek medical attention if the pain and numbness continue after warming or if blisters develop.

Deep frostbite is very serious and requires extra care to reduce or avoid losing all or parts of the fingers, toes, hands, or feet. If possible, transport the victim to a hospital or contact emergency medical services immediately, since it is preferable that deep frostbite injuries be rewarmed under medical supervision. If this is not possible, rewarm the injured parts, protect them from re-freezing, and seek medical help as soon as possible.

TREATING FROSTBITE

Superficial frostbite:

1. Warm affected area with direct body heat.
2. Consult with medical personnel ASAP.
3. DO NOT thaw frozen area if treatment will be delayed.
4. DO NOT massage or rub affected area.
5. DO NOT wet area or rub with snow or ice.

Deep frostbite:

1. DO NOT attempt to thaw the affected part if you believe you cannot keep it warm until the victim receives medical treatment. It is extremely dangerous for an injured part to re-freeze after warming. It is less dangerous to leave the part frozen than to warm it and have it re-freeze.
2. Avoid having the victim walk on frostbitten feet, especially if they thaw. If the victim must walk, it is less dangerous while his or her feet are frozen.
3. DO NOT rub the injured part with snow or apply cold water packs.
4. DO NOT warm the injured part by massage; ice crystals in the tissues will damage more cells when rubbed.
5. DO NOT expose the injured part to open fire; the frozen part may burn because of lack of feeling.
6. DO NOT have the victim move the injured part to increase circulation.
7. DO NOT break any blisters.
8. DO NOT use ointments or other medications.
9. DO NOT let the victim use alcohol or tobacco. Alcohol reduces the body's resistance to cold, and tobacco decreases blood circulation.

Figure 3.6.7

Immersion Foot / Trench Foot

Immersion foot and trench foot result from long exposure of the feet to wet conditions at temperatures between approximately 32° and 60°F. Keeping your feet in damp or wet socks and shoes or tightly laced boots for long periods of time may affect circulation and contribute to injury. Inactivity also increases the risk of immersion foot/trench foot. This injury can be very serious, leading to loss of toes or parts of the feet.

SIGNS OF IMMERSION FOOT AND TRENCH FOOT

Symptoms of immersion foot/trench foot in the primary stage include:

- Affected parts that are cold, numb, and painless
- Affected parts may begin to feel hot, with burning and shooting pains
- In the advanced stages, the pulse decreases and skin becomes pale with a bluish cast
- Redness, blistering, swelling, heat, hemorrhages, and gangrene may follow

Figure 3.6.8

TREATMENT OF IMMERSION FOOT OR TRENCH FOOT

Someone suffering from trench foot should remove shoes and socks then clean and dry the feet thoroughly. Elevate the feet to reduce swelling and avoid walking to prevent tissue damage. Keep the feet warm and dry with a sheet or blanket while they are healing, but do not wear socks. Skin that is discolored—greenish or blackish—is usually an indication of dying tissue. Get immediate medical attention to prevent further damage.

TREATING IMMERSION FOOT / TRENCH FOOT

1. Remove shoes and socks.
2. Dry the feet thoroughly.
3. Warm feet by exposing them to warm air, or a loose sheet or blanket.
4. Evacuate victim to a medical facility.
5. DO NOT massage, rub, moisten, or expose affected area to extreme heat.

Figure 3.6.9

Hypothermia

Hypothermia is a general cooling of the body to a temperature below 95°F caused by continued exposure to low or rapidly dropping temperatures, cold moisture, wind, snow, or ice. With hypothermia, the body loses heat faster than it can produce it. Inadequate insulation, fatigue, poor physical condition, dehydration, faulty blood circulation, alcohol, trauma, and immersion in cold water can bring on this condition. People at high risk of hypothermia include infants, older people, people with limited mobility due to illness or other medical conditions, very thin people, and people with heart and lung problems.

Figure 3.6.10

Remember, cold weather affects the body slowly and almost without notice. Even when well protected by clothing, a person may suffer cold injuries if exposed to low temperatures for long periods of time. As the body cools, it goes through several stages of symptoms.

SIGNS OF HYPOTHERMIA

- Shivering or trembling which indicates mild hypothermia and will eventually stop as body temperature drops
- Cold skin
- Weakness
- Dizziness
- Drowsiness and mental slowness or confusion
- Uncoordinated movements and slurred speech
- Low body temperature; in severe hypothermia, 90°F or below
- Stiff or rigid muscles
- Decreasing pulse and breathing rate
- Unconsciousness
- Shock, coma, and death, which may result as body temperature drops and the body freezes

Figure 3.6.11

TREATMENT OF HYPOTHERMIA

The treatment for hypothermia is directed toward re-warming the body evenly and without delay. If you suspect hypothermia, call for emergency medical help! Get the person indoors if possible. If that is not possible, protect the person from wind—especially around the neck and head. Try to get the person to lay on a thick blanket, cardboard, or anything that will **insulate** from the cold ground.

Treating a person with severe hypothermia is extremely dangerous because of the possibility of shock and disturbances of the heartbeat while re-warming. If possible, as you begin to re-warm the victim, transport them to a hospital or contact Emergency Medical Services immediately. If this is not possible, treat the victim gently since the heart is weak when the body is cold. Stabilize the body temperature by containing the body heat, and continue to keep them warm until medical treatment is available.

If further warming is needed, go slowly. Use a dry warm—not hot—compress on the chest and groin. You can also use an electric blanket if one is available. Offer warm, sweet, nonalcoholic drinks. In addition to these steps, there are also steps you must avoid:

- DO NOT warm the person too quickly.
- DO NOT warm the arms or legs; heating the extremities of a hypothermia victim can stress the heart and lungs.
- DO NOT give the person alcohol or cigarettes. Both can hinder the body's attempts to rewarm itself.

Key words

insulate:
To use materials to protect or isolate something from the elements of weather

TREATING HYPOTHERMIA

1. Strip off wet clothing and wrap victim in dry blankets or sleeping bag.
2. Get victim to a heated location and medical treatment as soon as possible.

Figure 3.6.12

Snow Blindness

Snow blindness is the effect the glare from an ice field, or snowfield, has on the eyes. It is more likely to occur in hazy, cloudy weather, since people tend to protect their eyes when the sun is shining and believe protection is unnecessary on cloudy days. If you wait until you feel discomfort or pain to use protective eyewear, a deep burn of the eyes may have already occurred.

SIGNS OF SNOW BLINDNESS

- A sensation of grit in the eyes
- Pain in and over the eyes made worse with eye movement
- Watery and red eyes
- Headache
- Increased pain with exposure to light

Figure 3.6.13

Symptoms may also include eyelid twitching and small pupils. There is rarely vision loss.

TREATMENT OF SNOW BLINDNESS

Snow blindness usually goes away on its own. To relieve the discomfort and prevent further damage, get out of the sun and into a dark room.

TREATING SNOW BLINDNESS

1. If wearing contact lenses, remove as soon as snow blindness is suspected.
2. DO NOT rub eyes.
3. Place a cold, damp washcloth over the eyes to alleviate the stinging of the burn.
4. During and after the healing process, use protection from light (i.e. sunglasses if outside) and limit eyelid movement.

Figure 3.6.14

Dehydration

Dehydration occurs when the body loses too much fluid, salt, and minerals. As mentioned in the previous lesson, you can lose large amounts of fluid and salt through sweating. This loss creates an imbalance of fluids, and dehydration occurs when fluids are not replaced.

Dehydration can occur in both hot and cold climates. In cold weather, sweat evaporates quickly and heavy layers of clothing absorb it, making dehydration more difficult to detect because the signs of sweating are less noticeable. Therefore, the danger of dehydration during strenuous cold weather activities can become a serious problem.

TREATING DEHYDRATION

The symptoms of cold weather dehydration are similar to those of heat exhaustion. Treat dehydration as follows:

1. Move the victim out of the wind and cold, and keep them warm.
2. Loosen the victim's clothes to promote circulation.
3. Ensure the victim receives proper fluid replacement, rest, and prompt medical treatment.

Figure 3.6.15

Prevention of Cold Weather Injuries

You can prevent many cold weather injuries by taking proper care and precautions when participating in cold weather activities.

- Be sure to receive adequate nutrition, hot meals, and warm fluids.
- Get enough rest.
- Practice good hygiene.
- Wear the right clothing and protective gear. Do not forget to protect your eyes, ears, and face.
- Wear layers of clothing that insulate and can be removed if you begin to perspire.
- Avoid tight clothes that interfere with circulation.
- Replace or remove any clothing that gets wet as soon as possible.

Figure 3.6.16

Since you may not feel cold injuries because of cold's numbing effect, always try to go out into cold weather with a partner, so you can check each other for signs of injury. Exercise and keep active to maintain steady circulation and improve resistance to the cold. Many cold weather injuries can be avoided by planning ahead, staying alert, and using common sense.

Conclusion

Whether or not snow and frost are present, cold weather injuries, such as frostbite or hypothermia, can be a threat to anyone's safety. Knowing the proper ways to treat these injuries is very important because, although it might seem like a good idea to re-warm the victim, you may in fact be making the injury worse. Read the first aid measures outlined in this lesson and review how to prevent these injuries in the first place. In doing so, the cold will not catch you off guard.

Lesson Check-up

- **What factors should you consider when preparing for cold weather?**
- **What are the symptoms of frostbite and how would you treat a victim with superficial frostbite?**
- **What medical threat does trench foot provide its victim?**
- **What are the symptoms of hypothermia and how would you treat someone presenting those symptoms?**

LESSON 7

Bites, Stings, and Poisonous Hazards

Key words

- allergic reaction
- antivenin
- calamine
- discoloration
- rabies
- tetanus
- venom

What You Will Learn to Do

Determine first aid for bites, stings, and poisonous hazards

Linked Core Abilities

- Do your share as a good citizen in your school, community, country, and the world

Learning Objectives

- **Identify** four types of poisonous snakes
- **Describe** symptoms of and treatment for snake bites
- **Describe** symptoms of and treatment for human and animal bites
- **Describe** symptoms of and treatment for insect bites and stings
- **Describe** symptoms of and treatment for poisonous plant exposure
- **Identify** ways to prevent bites, stings, and poisonous plant exposure
- **Define** key words: allergic reaction, antivenin, calamine, discoloration, rabies, tetanus, venom

Essential Question

How can bites, stings, and poisonous hazards be treated and prevented?

Introduction

With so many outdoor activities to participate in, such as hiking, camping, bicycle riding, skate boarding, and skiing, it is common to come across emergencies involving bites, stings, and poisonous hazards. It is estimated that one of every two Americans will be bitten at some time by an animal. Dogs are responsible for about 80 percent of all animal-bite injuries. Depending upon where you live, the type of first aid you should perform for snake bites and plants will vary. Knowing what to do when you are outdoors can mean the difference between life and death.

Key words

venom:
A poison produced by animals such as snakes, scorpions, and spiders that is transmitted by a bite or sting

Snake Bites

If you spend much of your time outdoors, it may be common for you to come across snakes; however, your chances of a snake bite are remote if you remain alert and careful. There are poisonous and nonpoisonous snakes, so the severity of snake bite depends on whether the snake is poisonous or not. Beyond that, the severity of snake bite depends on the type of snake, location of the bite, and the amount and type of **venom** injected.

Figure 3.7.1

SIGNS OF A SNAKE BITE

- Puncture marks on the skin may be visible
- The following may take from 15 minutes to 2 hours to develop:
  - Redness and swelling of the bitten area
  - Nausea and vomiting
  - Diarrhea
  - Headache
  - Double vision
  - Faintness
  - Tightness in the chest and difficult breathing
  - Unconsciousness

TYPES OF SNAKE BITE VENOM

There are three types of venoms: neurotoxin, which affects the nervous system and can cause death by paralysis; hemotoxin, which digests tissue including blood cells; and cardiotoxin, which directly affects the heart.

TYPES OF SNAKES

There are approximately 130 different varieties of nonpoisonous snakes in the United States. They have oval-shaped heads and round pupils.

Poisonous snakes exist throughout the world, primarily in tropical to moderate climates. In the United States, there are four kinds of native poisonous snakes: coral snakes, rattlesnakes, copperheads, and cottonmouths (water moccasin). Rattlesnakes make a rattling noise by shaking the rings at the end of their tails. Cottonmouths have a white cottony surface in their mouths. Coral snakes have red, yellow and black rings—with the red bands flanked by yellow bands. Copperheads also have distinct markings. They have brownish bands shaped like an hourglass.

Rattlesnakes, copperheads, and cottonmouths are pit vipers. The coral snake is a type of cobra.

Rattlesnake *Figure 3.7.2*

Pit Vipers

Pit vipers have slit-like pupils; flat, triangular-shaped heads; small, deep, heat-sensing pits between their nostrils and eyes; and in most cases, hemotoxic venom. When a pit viper bites, it injects this venom from sacs through long, hollow fangs. This produces a severe burning pain, along with **discoloration** and swelling around the fang marks. The hemotoxin destroys blood cells, which causes the discoloration of the skin. Blisters and numbness in the affected area follow this reaction. Pit viper bites attack the circulatory system, possibly causing weakness, rapid pulse, and shortness of breath, as well as nausea, vomiting, and shock.

Cobras

Corals, cobras, kraits, and mambas belong to the cobra family. The coral snake *(Figure 3.7.3)* is the only one native to the United States. Rings of red, yellow, and black color encircle its body. While other nonpoisonous snakes have the same colors, only the coral snake has a red ring next to a yellow ring.

Coral snake *Figure 3.7.3*

Key words

discoloration:
An altered or changed color

Cobra Figure 3.7.4

Krait Figure 3.7.5

Mamba Figure 3.7.6

The cobra *(Figure 3.7.4)*, found in Africa and Asia, forms a hood with its neck when on the defensive. The krait *(Figure 3.7.5)*, found in India and Southeast Asia, is brightly banded, while the mamba *(Figure 3.7.6)* in Africa is either almost black or green. These snakes look very different, but all four inject their venom, a neurotoxin, through short, grooved fangs leaving a characteristic bite pattern. There is minimal pain and swelling compared to a pit viper bite, but since their powerful venom affects the central nervous system, it can cause blurred vision, drooping eyelids, slurred speech, drowsiness, and increased salivation and sweating. Nausea, vomiting, shock, respiratory difficulty, paralysis, convulsions, and coma develop if the bite is not treated promptly.

Sea Snakes

Sea snakes are found in warm water areas of the Pacific and Indian Oceans. They have small heads, thick bodies, and tails flattened along the sides. The poisonous yellowbelly sea snake is found in waters off the coasts of California and Hawaii. Bites from these snakes are rare.

Figure 3.7.7

TREATMENT FOR SNAKE BITES

Snake bites are rarely fatal if treated within an hour or two, but they can cause pain and illness and may severely damage a bitten hand or foot. Although snakes do not always inject venom, all snakes may carry **tetanus** (lockjaw). Therefore, anyone bitten by a snake, whether poisonous or nonpoisonous, should receive immediate medical attention.

One of the most important parts of treating a snake bite is identifying the type of snake making the bite. The type of **antivenin** used in medical treatment of snake bites varies by the snake. Try to remember the color and shape of the snake. If you can identify the type of snake causing the injury, let Emergency Medical Services know when you call for help or phone the information ahead to the hospital if you plan to transport the victim yourself.

Key words

tetanus:
An acute infectious disease caused by the poison of a certain bacterium that enters the body through a wound, resulting in muscle contractions, rigidity, and death

antivenin:
Antitoxin used to counteract venom

If you are bitten by a snake, remain calm and move out of striking distance from the snake. Call for emergency help if you suspect a poisonous bite.

TREATING SNAKE BITES

1. Apply roller bandage
2. Restrict movement with a loose splint and keep the bitten area below the level of the heart.
3. Monitor vital signs and check for shock.
4. Remove rings or tight clothing near the bite. The area may swell.

Figure 3.7.8

There are also a few things you should NOT do in the case of snake bite:

- DO NOT use ice on the bite, nor a tourniquet.
- DO NOT cut into the bite and attempt to suck out the venom by mouth.
- DO NOT give the person anything by mouth.
- DO NOT try to capture the snake. This can be dangerous!
- DO NOT give the person any medication unless a doctor tells you to do so.

PREVENTION OF SNAKE BITES

Most snakes are shy and passive. Unless they are injured or disturbed, they tend to avoid contact with humans. You can prevent a snake bite by using caution and common sense. If you are working outside clearing dense undergrowth, wear gloves, long sleeves, long pants, and boots for protection. When hiking in the wilderness, wear boots and long pants. Try to walk in open areas or stay on established paths. Look where you are stepping or placing a hand if climbing or pushing away tree limbs. Check before sitting on a rock or fallen tree. If possible, stay away from brush, rocks, and undergrowth. If you must handle a snake, even a freshly killed one, use a long tool or stick.

Human and Animal Bites

Animal bites can puncture the skin causing a high risk of infection. Animal bites also pose the threat of exposing the victim to **rabies**. Rabies is a potentially deadly disease that is spread through the saliva of rabid animals, which behave strangely. Animals that may carry rabies include raccoons, bats, skunks, and household pets that have not been vaccinated.

Key words

rabies:
A viral disease that affects the central nervous system of mammals and is transmitted by a bite from an infected animal; can result in paralysis and death if left untreated

Human bites, like animal bites, can cause infections. This usually happens in fights for example, when one person's hand may come in contact with another person's mouth. When human bites puncture the skin, they have a high risk of infection and also pose a risk of injury to tendons and joints.

Figure 3.7.9

SYMPTOMS OF AN ANIMAL BITE

Possible symptoms include:

- Break or major cuts in the skin with or without bleeding
- Bruising
- Crushing injuries
- Puncture-type wound

TREATMENT FOR ANIMAL BITES

If you are concerned that the bite might have been caused by a rabid animal, see a doctor immediately. Tetanus is also a concern. Your doctor may order a tetanus booster shot depending on your circumstances.

TREATING ANIMAL BITES

1. Wash your hands thoroughly before AND after with soap, or use sterile gloves.
2. *If the bite IS NOT bleeding severely* – Wash thoroughly with mild soap and running water for 3 to 5 minutes, then apply antibiotic ointment and a clean dressing.
3. *If the bite IS actively bleeding* – Apply direct pressure with a clean, dry cloth until bleeding stops; raise the area of the bite.
4. Carefully monitor for 24 to 48 hours for signs of infection (increasing skin redness, swelling, and pain). *

* *Seek medical attention if the bite becomes infected or if it is on the hand or finger*

Figure 3.7.10

Insect Bites and Stings

In the outdoors, you may come in contact with various types of biting and stinging insects—bees, mosquitoes, ticks, fleas, spiders, etc. Most of these insect bites and stings

Key words

allergic reaction:
A physical reaction, often marked by sneezing, breathing difficulties, itching, rash, or swelling, that some people have when they come in contact with certain substances

Figure 3.7.11

result in minor reactions, such as itching, redness, swelling, and irritation. However, scorpions and certain spiders can inject powerful poisons when they bite, and some people may have an **allergic reaction** to an insect bite or sting, particularly made by bees or wasps. In these cases, seek medical treatment immediately.

The black widow and brown recluse spiders, tarantulas, and scorpions are some of the more harmful insects you may encounter. Venom from the black widow is neurotoxic and may cause stomach and muscle cramps, breathing difficulties, nausea, sweating, vomiting, and convulsions. Tarantula venom is basically neurotoxic and may produce symptoms like that of a black widow bite, but in some cases can affect the heart and may digest tissue producing a severe local wound. The brown recluse spider can produce severe tissue damage around the bite, possibly leading to gangrene; and while stings from certain types of scorpions are painful but not dangerous, some can cause nausea, fever, stomach cramps, and possible convulsions and shock.

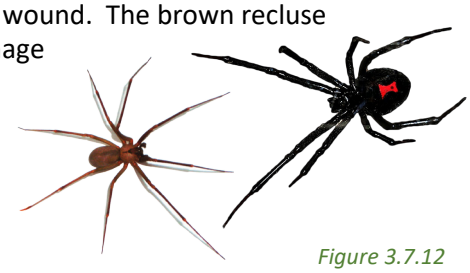


Figure 3.7.12

In most cases, bee and wasp stings produce minimal swelling, pain, redness, itching, and burning at the site of the sting. Multiple stings may cause headaches, fever, muscle cramps, and drowsiness. In addition, allergic reactions to stings can be serious.

SYMPTOMS OF AN ALLERGIC REACTION

- Swelling, itching, and pain at the sting site
- Itchy rash and welts elsewhere on the body
- Swelling of the eyelids and face
- Breathing difficulty

TREATMENT FOR INSECT BITES AND STINGS

Notice what kind of insect made the bite and be prepared to describe it if needed. Only attempt to capture the insect if you can do so without putting yourself at risk.

If you are allergic to stings, your doctor may have already given you a prescription for an allergic attack. People who are allergic to stings should carry their epinephrine auto injector when they know they'll be in close proximity to stinging insects. If signs of infection like pus, red streaks leading away from the bite, swollen glands, or fever occur within hours or several days after an insect bite, seek medical attention.

Figure 3.7.13

TREATING INSECT BITES AND STINGS

Initial treatment for ALL insect bites and stings:

1. Move to a safe area.
2. *For a sting* – Scrape or brush off the stinger with a straight-edged object.
3. Apply a cold pack.
4. Apply hydrocortisone cream.
5. Take an antihistamine.

Treatment for MORE SERIOUS allergic reactions while waiting for medical help:

6. Use an epinephrine auto injector if available.
7. Loosen tight clothing and keep the person warm.
8. Do not give the person anything to drink.
9. Turn the person on their side to prevent choking.
10. Be prepared to perform basic life-support measures if the person shows no signs of circulation, such as breathing or movement.

Figure 3.7.14

PREVENTION OF INSECT BITES AND STINGS

Wear insect repellent when outside in areas where biting insects are present. Re-apply repellent every few hours when participating in activities that cause heavy perspiration. Wear appropriate protective clothing when hiking or camping in the wilderness or working in a yard, garden, or overgrown area.

Poisonous Plants

Most plants are harmless, but a few can cause allergic reactions upon contact. Poison ivy, poison oak and poison sumac produce an oily substance that irritates the skin of many people. Reactions to this substance include a rash characterized by redness, blisters, swelling, and intense burning and itching, as well as headaches and fever. Although the rash usually begins within a few hours after contact, it may appear 24 to 48 hours later.

Poison Ivy *Figure 3.7.15*

Poison Oak *Figure 3.7.16*

Key words

calamine:
A pink powder that is made of zinc oxide and some ferric oxide and is used in lotions and ointments

SYMPTOMS OF AN ALLERGIC REACTION

- Red rash with extreme itching
- Rash erupts in streaks or patches where the plant came in contact with the skin
- Rash includes red bumps and may also form large, weeping blisters

TREATMENT FOR POISONOUS PLANT CONTACT

In general, treat someone who has come in contact with a poisonous plant by washing the area and treating with an oral antihistamine and **calamine** lotion or hydrocortisone. Do not use other creams or ointments on the area; they can make the skin more sensitive. Washing the area within 10 minutes of exposure can greatly minimize reactions and symptoms.

Seek emergency medical care if the person is having a severe allergic reaction, such as difficulty breathing. See a doctor if there is a rash covering a large part of the body or if blisters develop.

TREATING REACTION TO POISONOUS PLANT

1. Remove exposed clothing and wash.
2. Wash the area thoroughly with soap and water as soon as possible.
3. Treat itching with an oral antihistamine and one of the following:
    - Colloid oatmeal bath
    - Paste of baking soda and water
    - Calamine lotion
    - Topical hydrocortisone cream

Figure 3.7.17

PREVENTION OF EXPOSURE TO POISONOUS PLANTS

Become familiar with what poison ivy and other poisonous plants look like, so you can recognize a poisonous plant and avoid contacting it.

The following are other precautions you should take to limit your exposure to poisonous plants:

- Dress appropriately when participating in outdoor activities.
- Avoid areas where you are aware that poisonous plants grow.
- Do not eat plants or parts of plants that you do not recognize.
- Do not put grass, twigs, stems, or leaves in your mouth.

Conclusion

Being able to adjust to new environments and protect yourself from harmful conditions is very important when participating in outdoor activities. Factors in nature such as extreme temperatures and humidity; animal, snake, and insect bites; and poisonous plants can pose a threat to you if you do not take precautions to guard against the possibility of injury. By being aware of potential hazards, knowing how to treat outdoor-related injuries, and exercising common sense, you can cope successfully with the environment and enjoy your time in the great outdoors.

Lesson Check-up

- **Why is it important to try to determine what kind of snake caused the bite?**
- **How would you treat someone who had an allergic reaction to an insect bite or sting?**
- **How would you treat someone who has come into contact with a poisonous plant?**

Controlling Bleeding

Key words

- arteries
- dressing
- elevated
- hemorrhage
- pressure bandage
- pressure points
- veins

What You Will Learn to Do

Demonstrate first aid procedures for bleeding victims

Linked Core Abilities

- Do your share as a good citizen in your school, community, country, and the world

Learning Objectives

- **Identify** the three types of bleeding
- **Identify** the best way to control most cases of bleeding
- **Distinguish** among direct pressure, pressure points, and a tourniquet to control bleeding
- **Describe** how to treat bleeding on the head or torso
- **Explain** the importance of following Universal Precautions when dealing with blood and other body fluids
- **Define** key words: arteries, dressing, elevated, hemorrhage, pressure bandage, pressure points, veins

Essential Question

Would you be able to save a life by providing first aid to a bleeding victim?

Introduction

In an accident situation, you may encounter injured persons bleeding from wounds such as scrapes, cuts, punctures, tears, or gashes in the skin. In this lesson, you'll learn what steps to take for both minor and serious bleeding wounds.

Figure 3.8.1

Key words

arteries:
Blood vessels that carry blood from the heart to other parts of the body

veins:
Blood vessels that carry blood from the body to the heart

hemorrhage:
Severe bleeding

Types of Bleeding

The deeper a wound goes, the more serious it is. Mild wounds to the outer layer of skin do not bleed heavily, but still require cleaning to avoid infection. Deeper wounds, in which **arteries** and **veins** are cut, can be life threatening. These kinds of wounds may involve great amounts of blood loss, with blood often pulsing or spurting out of the wound. Severe bleeding, or **hemorrhage**, can result in shock or death if not treated promptly. Stopping the loss of blood in these cases is essential. If a victim loses too much blood, even cardiopulmonary resuscitation (CPR) will not keep the person alive, because there will not be enough blood to deliver oxygen from the lungs to the body.

There are three types of bleeding: arterial, venous, and capillary. First aid treatment in all of these cases includes stopping the flow of blood and preventing infection.

ARTERIAL BLEEDING

Arterial bleeding is the loss of blood from an artery. Arteries carry blood from the heart to the rest of the body. Characterized by bright red blood that spurts with each heartbeat, arterial blood loss is severe and hard to control. ***Give it first priority for treatment.*** Bleeding from injured arteries is generally more serious and more likely with deep injuries. This bleeding needs to be controlled ***immediately***.

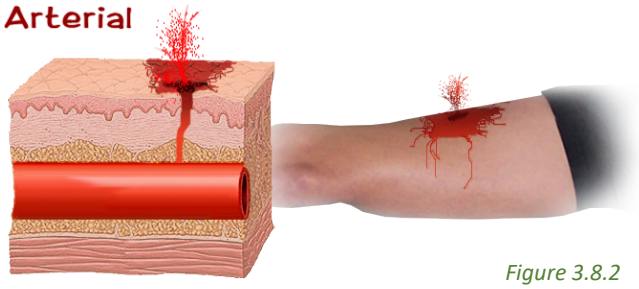


Figure 3.8.2

VENOUS BLEEDING

Venous bleeding is blood loss from a vein. Veins carry blood to the heart from other parts of the body. Venous bleeding is characterized by a steady flow of dark blood. Bleeding from injured veins is generally slow and steady, but can still be serious. The dark red blood flows steadily, rather than spurting. This bleeding is usually easier to control.

Figure 3.8.3

CAPILLARY BLEEDING

Capillary bleeding is the loss of blood from the smallest blood vessels, the capillaries, and is usually characterized by a slow flow of blood. Capillary bleeding occurs with shallow cuts or scrapes. The bleeding stops fairly quickly. However, the wound still requires cleaning to prevent infection.

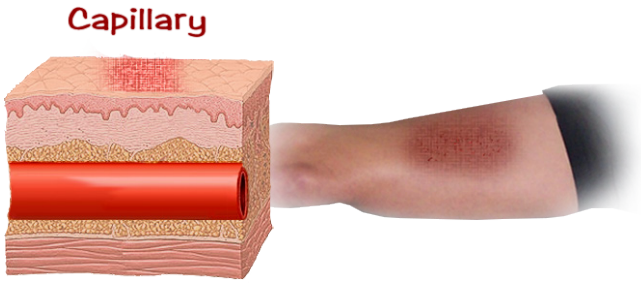


Figure 3.8.4

Content Highlight:

BLEEDING vs. INJURY

You should note that serious injuries don't always bleed heavily, while some relatively minor injuries, such as scalp wounds, can bleed quite a lot. People who take blood-thinning medication or who have bleeding disorders, such as hemophilia, may bleed profusely because their blood does not clot properly. Bleeding injuries in these situations require immediate medical attention.

Direct Pressure

In most cases, applying continuous, direct pressure to a wound is the best way to control bleeding. To apply direct pressure, place a **dressing** over the wound. A dressing should be:

Figure 3.8.5

- Sterile; if a sterile dressing is not available, use a clean cloth, such as a washcloth, towel, or handkerchief
- Larger than the wound
- Thick, soft, and compressible so pressure is evenly distributed over the wound
- Lint free

If a clean cloth or gauze is not available, use clothing or your bare hands or fingers—whatever is the cleanest. Continue applying pressure and bleeding should begin to slow or stop within 30 minutes.

Stopping Infection

Even the slightest wound requires immediate cleansing. The best way to clean wounds is to wash them with soap and water. At home, use water from the faucet. On a hike, use water from a canteen or the clear running water of a stream. If available, use an antiseptic cleanser instead of soap. Wait until the skin around the wound dries, then put on a bandage. If available, apply an antiseptic cream to the wound before bandaging it.

For a minor wound, cleaning and bandaging is probably all that is required. Deep wounds, wounds made by animal or human bites, and wounds contaminated by dirt, rust, or other items, require medical treatment. Clean and bandage these wounds and seek medical assistance as soon as possible. If a wound contains glass or other objects stuck into the flesh, do not remove them unless they wash out of the wound easily.

Controlling Bleeding to Extremities

In most cases, direct pressure is the best way to stop bleeding of wounds to the extremities. As you apply direct pressure, keep the injured limb **elevated** above the heart to slow the flow of blood out of the body.

After initially applying direct pressure, you should apply a **pressure bandage**.

Figure 3.8.6

Key words

dressing:
In this case, a bandage or gauze applied to a wound

elevated:
Raised or moved above

pressure bandage:
A snug bandage using the pressure to control bleeding

Do this by applying a bandage snugly, using overlapping turns with a roll of gauze. Do not tie the pressure bandage so tightly that it restricts blood flow to the lower part of the limb. If fingertips or toes appear bluish, or if there is no pulse below the dressing, loosen the material used to secure the dressing immediately. Once you apply a pressure bandage, only qualified medical personnel should remove it.

Content Enhancement:

USING UNIVERSAL PRECAUTIONS

Remember that blood can be a carrier of contagious diseases, such as hepatitis and HIV. Wear protective gloves when giving first aid to a bleeding victim, and avoid touching other surfaces with bloody gloves. You'll not only be protecting yourself, you'll also be protecting the bleeding victim, who might develop an infection if your hands were not clean.

Figure 3.8.7

When to Call for Emergency Help

Seek emergency help anytime bleeding is due to a major trauma or injury. Serious abdominal or chest wounds usually warrant emergency medical attention. Arterial bleeding—spurting blood—warrant immediate attention. Blood loss can be life threatening. If bleeding continues after 10 minutes of firm and steady pressure, call 911. In addition, call your local emergency number if you suspect internal bleeding. Signs of internal bleeding include:

Figure 3.8.8

- Bleeding from the mouth, ear, nose, or anus
- Vomiting or coughing up blood
- A swollen stomach
- Cold, clammy skin accompanied by thirst
- Signs of shock: fast pulse, sweating, rapid breathing, and lessened alertness
- Bruising or fracture

Steps for Tending to a Bleeding Victim

Let's go over a few helpful first aid tips that you should always practice when tending to a bleeding victim. When you see bleeding from a wound, blood on a victim, or signs of shock, such as pale, clammy skin, take the following steps:

Figure 3.8.9

Step 1: Put on medical gloves or use some type of barrier to protect yourself from contact with the victim's blood.

Step 2: Move aside any clothing and place a sterile dressing, or clean cloth, on the wound. Then apply direct pressure on the wound with your hand.

Step 3: With a bleeding arm or leg, raise the limb above the heart level while keeping pressure on the wound. Be careful moving the victim because of the possibility of other injuries.

Step 4: If blood soaks through the dressing, do not remove the old dressing. Instead, put another dressing or cloth pad on top of it and keep applying pressure.

Step 5: If possible, wrap a roller bandage around the limb to hold the dressings in place and apply direct pressure. If direct pressure does not control the bleeding, also apply indirect pressure at a pressure point in the arm or leg to squeeze the artery closed.

Figure 3.8.10

Pressure Points

In case of severe bleeding that does not slow or stop using direct pressure, finger pressure may be applied to the **pressure point** on the injured limb between the wound and the heart. Pressure points are locations on the body where arteries are close to the surface. *(See Figure 3.8.11)* By applying pressure at these points, you slow or stop the flow of blood through the artery.

Key words

pressure points: Locations on the body where arteries are close to the surface

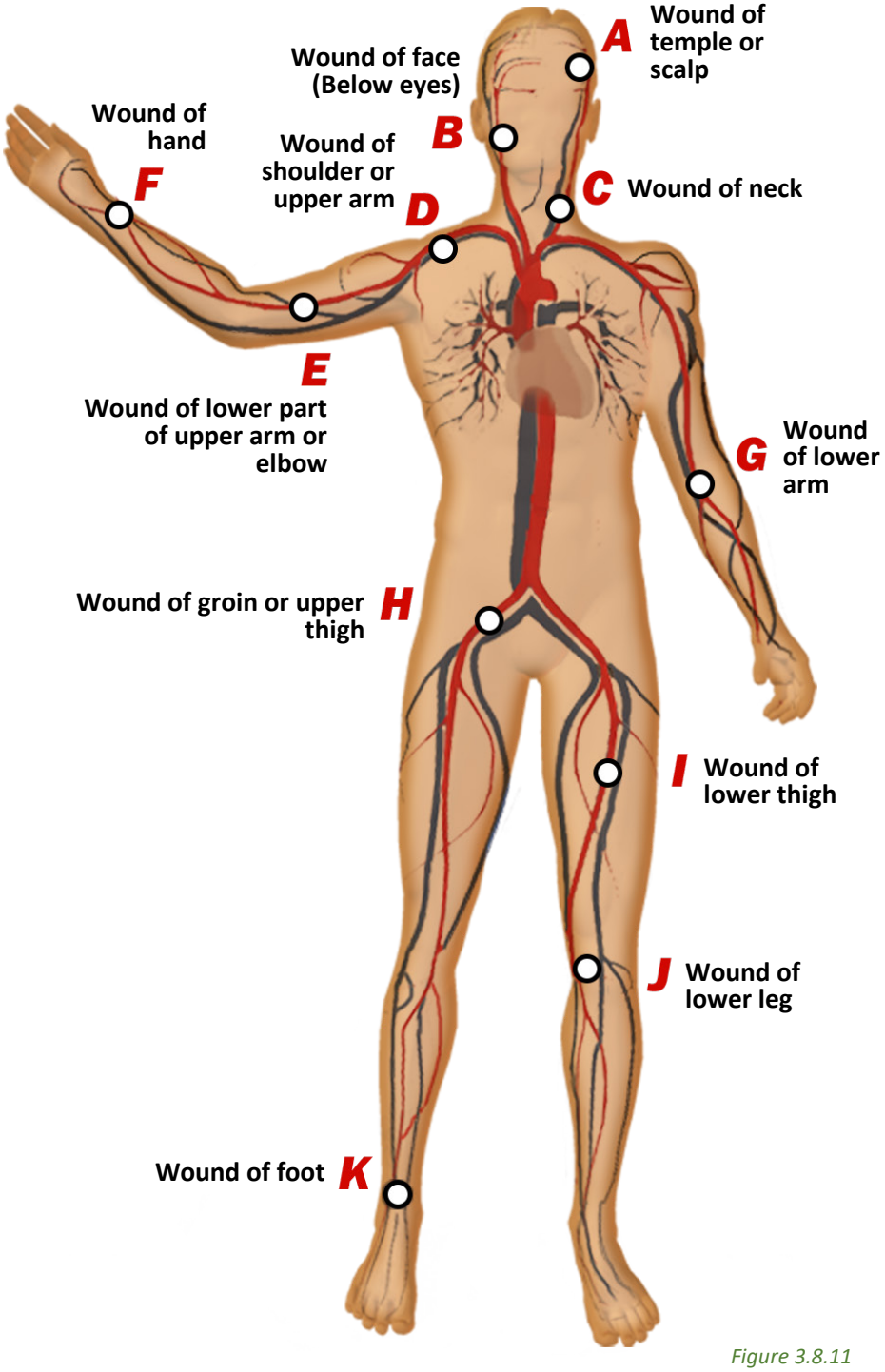


Figure 3.8.11

Indirect Pressure

When using indirect pressure, squeeze the main artery in these areas against the bone. Keep your fingers flat. With your other hand, continue to exert pressure on the wound itself. To check if bleeding has stopped, release your fingers slowly from the pressure point, but do not release pressure at the bleeding site. If the bleeding continues, continue to apply pressure to the artery until the bleeding stops or help arrives. After bleeding stops, do not continue to apply pressure to an artery for longer than five minutes.

NOTE: The use of indirect pressure should not be used unless the technique is absolutely necessary to help stop severe bleeding, as it may result in in adequate flow of blood to the limb.

Figure 3.8.12

Content Highlight:
WHEN TO USE A TOURNIQUET

If heavy blood loss continues, as from an amputation, it may be necessary to use a tourniquet. **CAUTION:** Since a tourniquet is a constricting band that ***stops*** the flow of blood below it, it can kill the limb to which it is applied. Therefore, ***ONLY use a tourniquet if no other method works to stop the bleeding and you believe the injured person's life is in danger.*** To apply a tourniquet:

1. Fold a cloth until it is approximately two inches wide and long enough to go around the injured limb.
2. Tie the material in a loop and position it two to four inches above the wound, but not over a joint.
3. Pass a rigid object, such as a stick, under the tourniquet loop and twist it until it the bleeding stops.
4. Tie off the end of the stick with another piece of cloth or string to prevent it from unwinding.
5. Mark the victim's forehead with a "T" to alert medical personnel that you have applied a tourniquet.

It is necessary to cover the victim with a blanket, but do not cover the tourniquet so it may be easily spotted by medical personnel. Once you apply a tourniquet, do not loosen or remove it. As with a pressure dressing, only qualified medical personnel should remove a tourniquet. Remember, ***use a tourniquet only as a last resort*** when all other attempts to stop the bleeding fail.

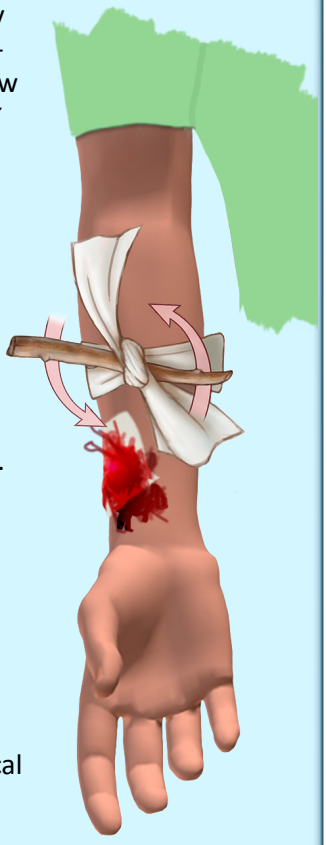


Figure 3.8.13

Controlling Bleeding to the Head and Torso

Figure 3.8.14

SCALP INJURIES

For wounds to the scalp, use a pressure dressing. If brain tissue is exposed, tie the dressing loosely over the wound. Do not press the brain tissue back into the open wound. *(See Figure 3.8.14)*

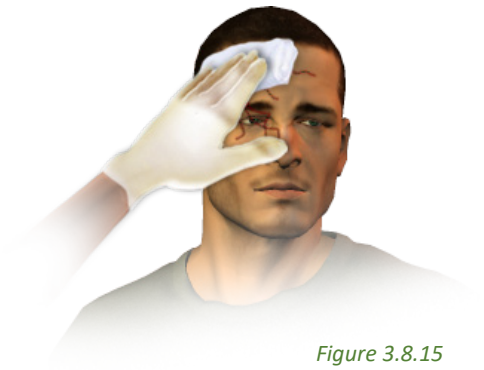


Figure 3.8.15

FACIAL INJURIES

Control bleeding from facial wounds by using a pressure bandage. Position the victim to prevent them from breathing blood. Victims who have sustained a severe blow to the head should be kept under close observation as they may have brain damage and could require rescue breathing. *(See Figure 3.8.15)*

CHEST INJURIES

A chest injury may result in an open chest wound, which could lead to air leaking from a lung and the collapse of a lung. If conscious, have the victim breathe out and apply some material such as plastic wrap or foil to the wound. Bind a pressure bandage tightly to the wound to prevent leakage of air and slow down blood loss. Have the victim sit up, if possible, or lay that person on the injured side. *(See Figure 3.8.16)*

Figure 3.8.16

Figure 3.8.17

ABDOMINAL INJURIES

When an open abdominal wound has exposed visceral (internal) organs, cover the abdomen loosely with dressings. Do not force the organs back into the body cavity and do not give victims with abdominal wounds any food or water. *(See Figure 3.8.17)*

Conclusion

Severe bleeding from wounds in which arteries or veins are cut can be life threatening to an injured person. Therefore, controlling the loss of blood is second in importance only to restoring breathing and circulation. In most cases, applying direct pressure to a wound is the best way to control bleeding. Cleaning a wound to stop infection is also extremely important. If you know these two facts, and the other details on controlling bleeding to the extremities, head, and torso, you can successfully accomplish the second life-saving step in an emergency situation.

Lesson Check-up

- **Describe how to treat arterial bleeding.**
- **When should a tourniquet be applied?**
- **Detail the five steps for tending to a bleeding person.**
- **Describe the proper way to clean a wound and why it is important.**

CHAPTER 4

Figure 4.0

GEOGRAPHY

Chapter Outline

LESSON 1

Introduction to Maps

Key words

- bar scale
- elevation
- GPS
- latitude
- legend
- longitude
- marginal information
- orient
- terrain
- thematic map

What You Will Learn to Do

Demonstrate basic map reading skills

Linked Core Abilities

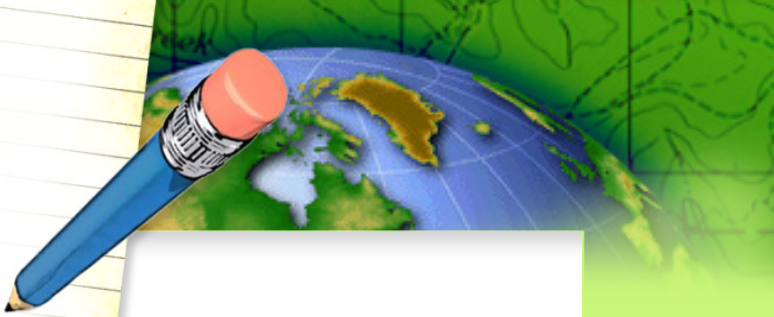
- Apply critical thinking techniques
- Build your capacity for life-long learning
- Communicate using verbal, non-verbal, visual, and written techniques

Learning Objectives

- **Compare** the features of a globe to those of a map
- **Compare** properties and purposes of road, topographic, and thematic maps
- **Describe** applications of the Global Positioning System
- **Determine** locations based on map features
- **Communicate** directions to a location
- **Identify** general direction traveled on the Interstate Highway System

Essential Question

How can you use a road map to determine locations, directions, and distances?



Learning Objectives (cont'd)

- **Orient** a map without using a compass
- **Estimate** distance with and without a map
- **Define** key words: bar scale, elevation, GPS, latitude, legend, longitude, marginal information, orient, terrain, thematic map, topographic map, USGS

Key words (cont'd)

- **topographic map**
- **USGS**

Introduction

Have you ever gotten lost while visiting a new neighborhood or city? If so, you may have had to ask for directions or use a map to figure out your location and how to get to your destination.

Knowing how to read and understand maps are valuable skills that can strengthen awareness of the world around you. Your effective use of maps requires a basic understanding of map scales, symbols, and colors. This lesson introduces you to this information and explains how to **orient** a map and how to estimate distances.

Types of Maps

Maps are everywhere. They are in car navigation systems and on cell phones. Airline pilots and ship captains would be lost without maps.

One of the first maps of Earth was a globe created by ancient Greeks. They knew our planet was a sphere and guessed at the oceans and continents. Today, globes represent an accurate view of Earth with mappings of all land and water. Globes and maps are based on a global coordinate system that uses imaginary lines of **latitude**, lines running from west to east (horizontal lines), and **longitude**, lines running from north to south (vertical lines). This coordinate system of latitude and longitude allows map applications on computers and phones to create very accurate maps and pinpoint your location.

Key words

orient:
To align or position oneself (or a map) in relationship to one's surroundings

latitude:
Imaginary horizontal lines around a globe of Earth

longitude:
Imaginary vertical lines that cut through polar regions on a globe of Earth

Figure 4.1.1

Key words

bar scale:
A scale line on a map used to measure actual ground distances by converting distances on a map

While a globe shows all of the Earth, a map is a drawing showing just a portion of the Earth. Both globes and maps are usually displayed with the cardinal direction north at the top and west at the left.

Maps are drawn to scale with each set measurement on the scale representing a set amount of distance on land. Maps indicate their scale so you can determine distances between points. Some maps indicate the scale in inches—for example, one inch on the map equals 10 miles on the ground. Other maps show a **bar scale**, a line that indicates how its length relates to distance on a map. In *Figure 4.1.2*, the neighborhood map on the right has a bar scale showing 50 meters and 200 feet. The regional map on the left has a larger scale—the lengths of the bar scale represent 10 kilometers and 5 miles.

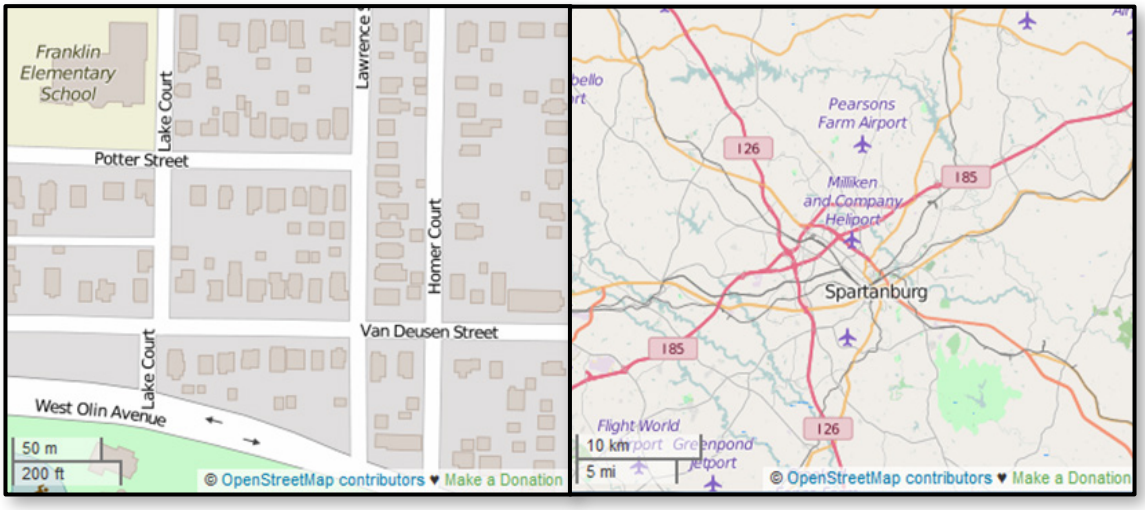


Figure 4.1.2

Maps give us a way to communicate directions—to others and ourselves. For example, looking at the neighborhood map in *Figure 4.1.2*, you can give the following directions from the school to Homer Court:

> *"Exit the school on Potter Street and turn left. Walk one block then turn right on Lawrence. Walk one block south and turn left on Van Deusen Street. The first intersection on Van Deusen is Homer Court."*

But that's not the only way to get there. What directions would you give?

Maps are a wealth of information about a location—a state, a city, or even a park. They can show:

- Distance
- **Terrain**
- Man-made and natural features

There are many different types of maps. Road maps provide information on street names, important buildings, route numbers, distance, and transportation centers. They may also include locations of businesses, bike or hiking trails, airports, and other man-made features. When you search for directions on your computer or phone, a road map is probably the first thing you will see. Political maps show the boundaries of nations, states, or cities. Weather maps show where it's sunny and where it's raining.

Topographic Maps

Topographic maps show terrain and landforms. They give you a way to measure **elevation** with the use of lines around landforms. In *Figure 4.1.3*, the lines show the peak of a small mountain and the gradual elevation leading up to it. The numbers on the lines show the number of feet or meters above sea level. Military personnel, hikers, and explorers use topographic maps because they are travelling off-road and need accurate information about terrain and distance. You'll learn more about topographic maps later in this chapter.

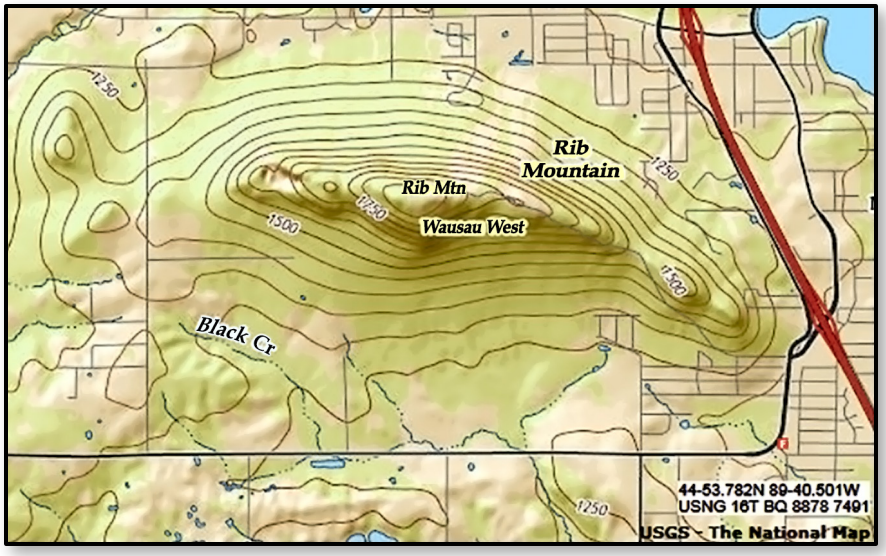


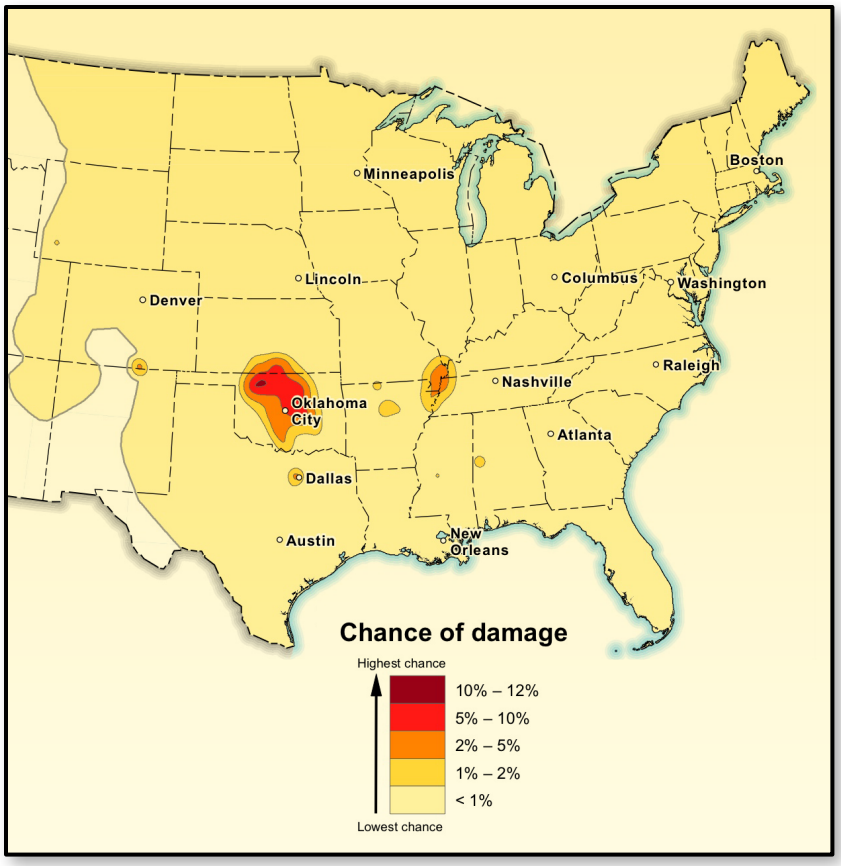
Figure 4.1.3

Key words

terrain:
An area of land with particular natural features

topographic map:
A map that shows elevation, terrain, and landforms

elevation:
Height above sea level or the earth's surface



USGS Forecasted Damage from Earthquakes in 2016 *Figure 4.1.4*

Thematic Maps

Thematic maps show an overall view of the mapped area in relation to a particular type of information, such as population, terrain, and/or vegetation. For example, a thematic map can show population density, the range of a particular bird or plant species, or the likelihood of an earthquake. The map in *Figure 4.1.4* from the United States Geological Survey (**USGS**) shows at a glance where earthquakes – natural or manmade – are expected to cause damage in 2016. Maps like this give people a way to generalize information quickly.

Many maps combine different types of information. For example, a road map might show terrain and landforms. Weather maps show state boundaries along with locations of major cities.

Maps that combine different kinds of information have become more common with digital technologies. Think about the digital maps you see on your computer or phone. You can hide or show satellite views, bike routes, businesses, and more. Digital maps use a technology called the Global Positioning System (**GPS**) to map Earth's coordinates. GPS is based on a network of satellites and ground stations. GPS is also used to create very accurate printed maps.

Digital maps have not made printed maps obsolete. While printed maps don't track your location like GPS-based technologies, they never run low on battery power or have dropped signals. In this lesson, we'll look at some of the information you may find on a printed map. This same information may or may not be available on a digital map.

Key words

thematic map:
A map that shows an area in relation to a particular type of information

USGS:
A government scientific agency which creates maps and collects data on natural sciences, including earth science and biology; United States Geological Survey

GPS:
A network of satellites and ground stations used to determine locations by coordinates; Global Positioning System

Road Map Information

You can compare a map to any piece of equipment—before you use it, you must first read the instructions. Most mapmakers place the instructions on a map (known as the **marginal information**) around the outer edge of a map. Not all maps are the same, so it is necessary to read the marginal information carefully every time you use a different map.

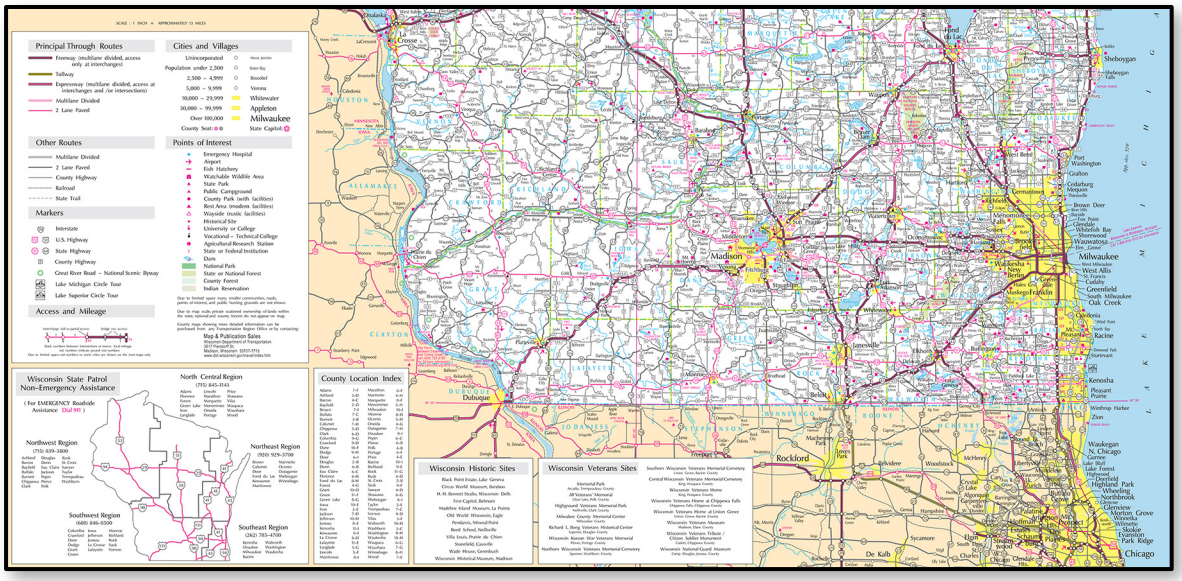


Figure 4.1.5

The following information describes the most commonly used elements of marginal information found on printed road maps.

Sheet or Map Name. Whenever possible, a map is named after the most prominent cultural or geographic feature in that area. Although the most prominent feature on the map may be a state or other large geographical region (for example the Mid-Atlantic States), the map sheet normally contains numerous inserts of smaller sections in order to show them in more detail. These inserts can be found around the margin or on the reverse side of the map sheet.

Bar Scale. A bar scale is a special ruler used to measure ground distance on a map. Although these scales vary with each road map, the most common units of measurement are miles and kilometers.

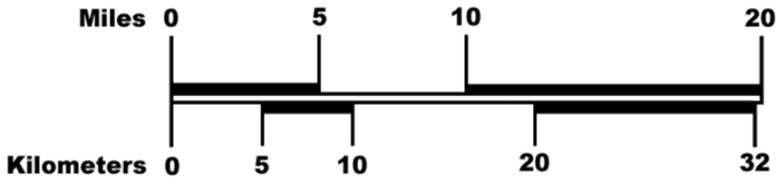


Figure 4.1.6

Legend. The **legend** is part of the mapmaker's dictionary. It is a shorthand method of illustrating and identifying mapped features using symbols to show some of the more prominent features on the map. These symbols are not the same on every road map. *(See Figure 4.1.7)*

Key words

marginal information
Instructions placed around the outer edge of a map

legend:
An explanatory description on a chart, map, or other illustration

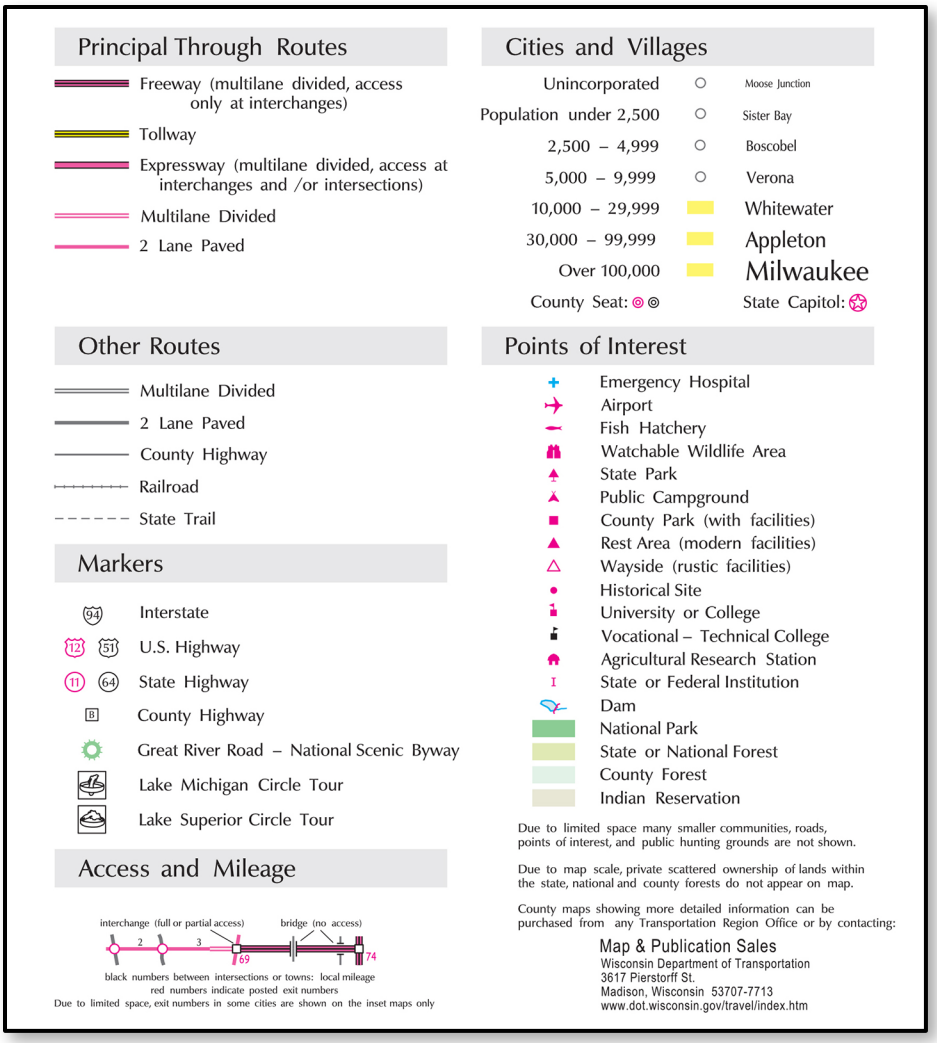


Figure 4.1.7

MAP SYMBOLS

Because all features on a map cannot represent their true position and shape, mapmakers must use symbols to represent these features. The map legend indicates the meanings of the symbols. Some of the commonly used symbols are:

- ***Roads.*** Indicated by parallel or solid lines; thickness and color of these symbols indicate the road size
- ***Interchanges.*** Indicated by a heavy solid line for major access roads and parallel lines for intersecting secondary roads; legends also illustrate full, partial, and no access at these interchanges
- ***Railroads.*** Commonly shown by single or parallel lines with horizontal tick marks
- ***Buildings.*** Symbols for buildings may vary from map to map according to the purpose of the map or building; schools and churches are commonly represented by a solid square with a flag or cross affixed; hospitals may be shown by a cross; universities and colleges may sometimes have a special symbol as a point of interest
- ***Points of Interest.*** Indicated by a special marking and its name; for example, a historical marker
- ***Airports.*** Normally shown by a picture of an airplane

Map Symbols *(cont'd):*

- ***Water Features.*** Normally shown in blue and take the approximate shape of the feature
- ***Special Features.*** Significant natural features (forests, recreational areas, national monuments, and so on), military reservations, or Indian reservations are normally highlighted with a specific color and do not have a standard shape; many road maps also have a chart indicating the services that are available at the recreational areas and parks shown on the map

You may also find the following symbols on road maps that can provide helpful information to you when using the map.

- ***Route Markers.*** Represented by a shield or some other shape containing the number of the road in its center
- ***Interstate Highways.*** There are a number of interstate highway types, and these are generally shown as:
  - ***Principle Routes.*** Red, white, and blue signs with one- or two-digit numbers
  - ***Loop Routes and Spur Routes.*** Red, white, and blue signs with three-digit numbers
  - ***Business Routes.*** Green signs marking routes from principal, loop, or belt highways that go to or through cities

Content Highlight:
UNLOCKING INTERSTATE NUMBERS

Have you ever noticed anything special about the way interstate highways are numbered? East-west routes have even numbers (I-4 or I-70), whereas north-south routes have odd numbers (I-5 or I-95).

In addition, the odd numbered interstates increase from west to east. That's why the west coast interstate is I-5 while the one on the east coast is I-95. A similar pattern follows even numbered interstates. Their numbers increase from south to north. I-10 goes through many southern states while I-90 is in the northern half of our states.

If you parachuted from a plane and landed at the intersection of I-5 and I-90, you'd know you were in the northwest corner of the United States.

But it gets even more interesting. Loop routes that bypass major cities are always three-digit numbers and the first number is always even. For example, I-294 is an east-west route that goes around Chicago.

Spur routes are three-digit numbers that begin with an odd number. These routes lead into major cities. I-794 is a spur from I-94 that goes along Milwaukee's lakefront.

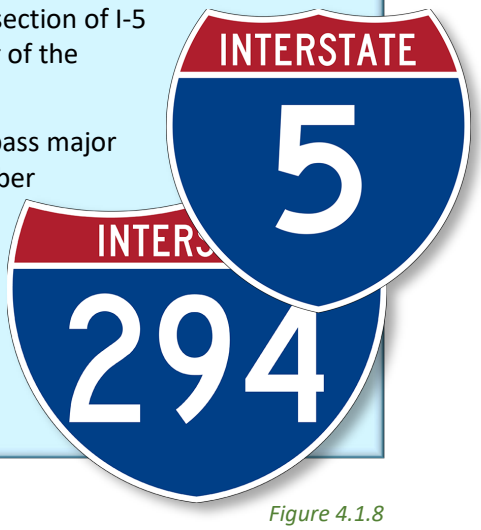


Figure 4.1.8

Road Map Symbols *(cont'd):*

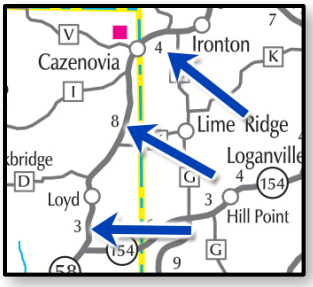


Figure 4.1.9

- ***Boundary Symbols.*** Shown as broken or intermittent lines that vary in pattern to denote different boundaries, such as state or county borders
- ***Mileage Markers.*** Shown between towns and road junctions, or between dots with the mileage indicated in red or black *(See Figure 4.1.9)*; this information is often shown on printed state maps
- ***Official Highway Mileages.*** Usually displayed in a table on the backside of a printed map; shows the actual ground mileage between the major cities that are located on the map (See *Figure 4.1.10)*

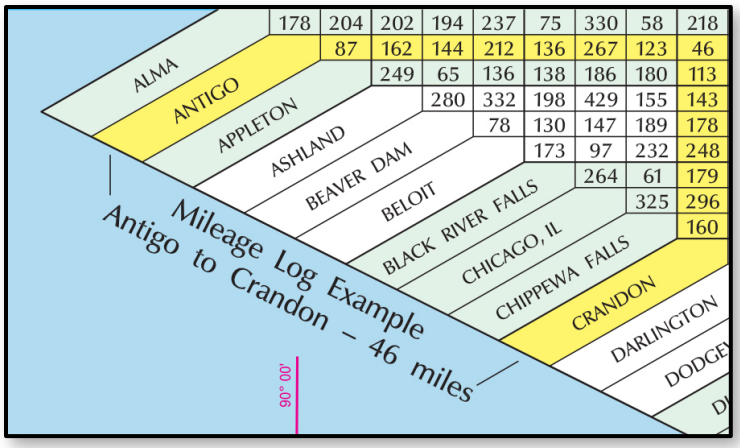


Figure 4.1.10

- ***City/Street Names Index.*** This information lists alphabetically the names of cities on state and regional maps, and the names of streets on city maps. Beside each city or street listing is a letter/number code. This is usually displayed wherever space permits on the map—including on the reverse side of it—and printed adjacent to its corresponding feature

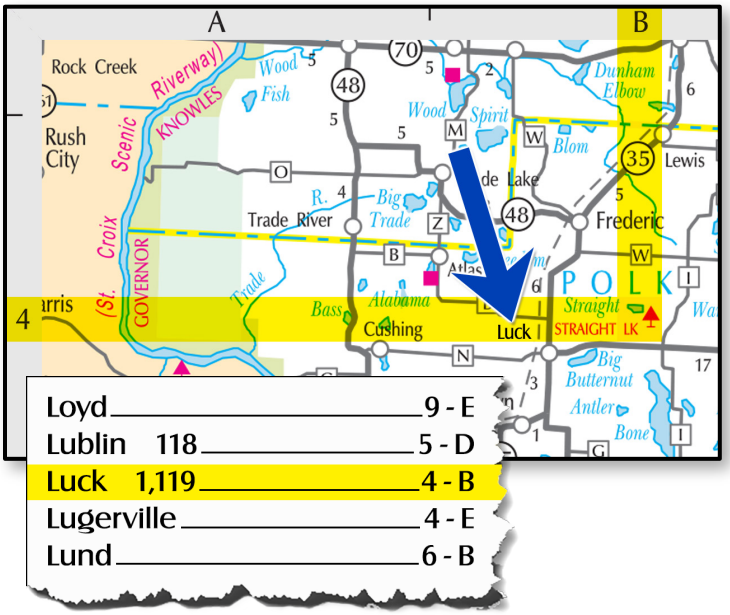


Figure 4.1.11

In the example shown here in *Figure 4.1.11*, the town of Luck is at 4-B. The letter/ code number refers to markings at the edges of the map. The top and bottom of the map marks a lettered grid (A, B, C, D, and so on). The left and right edge of the map mark numbers (1, 2, 3, and so on).

To find the town of Luck, follow the "4" from the left margin and the "B" from the top margin. You'll notice Luck is not exactly at 4-B, but is in the general area.

On city maps, you can use a street name index the same way to locate a street.

Map Colors

Colors on a road map provide contrast to map features, making them easier to identify. Map symbols are usually printed in different colors with each color identifying a class of features. However, colors may vary from one map to another. Mapmakers indicate these colors and their uses in the marginal information.

Some common indicators by color are:

- ***Black.*** Indicates the majority of man-made features—buildings or roads
- ***Blue.*** Identifies water features—lakes, swamps, or rivers
- ***Brown.*** Identifies elevation and relief features—mountain ranges
- ***Green.*** Identifies vegetation—woods, grasslands, brush, orchards, or vineyards
- ***Red.*** Classifies man-made features—populated areas, main roads, special features, or boundaries on older maps

Orienting a Map

Finding your way requires the ability to read and interpret a map, compare it to the features on the ground, and move to the desired location. One method of comparing your map to the ground is to orient it so that the map symbols fit the location of the features as they appear on the ground.

The following situation shows you how to orient a map without using a compass.

Content Enhancement:

HOW TO ORIENT A MAP WITHOUT USING A COMPASS

While participating in a bike rally, Barry traveled off the main road and became lost. He knew for certain he was lost when he came upon the main entrance to North Fork State Park on his right. Across from this entrance was a small bridge which crossed the North Fork River. Because Barry had a route map for this bike rally, he took the following steps to orient it:

1. Barry determined his location using two known points. He chose to use the bridge by the river and the park entrance.
2. Next, he located these same features on his map. With the map in a horizontal position, he rotated it until the symbol for the bridge on the river was pointed in the same direction as (or aligned with) the bridge in front of him.
3. Barry then checked to ensure that the park entrance was correctly aligned with its actual location. From where he was located, the park entrance was on the right side of the road. He checked to see if the map symbol for the park entrance was also on the right side of the road.

With his map properly oriented, he realized what direction he had to take to rejoin the bike rally.

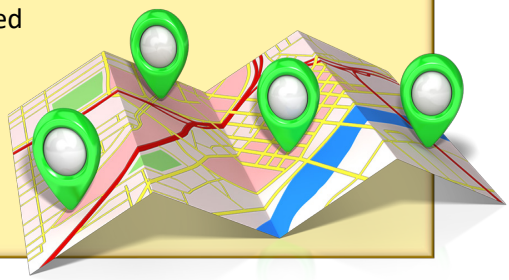


Figure 4.1.12

In many cases, orienting a map may mean turning it upside down or holding it with one of its edges pointing toward you. Holding a map like this may make it harder for you to read street names or other symbols, but it properly aligns the features on the ground with those on the map. After you know where you are (by using the two or more known points), keep the map oriented until you are at your destination or in an area familiar to you. And don't forget about using natural features like the sun to help you orient. If it's morning, the sun is in the east; in the evening the sun is in the west.

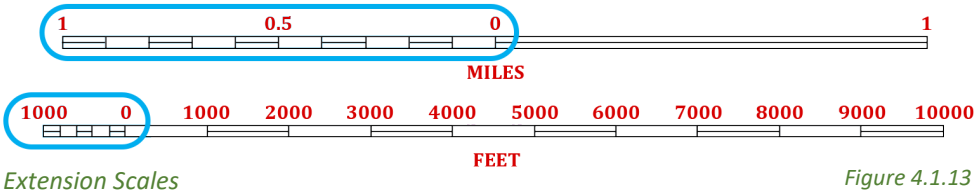
The next time you are on a trip to a place where you have never been before, try this method. It works! You will be able to navigate your way to your destination much more easily.

Determining Distance

The ability to determine the distance between two points on a map is an important skill. You may not have access to a digital map or you may have a map without mile markers. What if you need to find the distance between two points and the points are not on a road?

When you determine distance, it's important to know the scale of the map. Some maps show scale as a representative fraction, which gives the ratio of map distance to ground distance. For example, the scale 1:50,000 indicates that one unit of measure on the map equals 50,000 units of the same measure on the ground.

Most maps use a bar scale to indicate distances. In some cases, the scale will have two parts: an extension scale and a primary scale. Use the primary scale, located to the right of the zero, to measure full units; use the extension scale, located to the left of the zero, to measure smaller units.



Extension Scales *Figure 4.1.13*

Measuring Straight Lines

Measuring distances involves using a straightedge piece of paper lined up with your starting and ending points. Mark the paper where it lines up with the two points. In *Figure 4.1.14*, we'll be measuring the straight-line distance between Clanton and Prattville, Alabama.

Figure 4.1.14

Move your straight edge paper to the map's bar scale. *Now* you can convert the distance on your paper to the actual distance on the ground. In this case, it's about 30 miles.

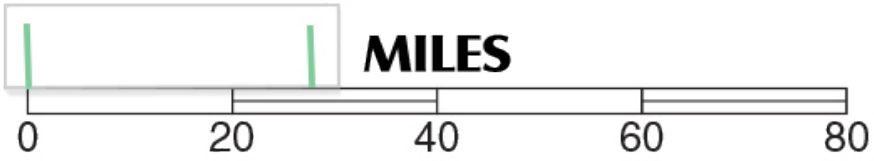


Figure 4.1.15

Measuring Curved Lines

Suppose you want to take a winding trail or hike along a meandering stream. The trail and the stream will not be straight lines on the map. But you can use a similar method for finding the distance of your route.

As before, start by making a mark on the straightedge paper at your starting point. You'll also mark the map with a pencil. Now pivot the paper and mark the next point on the route that is straight in line with your first marking. The third marking is where the fun begins. Pivot the paper again, but keep the second points aligned on the map and the paper. Pivot until the paper aligns with a point on the route. Now you've got your third point.

Figure 4.1.16

Keep pivoting and marking points until you reach your destination on the map. To find the distance, line up your marked straightedge paper with the map bar scale. Now you can measure the distance between your first and last marks to find the distance of the curved route.

Use Pace Count to Determine Distance

Sometimes you may find yourself in a situation where you are not able to determine distance with a map or an electronic device. Imagine you are on a hiking trail. You know you need to cut off about a half mile from your starting point to a spur trail at the left. You've been warned that the spur trail is not marked and might be hard to find because of heavy forest growth. How can you estimate when you've walked a half mile? One way to accomplish this is to count your paces.

A pace is one step. To determine your personal pace count, you'll want to know how many paces it takes you to walk a defined distance. Typically, the distance of 100 meters is used for gauging personal pace counts.

Content Highlight:
DETERMINING YOUR PERSONAL PACE COUNT

If you have a football field at your school, you'll have easy access to measure your pace count with one modification. A football field is 100 yards, which is about 91 meters. To reach 100 meters, you'll want to add 9 yards to the length of the football field when you make your pace count.

To convert meters to miles, divide the number of meters by 1609. For example, if you walked 900 meters, you will have travelled more than half a mile. So, if you are looking for the half-mile spur trail, you may have just passed it!

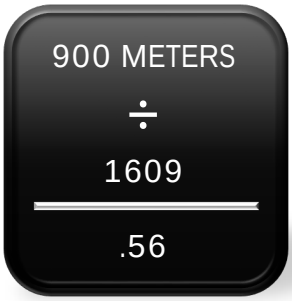


Figure 4.1.17

Once you know your pace count, you can keep track of the distance you've travelled. Ideally, you want to restart your count when you've reached 100 meters. That way you don't have to keep counting into the hundreds and thousands. To keep track of every 100 meters you've travelled, you can:

- Put a pebble in your pocket
- Tie knots in a string for each 100 meters
- Put marks in a notebook

Pace count is not an accurate measure of distance, but you'll find that it's better than guessing! Some things that will affect the accuracy of your pace count include:

- ***Slopes.*** Your pace will lengthen on a down-slope and shorten on an upgrade.
- ***Wind.*** A head wind shortens the pace and a tail wind increases it.
- ***Surfaces.*** Sand, gravel, mud, snow, and similar surfaces tend to shorten your pace. Shoes with poor traction can also affect pace length.
- ***Visibility.*** Poor visibility, such as fog, rain, or darkness, can shorten your pace.

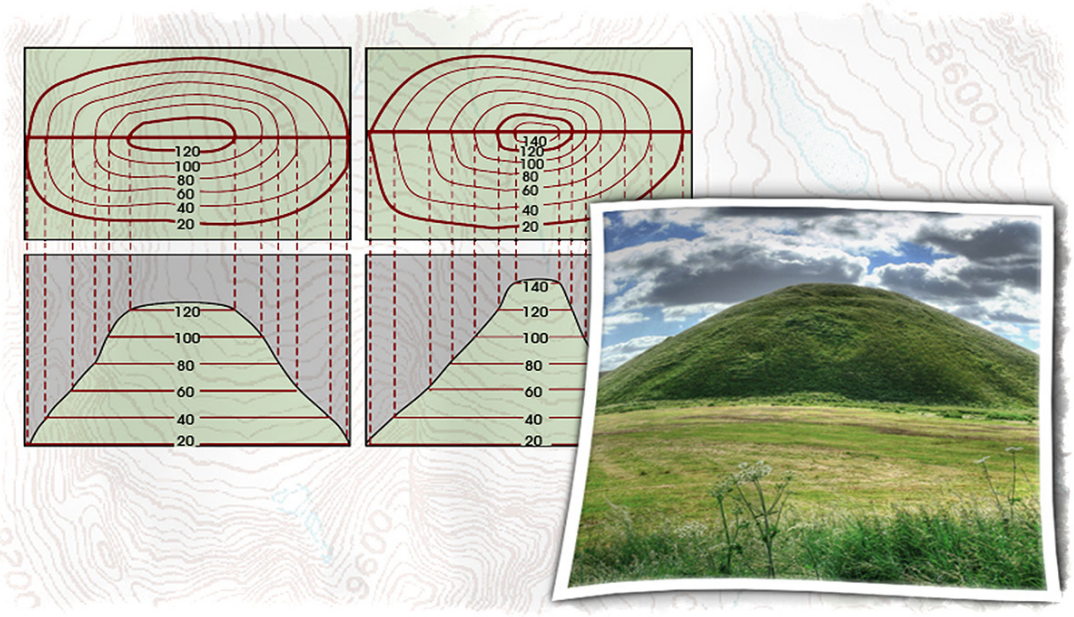
Conclusion

In this lesson, you learned some basic map reading skills. You also learned how to orient a map if you are lost and how to estimate distances with and without a map. These skills can help you prevent wasted time and effort when you are travelling in an unfamiliar area.

Lesson Check-up

- **What can you learn by reading the marginal information of a map?**
- **Why do people use topographical maps instead of road maps?**
- **How can you orient a map when you are lost?**
- **Describe how to estimate distance when do you not have a map or an electronic device.**

Using Topographic Maps



Key words

- concave
- concentric
- contour interval
- contour line
- convex
- depression
- draw
- mean sea level
- relief
- saddle
- spur

What You Will Learn to Do

Determine location and elevation using a topographic map

Linked Core Abilities

- Apply critical thinking techniques
- Build your capacity for life-long learning
- Communicate using verbal, non-verbal, visual, and written techniques
- Take responsibility for your actions and choices

Learning Objectives

- **Differentiate** between elevation and relief
- **Calculate** elevation on a topographic map
- **Recognize** terrain features on a topographic map
- **Identify** marginal information on a topographic map
- **Define** key words: concave, concentric, contour interval, contour line, convex, depression, draw, mean sea level, relief, saddle, spur

Essential Question

How can you use a contour map to find your location and elevation?

Introduction

Have you ever taken a hike where you were surprised by the terrain? Maybe the trail was flatter or hillier than you expected. Using a topographic map is the key to knowing the terrain before you head out. Topographic maps can make you better prepared for what lies ahead. This lesson describes topographic maps. You'll learn about using this type of map to find elevations and recognize where you are based on landforms.

Topographic Maps

Compared to road maps, topographic maps show more detail of an area's natural features. They show terrain, elevation, and **relief** as well as lakes, rivers, and canyons. Whether you are practicing basic land navigation techniques, participating in orienteering, or performing land navigation at summer camp, knowing how to use topographic maps can help you in the following ways:

- Finding your way if you become separated from a group
- Successfully and safely navigating a group, especially during cross-country movements
- Determining distances from one location to another
- Pinpointing locations in a given area
- Determining the type of terrain in which you or your unit must operate
- Planning trips or operations

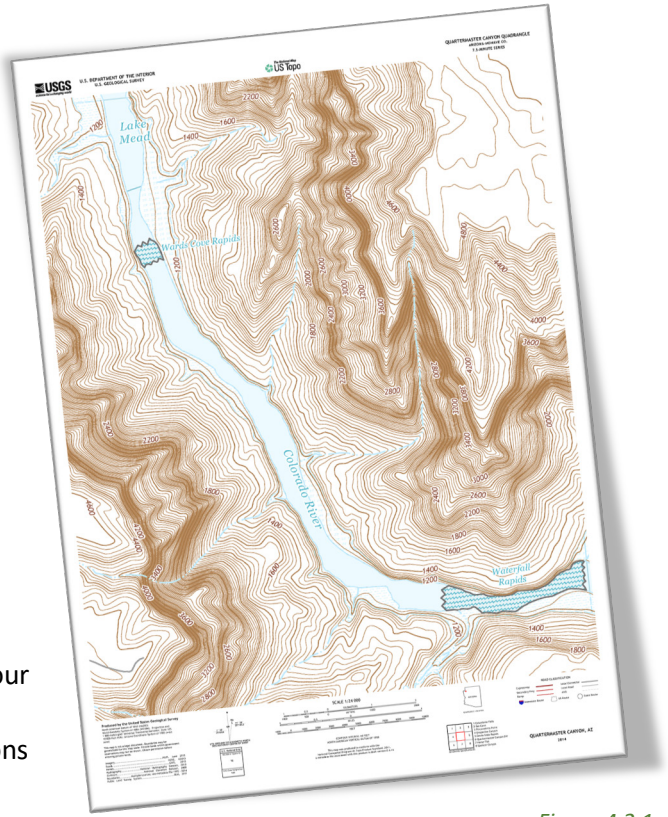


Figure 4.2.1

Key words

relief:
The shape of landforms

Content Highlight:

INTERPRETING A TOPOGRAPHIC MAP

A hiker poised at the start of an unfamiliar trail needs a special kind of map: a topographic, or contour, map. This kind of map shows the changes in elevation that lie ahead—and how quickly these changes take place. Does the trail climb steeply for the next mile, or is the grade a slow and steady rise? Will there be serious climbing involved, or can the hiker cover the distance at an easy pace? How far can the hiker expect to go in a single afternoon? A good topographic map can be used to answer all these questions and help ensure the success and safety of a hike.

Many people use topographic maps. Backpackers take them along when they set out on hiking, rock climbing, and camping trips. Engineers use them when deciding where to build highways and dams. Police and emergency medical personnel often consult topographic maps during search and rescue operations for people who are lost in a park or another undeveloped area.

The two images below show the same area. The top image is a 3-D view of the land; the bottom is a topographic map of the same area. Once you know how to read a topographic map, you'll be able to interpret mountains, cliffs, valleys, and more—just by looking at the **contour line**s on the map.

Key words

contour line:
A line indicating elevation and relief

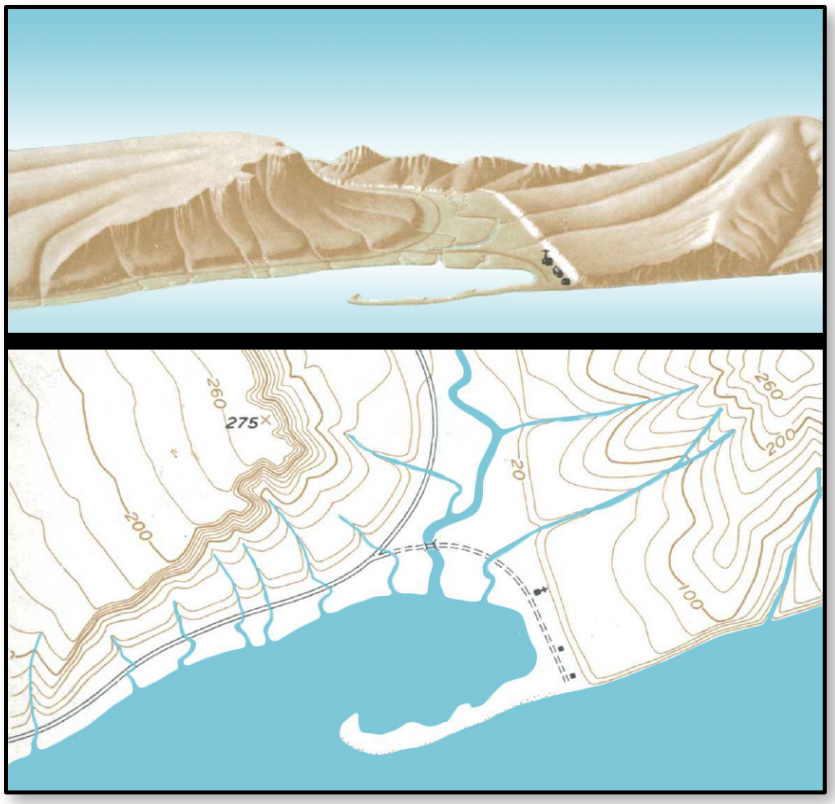


Figure 4.2.2

Understanding Contour Lines

A contour line connects all points where elevation is equal. *Figure 4.2.3* shows a portion of the Grand Canyon. Wavy contour lines indicate elevation and relief – the shape of landforms.

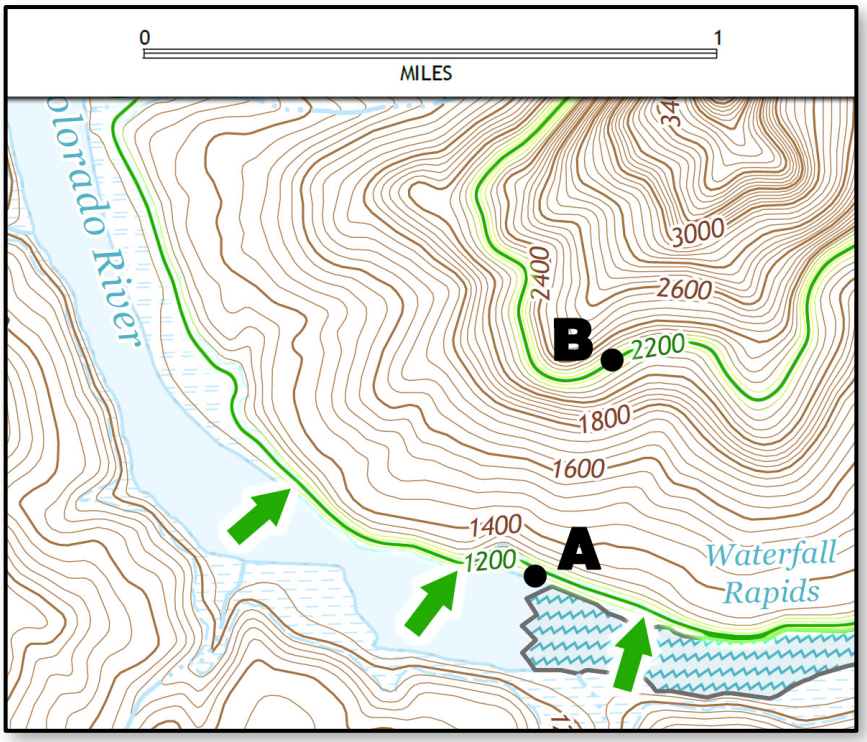


Figure 4.2.3

The contour lines are labeled with numbers showing their elevation. If you were to hike along the contour line at Point A, adjacent to the river, you would always be at the same height above **mean sea level**—1200 feet. The mean sea level is the level of the surface of the sea between high and low tides.

INTERPRETING THE RELATIONSHIPS AMONG CONTOUR LINES

When a series of contour lines is close together, it means that the elevation of the land is changing rapidly—in other words, the terrain is steep. On the topographic map of the Grand Canyon, you can see from the bar scale that the straight line distance between Points A and B (2200 feet) is less than half a mile. But from the contour lines we know that the vertical change in height is 1000 feet! That's pretty steep. The closer the contour lines are, the steeper the terrain. Conversely, when the contour lines are far apart, the land is flatter.

In the Grand Canyon, there are no easy routes. But in many cases, reading the contour lines can help you find an easier route to a hiking destination. For example, you can choose a route that is longer but easier—perhaps one that goes around a large hill or cliff.

Many topographic maps have three types of contour lines: index, intermediate, and supplementary.

Key words

mean sea level:
The level of the surface of the sea between high and low tides

Index

Every fifth contour line is an index contour line. Maps may show index contour lines with a thicker line. Topographic maps may also label the elevation on the index lines.

Intermediate

The contour lines that fall between the index lines are the intermediate contour lines. These lines are more finely drawn and they do not show the elevation number. However, when you look at the marginal information, you'll see that it indicates the **contour interval**s—the vertical distance between the contour lines.

Supplementary

These contour lines resemble dashes. They show sudden changes in elevation.

Key words

contour interval
The vertical distance between contour lines

DETERMINING ELEVATION

By using the interval information, you can figure out the elevation of any point on the map, even if the point is not on an index line.

1. First find the contour interval and the unit of measurement.
2. Next, find the numbered index line closest to your point on the map.
3. Now you can count the number of intermediate contour lines to your point. If you are increasing elevation, add the contour interval to the nearest numbered line. If you are decreasing elevation, subtract the contour interval from the nearest numbered line.

For example, on the map of a hill in *Figure 4.2.4,* the contour interval is 20 meters. What is the elevation of Point A? Since your point is closer to the 300-meter index contour line, start there and add 20 meters for each intermediate contour line. You pass two contour lines, so the elevation of Point A is 340 meters. Notice that your elevation has increased.

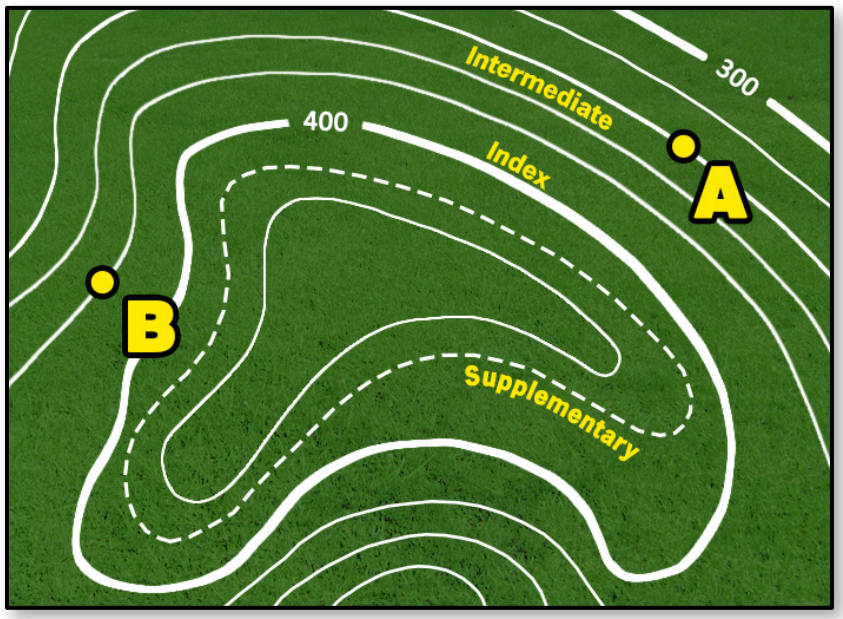


Figure 4.2.4

However, if you want to know the elevation of Point B, the closest index line is at 400 meters. It's below the index line, which means the point is downhill one contour line. Subtract 20 meters from the index line to find the elevation. The elevation of Point B is 380 meters.

There may be times when your point is not on any contour line. Then you'll need to estimate. For example, in *Figure 4.2.5* the contour lines are 20 meters apart. Therefore, a point half-way between two contour lines would be half of the interval or 10 meters.

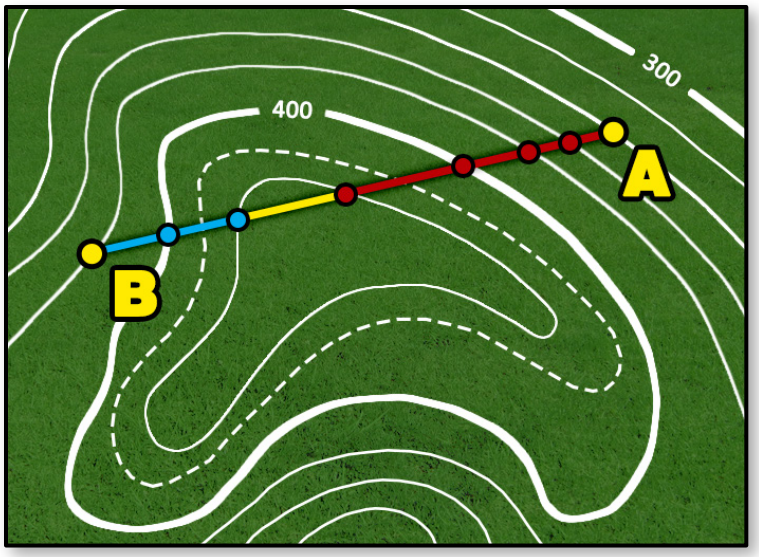


Figure 4.2.5

Using contour lines will also give you a better sense of distance. Suppose the straight-line distance between Points A and B is 1000 meters. If you travelled the straight line, you'd cross eight contour lines: five from Point A to the top contour line and three contour lines on the way down. You'll have an upward climb of 100 meters, crossing five contour lines to the crest of the hill. To get to Point B, you'll cross three contour lines, descending 60 meters. That means you'll be adding 160 meters of vertical distance to your overall distance of 1000 meters. Your actual on-foot travel distance would be 1160 meters.

You can also determine elevation for valleys, pits, gullies, or low places on the terrain. These **depression**s are usually marked on topographical maps with tick marks pointing to lower elevations. On the map below, the north side of the depression is 300 meters; the south side is 200 meters. So the depression is located on the side of a hill. And because there is no depth noted inside the depression, you know that it is no deeper than 20 meters. It could be a sinkhole or a quarry.

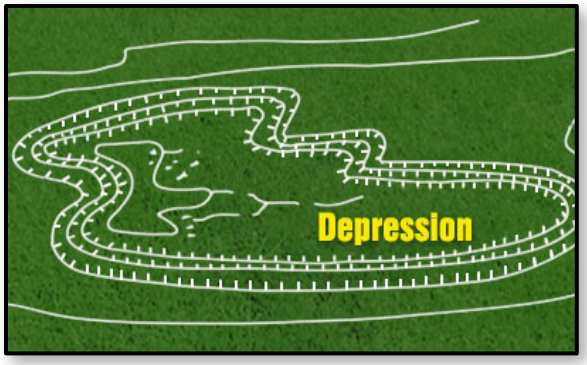


Figure 4.2.6

Key words

depression:
A low area on the ground surrounded by higher land on all sides

In addition to contour lines, mapmakers use bench marks and spot elevations to indicate points of known elevation on a map. Bench marks (abbreviated BM) are the more accurate of the two. Mapmakers show a bench mark with a black "X" and the center of its elevation given in feet, meters, or yards above sea level. Mapmakers show spot elevations with a brown "X" to mark road junctions, hilltops, or other prominent terrain features.

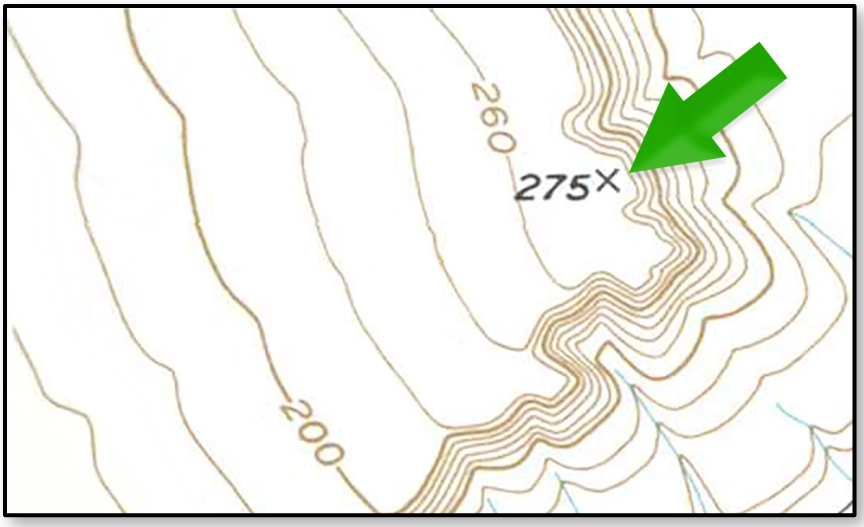


Figure 4.2.7

Topographical Marginal Information

The marginal information for topographic maps is more standardized than that on other maps, such as road maps. However, all topographic maps are not the same. Following are ten common items of marginal information.

- ***Sheet Name.*** You can locate the sheet name at the center of the top margin. As with road maps, mapmakers generally title a map after its prominent cultural or geographic feature.
- ***Sheet Number.*** You can find the sheet number located in either the upper right or the lower left corners. Use it as a reference number for the map sheet.
- ***Adjoining Map Sheets Diagram.*** Locate the adjoining (or adjacent) map sheets diagram in the right corner of the lower margin. This diagram contains nine squares; the center square is the map sheet at which you are looking. The remaining squares show the sheet numbers for those maps at the same scale that surround the area covered by the center square.
- ***Special Notes.*** Special notes are statements of general information that relate to the mapped area. For example, a note might indicate a map is red-light readable. Maps like this can be read at night using a red light. These maps combine red and brown to identify various features.
- ***Declination Diagram.*** Another item of information located in the lower right margin is the declination diagram. All you need to know at this time is that it indicates the direction and relationship of true, magnetic, and grid north.
- ***Scales.*** Locate the graphic (bar) scales in the center of the lower margin of the map. Many topographic maps have more than one scale, each using a different unit of measurement, such as miles and kilometers or feet and meters.

Ten common items of marginal information *(cont'd):*

- ***Contour Interval Note.*** The contour interval note also appears in the center of the lower margin. It represents the vertical distance between contour lines on the map.
- ***Grid Reference Box.*** Located at the bottom center of the lower margin, the grid reference box contains information for identifying the grid zone and the 100,000-meter square representing the area. It also provides instructions for giving grid references on the map. You'll learn more about using referencing systems in later lessons. For now, just know that topographical maps include information about the grid reference.
- ***Unit Imprint.*** You can find the unit imprint below the left corner of the mapped area. It identifies the agency that prepared and printed the map.
- ***Legend.*** The legend appears below the unit imprint. It states the effective date of the road and other data and illustrates the symbols used on the map.

Slopes

Contour maps define slopes—the rise or fall of the ground. The four types of slopes are gentle, steep, **concave**, and **convex**. The contour lines tell you which type of slope you are looking at on a topographic map.

- ***Gentle Slope.*** On a gentle slope, the contour lines are farther apart. *(See Figure 4.2.8)* The elevation of the slope decreases slowly as you move from the top of the slope to the bottom. It's not steep.

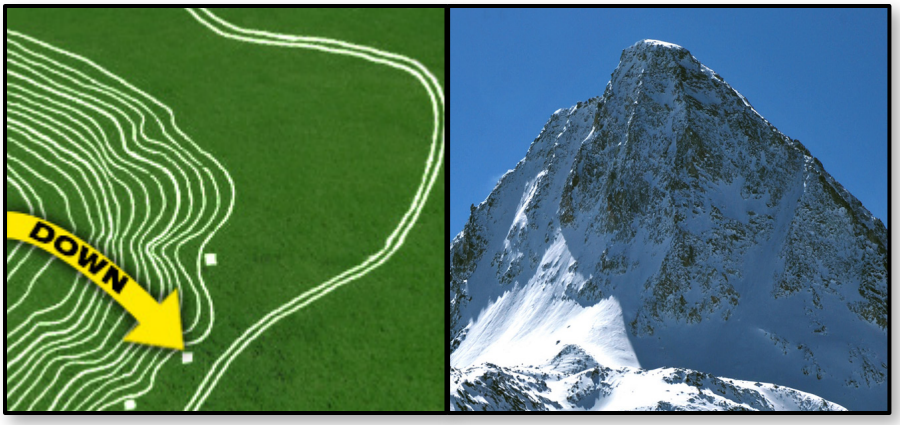
Gentle Slope *Figure 4.2.8*

- ***Steep Slope.*** On a steep slope, the contour lines are close together. *(See Figure 4.2.9)* The elevation increases rapidly as you walk down from the top to the bottom.

Key words

concave:
Curving inward

convex:
Curving outward



Steep Slope *Figure 4.2.9*

- ***Concave Slope.*** When you look at the profile of a concave slope, it curves inward. *(See Figure 4.2.10)* On a map, the *contour* lines are closely spaced at the top of the feature and widely spaced at the bottom.

Concave Slope *Figure 4.2.10*

- ***Convex Slope.*** Convex slopes are the opposite. The profile of a convex slope bulges outward. *(See Figure 4.2.11)* The contour lines are widely spaced at the top and closely spaced at the bottom.

Convex Slope *Figure 4.2.11*

Terrain Features

No matter where you live, there are hills, valleys, streams, or other landforms in your area. Mapmakers use symbols to represent these natural land formations. They position them on a map so that the center of the symbol remains in its true location. These symbols closely resemble the actual features when viewed from above.

Maps may show as many as 10 different terrain features. All terrain features are based on various elevations or reliefs of the land. The 10 natural or man-made terrain features fall into three categories—major features, minor features, and supplementary features. There are five major features, two minor features, and three supplementary features.

MAJOR TERRAIN FEATURES

The five major terrain features are hill, **saddle**, valley, ridge, and depression.

- ***Hill.*** A hill is an area of high ground. *(See Figure 4.2.12)* When you are located on a hilltop, the ground slopes down in all directions. Maps will show a hill with a regular closed contour line, or a series of **concentric** closed contour lines. The inside of the smallest closed circle is the hilltop. The more contour lines, the higher the hill.

Hill *Figure 4.2.12*

- ***Saddle.*** A saddle is a dip or low point between two areas of higher ground. *(See Figure 4.2.13)* It is not necessarily the lower ground between two hilltops; it may simply be a dip or break along a level ridge or crest. If you were in a saddle, there would be high ground in two opposite directions and lower ground in the other two directions. Maps will show a saddle with the contour lines forming an hourglass or a figure-eight-shaped feature.

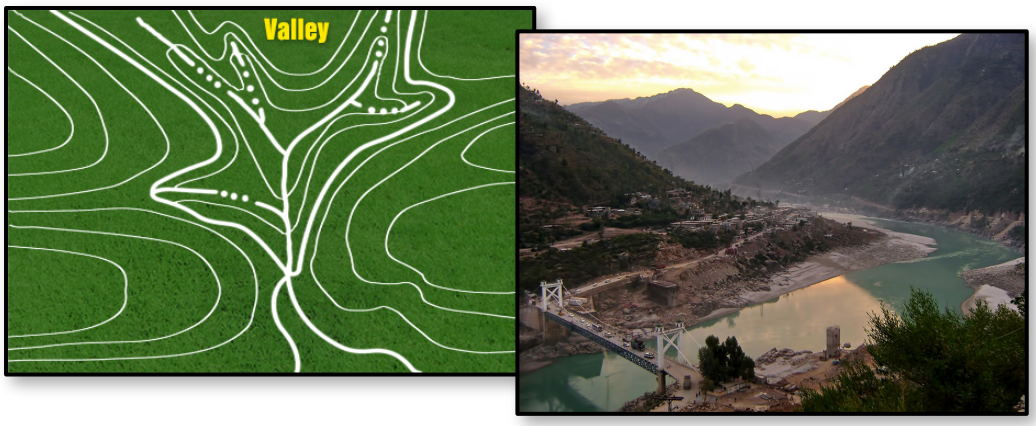
Saddle *Figure 4.2.13*

Key words

saddle:
A lower area between two hills or mountains

concentric:
A group of circles having a common center

- ***Valley.*** A valley is a stretched-out groove in the land, usually formed by streams or rivers. *(See Figure 4.2.14)* A valley begins with high ground on three sides, and usually has a course of running water through it, which always flows from higher to lower ground. If you were standing in a valley, there would be high ground in two opposite directions and a gradual slope in the other two directions. Contour lines forming a valley are either "U-shaped" or "V-shaped." To determine the direction water is flowing, look at the contour lines. The closed end of the "U" or "V" always points upstream or toward the high ground.

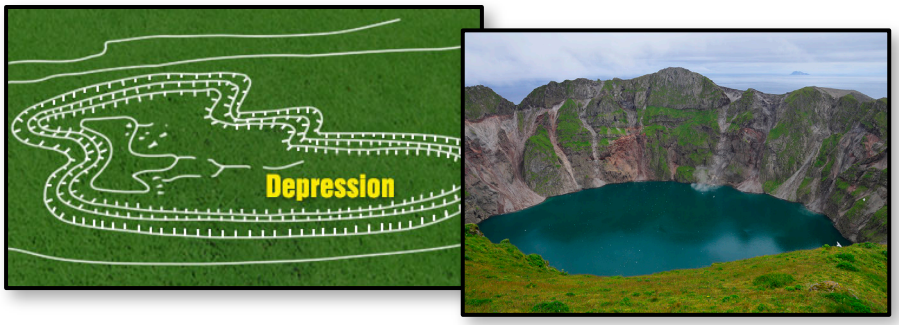


Valley *Figure 4.2.14*

- ***Ridge.*** A ridge is a sloping line of high ground. *(See Figure 4.2.15)* If you were standing in the center of a ridge, you would normally have low ground in three directions and high ground in one direction. Ridges are often shown as dashed lines on a topographic map. If you cross a ridge at right angles, you climb steeply to the crest, and then descend steeply to the base. When you move along the path of the ridge, depending on your location, there may be either a barely noticeable slope or a very obvious incline. Contour lines forming a ridge tend to be "U-shaped" or "V-shaped."

Ridge *Figure 4.2.15*

- ***Depression.*** A depression is a low point in the ground, or a sinkhole, surrounded by higher ground in all directions. *(See Figure 4.2.16)* Maps will show depressions by closed contour lines that have tick marks pointing toward the low ground. The closer the contour lines, the deeper the depression.



Depression *Figure 4.2.16*

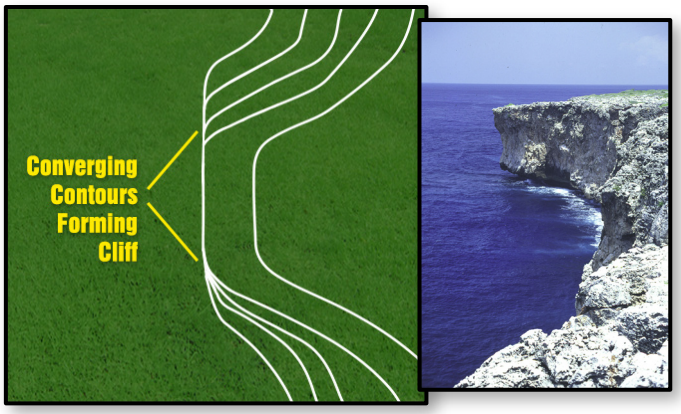
MINOR TERRAIN FEATURES

Along with the major terrain features, there are three minor terrain features. These are **draw**, **spur**, and cliff.

- ***Draw.*** A draw is a stream course that is less developed than a valley. There is no level ground. *(See Figure 4.2.17)* If you were standing in a draw, the ground would slope up in three directions and down in the other. A draw is sometimes considered to be the initial formation of a valley. Maps will show a draw as a series of successive "U-shaped" or "V-shaped" contour lines that point uphill or upstream.

Draw *Figure 4.2.17*

- ***Cliff.*** A cliff is a vertical or near vertical slope that is an abrupt change of the land formation. *(See Figure 4.2.18)* Maps show the contour lines for cliffs as being very close together, and in some cases, touching each other.



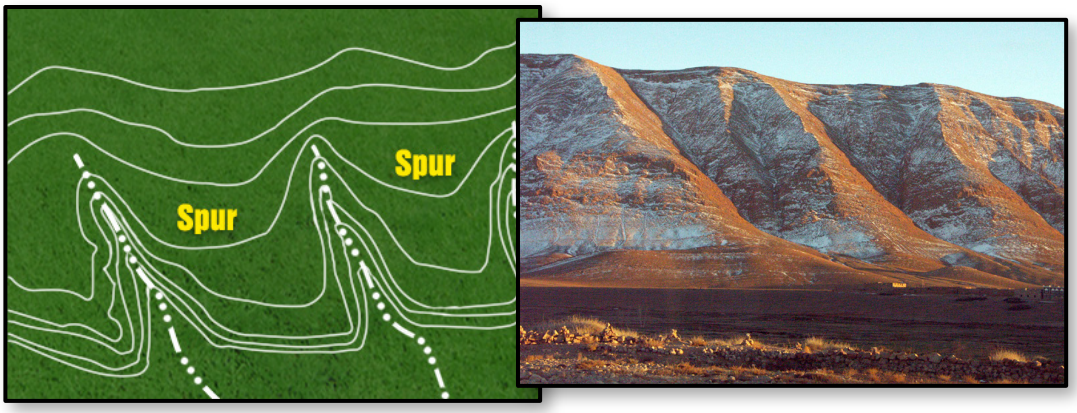
Cliff *Figure 4.2.18*

Key words

draw:
A stream course that is less developed than a valley

spur:
A short sloping narrow area cutting through the side of a slope

- ***Spur.*** A spur is a short, continuous sloping line of high ground, normally jutting out from the side of a ridge. *(See Figure 4.2.19)* It is often formed by two parallel streams cutting draws down the side of a ridge. The ground will slope down in three directions and up in one. Maps will show a spur as a series of successive "U-shaped" or "V-shaped" contour lines that point in a downhill direction.

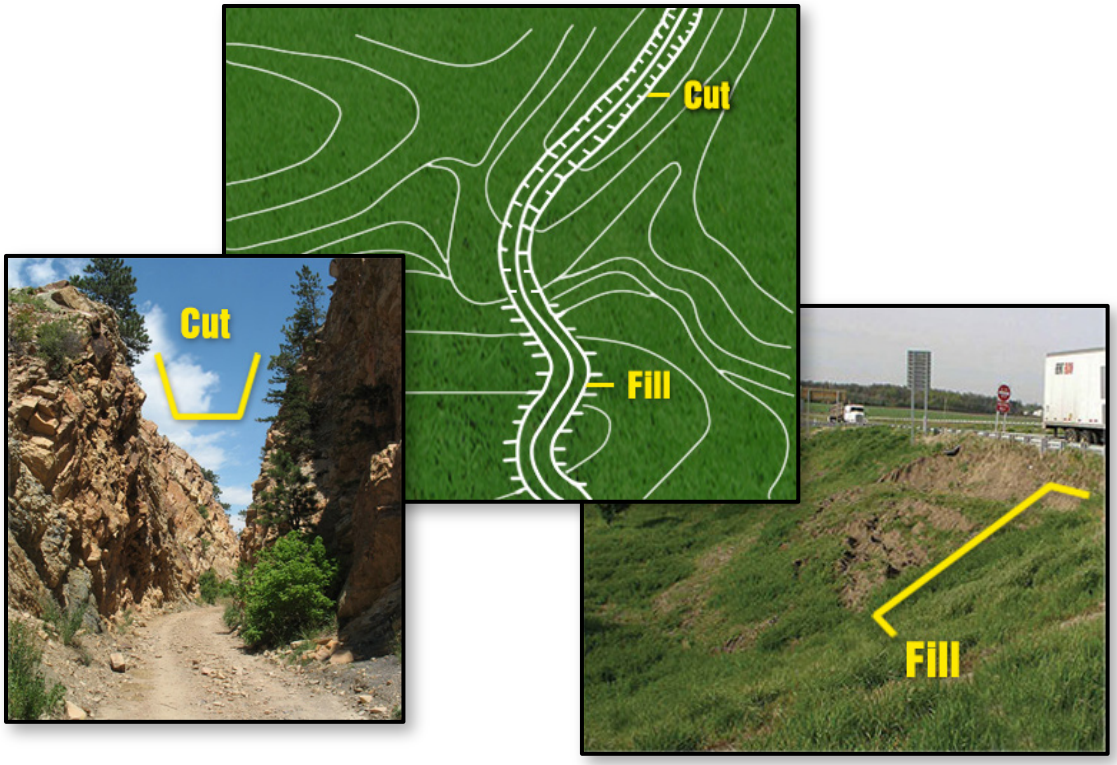


Spur *Figure 4.2.19*

SUPPLEMENTARY TERRAIN FEATURES

The two supplementary terrain features are cut and fill. *(See Figure 4.2.20)*

Cuts and fills are man-made features resulting from the cutting through of high areas and the filling in of low areas to form a level bed for a road or railroad track. Maps will show cuts when they are at least 10 feet high. Mapmakers draw the contour lines along the length of the cut. They also use tick marks to extend from the cut line to the roadbed, if the map scale permits this level of detail.



Cut and Fill *Figure 4.2.20*

Conclusion

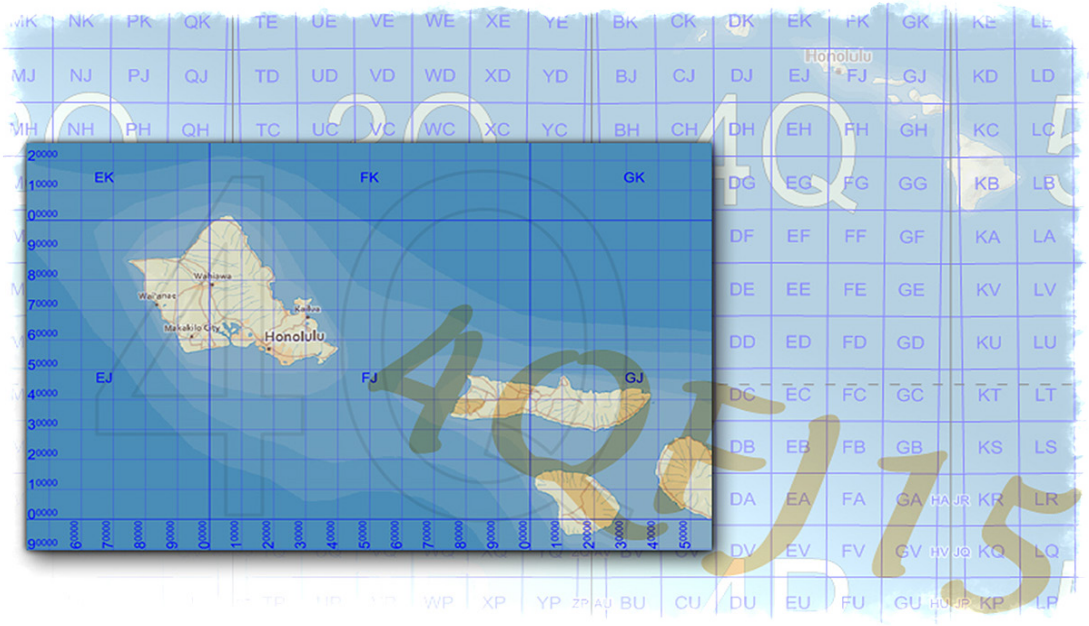
In this lesson, you learned two fundamental concepts of land navigation—understanding elevation and recognizing terrain features. Practice using these concepts. Study the contours and landforms within your region. When traveling, look for differences in terrain and elevation. Become successful in applying your map reading skills so that you will always be able to answer the question, "Where am I?"

Lesson Check-up

- **What are some professional and recreational uses of topographical maps?**
- **Explain how to use contour intervals to determine elevation gain or loss.**
- **What are the five land formations found in or near your city?**

LESSON 3

Grid Reference Systems



What You Will Learn to Do

Use a grid reference system to find locations

Linked Core Abilities

- Apply critical thinking techniques
- Build your capacity for life-long learning
- Communicate using verbal, non-verbal, visual, and written techniques
- Take responsibility for your actions and choices

Learning Objectives

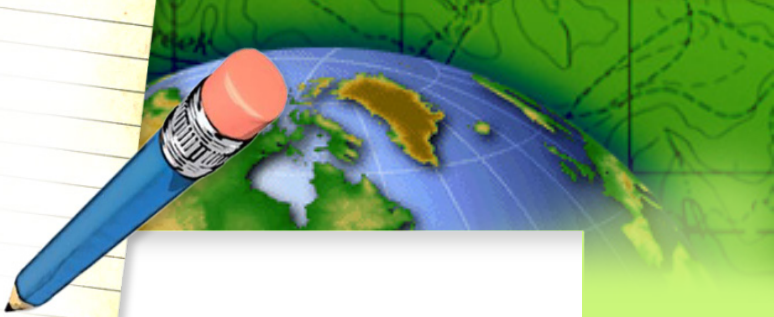
- **Describe** how latitude and longitude are used in the global coordinate system
- **Locate** grid zones and grid segments using the UTM and MGRS grid reference systems
- **Determine** the six-digit MGRS coordinates of a known location on a map
- **Use** the six-digit MGRS coordinates to locate a point on a map

Key words

- **antimeridian**
- **eastern hemisphere**
- **eastings**
- **grid coordinate**
- **meridians**
- **MGRS**
- **northings**
- **parallels**
- **prime meridian**

Essential Question

How can you use a grid reference system to determine location?



Learning Objectives (cont'd)

- **Use** a coordinate scale tool to determine MGRS locations
- **Define** key words: antimeridian, eastern hemisphere, eastings, grid coordinate, meridians, MGRS, northings, parallels, prime meridian, UTM, western hemisphere

Key words (cont'd)

- **UTM**
- **western hemisphere**

Introduction

This lesson introduces you to map coordinate systems and grid referencing systems. After you are familiar with these systems, you can better understand how to locate and identify points anywhere in the world. This lesson will show you how to locate a point on a topographic map to within 100 meters using a six-digit **grid coordinate**.

The Latitude and Longitude Coordinate System

To keep from getting lost, you must know how to find your location. Electronic mapping devices may not always be available to you. Learning to use grid referencing systems in conjunction with maps will help you quickly and accurately pinpoint your location.

All grid reference systems are based on the coordinate system of latitude and longitude. Chances are your electronic mapping applications are also using latitude and longitude. The **UTM** and **MGRS** grid systems we'll look at later in this lesson use this part of the coordinate system, so it's important to understand how it works.

By now you know that latitude is the group of parallel lines that circle the globe from east to west. Sometimes these lines are just called **parallels**. These east-west lines measure north and south distances from the equator—the latitude that shows the widest part of the globe.

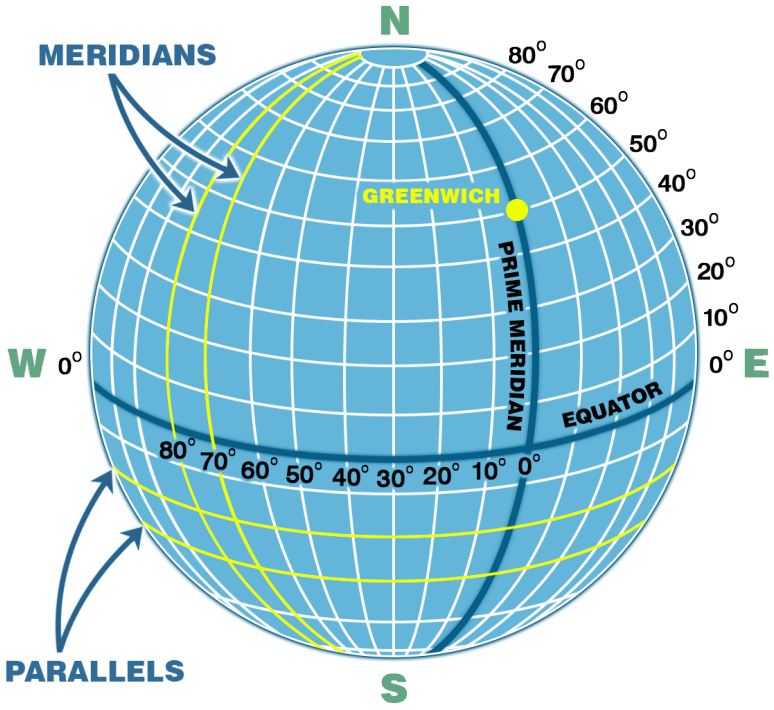
Key words

grid coordinate:
A set of letters and numbers specifying the location of a point to the desired position within a 100,000-meter square

UTM:
A global grid system that divides the Earth into 60 numbered grid zones and 20 lettered segments

MGRS:
A grid system used by the military to determine precise location

parallels:
Lines of latitude



Meridians and Parallels *Figure 4.3.1*

The equator is at zero degrees latitude. From the equator, the parallels increase in both directions, from zero to 90. The latitude of the North Pole is 90°N. The South Pole is 90°S.

In the image above, the lines of latitude are shown in degrees. For more precise measurements between parallels, latitude can also be shown in minutes and seconds. Sometimes, these measurements are shown as a decimal.

In the table below, you can tell that Chicago is in the northern hemisphere and Rio is in the south, indicated by the "N" and "S" before the latitude numbers. Notice that the decimal notation for Rio uses a negative number to indicate that it is south of the equator.

	Degrees, Minutes, Seconds	Decimal
Chicago, IL		
Latitude	N 41° 52' 41.2104"	41.878114
Longitude	W 87° 37' 47.2735"	-87.62979819999998
Rio de Janeiro, Brazil		
Latitude	S 22° 54' 24.6481"	-22.906847
Longitude	W 43° 10' 22.4256"	-43.172896

Figure 4.3.2

The vertical rings around the globe that pass through the poles are called longitude or **meridians**. An important meridian to know is the **prime meridian**, which runs through Greenwich in the United Kingdom. Starting

Key words

meridians:
Imaginary circles on the earth's surface passing through the North and South poles; a line of longitude

prime meridian:
The line of longitude that passes through Greenwich, England, designated as zero degrees longitude, and from which longitude east and west is measure

at the prime meridian, mapmakers number meridians from zero to 180 degrees both east and west.

In the table above, we can see that both Chicago and Rio are west of the prime meridian by the "W" before the longitude in degrees. The negative numbers for the decimal longitude also indicates locations west of the prime meridian.

THE OTHER SIDE OF THE PRIME MERIDIAN

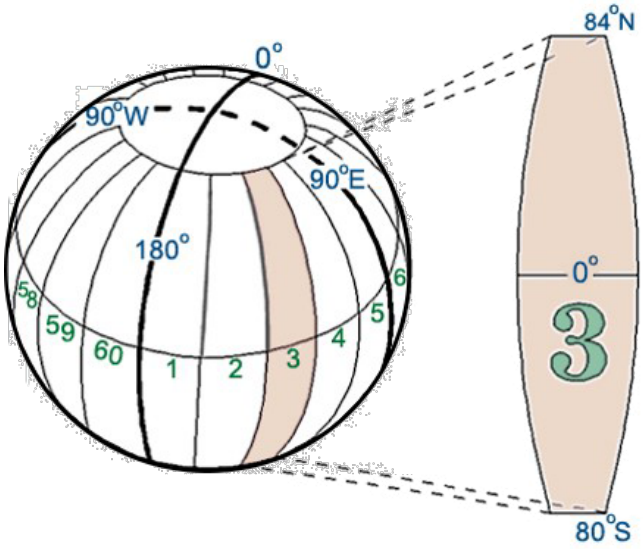
The line opposite the prime meridian in Greenwich is the meridian at 180 degrees. These two imaginary lines form a great circle that divides the earth into the eastern and **western hemisphere**s. The meridian at 180 degrees is sometimes called the **antimeridian**. In addition to being used in the global coordinate system, it's also the basis for the International Date Line (IDL). IDL is used to mark the change of one calendar day to the next.

UTM Grid System

The Universal Transverse Mercator (UTM) system divides the globe into a flat grid. It was developed to translate the sphere of the globe into a flat map scale with minimal distortion. The UTM is also the basis of the Military Grid Reference System (MGRS), which gives you a way to find precise locations without the use of an electronic device.

EAST-WEST MERIDIANS

The UTM grid system divides the surface of the earth into 60 equal north-south grid zone numbers. Each of these zones are 6 degrees of longitude across.



Grid Zones of the UTM Grid System *Figure 4.3.3*

Grid zones 1 through 30 cover the western hemisphere. They begin with grid zone 1 at the 180 degree antimeridian line. As the zone numbers increase, the longitude changes by 6 degrees.

Key words

western hemisphere: The portion of the globe that is west of the prime meridian

antimeridian: The line of longitude at 180 degrees

For example:

- Grid zone 1 is from 180°W to 174°W
- Grid zone 2 is from 174°W to 168°W
- Grid zone 3 is from 168°W to 162°W *(highlighted in Figure 4.3.3)*

These measurements and coordinates are sometimes called **eastings** because they measure east and west meridians.

The grid zone numbers for the western hemisphere proceed half way around the earth until grid 30 ends at the 0-degree prime meridian line.

Grid zone numbers 31 through 60 cover the 180-degree **eastern hemisphere**. They begin with grid 31 at the 0-degree prime meridian line and proceed across the second half of the earth by 6 degrees of longitude.

For example:

- Grid zone 31 is from 0°E to 6°E
- Grid zone 32 is from 6°E to 12°E
- Grid zone 33 is from 12°E to 18°E

Grid zone 60 ends at the 180-degree antimeridian line. This system ensures a complete circular coverage of the Earth's surface with grid zones.

Key words

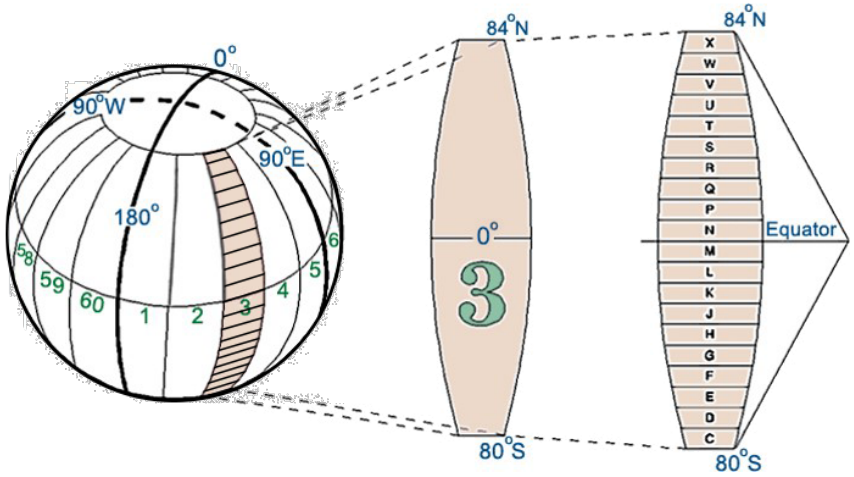
eastings:
Coordinates that measure location based on east-west meridians

eastern hemisphere:
The portion of the globe that is east of the prime meridian between zero and 180 degrees

northings:
Coordinates that measure location based on parallels north and south of the equator

NORTH-SOUTH PARALLELS

UTM further divides each number zone into 20 north-south segments. These are called **northings** because they measure areas north and south of the equator. Each grid segment has a letter for identification. Mapmakers use the letters "C" through "X" (omitting the letters "I" and "O") to identify these 20 grid segments. They do not use "I" and "O" because those letters can easily be mistaken for the numbers "1" and "0," respectively. The equator is the line between N and M.



Grid Segments of the UTM Grid System *Figure 4.3.4*

Nineteen of these grid segments are eight degrees high and the one row at the extreme north is 12 degrees high. This combination of zone number and row letter constitutes the grid zone designation.

With this designator, you are now able to identify specific grids. For example, if you wanted to locate the first segment north of the equator in the numbered zone 3, its UTM grid zone designation would be 3N (3 is the zone number and N is the lettered zone). *(See Figure 4.3.5)*

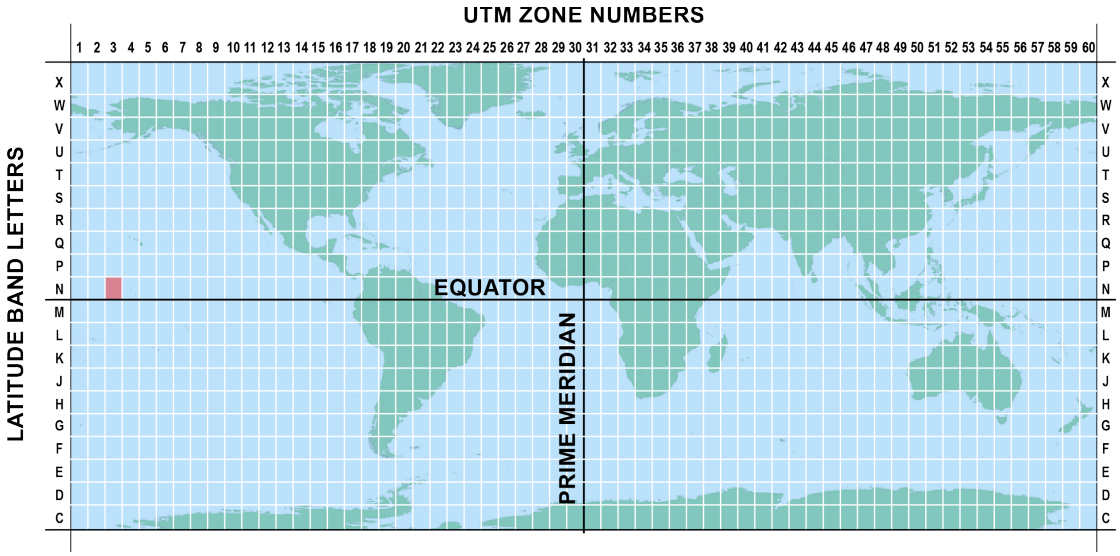
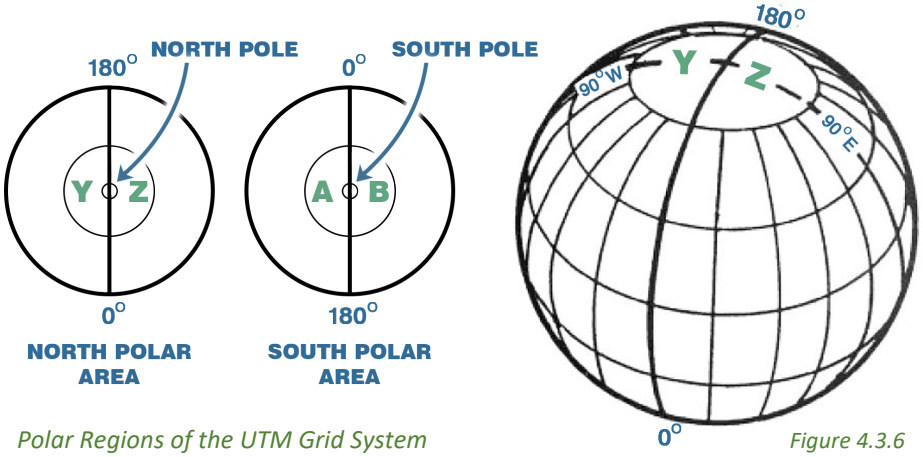


Figure 4.3.5

One thing missing from the UTM figures of the globe that you've seen so far is the polar regions. Therefore, to complete the globe, mapmakers extend these grid lines to 90 degrees in both directions: 90 degrees north latitude is the North Pole and 90 degrees south latitude is the South Pole. Mapmakers use the remaining four letters, "A," "B," "Y," and "Z" to identify the polar regions as shown in *Figure 4.3.6*.



Polar Regions of the UTM Grid System

Figure 4.3.6

Topographic maps indicate the UTM grid zone in the map's marginal information section. The maps will also have grid lines for northings and eastings. *Figure 4.3.7* is an example of Grid Zone Designation on a map.

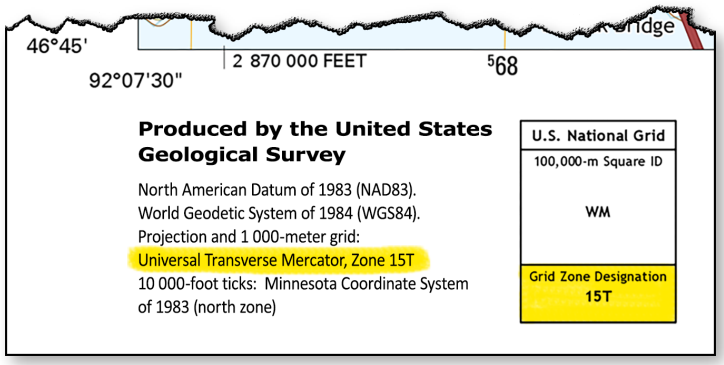


Figure 4.3.7

Military Grid Reference System

Although the UTM is a good system for locating a position anywhere around the globe, sometimes a more precise method is required. This is why the Military Grid Reference System (MGRS) was developed. It meets the military's need to be precise with reporting exact locations for enemies or the requirement to fire an artillery projectile to a precise location. To accomplish this, the MGRS sub-divides each UTM grid into much smaller grids. This ultimately allows you to determine any location to within one meter!

For example, if you had the 10-digit MGRS grid coordinate to a cell phone dropped in the middle of the Amazon forest in South America, you could follow those coordinates until you are within one meter—two steps—of that cell phone.

MGRS is based on UTM grid squares, which measure 100,000 meters. MGRS divides those squares into smaller squares that are 1,000 or 10,000 meters in width and length (depending on the scale of the map). Those smaller squares are assigned two letters. In the example in *Figure 4.3.8*, the circled area shows the MGRS location of **15SWC:**

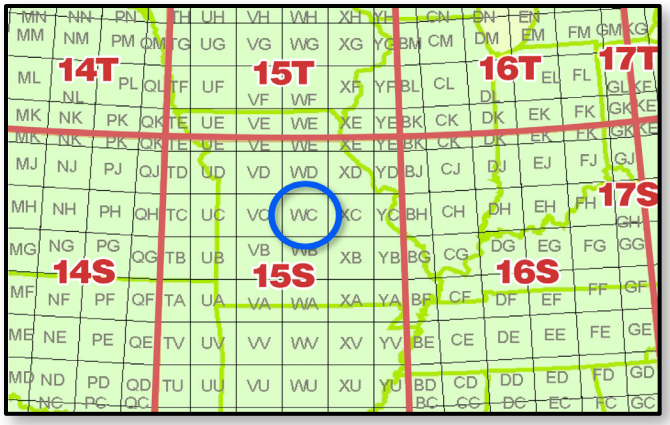


Figure 4.3.8

- **15S** is the UTM grid designation
- **WC** is the MGRS 100,000-meter grid square identifiers

To further pinpoint a location with MGRS, you need to see the northings and eastings value of the squares within the WC area. These are highlighted on the map in *Figure 4.3.9*.

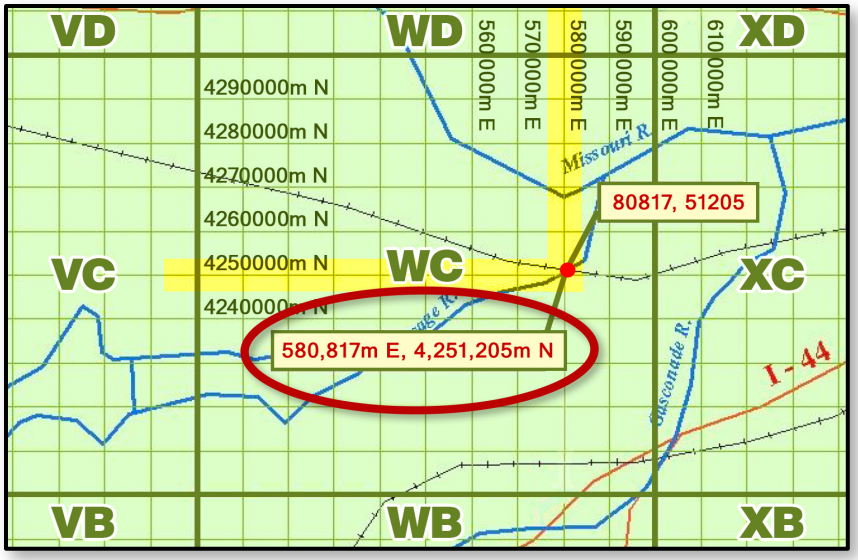


Figure 4.3.9

The map marks a location along the 425,000-meter northings line and the 580,000-meter eastings line in yellow. The circled numbers show the MGRS location at a one-meter refinement. To actually get those numbers, you'd use a map with more grid

lines. In practice, the MGRS locations are used at several refinements in addition to the one-meter designation.

In the table below, notice that the longer the coordinates are, the more precise the location will be. Also, notice that the first five characters **15SWC** are the UTM and MGRS identifiers. The numbers that follow show the northings and eastings locations.

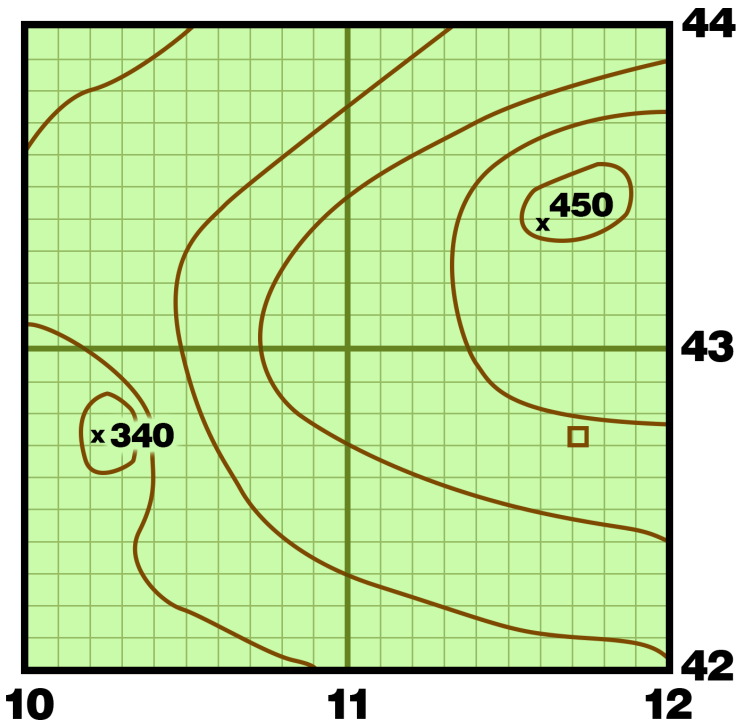
Refinement	MGRS Location	Description
one-meter	15SWC**8081751205**	ten-digit
10-meter	15SWC**80825121**	eight-digit
100-meter	15SWC**808512**	six-digit
1000-meter	15SWC**8151**	four-digit

Figure 4.3.10

In this lesson, you'll be using the 100-meter refinement. One hundred meters is about the length of a football field. The 100-meter refinement is often called the six-digit grid coordinate because it uses three digits for northings and three for eastings.

FINDING A SIX-DIGIT MGRS LOCATION

Here are the steps for finding a six-digit MGRS location on a topographic map. In this example, we'll determine the location of the 450-foot spot elevation in the map in *Figure 4.3.11*.



Determining a Six-Digit Grid Coordinate *Figure 4.3.11*

1. Identify the UTM grid designation and 100,000-meter square identification letters for the map you are using. You can find this in the marginal information of your map. For this example, we'll use **15S** for the UTM and **YF** for the MRGS identification letters.
2. Identify the 1,000-meter grid square in which the 450-foot spot elevation is located. To do this, remember the first cardinal rule of map reading: read right, and then up. When reading a map right and up, each north-south grid line increases in value from west to east, and each east-west grid line increases in value from south to north. You will see that the last north-south grid line before reaching the grid square containing the spot elevation is **11**. Still reading right, count the smaller lines until you reach your location. It's about **6** lines. Your northings reading is **116**.

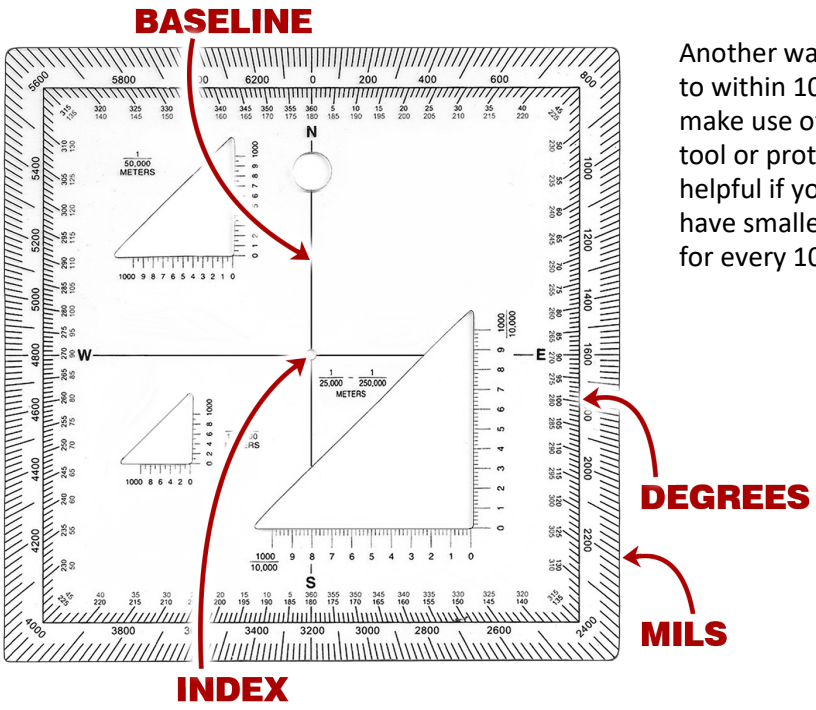
3. Next, read up for the eastings. Note that the last east-west grid line before reaching the grid square containing the spot elevation is **43**. It's also about **4** lines up. The eastings value is **434**.
4. Combine the northings and eastings values with the UTM and MRGS identifiers to get the six-digit location. The spot elevation is **15SYF116434**.

FINDING A LOCATION GIVEN GRID COORDINATES

You can also use this method in reverse. When you know the six-digit location, you can find the point on the map. For example, try to find the location of **15SYF102427** on the map in *Figure 4.3.11* on the previous page. Even without additional grid squares you can use what you know to estimate.

1. You know that the UTM and MGRS Identifiers are the first five characters of the location description: **15SYF**102427. The remaining numbers are the actual grid coordinates. Remember that the coordinates will always be an even number of digits. In this case, there are six digits: 15SYF**102427**.
2. Now, split the number of digits into two groups of three digits: **102** and **427**. The first two digits of both groups will identify which grid square we are using. In this case, we are using the "**10** – **42**" grid box.
3. Find the intersection of the east-west **10** line, with the north-south **42** line. Remember the cardinal rule of map reading: always read right, then up. The grid square we want is in the lower left corner of the image.
4. Now you've found all of the digits except **2** and **7**: **15SYF10-42-**. On the map, go right **2**, and up **7**. A good estimate of this location is the spot elevation hilltop marked at 340 feet.

Using a Coordinate Scale Tool

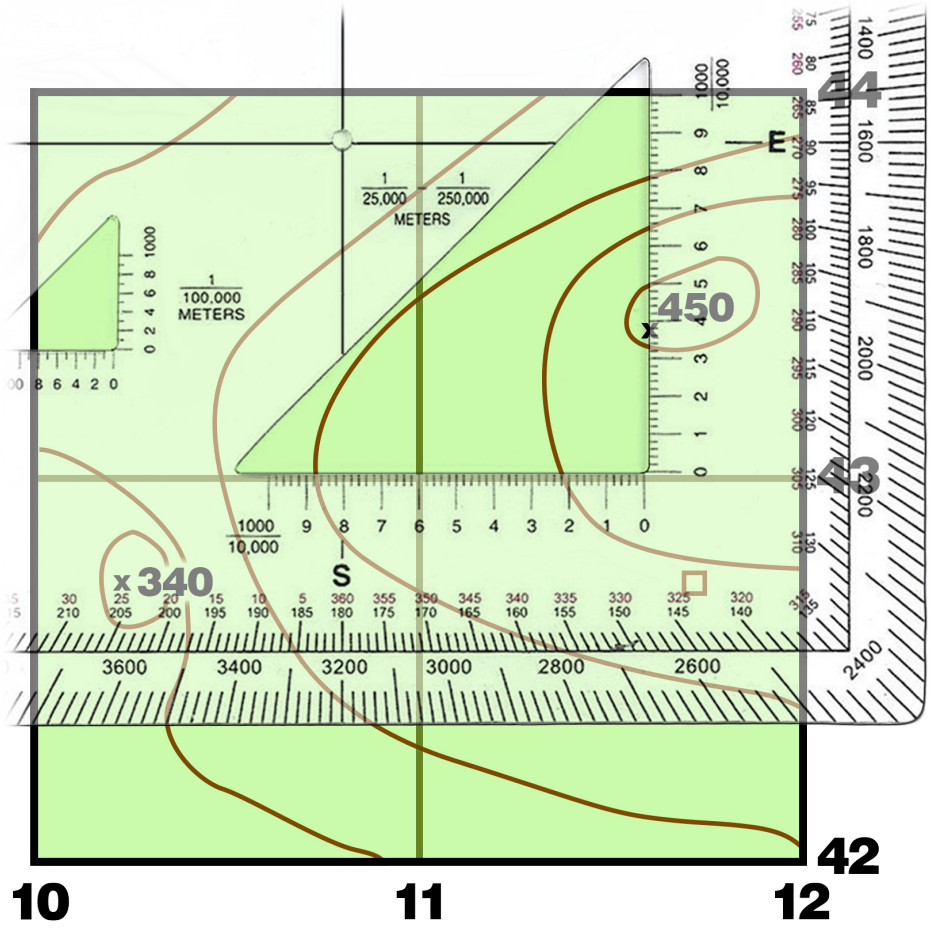


Another way to locate a point to within 100 meters is to make use of a coordinate scale tool or protractor. This is helpful if your map does not have smaller squares marked for every 100 meters.

The Army Coordinate Scale *Figure 4.3.12*

Content Highlight:
ROUNDING NUMBERS

When you have to round off numbers using a coordinate scale for a six-digit coordinate, apply the following rule: round down for numbers that are four or less; round up for numbers that are five and above.



Using a Coordinate Scale *Figure 4.3.13*

The following is the correct way to use a coordinate scale. To explain this procedure, we'll again find the six-digit grid coordinate for spot elevation 450. *(See Figure 4.3.13)*

1. First, check to ensure that you are using the correct scale. If you obtained a paper coordinate scale from your JROTC instructor, use the 1:25,000 scale.
2. Place the horizontal scale parallel to and directly on top of grid line 43 with the "0 mark" at the lower left corner of grid square YF1143.
3. Keeping the horizontal scale on top of grid line 43, slide the scale to the right into the grid square until the vertical scale intersects the center of mass of spot elevation 450.
4. Now, reading left from the "0 mark," you can see that spot elevation 450 lies almost directly on the six-tenths indicator. Therefore, you would read this number as **116**.

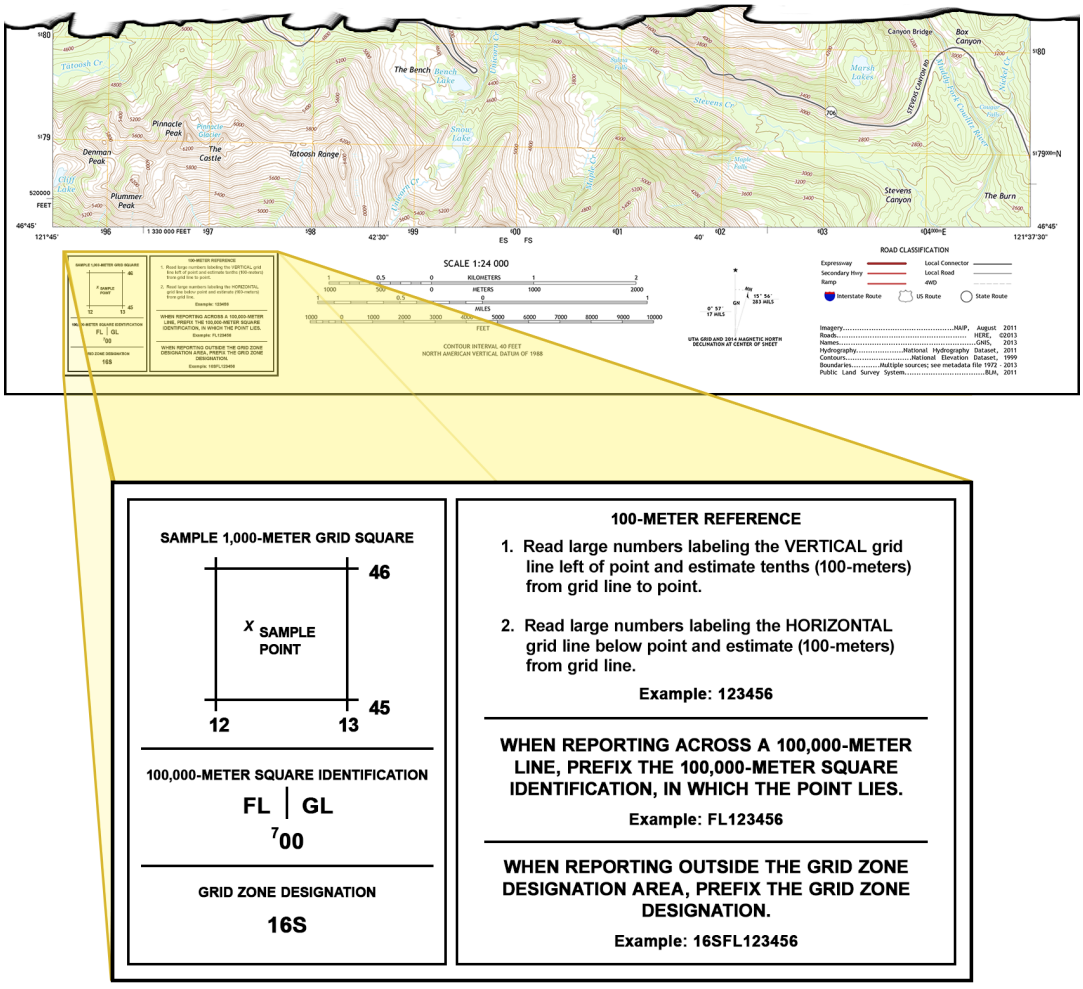
5. Reading up, you can see that spot elevation 450 lies midway between the three and four mark on the coordinate scale. By applying the rounding-off rule, round up to read this number as **434**.

As before, the MGRS for the spot elevation is **15SYF116434**.

Grid Reference Box

As you begin to use your topographic map for land navigation, you'll want to pay attention to the grid reference box. Some topographic map sheets will have step-by-step instructions for using the grid and military grid reference systems. Mapmakers divide the grid reference box into two parts, as shown below.

The left portion identifies the grid zone designation and the 100,000-meter square identifier. If the map sheet falls in more than one 100,000-meter square, the number of the grid line that separates these squares and the 100,000-meter square identifications are given. The right portion briefly explains how to find and write a six-digit coordinate.



A Grid Reference Box *Figure 4.3.14*

Conclusion

Being successful at map reading requires a thorough understanding of many basic concepts. This lesson has presented several precise systems of finding locations on maps. Your ability to use these systems and locate six-digit grid coordinates can increase your confidence in identifying your location.

Lesson Check-up

- **How are latitude and longitude used in grid reference systems?**
- **Explain why northings is an east-west measurement.**
- **When would you use a grid scale? If a friend told you to meet him at 29SMS123789 for an orienteering exercise, would you know how to find the location?**

Determining Direction

Key words

- azimuth
- back azimuth
- field-expedient
- grid azimuth
- grid north
- magnetic azimuth
- magnetic north
- Polaris
- true north

What You Will Learn to Do

Determine direction with angle measurement tools and field expedient methods

Linked Core Abilities

- Apply critical thinking techniques
- Build your capacity for life-long learning
- Communicate using verbal, non-verbal, visual, and written techniques
- Take responsibility for your actions and choices

Learning Objectives

- **Define** the three base directions found on a topographic map
- **Describe** the key features of a compass
- **Demonstrate** how to determine and measure a magnetic azimuth
- **Demonstrate** how to determine, measure, and plot a grid azimuth

Essential Question

How can you determine direction with and without a compass, map, and protractor?

Learning Objectives (cont'd)

- **Calculate** a back azimuth
- **Explain** how to determine direction using field-expedient methods
- **Define** key words: azimuth, back azimuth, field-expedient, grid azimuth, grid north, magnetic azimuth, magnetic north, Polaris, true north

Introduction

Directions play an important role in everyday life. People often express them as right, left, straight ahead, and so forth; but then the question arises, "to the right of what?" To answer that question, this lesson looks at ways to define direction in relation to north. You'll also learn how to use a compass and a protractor to determine direction in degrees on a topographic map.

Describing Direction

You've already seen that maps have a consistent way of showing direction. North is at the top of the map, south is at the bottom, east is to the right, and west is to the left. But how would you describe the direction between two points on a map? You might say that the first point is slightly northeast of the second point. But that's not very precise. If you were out in the field without an electronic device, you'd need a better way to describe the direction.

Precise measurement of direction is done in degrees, similar to what you might have learned about measuring circles and arcs in geometry class. Due north is 360° (or 0°), east is 90°, south is 180°, and west is 270°.

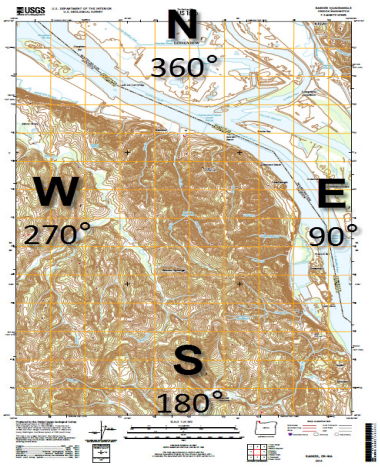


Figure 4.4.1

Key words

azimuth:
A horizontal angle usually measured clockwise in degrees from a north base line

true north:
A line from any position on the earth's surface to the geographic north pole

magnetic north:
The direction to the north magnetic pole, as indicated by the north-seeking needle of a magnetic instrument

grid north:
The direction of north that is established by using the vertical grid lines on a map

grid azimuth:
The angle measured between grid north and a straight line plotted between two points on a map

magnetic azimuth:
A direction that is expressed as the angular difference between magnetic north and a line of direction

The angle in degrees between two points is called an **azimuth**. Azimuths are based on the starting point of north. North is always the base direction when finding azimuths.

By now you may have noticed that topographic maps show different ways of describing north: **true north**, **magnetic north**, and **grid north**.

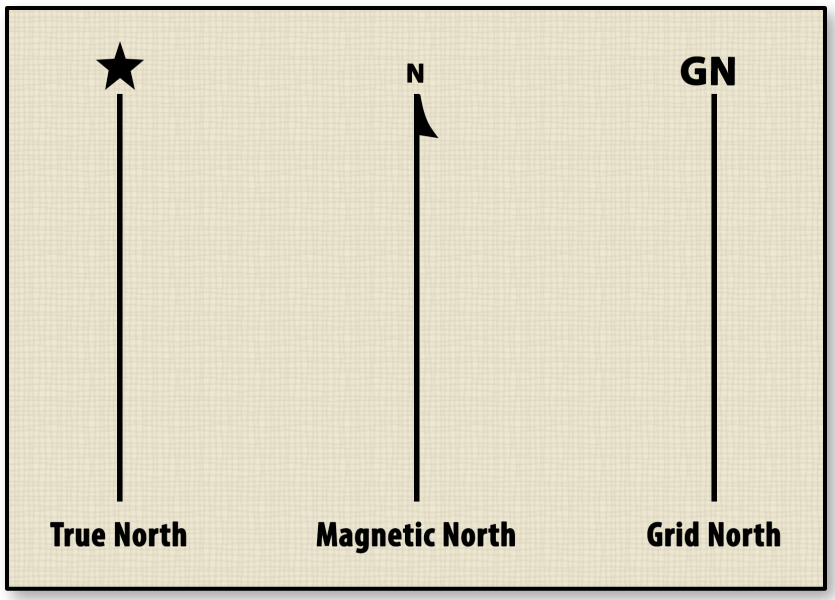


Figure 4.4.2

True North

True north is an imaginary line from any point on the earth's surface to the north pole. All lines of longitude are true north lines. Mapmakers normally represent true north in the marginal information with a star.

Magnetic North

Magnetic north is the direction to the north magnetic pole. A compass shows magnetic north. Mapmakers usually illustrate magnetic north in the marginal information by a line ending with a half arrow-head.

Grid North

Grid north is the north that mapmakers establish with the vertical grid lines on a map. They usually illustrate it by placing the letters "GN" on a vertical line in the marginal information.

Azimuths

To describe a precise direction with an azimuth, you'll use either grid north or magnetic north. A **grid azimuth** uses grid north and a **magnetic azimuth** uses magnetic north. When you are finding an azimuth, the distance between two points has no effect on your measurement. You are measuring the angle between the two points, not the distance.

Grid Azimuth

A grid azimuth is the angle measured between grid north and a straight line plotted between two points on a grid map. You would use a protractor to measure this angle.

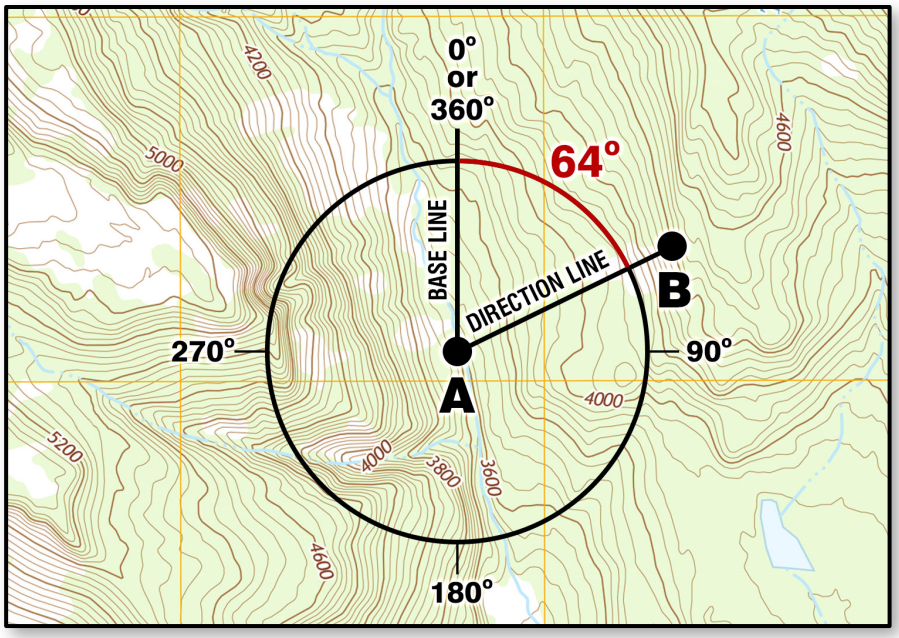


Figure 4.4.3

In the example in *Figure 4.4.3*, you are traveling from point A to point B. The line between points A and B shows your "direction line", and the line from point A to grid north shows your "base line". Use a protractor to measure the angle between those two lines, and that will give you your grid azimuth, 64°.

Magnetic Azimuth

A magnetic azimuth is a direction expressed as the angular difference between magnetic north and the direction line. You can determine a magnetic azimuth using a compass or other magnetic instrument (such as surveying equipment).

Back Azimuth

A **back azimuth** is the opposite direction of an azimuth—either grid or magnetic. It is just like doing an "about face." If you traveled from point A to point B, you'd use a back azimuth if you wanted to return to point A. To obtain a back azimuth from either a grid or magnetic azimuth, add 180° if the azimuth is 180° or less; or subtract 180° if the azimuth is 180° or more. In the earlier example, if the azimuth is 64°, the back azimuth is 64° + 180° or 244°. **NOTE**: The back azimuth of 180° may be stated as 0°or as 360°.

Magnetic Declination

An important thing to know about azimuths is that when you take measurements, the magnetic azimuths will almost always be different than the grid azimuth. The grid azimuth is drawn on paper. Regardless of where you are physically located around the world, the map doesn't change.

However, the magnetic azimuth from a compass will change ever so slightly as you move around the earth's surface. The Earth's magnetic

Key words

back azimuth:
The opposite direction of an azimuth obtained by adding 180 degrees to or subtracting 180 degrees from an azimuth

field will "pull" the needle of the compass toward one side or the other. That effect is known as the magnetic declination.

Constant changes in the core of the Earth, along with deposits of iron ore or magnetite in the Earth's crust may strongly affect the declination and the compass needles. Each year the effects change in intensity. Because of these yearly changes, you should always use the most current topographical map for land navigation.

The Silva Compass

The Silva **Polaris** (Type 7) precision compass *(see Figure 4.4.4)* is one of the most accurate compasses on the market today. The Silva compass is affordable and easy to use, especially with its hand-contoured base plate. The image below shows the Silva Polaris (Type 7) compass along with its eight features.

Key words

Polaris:
Another name for the North Star

The floating needle is mounted on a pivot so that it can rotate freely when you hold the compass level. It settles within four seconds, always pointing to magnetic north. Printed distinctly on the rotating dial are the letters N and S, to represent 0/360° and 180°, respectively. The dial is graduated at two-degree intervals, marked at 20-degree intervals, and contains the letters E (at 90°) and W (at 270°).

The base plate contains two rulers (one measured in inches and the other in millimeters). It also has a 40-degree east and west declination scale inside the area of the floating dial.

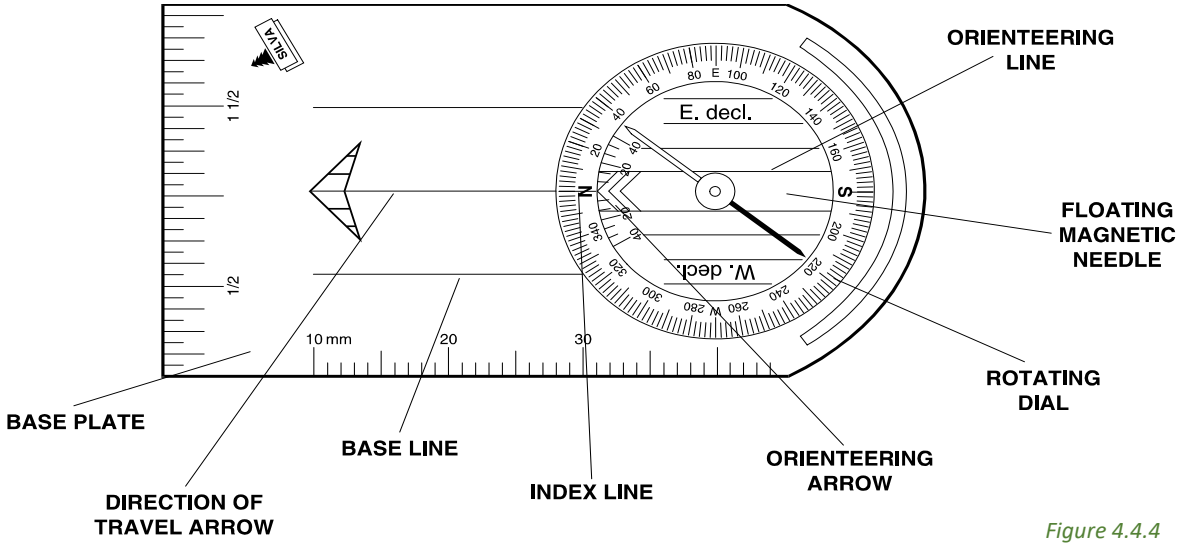


Figure 4.4.4

USING A COMPASS WITH A MAP

Suppose you have a map with your starting point and destination marked. You can't see your destination on the ground, but you know where it is on the map. You can use three simple steps to "lock in" your azimuth to your compass.

1. Put your compass on your map. The base plate edge should form a line connecting your current position and your destination.

2. Set the compass by turning the dial until the "N" is aligned with the red compass needle on your compass.
3. Hold the compass level and in front of you. The direction of travel arrow should point straight ahead. Now turn your body until the red compass needle points to "N" on the dial. The direction of travel arrow is now correct for travelling to your destination. Visually sight a landmark, walk to it, and repeat these three steps.

Figure 4.4.5

This method allows you to quickly verify your azimuth while you are walking toward your destination. If the floating needle is NOT under the "N" on your compass after going through the three steps, just turn your body until the needle lines up with the "N". Then you can continue walking toward your destination.

Measuring a Magnetic Azimuth

The following steps explain how to determine a magnetic azimuth using the center-hold technique. The center-hold method ensures that the compass is level and readable. This method is the fastest and easiest way to measure a magnetic azimuth. It is not used with a map.

Figure 4.4.6

1. Hold the compass either completely in one hand (with the curved end toward the back palm) or with both hands.
2. Pull your elbows firmly into your sides. This action places the compass against your body between your chin and waist (the direction of travel arrow will point directly away from your body to the front).
3. Keep the compass level, to allow the free-floating dial to rotate freely.
4. To measure a magnetic azimuth, simply turn your entire body toward the object, so that the direction of travel arrow is pointing in the direction you wish to measure.
5. Once the floating dial stops moving, read the azimuth from beneath the fixed black index line (located at the base of the direction of travel arrow).

Content Highlight:

ENSURE ACCURACY

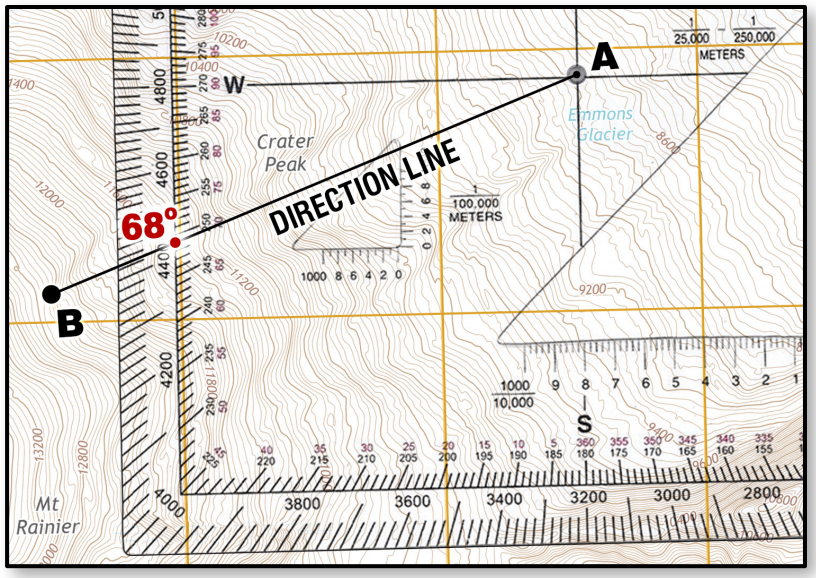
Ensure that you are away from power lines, vehicles, or other metal objects when using a compass, because these objects will affect its accuracy.

Some compasses may have a 1:25,000 scale; you can still use this scale with a 1:50,000 scale map, but you must halve the values read.

Measuring a Grid Azimuth

The following steps explain how to measure a grid azimuth using a map and protractor.

1. Draw a line connecting the two points (A and B in *Figure 4.4.7*).
2. Place the index of the protractor at the point where the drawn line crosses a vertical (north-south) grid line.
3. Keep the index at that point and align the 0–180° line of the protractor on the vertical grid line.
4. Read the value of the angle from the scale. This value is the grid azimuth from point A to point B, or 68° in our example.



Using a Protractor to Measure a Grid Azimuth *Figure 4.4.7*

Content Highlight:
USING PROTRACTORS

You determine a grid azimuth with the use of a protractor. There are several types of protractors: full circle, half circle, square, or rectangular. All of them divide the circle into units of angular measure, and each has a scale around the outer edge and an index mark. The index is the center of the protractor circle from which you measure all directions.

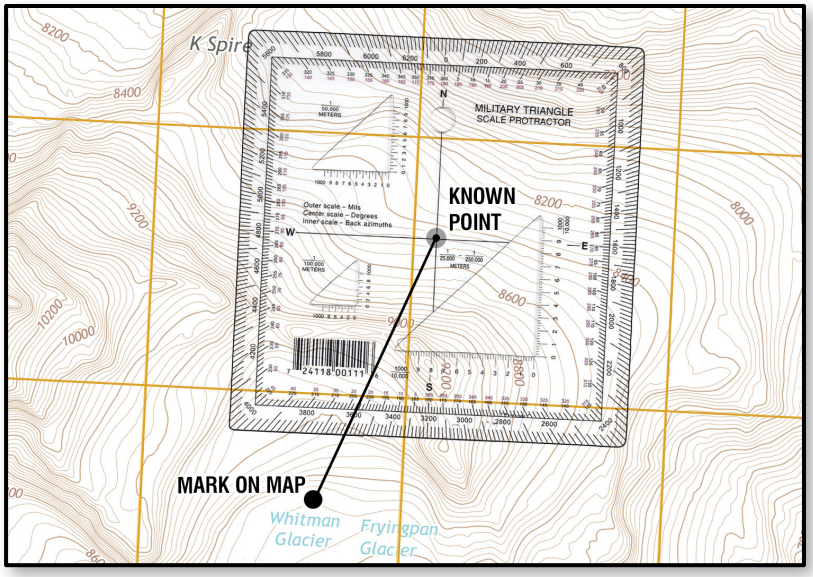
On the military protractor, you read the inner of two scales because it is graduated into degrees—from 0 to 360°. Each tick mark on the degree scale represents one degree. The base line of this protractor is a line from 0° to 180°. Where the base line intersects the horizontal line, between 90° and 270°, is the index or center of the protractor.

When using the protractor, the base line is always oriented parallel to a north-south grid line. The 0- or 360° mark is toward the top or north on the map, and the 90° mark is to the right.

Plotting a Grid Azimuth

Use the following steps to plot an azimuth from a known point on a map. *(See Figure 4.4.8)*

1. Place the protractor on the map with the index mark at the center of mass of the known point and the 0–180° base line parallel to a north-south grid line.
2. Make a mark on the map at the desired azimuth.
3. Remove the protractor and draw a line connecting the known point and the mark on the map. This is the grid direction line or grid azimuth.



Using a Protractor to Plot a Grid Azimuth *Figure 4.4.8*

When measuring azimuths on a map, remember that you are measuring from a starting point to an ending point. If you make a mistake and you take the reading from the ending point, the grid azimuth will be opposite, thus causing you to go in the wrong direction.

Determining Direction with Field-Expedient Methods

How would you find direction if you lost your compass? How would you orient your map? You might think you're lost with no hope of easily determining direction. However, that is not the case. Even without a compass, you can easily determine direction by using what's available to you in the field. These are called **field-expedient** methods.

SHADOW-TIP METHOD

The following steps show you how to use the shadow-tip method to determine direction and/or orient a map without a compass.

1. Find a fairly straight stick or branch. Place it into the ground so that the portion above ground is at least 12 inches. You'll want to place it at a fairly level spot where the sun will cast a distinct

Key words

field-expedient: A method of accomplishing a task that relies on using available resources instead of additional tools

shadow. Make sure the stick is not leaning at an angle. Get it into the ground as straight as possible. Mark the shadow tip on the ground with a small stone, twig, or other means. *(See Figure 4.4.9)* This point is west. **NOTE**: If the tip of the shadow is difficult to find, tap the end of the stick; the movement of the shadow will help you locate it.

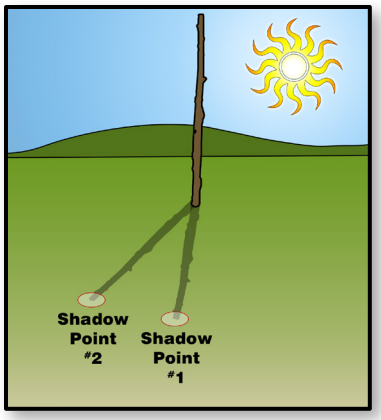


Figure 4.4.9

2. Wait 10 to 15 minutes until the shadow moves a few inches. Mark the new position of the shadow-tip in the same way as the first. *(See Figure 4.4.10)* This point is east. Draw a straight line through the two marks to obtain an east-west line. Extend this line past the second mark.
3. To find north and south, draw a line at a right angle to the east-west line at any point. From this north-south line, you can now orient your map and determine the direction you want.

This method works because the sun rises in the east and sets in the west. The shadow-tip of your stick moves in the opposite direction. So the first shadow-tip mark is always west, and the second mark is always east.

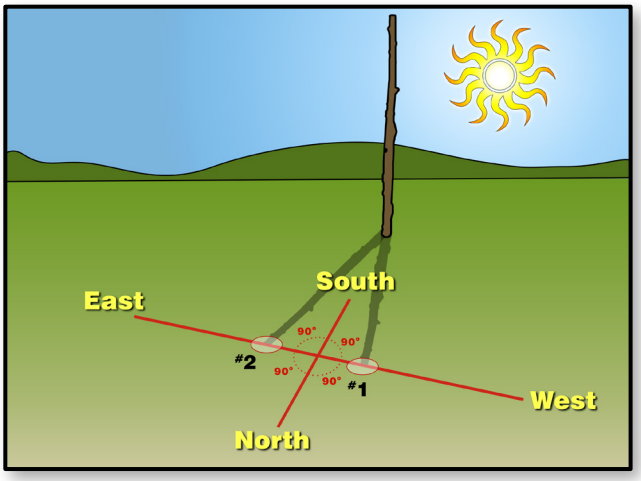


Figure 4.4.10

STAR METHOD

At night, you can locate north by finding the North Star, which is also called Polaris. First, find the Big Dipper. The last two stars of the dipper's cup point directly at Polaris. It is about five times as far out as the distance between those two stars. Polaris is also the last star in the "handle" of the Little Dipper.

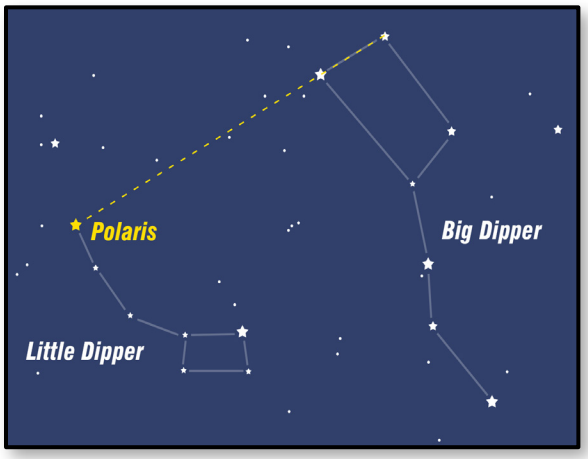


Figure 4.4.11

Using the Big Dipper to find the North Star is reliable about 60 percent of the time. The rest of the time, the Big Dipper is too low in the sky in the northern hemisphere. Navigators use another constellation called Cassiopeia to find Polaris. It is on the opposite side of Polaris and is usually visible when the Big Dipper can't be found.

WATCH METHOD

You can also use a non-digital watch (a watch with hands for hours and minutes) to determine the approximate true north or true south.

Be careful using this method. In lower latitudes near the equator, this method is not reliable and can lead you to go in circles!

In the northern hemisphere, point the hour hand toward the sun. Find a north-south line midway between the hour hand and 12:00, standard time. If on daylight saving time, find the line between the hour hand and 1:00. If you have any doubt as to which end of the line is north, remember that the sun is in the east before noon and is in the west after noon.

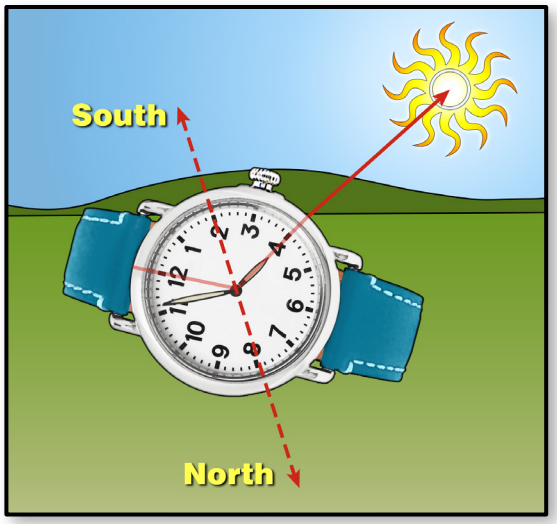


Figure 4.4.12

In the southern hemisphere, point the 12:00 dial toward the sun, and halfway between 12:00 and the hour hand will be a north-south line. If on daylight saving time, the line will lie midway between the hour hand and 1:00.

Conclusion

Once you are able to find north using your compass, the sun, your watch, or the stars, you are ready to locate your position on the map. There are many good ways to locate your position on the map. Orient your map. Your map must be oriented so that north, south, east, and west on the map point the same way as they do on the ground.

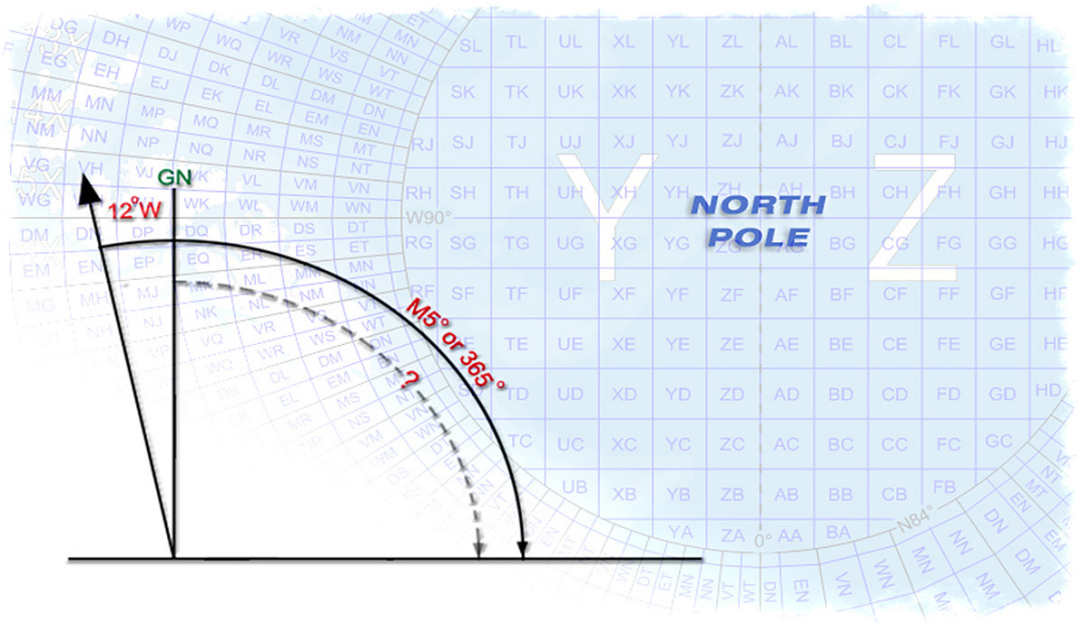
Regardless of where you live, you need a way of expressing direction that is accurate and has a common unit of measure. Simply expressing, "to the right of that _____," may not be sufficient. The use of azimuths, compasses, protractors, and maps, will improve the accuracy of your directions.

Lesson Check-up

- **Define and describe the three base directions.**
- **Describe how to determine and measure a magnetic azimuth.**
- **Describe how to determine, measure, and plot a grid azimuth.**
- **How can you find north with some sticks and stones?**

LESSON 5

The Grid-Magnetic Angle



Key words

- agonic line
- declination diagram
- grid-magnetic angle
- isogonic lines

What You Will Learn to Do

Use the grid-magnetic angle to accurately measure direction

Linked Core Abilities

- Apply critical thinking techniques
- Build your capacity for life-long learning
- Take responsibility for your actions and choices

Learning Objectives

- **Explain** why it is necessary to convert magnetic azimuths to grid azimuths
- **Calculate** a grid azimuth from a magnetic azimuth
- **Calculate** a magnetic azimuth from a grid azimuth
- **Define** key words: agonic line, declination diagram, grid-magnetic angle, isogonic lines

Essential Question

How can you use the G-M angle to obtain an accurate measurement of direction?

Introduction

In this lesson, you'll use what you learned about magnetic and grid azimuths to reconcile a precise direction. The steps for converting magnetic angles to grid angles rely on your map reading skills and some simple math.

Earth's Magnetism and Your Compass

You may not have thought much about Earth's magnetism, but it actually has something to do with finding direction. Earth itself is a magnet and can interact with other magnets, such as the magnetic pointer on your compass. Your compass points at the magnetic North Pole, which is about 1000 miles south of the geographic North Pole, or true north.

However, your compass does not give you a completely accurate reading. The Earth's magnetic field changes and so does the magnetic North Pole. In the last 100 years, the magnetic North Pole has shifted more than 600 miles! Likewise, the difference between true north and magnetic north changes.

There is a pattern to the magnetic fields. In *Figure 4.5.1*, they are shown as magnetic contour lines, or **isogonic lines**. They trace the variation in magnetic and true north. Where there is no variation between true north and magnetic north, the isogonic lines show zero degrees—the **agonic line**.

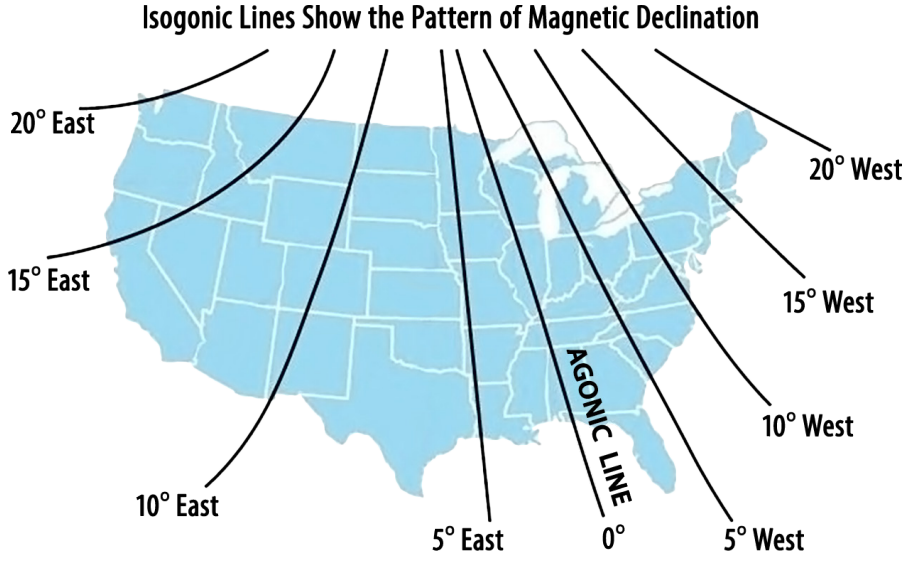


Figure 4.5.1

Key words

isogonic lines:
The imaginary lines on a map that show the magnetic contour lines and the variation of magnetic and true north

agonic line:
A map line that indicates no variation between true north and magnetic north

You don't need to know where these lines are or memorize them. However, understanding that they exist will help you know why it is important to use some simple math to adjust grid and magnetic azimuths to measure the correct direction. The changing nature of magnetic north is also why you need to use the most recent map possible for land navigation.

The Grid-Magnetic Angle

Topographic maps show north in three different ways: true north, grid north and magnetic north. This part of a map, usually found in the marginal area, is called the **declination diagram**.

Declination is the angular difference between true north and either magnetic or grid north. The declination diagram below shows the angular relationship, represented by prongs, between the three norths. However, the position of the three prongs in relation to each other varies according to the declination data for each map.

Key words

declination diagram: The information on a topographical map that shows the angular differences between grid north, magnetic north, and true north

grid-magnetic angle: The angle between grid north and magnetic north

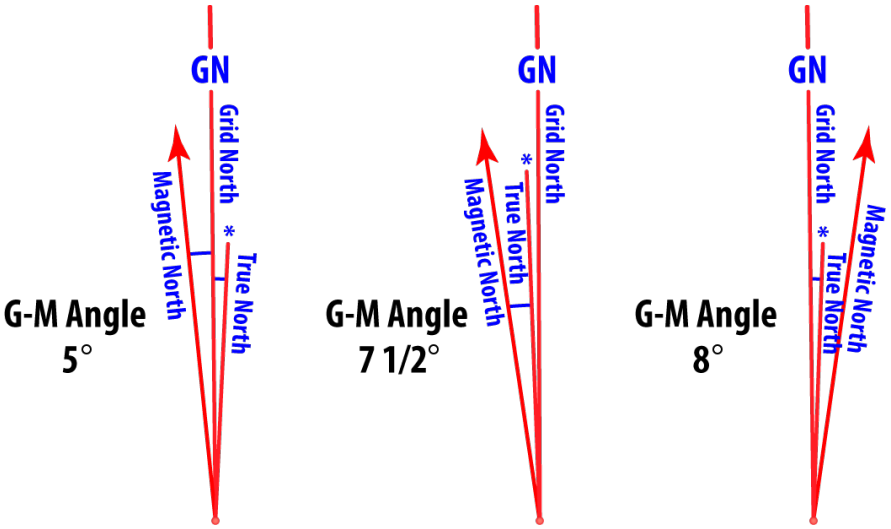


Figure 4.5.2

Content Highlight:
USING A DECLINATION DIAGRAM

The diagram is a rough visual guide for declinations. It is not to scale. When you work with the **grid-magnetic angle** (G-M angle) always use the numbers listed, not the visual representation of the angle in the diagram.

The G-M angle is the angle between grid north and magnetic north in the year that mapmakers prepared the angular size. It is an arc that connects the grid north and magnetic north prongs. Maps express this value to the nearest one-half degree. The G-M angle is important in map reading because it helps a user apply direction to a known location on a map

(water tower, bridge, intersection, etc.) with its actual direction on the ground and vice versa. If you don't adjust for the G-M angle, you'll be heading in the wrong direction. The exception is if the G-M angle on your map is zero degrees—then the grid and magnetic azimuths will be the same.

G-M Angle Conversion

The difference between the grid north and the magnetic north is caused by the attraction of the earth's magnetic field (found in Northern Canada). Because all compasses point toward magnetic north, the location of this magnetic field does not match exactly with the grid-north lines on the maps. Therefore, navigators need a conversion from magnetic to grid, or vice versa.

Figure 4.5.3

Converting the grid-magnetic angle will prevent you from getting lost. Suppose you are in a northeastern state where the declination is 15° W. You want to travel due north on your map (the map bearing is zero degrees). You ignore the G-M angle, set your compass dial to zero, turn your body to align the magnetic needle over the direction of travel, and start walking in that direction. By ignoring the G-M angle, for each 60 feet you travel, you will be 15 feet to the west of your course. After traveling one mile, you'll be one-quarter of a mile off course. In two miles, you'll be a half-mile off course to the west. The further you travel, the more you'll be off course.

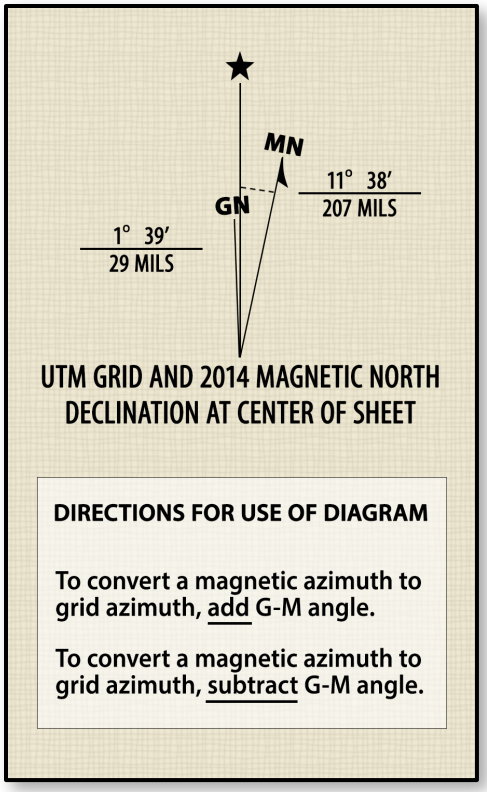


Figure 4.5.4

Anytime you switch between a map azimuth and a magnetic azimuth, or vice versa, you MUST remember to factor in the G-M angle in order to stay on course.

On some topographic maps, the G-M angle will not be listed. For example, many USGS maps show a declination diagram without the G-M angle spelled out.

Other maps show the G-M angle in the declination diagram, *(Figure 4.5.4)* along with directions on how to use the angle in conversions. The directions give instructions for converting a magnetic azimuth to a grid azimuth and vice versa. The conversion (to add or subtract) depends on the direction of the magnetic-north prong relative to the grid-north prong.

Converting Grid Azimuth to Magnetic Azimuths

Suppose you are out hiking. You can see a water tower in the distance, and you can also see it marked on your topographic map. Once you use your map to determine the grid azimuth, you'll need to use your compass to navigate on the ground.

This is just one example where using the G-M angle to convert to a magnetic angle is important. You'll also want to pay attention to the declination diagrams and notice if the magnetic north is to the east or west of grid north. This east or west orientation determines how you will convert the grid azimuth to a magnetic azimuth.

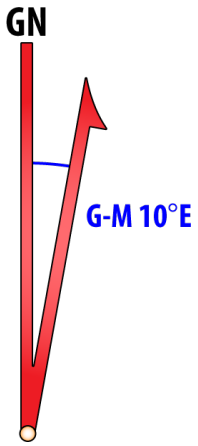


Figure 4.5.5

EAST G-M ANGLES

The declination diagram on your map shows that the G-M angle is 10° *(Figure 4.5.5).* Your grid azimuth is 110°. Subtract the G-M angle from the grid azimuth: 110° – 10° = 100°. Your magnetic azimuth is 100°.

Here's another example. Using the same G-M angle, suppose your grid azimuth is 7°. You can't subtract 10° from 7°—you'll get a negative number and there are no negative azimuths. So we'll add 360° to 7° to get 367°. This works because 367° is at the same point as 7° on the azimuth circle. Now we can subtract the G-M angle: 367° - 10° = 357°. Your magnetic azimuth is 357°.

WEST G-M ANGLES

Another map shows that the magnetic north is to the west of grid north, and the G-M angle is 8° *(Figure 4.5.6).* Suppose your grid azimuth is 125°. Add the G-M angle: 125° + 8° = 133°. Your magnetic azimuth is 133°.

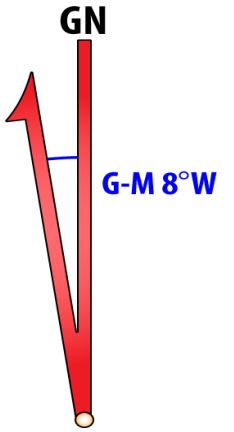


Figure 4.5.6

CONVERSIONS

In summary, for grid to magnetic east G-M angle conversion:

- Subtract the G-M angle from the grid azimuth to find the magnetic azimuth.
- If the grid azimuth is smaller than the G-M angle, first add 360° to the grid angle, and then subtract the G-M angle to find the magnetic angle.

For grid to magnetic west G-M angles conversion:

- Add the G-M angle to the grid azimuth.

Converting Magnetic to Grid Azimuth

It's also important to use the G-M angle the other way around—to convert magnetic to grid azimuths.

Imagine a situation where you are hiking and see a major storm approaching. While on a hilltop, you see a cabin at a lower elevation that you can use for shelter. The cabin is over a

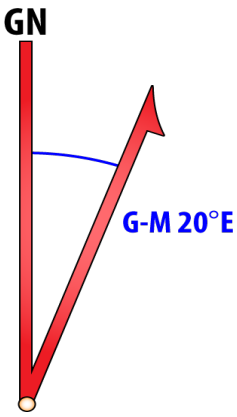


Figure 4.5.7

mile away and you will lose sight of it when you descend from the hilltop. You determine a magnetic azimuth to the cabin and want to check the map for the easiest path to the cabin. If you don't convert the magnetic azimuth to a grid azimuth, you may not find the cabin on the map. You'd get stuck in the storm with no shelter.

EAST G-M ANGLES

When the magnetic angle is to the east of the grid angle, add the G-M angle to the magnetic azimuth.

Suppose you've measured a magnetic azimuth of 100°. Using the declination diagram, you see that the G-M angle is 20° *(Figure 4.5.7)*. You calculate 100° + 20° = 120°. Therefore, the grid angle is 120°. Now you can use this to keep your direction oriented on your topographic map.

WEST G-M ANGLES

When the magnetic angle is to the west of the grid angle, subtract the G-M angle from the magnetic angle. Suppose your magnetic azimuth is 160° *(Figure 4.5.8)*. The declination diagram shows that the G-M angle is 15°. You calculate 160° - 15° = 145°. Your grid angle is 145°.

Converting the G-M angle requires practice. Become familiar with the proper procedures to follow whether there is an east or west G-M angle, or the G-M angle is greater than your grid or magnetic azimuth.

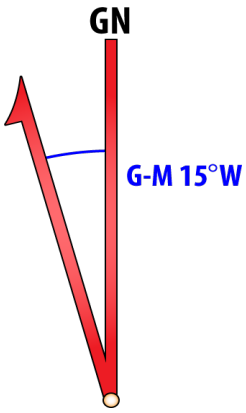


Figure 4.5.8

Conclusion

This lesson presented map reading skills that you can use not only in later map reading instruction, but also in many practical ways. Mastering these skills will help you to navigate more effectively when the challenge arises.

Lesson Check-up

- **What does the declination diagram on a map indicate?**
- **Explain how to convert grid azimuths to magnetic azimuths.**
- **Explain how to convert magnetic azimuths to grid azimuths.**

LESSON 6

Determining Location

What You Will Learn to Do

Apply map reading and land navigation skills to determine location

Linked Core Abilities

- Apply critical thinking techniques
- Build your capacity for life-long learning
- Take responsibility for your actions and choices

Learning Objectives

- **Determine** how to locate and read an eight-digit coordinate on a grid map
- **Describe** the procedure for locating an unknown point on a topographic map by intersection
- **Describe** the procedure for locating an unknown position on a topographic map by resection
- **Identify** procedures for locating or plotting an unknown point on a topographic map using polar coordinates
- **Define** key words: intersection, polar coordinates, resection

Key words

- **intersection**
- **polar coordinates**
- **resection**

Essential Question

How can you locate and plot points on a map to within 10 meters of accuracy?

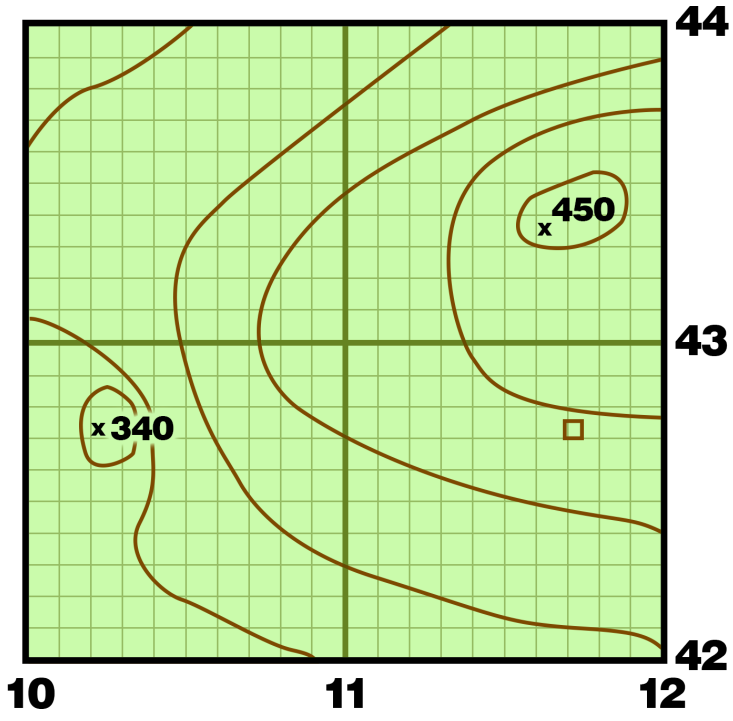
Introduction

Sometimes it is not enough to know how to locate a point to within 1,000 or 100 meters, or to estimate the location of a distant point on the ground. There may be times when you have to determine your location, or a distant point, even more accurately. Or, perhaps you will need to use certain known locations as reference points. This lesson will help you to accomplish these tasks.

In this lesson, you'll learn about locating points to within 10 meters. You'll also learn how to locate points using **polar coordinates**, **intersection**, and **resection**.

Determining an Eight-Digit Grid Coordinate

In an earlier lesson, you worked with six-digit coordinates on the MGRS system. Those coordinates locate points to within 100 meters. If you want to locate a point to within 10 meters, you need to work with eight-digit coordinates.



Determining an Eight-Digit Grid Coordinate *Figure 4.6.1*

Key words

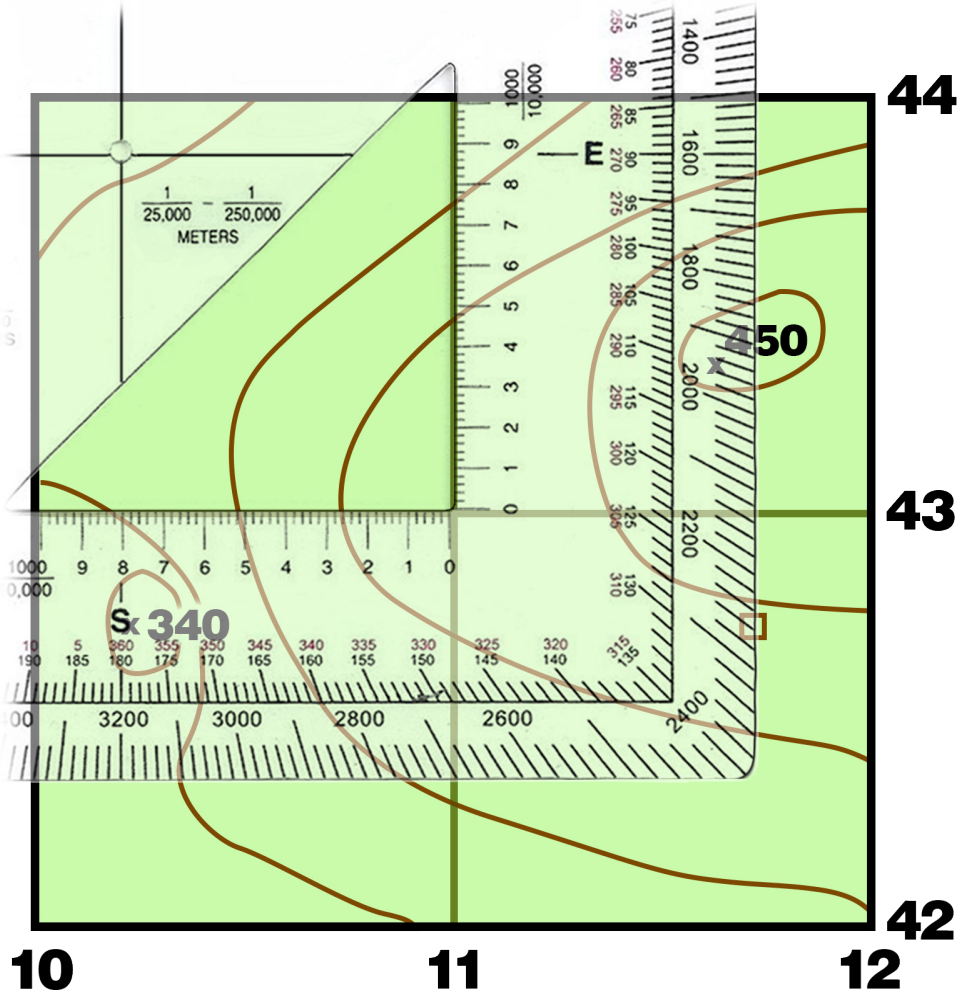
polar coordinates:
A method used to locate or plot an unknown position from a known point by direction and distance along that direction line

intersection:
A method of locating an unknown point by determining where the azimuths from at least two known points meet

resection:
A method used to locate your unknown position by determining where the back azimuths from two or three well-defined locations meet on a map

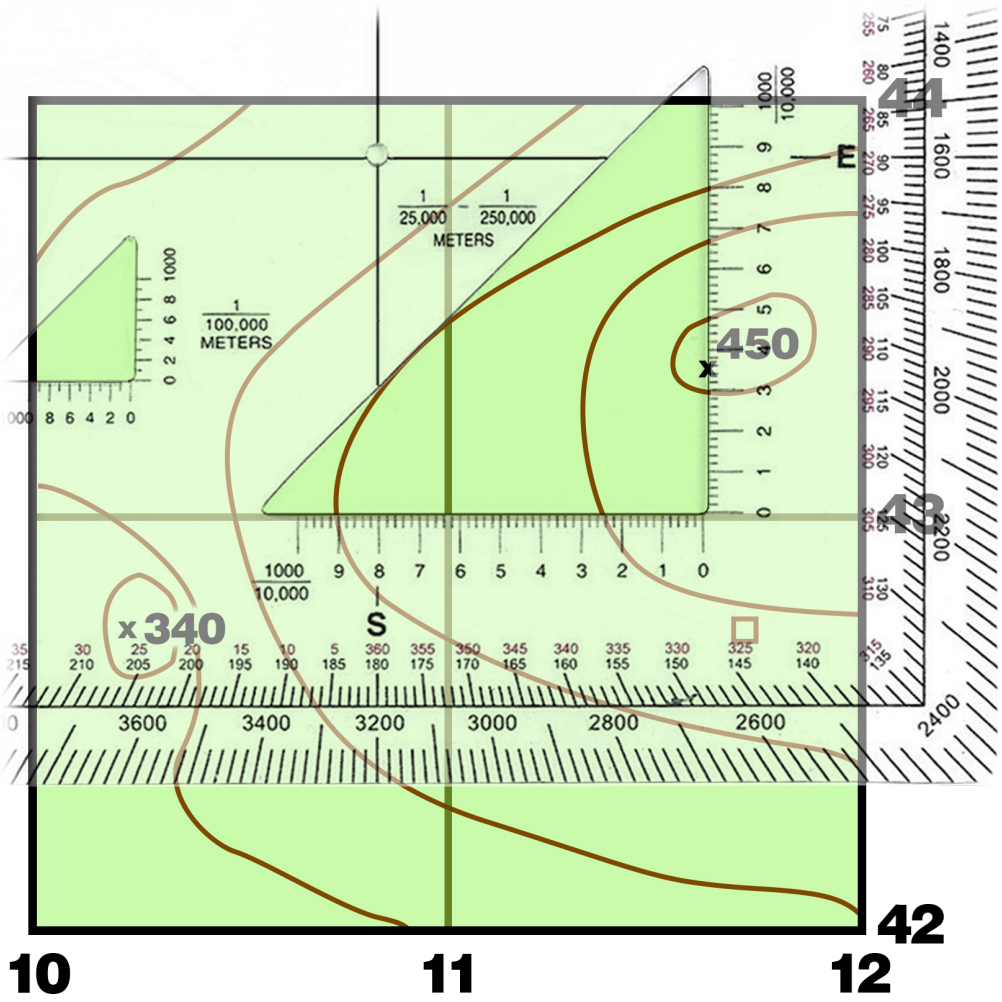
As before, you'll use a coordinate scale. Keep in mind that there are 100 meters between each 100-meter mark (number) on the coordinate scale, with a short tick mark to indicate 50 meters between each 100-meter mark. To locate the spot elevation 450 in *Figure 4.6.1* to within 10 meters, use the following procedures:

1. First identify the 1,000-meter grid square where spot elevation is located. To do this, read right, then up. When reading a map right and up, each north-south grid line increases in value from west to east, and each east-west grid line increases in value from south to north.
   - By reading right, the last north-south grid line before reaching the grid square containing spot elevation 450 is **11**.
   - By reading up, the last east-west grid line before reaching the grid square containing spot elevation 450 is **43**.
   - By adding the 100,000-meter square identifier (**YF**), **YF1143** locates the spot elevation to the nearest 1,000 meters.
2. Place the coordinate scale parallel to and directly on top of grid line **43** with the "0 mark" at the lower left corner of grid square **YF1143**. (*See Figure 4.6.2*) Be sure you are using the correct scale.



Placing the Coordinate Scale *Figure 4.6.2*

3. Keeping the horizontal scale on top of the **43** grid line, slide the scale to the right into the grid square until the vertical scale intersects the center of mass of the spot elevation. *(See Figure 4.6.3)*



Slide the Scale to the Right *Figure 4.6.3*

4. Reading from the "0 mark," the reading shows that spot elevation 450 lies between the 600 and 650-meter mark by approximately 30 meters. You determine that it is approximately 30 meters by estimating how many 10s the spot elevation is beyond the 600-meter mark. In this case, there are **3**, which gives you the third and fourth digits of the coordinate. Thus, the center of mass of spot elevation 450 is **630** meters into the grid square. You read this number as **1163**.
5. Reading up, you can see that spot elevation 450 lies exactly midway between the three and four mark on grid square 43. You read this number as **4335**.
6. By combining both sets of numbers and adding the 100,000-meter square identifier, the location of spot elevation 450 is **YF11634335**. You have now correctly located a point to the nearest 10 meters.

   To trace the degree of accuracy of an eight-digit grid coordinate from 1,000 to 10 meters, you can break it down as follows:

   - The underlined numbers in YF**11**63**43**35 represent the 1,000-meter grid square and they locate the point to within 1,000 meters (the "**11** – **43**" grid square).
   - The third and seventh digits of YF11**6**343**3**5 denote 600 and 300 meters and locate the point to within 100 meters.
   - The fourth and eighth digits of YF116**3**4335 denote 30 and 50 meters and locate the point to within 10 meters.

Intersection

You can use intersection to locate an *unknown* point by determining where the azimuths from two (preferably three) *known* positions on the ground intersect.

Suppose you and a friend want to go for a hike. You'll each start at a different trailhead and meet at a cell tower you both can see. You can use the intersection method to find the eight-digit grid location of the cell tower. The intersection method also has military applications—for example, if two soldiers see an enemy in the distance.

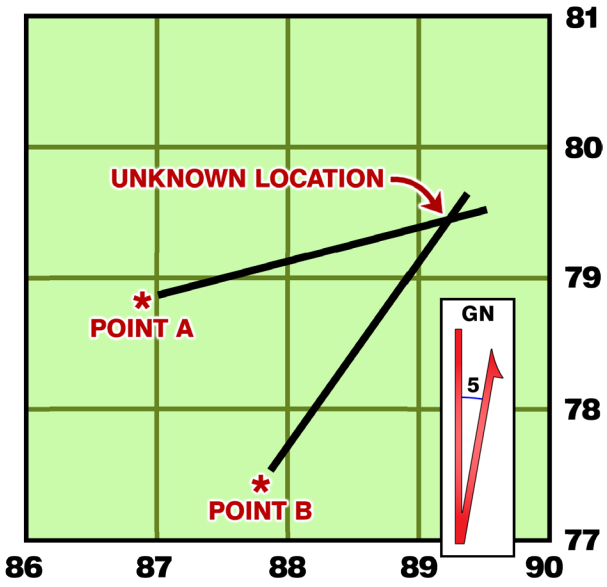
The intersection method answers the question: *What is the location of something I can see from two or more known locations?*

There are two ways to determine intersection—the map and compass method, and the straightedge method.

MAP AND COMPASS METHOD

The first way to find an unknown point by intersection is with a map and compass. Follow these steps and examine *Figure 4.6.4*.

1. Orient the map using the compass. (Note: The best way to orient a map is to use a compass.)
2. Determine the grid-magnetic angle (G-M angle) of your map by reading the declination diagram. In this example, the G-M angle is **5° E**.
3. Locate and mark your first known position (Point A) on the map.

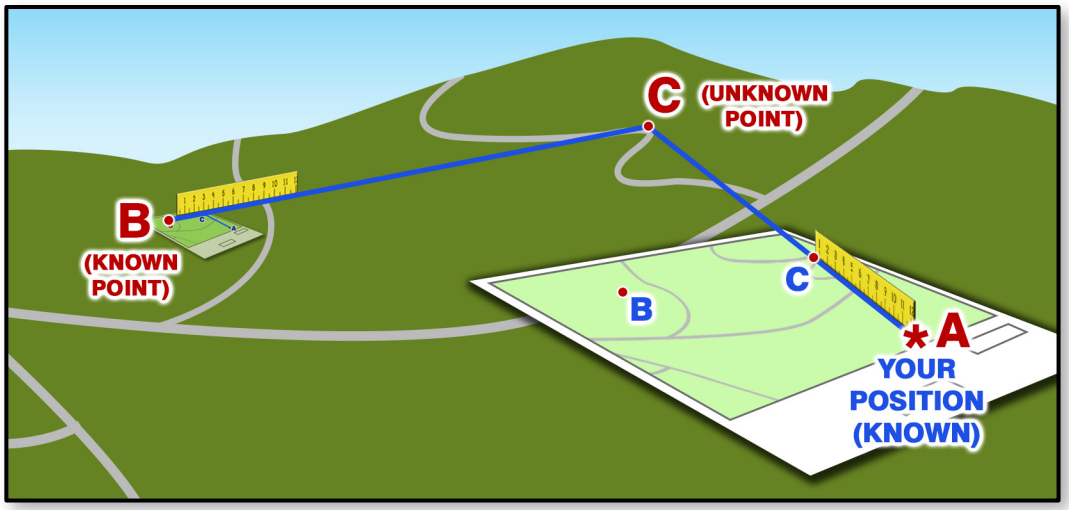


Using Map and Compass: The Intersection Method *Figure 4.6.4*

4. Measure the magnetic azimuth to the unknown point from Point A using a compass. In this example, the magnetic azimuth is **71°**.
5. Convert the magnetic azimuth to a grid azimuth. In this example, 71° + 5° = **76°** grid azimuth.
6. Place the coordinate scale on the map, ensuring that the 0° indicator is at the top and the index point is directly over the center of mass of Point A. Place a tick mark at **76°** on the map. Draw a line from Point A along this grid azimuth.
7. Move to Point B (the second known point) and locate it on the map. Then repeat steps 4, 5, and 6. For this example:
   - The magnetic azimuth in step 4 from Point B to the unknown point is 35°.
   - Convert this to a grid azimuth by adding the G-M angle to the magnetic azimuth: 35° + 5° = 40°.
   - Place a tick mark at **40°** on the map and draw a line along that grid azimuth.
8. The location of the unknown position is where the lines cross on the map. Determine the eight-digit grid coordinate for this position.

STRAIGHTEDGE METHOD

The second way to locate an unknown point by intersection is by using a straightedge. Examine *Figure 4.6.5*, and follow these steps to find an unknown distant location.



Using Intersection: The Straightedge Method *Figure 4.6.5*

1. Orient the map (on a flat surface) to the ground by terrain association.
2. Locate and mark your *known* position on the map (Point A).
3. Place a straightedge on the map with one end at your position (Point A) as a pivot point. Rotate the straightedge until the *unknown* point (C) is sighted along the edge.
4. Draw a line along the straightedge.
5. Move to the second *known* position (Point B), repeat steps 3 and 4, and check for accuracy.
6. The intersection of these lines on the map is the location of the unknown point (C).
7. Determine the six- or eight-digit grid coordinate (depending upon the desired degree of accuracy) for the unknown point.

Resection

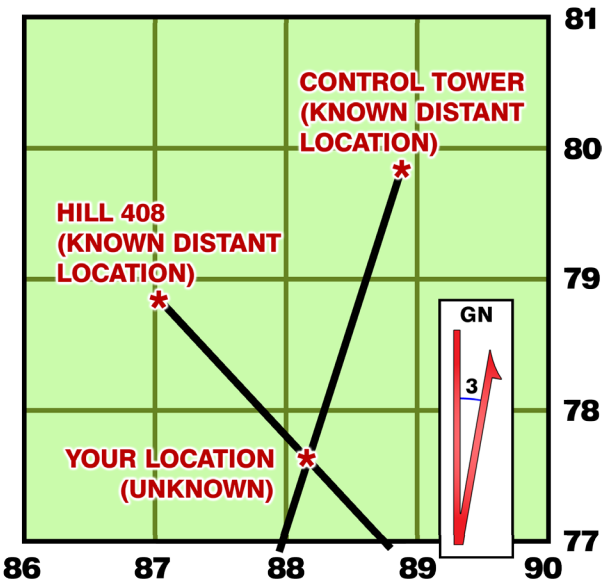
Suppose you are lost. You have a map and a compass or straightedge. You can use the resection method to locate your position on a map. The resection method answers the question: *Where am I on the map?*

To use resection you'll determine the grid azimuth to at least two well-defined locations on the map. For greater accuracy, the desired method of resection would be to use three well-defined locations. There are three ways you can use resection: the map and compass method, modified resection, and the straightedge method.

MAP AND COMPASS METHOD

The first way to find your unknown location by resection is with a map and compass. Follow these steps and examine *Figure 4.6.6.*

1. Orient the map using the compass.
2. Determine the G-M angle of your map. In this example, the G-M angle is **3° E**.
3. Identify two or three known locations on the ground. Mark them on the map, such as Hilltop 408 and the Control Tower.
4. Measure the magnetic azimuth to one of the known positions from your location using a compass. In this example, the magnetic azimuth to Hilltop 408 is **312°**.



Using Resection: The Map and Compass Method *Figure 4.6.6*

5. Convert the magnetic azimuth to a grid azimuth by adding the G-M angle to the magnetic azimuth: 312° + 3° = 315°. The grid azimuth is **315°.**
6. Convert the grid azimuth to a back azimuth by adding or subtracting 180°. The back azimuth is: 315° – 180° = **135°.**
7. Place the coordinate scale on the map, ensuring that the 0° indicator is at the top and the index point is directly over the center of mass of the known point. Place a tick mark at 135°. Draw a line on the map from the known position back toward your unknown location.
8. Repeat steps 4, 5, 6, and 7 for the second known position (the control tower). For this example:
   - The magnetic azimuth to the control tower is 15°.
   - Convert this to a grid azimuth: 15° + 3° = 18°.
   - Convert this to a back azimuth: 18° + 180° = 198°.
   - Place a tick mark at **198°** on the map and draw a line back toward your unknown location.
9. The intersection of these two lines is your location. Determine the eight-digit grid coordinate for your position.

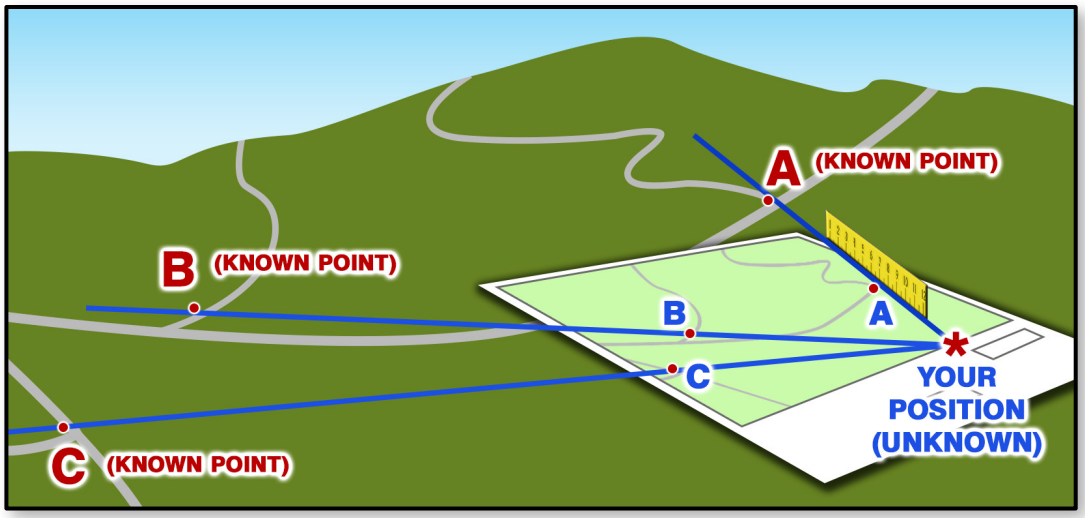
Content Highlight:

USE OF MODIFIED RESECTION

You can use modified resection to locate your position on the map when you are at a linear feature on the ground, such as a road, canal, stream, and so on. To do this, you need only one known location. Use the first seven steps; then where the drawn line (in step 7) crosses the linear feature is your location.

STRAIGHTEDGE METHOD

Another way to locate your unknown position by resection is by using a straightedge. Examine *Figure 4.6.7*, and follow these steps to find your current unknown position.



Using Resection: The Straightedge Method *Figure 4.6.7*

1. Orient the map (on a flat surface) to the ground by terrain association.
2. Locate at least two *known* distant locations or prominent features on the ground and mark them on the map (Points A, B, and C).
3. Place a straightedge on the map pointing toward one of the *known* points (Point A). Rotate the straightedge until the known point on the map is aligned with the same known point on the ground.
4. Draw a line along the straightedge away from the known point on the ground toward your position.
5. Repeat steps 3 and 4 using the other *known* points (Points B and C).
6. The intersection of these lines on the map is your location.
7. Determine the six- or eight-digit grid coordinate (depending upon the desired degree of accuracy) for your location.

Polar Coordinates

Polar coordinates answer the question: *Where will I be if I walk in a certain direction for x-number of meters?* Polar coordinates are a way to locate or plot an *unknown* point from a *known* location by giving a direction and a distance along the direction line.

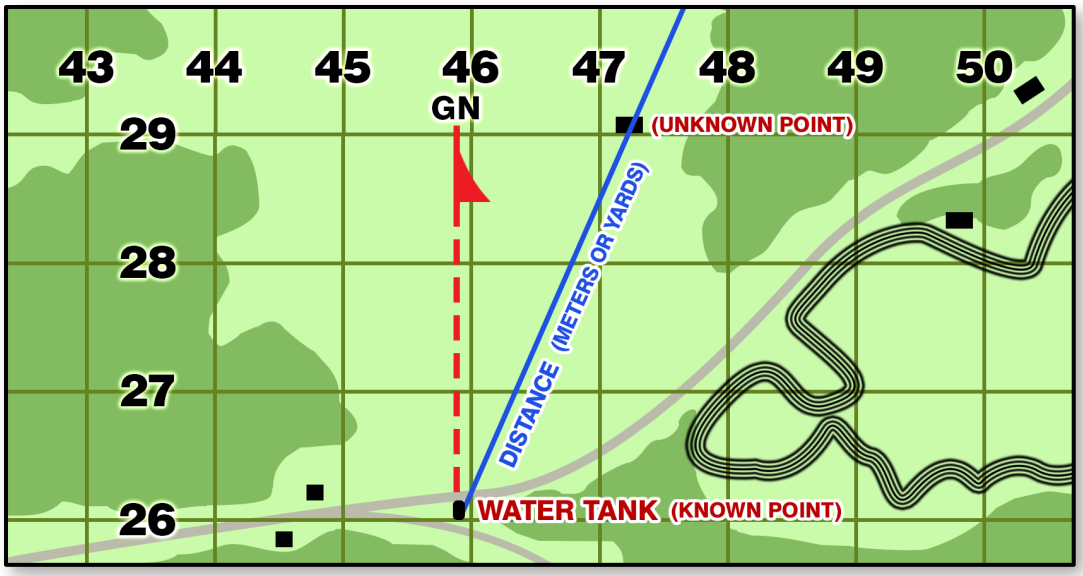
Three elements must be present to use polar coordinates:

- a known location on the map
- an azimuth (grid or magnetic)
- a distance (normally in meters)

There are two ways that you can use polar coordinates—the map and compass method, and the protractor method.

MAP AND COMPASS METHOD

Use the following steps and examine *Figure 4.6.8* for the map and compass method.



Using Polar Coordinates *Figure 4.6.8*

1. Orient the map using a compass.
2. Determine the Grid-Magnetic Angle (G-M Angle) of the map you are using. In this example, the G-M Angle is **0°.**
3. Identify the *known* location on the ground and mark it on the map. In this example, the known location is the water tank in grid square **FL4526**.
4. Measure the magnetic azimuth to the *unknown* point (a building in grid square **FL4729**) from the known location using a compass. In this example, the magnetic azimuth to the building is **24°**.
5. Convert the magnetic azimuth to a grid azimuth. In this example, 24° + 0° = **24°** grid azimuth.
6. Place a coordinate scale on the map, ensuring that the 0° indicator is at the top and the index point is directly over the center of mass of the known point.
7. Place a tick mark at **24°**.
8. Draw a line on the map from the known location along this grid azimuth until it intersects the building.
9. Determine the distance to the unknown position. Using a straightedge and the procedure for measuring straight line distance, you determine the distance to the building in grid square **FL4729** to be 3,600 meters.

PROTRACTOR METHOD

The second way to locate or plot an unknown point from a known location using polar coordinates is the protractor method. Follow these steps and examine *Figure 4.6.8*.

1. Determine the location of a *known* point on the map to within 100 or 10 meters. In this example, the known location is the water tank at grid coordinates **FL45952610**.
2. Measure a grid azimuth to the desired location or destination (the building in grid square **FL4729**). By using your protractor, you determine the grid azimuth to be **24°** to the building.
3. Determine the distance as you did in step 9 of the map and compass method.

Conclusion

In this chapter, you discovered how to determine a point on a map to within 10 meters using an eight-digit coordinate. You also learned how to locate an unknown point using intersection, resection, and polar coordinates.

By using these skills in conjunction with the other map reading skills you should be capable of finding your way regardless of the situation. You may even have the opportunity to test your skills on an orienteering course or on another form of a land navigation course.

Lesson Check-up

- **Describe the procedure for locating an unknown point on a topographic map by intersection.**
- **Describe the procedure for locating an unknown position on a topographic map by resection.**
- **How do you locate an unknown point on a topographic map using polar coordinates?**

LESSON 7

Orienteering

Key words

- aiming off
- attack point
- control points
- orienteering
- steering mark

What You Will Learn to Do

Apply map reading skills to orienteering

Linked Core Abilities

- Apply critical thinking techniques
- Build your capacity for life-long learning
- Communicate using verbal, non-verbal, visual, and written techniques
- Do your share as a good citizen in your school, community, country, and the world
- Take responsibility for your actions and choices
- Treat self and others with respect

Learning Objectives

- **Differentiate** between six types of orienteering courses
- **Explain** the five-step process to determine direction of travel
- **Demonstrate** five movement techniques used in orienteering

Essential Question

How can you complete an orienteering course?

Learning Objectives (con't)

- **Identify** the control areas and safety aspects used in orienteering
- **Define** key words: aiming off, attack point, control points, orienteering, steering mark

Introduction

This lesson introduces you to **orienteering**, its techniques and terminology, as well as the various types of orienteering courses. In addition, many of the map reading and land navigation skills practiced in previous lessons are applied.

What is Orienteering?

Orienteering began in Scandinavia in the 1800s, primarily as a military event and as part of military training. By 1919, it had become a competitive sport in Sweden. In the early 1930s, the sport received a boost with the invention of an improved compass. Bjorn Kjellstrom, one of the inventors of that compass, introduced orienteering to the United States in 1946.

Orienteering is for all ages and degrees of fitness and skill. It provides the suspense and excitement of a treasure hunt. The object is to locate **control points** *(see Figure 4.7.1)* by using a map and compass to navigate the terrain.

Figure 4.7.1

Key words

orienteering: A competitive form of land navigation in which each participant uses a map and compass to navigate between check points

control points: Trapezoid-shaped markers used on an orienteering course to show proof of arrival

Organizers of an orienteering event will give each participant a topographic map with various control points circled. *(See Figure 4.7.2)* Each control point has a corresponding flag marker on the ground and a special punch which organizers use to mark the scorecard. Competitive orienteering involves running from point to point. It is more demanding than road running, not only because of the terrain, but because the participant must make decisions, and keep track of the distances covered. Courses may be as long as 10 kilometers.

Figure 4.7.2

Although orienteering challenges both the mind and the body, the competitor's ability to think under pressure and make wise decisions is sometimes more important than speed or endurance. The person just starting out in orienteering should concentrate more on refining map reading and land navigation skills than on running between the control points.

Types of Orienteering Courses

There are different types of orienteering events that range from individual courses, to a relay event, to night competition. All types of orienteering courses are interesting and challenging, but they vary in their degree of difficulty. The best location for an orienteering course is one that is easily identifiable on both a map and the actual terrain. It should also be accessible from several routes. Listed below are some of the most common orienteering events/courses.

ROUTE ORIENTEERING

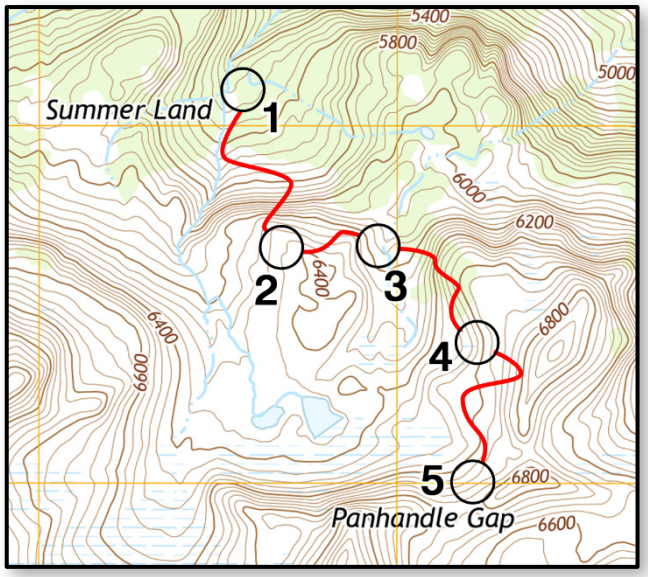
This form of orienteering can be used by beginners to the sport, as well as for advanced competition. In route orienteering, a master (or advanced competitor) walks a route while beginners trace the actual route walked on the ground using their maps. Beginners circle the location of the different control points found along the walked route. When they finish, organizers analyze and compare the maps. For beginners, time is not a factor in this event.

Figure 4.7.3

Another variation of route orienteering involves a course laid out with markers for the competitor to follow. Because the route is indicated with flags or markers, there is no master map. The winner of the event is the competitor who successfully traces the route and accurately plots the most control points.

LINE ORIENTEERING

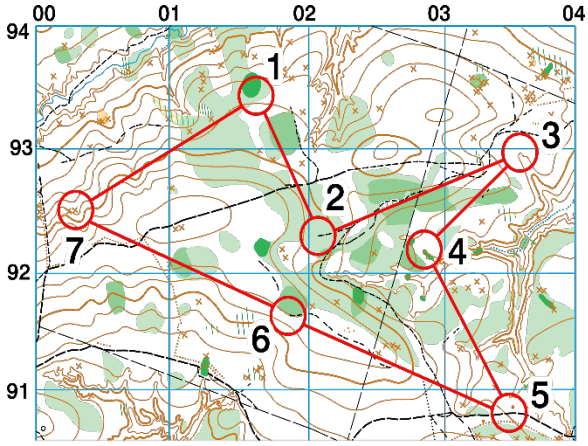
In line orienteering, competitors trace on their maps a pre-selected route from a master map that has at least five control points. The object is to walk the route shown on the map, circling the control points on the map as competitors locate them on the ground. *(See Figure 4.7.4)*



Line Orienteering *Figure 4.7.4*

CROSS-COUNTRY ORIENTEERING

Cross-country (or free-point orienteering) is the most common type of orienteering competition. It is considered to be the most competitive and intriguing form of orienteering. In this event, all competitors must visit the same control points in the same order. With the normal one-minute starting interval, it becomes a contest of route choice and physical skill. The competitor with the fastest time is the winner.



CONTROL NO.	COORDINATES	CONTROL CODE	DESCRIPTION OF CLUES
1	GL01079304	WE	CEMETARY, NORTHERN
2	GL02019202	WT	CREEK, JUNCTION-CENTER
3	GL03069209	DA	DRAW, CENTER
4	GL02089202	WK	SOUTH END OF RUNWAY
5	GL03059008	CM	EAST END OF POND
6	GL01089107	RD	HILLTOP 134-TOP
7	GL00039205	JD	SPUR-150 SOUTHEAST OF HILLTOP

Cross-Country Orienteering *Figure 4.7.5*

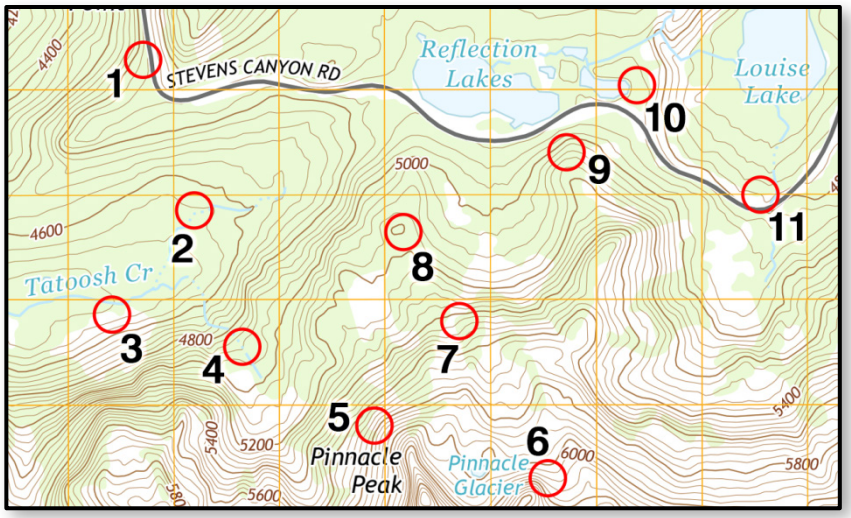
The length and difficulty of the course is determined by the skill of the competitors. There are usually 6-12 control markers on the course in varying degrees of difficulty and distances apart so that there are no easy, direct routes. The course may be closed-in with the start and finish located at the same position or the start and finish may be at different locations.

Organizers mark each point in order on a master map. They give competitors a clue list that describes each control point with an 8-digit grid coordinate, a two-letter control code *(see Figure 4.7.5),* and a clue describing the terrain in the location of the marker. Competitors must indicate on their score cards proof of visiting each control marker. This is usually done with a special stamp or punch.

SCORE ORIENTEERING

In this event, the area chosen for the competition has many control points. The control points near the start/finish point (usually identical in this event) have a low point value, while those more distant or more difficult to locate have a high point value. The competitor must locate as many control markers as possible within the specified time (usually 90 minutes).

As with a cross-country event, organizers give each competitor a map and an event card. The card lists all the control points with their different values. Organizers design the course so that there are more control points than a competitor can possibly visit in the allotted time. *(See Figure 4.7.6)* Therefore, competitors must plan and choose their route between control points carefully. Points are awarded for each control point visited and deducted for exceeding the specified time; however, there is no reward for returning early with time still available to find more points. The good competitor must be able to coordinate time and distance with the ability to land navigate while running the course. The competitor with the highest point score is the winner.



Score Orienteering *Figure 4.7.6*

RELAY ORIENTEERING

This type of orienteering is a popular team sport. Each member of the team runs a free-point or line orienteering leg of one to two miles. No person runs more than one leg. The competition may be held using a master map for the entire course or one for each leg.

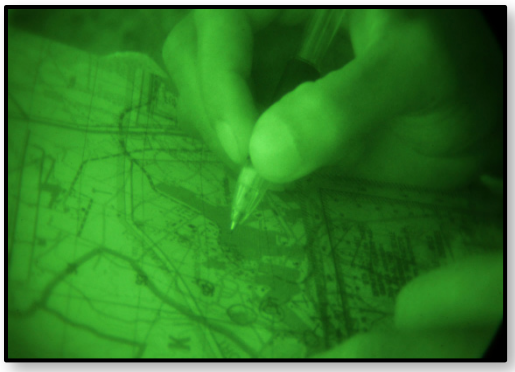
In the case of a master map for the entire course, the first team member copies down all legs of the course. After completing the first leg, they hand the map to the next runner, who completes the next leg of the course. The team repeats this process until all members have run their portion of the course.

In the case of a master map for each leg, the first team member goes to a master map that has only the first location on it. When that person completes the first leg, they give the map to the next person, who goes to a different master map and copies the second portion of the course. This continues until all members of the team have completed their leg.

NIGHT ORIENTEERING

Night orienteering is a free-point or score event occurring in the evening. The main differences between a night conducted free-point or score and one conducted during the day are:

- Control points are marked by a light that is visible from 30 to 50 meters in all directions.
- The event is run over less difficult terrain.



Night Orienteering *Figure 4.7.7*

Night Orienteering *(cont'd):*

- Control points are located no more than 400 to 800 meters apart.
- Competitors receive a detailed safety briefing before the event begins.
- The signal used to indicate the conclusion of the event or an emergency is a vehicle horn or a flare.

Orienteering Strategies

A sound knowledge of the basics of map reading will help you immensely as an orienteering event competitor. Additional skills such as accurate compass reading, good decision making, and using the terrain are critical as well. The beginner-level orienteer should learn the following techniques.

DETERMINING DIRECTION OF TRAVEL

After you have plotted the course's control points, you must determine how to get to the first and other control points. The basic compass technique used in orienteering to determine direction of travel consists of five steps:

1. Lay the map on a flat surface and orient it to magnetic north by placing the edge of the compass along a north-south grid line. Rotate the map and compass until the red north magnetic needle is lined up directly with the index line and direction of travel line.
2. While keeping the map oriented, move the compass in such a way that the base plate edge of the compass touches 'your location' and the location of 'your destination'. (The compass is now pointing in the direction of travel.)
3. Rotate the dial with the degrees and the red orienting arrow until the orienting arrow is hovering directly over the red magnetic needle. You have now locked in your grid azimuth to your destination.
4. Now you must convert the grid azimuth to the magnetic azimuth. Lift the compass off the map and correct for magnetic declination. Refer to the declination diagram on your map. This will show the G-M angle. If the declination is west, rotate the compass' degree dial counterclockwise the appropriate number of degrees; if the declination is east, then rotate the degree dial clockwise the appropriate number of degrees.

   REMINDER: When you convert grid to magnetic, you subtract a west G-M angle from the grid azimuth. You add an east G-M angle to the grid azimuth.
5. Holding the compass in front of you, rotate your body until the north arrow lies under the orienting arrow. The direction of travel to your destination is now indicated by the direction of travel arrow.

Figure 4.7.8

ROUTE SELECTION

As mentioned at the beginning of this lesson, orienteering develops many skills besides map reading. An important one is decision making. Route selection is where competitors must make decisions. Which is the fastest way from point A to point B? Is it over or

around a hill? Is it going cross-country or using a road or trail? Except for those instances when organizers mark or specify the route in advance, wise route selection is important.

A good orienteering course will have some elevation obstacles. These obstacles will force you to decide if it is faster to go the most direct route over it or to take a longer detour around it. A simple formula to convert height into comparable flat distance is—25 feet of elevation equals 100 meters on a flat surface.

For example, suppose the straight-line distance to point B is 500 meters with a 50-foot high hill. The energy you would expend would be equivalent to running 500 meters plus an additional 200 meters for going over the hill (50 feet is twice as high as 25 feet, so the distance will be 200 meters). That's 700 meters. If the detour around the hill equals a total of 680 meters, it may be easier to go around it, depending upon the type of terrain you encounter.

25 Feet of elevation = 100 Meters on a flat surface

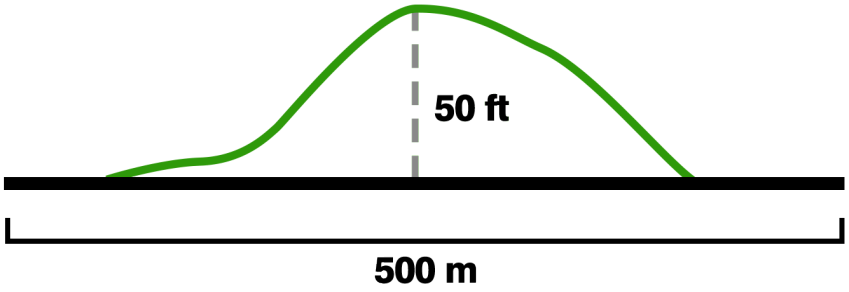


Figure 4.7.9

The type of terrain and vegetation that you encounter has a major impact on your pace. You must know your pace count through several types of terrain. In addition, you must know your pace when trotting and running, both when you are fresh and when you are tired. Although pacing will vary from individual to individual, *Figure 4.7.10* may be useful, but remember there are individual differences. This table assumes it is daylight, when the runner is fresh and on flat terrain.

Terrain	Typical Pace Count for Someone 5'9" to 6' Tall
Road/Path	40
Light Vegetation	43
Open Forest	46
Dense Forest	50

Figure 4.7.10

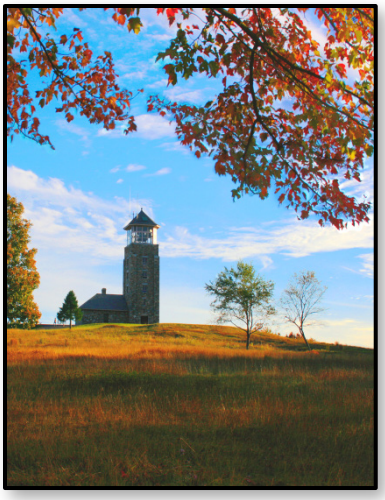
MOVEMENT TECHNIQUES

In addition to knowing the control points locations and where you are at all times, you must also know the best route for getting to the next control point. The shortest route may not be the fastest, and it may not pay to travel between two points as fast as possible if you tire yourself out in the process.

NOTE: Remember, you can locate your position on a map using terrain features, a back azimuth, or resection.

There are several techniques available to aid you in moving from one control point to another. They include the following:

- ***Direct Line.*** This method involves establishing a compass bearing between your location and the destination; then, following the compass bearing until you reach the point. A variation of this technique is to establish a compass bearing that you will follow for a specific distance at which time you establish a new bearing. Repeat this process until you reach the final destination.
- ***Steering Marks.***
  A **steering mark** is a prominent object or terrain feature on the ground that you can see and that is in the general direction of travel. Such objects as a lone tree or building are good examples of steering marks. One of the advantages of this technique is that once you reach the steering mark, you can reorient yourself before continuing.



Steering Mark *Figure 4.7.11*

- ***Aiming Off.*** The **aiming off** technique is valuable when your destination lies along a linear terrain feature such as a road or stream. Due to errors in compass or map reading, you may reach a linear feature and not know whether your objective lies to the right or the left. Furthermore, each degree that you are offset to the right or left will move the aim-off point from the destination 17 meters to the right or left for each 100 meters traveled. For example, if the number of degrees offset is 10 and the distance traveled is 100 meters, then your location is 170 meters to the left of the objective (10 degrees offset X 17 meters per 100 meters traveled = 170).

  NOTE: A proven technique to prevent confusion about turning left or right is to deliberately aim to one side of a linear feature destination. When you reach the linear feature, you will know in which direction to turn.
- ***Attack Points.*** When using the **attack point** technique, you select a prominent terrain feature, such as a hilltop or road junction, near your destination. You may use any technique to arrive at this point. Then you can reorient yourself, and then make a final short approach to it. The purpose of this technique is to minimize the distance you have to travel on the final approach. This, in turn, limits any errors in compass work or pacing you might make in locating the destination. The difference between an attack point and a steering mark is that you select an attack point from a map.

Key words

steering mark:
An easily identifiable feature in the landscape which is not shown on the map but is used by the orienteer to follow a bearing

aiming off:
An orienteering method where the navigator aims to one side of a destination point instead of directly at it

attack point:
An easy-to-find landscape feature shown on the map from which the final approach to a control point may be made

- ***Geographic Orientation.*** This technique involves keeping the map oriented as you travel and remembering what terrain features you will encounter en route to the next control point. For example, if you decide to follow a road to reach the next control point, you should orient the map as you stop and make turns along the road.

  Using *Figure 4.7.12*, assume that you want to travel from your position at "A" to control point 4. One route that you could take would be to use the north-south intermittent stream bed. Pass the first two east-west intermittent stream junctions that you encounter and take the eastern fork at the third junction. Follow that intermittent stream to the road junction (which you can call an attack point). From the road junction, shoot an azimuth to the control point.

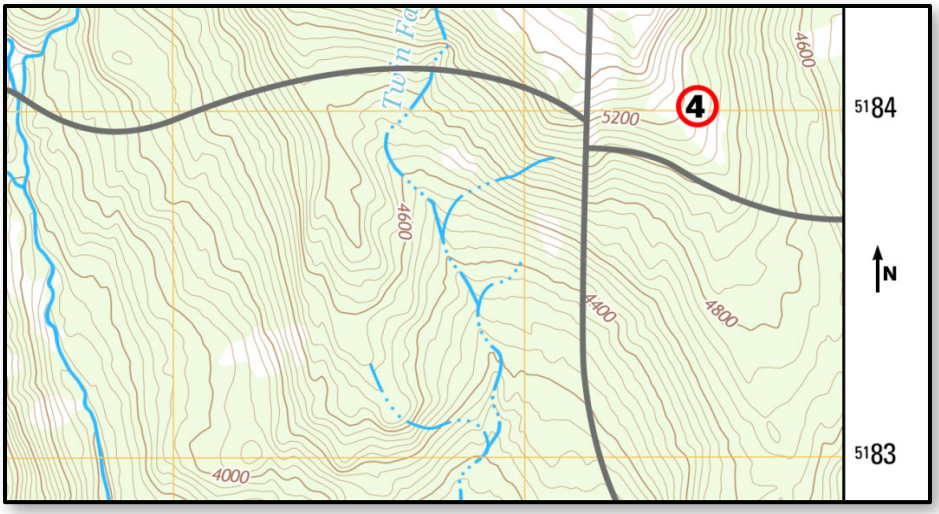


Figure 4.7.12

Equipment

Figure 4.7.13

When planning to participate in an orienteering event, you should wear and take the proper clothing and equipment.

Choose the clothing to wear depending on the type of vegetation and terrain you will encounter on the course. For example, in bushy terrain, you should wear a long-sleeve shirt and long pants to protect against cuts and scratches. For those who want to pursue orienteering as a sport, consider purchasing light nylon racing suits. These are full-length suits (usually fluorescent) with long sleeves and pouches in the front to carry maps, compasses, and so on.

Hiking shoes or boots are excellent for orienteering because of their durability and the ankle support they provide. High-top sneakers also provide excellent ankle support. Cross-country running shoes are good because they are lightweight and have better traction in mud, but they do not normally support the ankles.

Although a standard military lensatic compass is very good for orienteering, its one disadvantage is the time required for the needle to stabilize prior to lining up an azimuth.

Those who desire to pursue orienteering as a sport may want to acquire an induction dampened or liquid-filled compass.

The map is probably the most important item the participant carries. The most common map used in orienteering is a topographic map with a 1:50,000 scale; however, competitors prefer a 1:25,000 scale because it is easier to read and it shows features in greater detail. Try to use multi-colored maps if they are available. Outline the course details on your own map and copy the key terrain features from color-coded master maps. Cover your map with a clear, plastic-like material such as a document protector to prevent these marks from smearing and/or becoming unreadable.

Course Organization

At every orienteering event, there are a few basic elements that you will encounter. These are essential to the efficient and safe operation of the event, and are covered in the following sections.

OFFICIALS

Most events often use the same officials at both the start and finish, although their functions are different at each end. At the start, these officials include:

- ***Course Organizer.*** Briefs competitors in the assembly area, issues event cards and maps, and calls competitors forward to start individually (or in groups if it is a group event).
- ***Recorder.*** Records the competitor's name and start time on the recorder's sheet, checks the competitor's name and start number on the event card, and issues any last-minute instructions.
- ***Timer.*** Controls the master clock and releases the competitors across the start line at their start time (usually at one-minute intervals) to the master map area.

At the finish, the officials include:

- ***Timer.*** Records the finish time of each competitor on their event card and passes the card to the recorder.
- ***Recorder.*** Records competitor's finish times on the recorder's sheet and tallies the final score based on time and correctness of control points visited.
- ***Course Organizer.*** Verifies correctness of names, finish times, and final score. Posts competitors' positions on a results board and accounts for all participants at the end of the event.

More officials and/or assistants may be used; however, the three listed here are the minimum required to run the competition.

CONTROL AREAS

In many orienteering events, there are at least three control areas. They are:

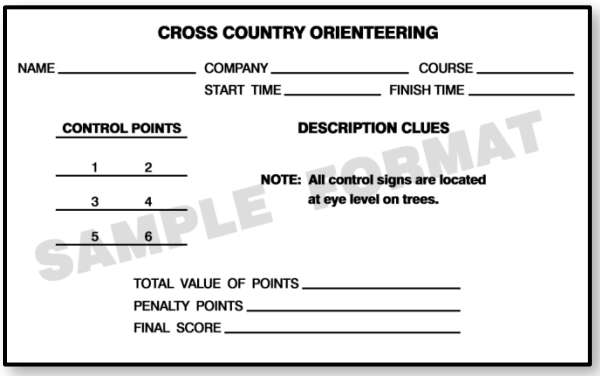
- ***Assembly Area.*** Here participants register and receive instructions, maps, event cards, and start numbers. They may also change into their orienteering clothes if facilities are available, study their maps, and fill out their event cards. Sanitation facilities are normally available in this area.
- ***Start (Start/Finish).*** At the start, each competitor reports to the recorder and timer to be logged in and released. Oftentimes, the start and finish are at the same location.

Control Areas *(cont'd):*

- ***Master Map Area.*** There are three to five master maps 20 to 50 meters from the start. When the participants arrive at this area, they must mark all the course's control points on their maps. Having done this, competitors must decide on the route they will follow. Experienced competitors will take the time to orient their map and carefully plot the route before rushing off.

CONTROL CARDS

Organizers make the event card as small as possible so that competitors can easily carry it in a pocket. It contains the following items: name, start number, start time, finish time, total time, place, and spaces for marking the control points visited. It may also contain a listing of descriptive clues. *Figure 4.7.14* is a sample event card for the most common type of an orienteering course.


CROSS COUNTRY ORIENTEERING

NAME _____ COMPANY _____ COURSE _____

START TIME _____ FINISH TIME _____

CONTROL POINTS

1 2

3 4

5 6

DESCRIPTION CLUES

NOTE: All control signs are located at eye level on trees.

SAMPLE FORMAT

TOTAL VALUE OF POINTS _____

PENALTY POINTS _____

FINAL SCORE _____

A Typical Control Card *Figure 4.7.14*

CLUE DESCRIPTION CARDS

Organizers prepare these cards with the master maps after the course is set. They contain the descriptive clues for each control point, control code, grid coordinate references, returning time for competitors, removal times for each location, and panic azimuth. Organizers keep the clue description cards and the master maps confidential until the competitors start the event.

SCORING

Organizers score the cross-country or free event by the competitor's time alone. Competitors must visit all control points; failure to visit one results in a disqualification. In this event, the fastest time wins. A variation that organizers often use for beginners is to have a "not-later-than" return time at the finish and to add minutes on to their final time for the number of minutes late and for the number of control points not located.

The score event requires the participant to collect as many points as possible within the time limit. Organizers deduct points for extra time spent on the course—usually one point for every 10 seconds over the time limit.

SAFETY

The following items and provisions are required to ensure that an orienteering course runs as safely as possible. Furthermore, the course organizer ensures that all participants receive a detailed safety briefing that covers the following key information.

- ***First Aid.*** Ensure that a first aid kit is available at the start and finish. One of the officials should be trained in first aid, or a qualified medical person should be at the event.
- ***Control Points.*** Locate all control points where the safety of the competitors is not endangered by hazardous terrain or other conditions.
- ***Safety Lane.*** Designate a location, usually linear, on the course where competitors may go if injured, fatigued, or lost. A good course will usually have a well-defined boundary as a safety lane; then competitors can set a panic azimuth on their compass and follow it until they reach the boundary.

Safety *(cont'd):*

- ***Finish Time.*** All orienteering events must have a final return time. At this time, organizers should sound a loud siren or horn and all competitors must report to the finish line, even if they have not completed the course.
- ***Search and Rescue Procedures.*** If all competitors have not returned by the end of the competition, the officials should drive along the boundaries of the course to pick up the missing people.

Content Highlight:

GIVE ORIENTEERING A TRY!

Interest in orienteering within the United States has grown rapidly over the years. Orienteering is conducted under the guidelines of the United States Orienteering Federation. For more information, check out the International Orienteering Federation's website at http://www.orienteering.org/.

Conclusion

Orienteering is a form of land navigation where the terms, symbols, and techniques are different from military land navigation. Although an expert military map reader/land navigator is by no means ready to complete a civilian orienteering event, military experience and training in navigating on the ground and reading maps (as well as physical training and decision making) will help you to become a good orienteering competitor. Several orienteering practices and a complete familiarization with the map reading skills presented in previous lessons will help you to gradually become competitive in this exciting and challenging sport.

Lesson Check-up

- **What is orienteering and how did it originate?**
- **List the six types of orienteering courses.**
- **Explain the five-step process to determine direction of travel.**
- **Describe the five movement techniques used in orienteering.**

CHAPTER 5

Figure 5.0

CITIZENSHIP & GOVERNMENT

Chapter Outline

Chapter Outline (cont'd)

LESSON 8: The Articles of Confederation (p.284)
What were the Articles of Confederation, and why did some Founders want to change them?

LESSON 9: The Philadelphia Convention (p.296)
How was the Philadelphia Convention organized?

LESSON 10: The Debate Over Representation (p.304)
Why was representation a major issue at the Philadelphia Convention?

LESSON 11: The Branches of National Government (p.312)
What questions did the Framers consider in designing the three branches of the national government?

LESSON 12: Balancing National and State Powers (p.324)
How did the delegates distribute powers between national and state governments?

LESSON 13: The Anti-Federalist Position (p.332)
What was the Anti-Federalist position in the debate about ratification?

LESSON 14: The Federalist Position (p.340)
What was the Federalist position in the debate about ratification?

LESSON 15: Amendments and Judicial Review (p.348)
How have amendments and judicial review changed the Constitution?

LESSON 16: Political Parties and the Constitutional System (p.358)
What is the role of political parties in the constitutional system?

Chapter Outline (cont'd)

Chapter Outline (cont'd)

LESSON 26: American Federalism (p.464)
How does American federalism work?

LESSON 27: The Bill of Rights (p.476)
What are bills of rights and what kinds of rights does the U.S. Bill of Rights protect?

LESSON 28: Freedom of Religion (p.488)
How does the First Amendment affect the establishment and free exercise of religion?

LESSON 29: Freedom of Speech and the Press (p.500)
How does the First Amendment protect free expression?

LESSON 30: Freedom to Assemble, Petition, and Associate (p.512)
How does the First Amendment protect freedom to assemble, petition, and associate?

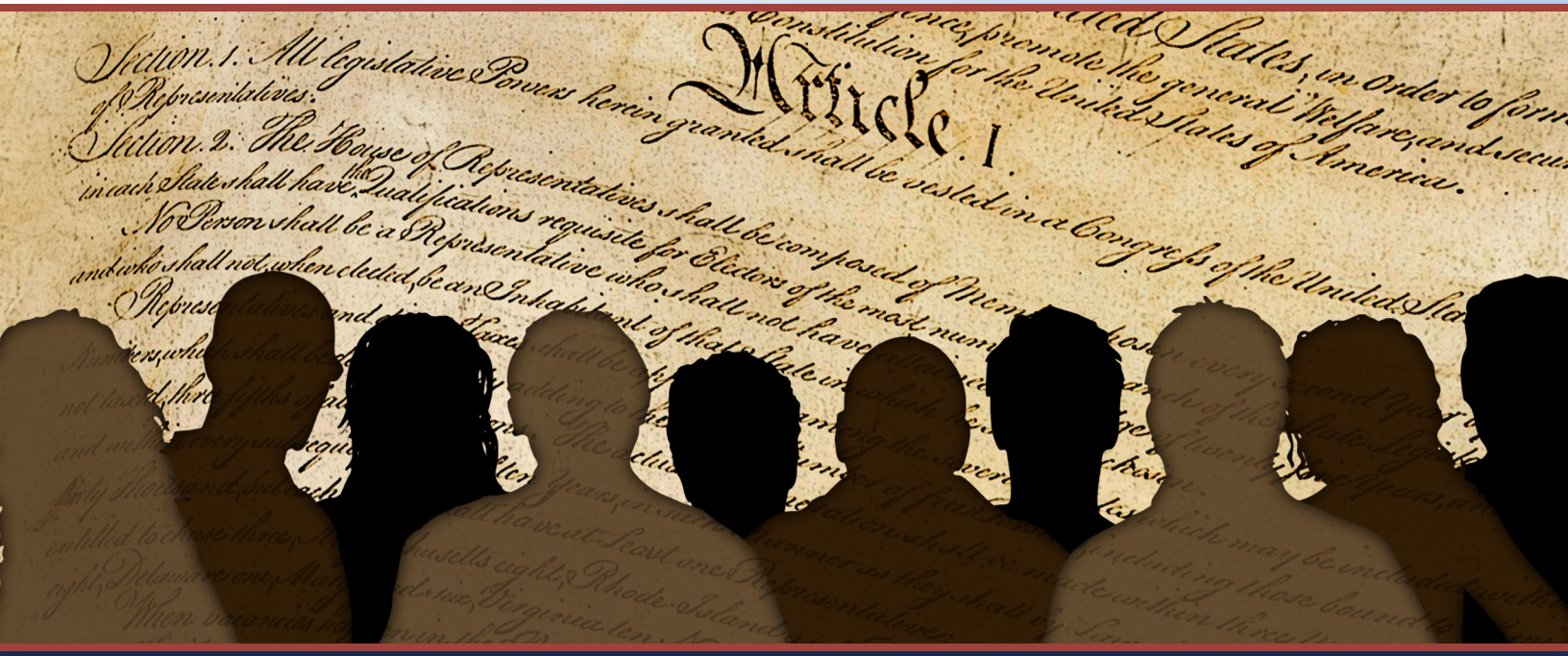
LESSON 31: Unreasonable Law Enforcement Procedures (p.522)
How do the Fourth and Fifth Amendments protect against unreasonable law enforcement procedures?

LESSON 32: Protecting Rights Within the Judicial System (p.536)
How do the Fifth, Sixth, and Eighth Amendments protect rights within the judicial system?

LESSON 33: The Meaning of Citizenship (p.548)
What does it mean to be a citizen?

LESSON 34: The Importance of Civic Engagement (p.562)
What is the importance of civic engagement to American constitutional democracy?

Chapter Outline (cont'd)



LESSON 1

Organizing a Government

Key words

- constitution
- constitutional government
- democracy
- forms of government
- limited government
- mixed constitution
- Parliament
- republic
- unwritten constitution
- written constitution

What You Will Learn to Do

Analyze the Founders' ideas about constitutional government

Linked Core Abilities

- Apply critical thinking techniques
- Build your capacity for life-long learning
- Communicate using verbal, non-verbal, visual, and written techniques
- Do your share as a good citizen in your school, community, country, and the world
- Take responsibility for your actions and choices
- Treat self and others with respect

Learning Objectives

- **Describe** the diverse features of the early American colonies and states and their populations
- **Explain** what the Founders learned about government from history and their firsthand experiences of government and how this knowledge shaped their thinking

Essential Question

What did the Founders think about constitutional government?

Learning Objectives (cont'd)

- **Explain** the meanings of the terms constitution and constitutional government and describe Aristotle's ideas about forms of government
- **Evaluate**, take, and defend positions on how constitutional governments should be organized to prevent abuses of power by people in government
- **Define** key words: constitution, constitutional government, democracy, forms of government, limited government, mixed constitution, Parliament, republic, unwritten constitution, written constitution

Introduction

This lesson introduces the basic ideas and experiences the founding generation drew on to create the kind of government they believed would best protect the natural rights of individuals and promote the common good. Classical Greek and Roman writers, natural rights philosophy, the Bible, Protestant theology, ancient and modern European history, and the Enlightenment in Europe and America were among the sources of the ideas that influenced the Founders. The Founders also participated in self-government in the American colonies before 1776 and in state and local governments after independence from Great Britain. The Founders' ideas about society and government and their experiences were diverse. The colonies differed widely. This diversity fostered a rich dialogue about the purpose of government and how it should be organized.

What Were Some Characteristics of Colonial America?

The United States was officially recognized as an independent nation in the Treaty of Paris of 1783, nearly two centuries after the first European settlers landed in America. Once colonies were established, one of the first things that the colonists noticed about their new surroundings were their vast size. England and Scotland together were smaller than the present states of New York and Pennsylvania. More than a thousand miles separated the citizens of northern Massachusetts from those of southern Georgia.

Of course, the colonists were not the first people on the North American continent. However, by the end of the Revolutionary War there was relatively few Native Americans living along the Atlantic coast. Encroachment of colonial settlements, disease, and warfare significantly reduced the indigenous population on the eastern seaboard, although many Native Americans remained on the western borders of the colonial frontier and beyond.

More than physical distance separated the colonists. Their backgrounds were diverse. Some, such as the Puritans in Massachusetts and the Quakers in Pennsylvania, came to the New World for religious reasons. Others came for economic reasons. They also differed in social structure and sometimes even in language. Pennsylvania, for example, had a large German-speaking population. French and Dutch were important languages in other colonies.

A few influential families dominated South Carolina, Maryland, and New York. They owned vast estates and tended to replicate European culture and habits as much as they could. By contrast, New England and Georgia had fewer large estates and, partly as a result, had different social and political cultures than those found elsewhere. Most of the colonies also had established official government religions. Slavery was practiced in all the colonies.

Almost all colonial Americans lived and worked on farms or in rural communities. But farming meant different things in different places. In South Carolina's coastal region, farming meant using slaves to work plantations that produced rice and indigo for export, mostly to England. Virginia's export crop was tobacco. By contrast, farming in New England meant growing crops and raising livestock for a local market. New England farmers relied less on slaves for labor than did Southern colonists, but the New England workforce included thousands of indentured servants, many of whom had entered into work contracts in exchange for transportation to America, food and shelter, or training in various skills.

What happened to Native Americans after the arrival of European settlers?

Figure 5.1.1

Colonists who did not work on farms followed various trades, working as sailors, shoemakers, silversmiths, and a host of other occupations. Many dabbled in a favorite American pastime, speculating on land. In many ways, colonial America was a society of traditions, in which people played social roles and exercised authority in long-established ways. But more than 300,000 people in 1760 were enslaved. These people, or their ancestors, had been transported to North America as captives from Africa. Later lessons

will examine the effect of slavery on American **constitutional government** and culture. Indeed, the British colonies developed a number of different ways of organizing local governments during the century or more of their existence.

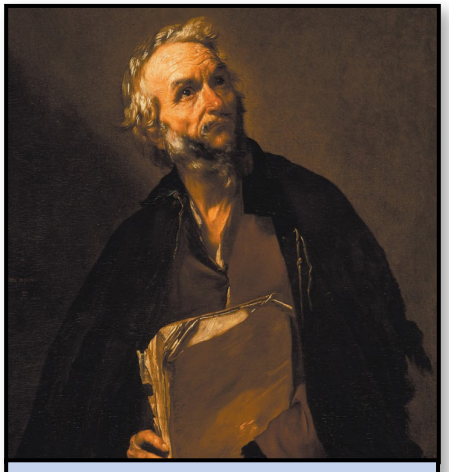
How Did the Founders Learn about Government? What Did the Founders Learn about Government?

The Founders learned about government from reading history and philosophy and their own experience of self-government as colonists within the British Empire. They were as familiar with ancient Greece and Rome as they were with later European history. Many had read classical texts about government and politics by ancients such as Aristotle (384–322 BC), Marcus Tullius Cicero (106–43 BC), and others. They also had read newer theories of government by sixteenth and seventeenth-century philosophers, such as Thomas Hobbes (1588–1679) and John Locke (1632–1704). By the 1770s some were familiar with the English jurist William Blackstone's explanations of English law, published between 1765 and 1769. Almost all were well read in Protestant theology. The Founders looked to many examples of good and bad government for guidance.

Why did the Founders read the works of William Blackstone and other jurists and philosophers?

Figure 5.1.2

By 1776 Americans also could look back on more than 150 years of experience in local self-government. Free white men from all walks of life had served on juries, attended town meetings, and voted in local elections. In fact, in the colonies and the early states more Americans participated in self-government than did people almost anywhere else in the world.



What purpose of government did Plato and other classical philosophers agree upon? Do you agree with them? Why?

Figure 5.1.3

Not all the sources that influenced the Founders taught the same lessons. Some sources contradicted others. Some did not teach clear lessons at all.

Key words

constitutional government: A government in which the powers of the government are limited in practice by a written or unwritten constitution which they must obey

For example, classical (ancient) political philosophers taught that human beings are naturally social creatures with obligations to each other and to their community, without which they could neither survive nor achieve human excellence. To Greek philosophers, such as Plato (c. 428–348 BC), those who govern must be wise. All the classical philosophers agreed that one purpose of government is to help people learn about and perform their civic and moral duties. Greek and Roman history taught that although democracies may appear to begin well, they tend to end in tyranny when the poor attack the rich. Class warfare breeds chronic disorder. The people then submit to tyrants, who enter the scene promising security.

Natural rights theorists taught that people have natural rights that others must respect. English philosopher John Locke summarized them as rights to "life, liberty, and estate." People agree to form a society and create a government to protect their rights.

British history showed that even a monarchy might evolve into free government. If the people are determined, they can ensure that monarchs respect the rights that the people have gained over time.

American colonial history showed that local self-government could coexist with a distant central authority—in this case, Britain. However, American colonial history also showed that when people believe that the central government is abusing its power, then social and political unrest follows.

In a nation in which government is the servant of the people, what obligations, if any, do the people have to the government?

Figure 5.1.4

The Founders had many examples of government to choose from in designing their state **constitution**s and the U.S. Constitution. Why did they make the choices they made? From reading their explanations in documents such as the Virginia Declaration of Rights, the Declaration of Independence, and various pamphlets, essays, and letters, it is clear that the Founders had learned at least two important lessons about government:

- Government should be the servant, not the master, of the people.
- A fundamental higher law, or constitution, should limit government.

Key words

constitution:
A set of customs, traditions, rules, and laws that sets forth the way a government is organized and operated

What Forms of Government Could the Founders Choose From?

The Founders were familiar with the writings of the Greek philosopher Aristotle (384–322 BC), who observed that every state—meaning "country" or national entity in this sense—must perform three functions. First, states must deliberate about what is to be done and decide what public policy should be. Today we call this the legislative function—deliberating on and enacting law. Second, states must perform an executive function, through which public officials carry out public policy. And third, states must carry out a judicial function, through which disputes about the interpretation of law are managed and applied in everyday life.

Aristotle also distinguished between types of governments on the basis of the number of persons exercising power. Countries may be governed by one person, a few people, or many people. Each of these three **forms of government** has a "right form" and a "corrupt form." Right forms are governed for the common good, whereas corrupt forms are governed for the private interests of the rulers.

The right form of government by a single person is called "monarchy." The right form of government by a few people is called "aristocracy," or the rule of the "best." And the right form of government by many people is called "polity." Aristotle referred to polity as a "mixed" form of government (or "**mixed constitution**") because it incorporates elements of **democracy** and oligarchy (see next paragraph). No group of citizens—for example, the rich or the poor—is able to abuse political power. Although a polity is a mixture of social elements, it is most like democracy, as we define the concept today.

According to Aristotle, corrupt forms of government are "tyranny," for rule of a single person; "oligarchy," for rule of a few, usually rich, people; and "democracy," for rule of the many, by which he meant the poor.

The following table illustrates right and corrupt forms of government as identified by Aristotle:

Rule of:	Right Form	Corrupt Form
One	Monarchy	Tyranny
Few	Aristocracy	Oligarchy
Many	Polity	Democracy

Figure 5.1.5

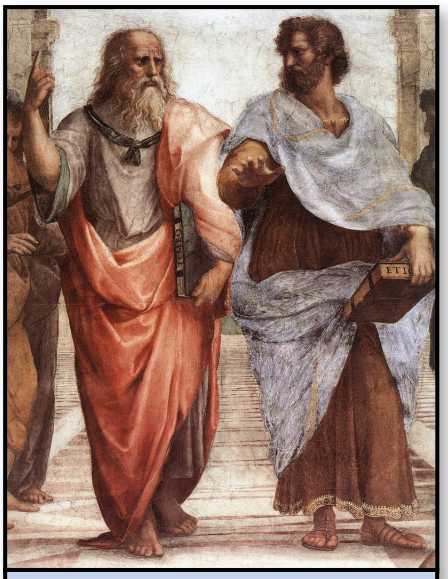
To Aristotle democracy meant "direct" democracy, in which the people themselves make decisions, rather than the type of government we call democracy today, which is largely representative. Aristotle's description of democracy as a corrupt form of government refers to what ancient Greece experienced when the poor ("the many") took power. They attempted to seize the property of the rich for themselves, setting off destructive civil wars based on social class. In such cases, the poor looked after only their own interests to the exclusion of the common good.

Key words

forms of government: Aristotle's idea of three forms of government based on the number of people exercising power. Each has a "right" form and "corrupt" form

mixed constitution: The basis of a form of government in which power is divided among different branches

democracy: Literally defined as "rule of the people;" a form of government in which all citizens exercise political power, either directly or through their elected representatives



According to Aristotle, what is necessary for a country to have a stable government? What threatens the stability of government?

Figure 5.1.6

Although Aristotle classified the governments of countries on the basis of their number of rulers, he also focused on economic considerations within countries, which usually are far more important. He was especially concerned with the distribution of wealth and the effects that various distributions have on political stability—specifically on the avoidance of civil strife. He concluded that the dominant group of most stable countries consists of those who are neither rich nor poor but occupy a middle ground of moderate wealth.

According to Aristotle, this middle group is known for moderation. Rule by those who are moderate yields the most stable form of government because those of moderate means are most likely to behave in accordance with reason. In Aristotle's view, the problem with "democracy" is that the poor, who are numerous, attempt to seize the wealth of the rich, who are few. But if a constitution can combine ("mix") the many poor with the lesser number of wealthy persons, then it can achieve stability.

The Founders were familiar with this idea of mixed constitution from reading Aristotle and other writers, such as the Greek historian Polybius (203–120 BC). Polybius popularized the idea in the ancient world that mixed constitution is a combination of monarchical, aristocratic, and democratic elements. This idea, embraced and passed on by the Roman statesman Cicero, then became widespread among scholars in the Middle Ages—roughly the fifth century to the fourteenth century, depending on the country. Through Cicero's great influence in the subsequent period of the Renaissance, the fifteenth through seventeenth centuries, the idea of mixed constitution was incorporated into Renaissance political thought and thus into republicanism. It was then passed on to the Enlightenment in the eighteenth century.

For example, the eighteenth-century French political thinker Charles-Louis de Secondat, Baron de la Brède et de Montesquieu (1689–1755), cited England as a mixed constitution. The British government had a limited monarch, an aristocracy in one house of **Parliament** (the House of Lords), and in theory, the House of Commons for the common people. In fact, the landed aristocracy dominated the House of Commons, though they were of lower rank than members of the House of Lords.

Both the British Parliament and the legislatures of colonies were examples of representative government.

Key words

Parliament:
The British legislature, which consists of two houses: the House of Lords, which once represented the nobility, and the House of Commons, which formally represents the common people

Representative government sometimes is called "republican government." The term **republic** comes from the Roman term res publica, which is Latin for "thing (or property) of the people."

The Roman Republic had an unwritten mixed constitution. Its form of government after 287 BC consisted of executive and legislative branches, in which virtually all classes and tribes in Roman society were represented.

Based on the Founders reading of history and their personal experiences, they did not believe that direct democracy was the best model for government. It could potentially fail to protect property and other rights, such as rights of minorities. The Founders preferred a representative, or republican, form of government, in which many interests can be represented in the legislature; and those who govern, like ordinary citizens, are required to obey the law.

Montesquieu cited England as an example of a mixed constitution. Is today's government of the United Kingdom a mixed constitution? Why or why not?

Figure 5.1.7

Key words

republic:
A form of government that derives its powers directly or indirectly from the people, is administered by officials holding power for a limited time, and incorporates representative institutions

Content Enhancement:

CRITICAL THINKING EXERCISE

Examining the Founders' Sources of Information

If you were a part of a group drafting a new constitution for the United States today, which of the sources the Founders used would you rely on in your deliberations? What other sources might you consult? Why?

What is a Constitution?

As it is understood today, a constitution is a plan that sets forth the structure and powers of government. Constitutions specify the main institutions of government. In so doing, constitutions state the powers of each of these institutions and the procedures that the institutions must

Key words

written constitution: A written plan of government that sets forth the structures and powers of government

unwritten constitution: The body of political practices developed through custom and tradition

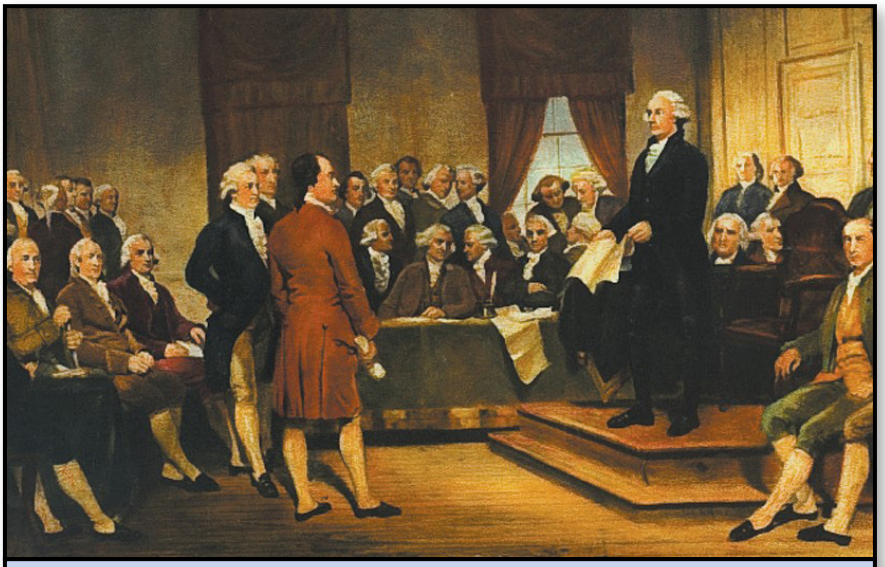
limited government: A system restricted to protecting natural rights that does not interfere with other aspects of life

use to make, enforce, and interpret law. Usually constitutions also specify how they can be changed, or amended. In the American conception of constitutional government, the constitution is a form of higher, or fundamental, law that everyone, including those in power, must obey.

Many controversies surround **written constitution**s, including what the words mean, whether the understanding of the document should evolve or remain unchanged, and who should have the final say about what the document means. Nearly all constitutions are written. Only three of the world's major democracies have **unwritten constitution**s—that is, constitutions that are not single written documents. These are Britain, Israel, and New Zealand. In each of these nations, the constitution consists of a combination of written laws and precedents.

Constitutional government means **limited government**—government limited by the provisions of the constitution. Limited government is characterized by restraints on power as specified by the Constitution. In democracies, for example, one restraint is the inclusion of free, fair, and regular elections. The opposite is unlimited government, in which those who govern are free to use their power as they choose, unrestrained by laws or elections.

Aristotle described the unlimited government of a single ruler as tyranny. Today the terms autocracy, dictatorship, or totalitarianism often are used to describe such governments. Believing that they had been subjected to tyranny by the British king, the Founders also believed that government in the newly independent United States of America should be limited by the higher law of a written constitution.



Why do you think the Founders wanted to establish a constitutional government?

Figure 5.1.8

How did Aristotle define tyranny? How did the Founders attempt to prevent tyrannical government in the United States?

Figure 5.1.9

How might a government be organized to prevent leaders from gaining unlimited power?

Figure 5.1.10

How Did the Founders Characterize Higher Law?

According to the founding generation, a constitution should function as a type of higher law.

A higher law differs from a law enacted by a legislature in these four ways:

- It sets forth the basic rights of citizens.
- It establishes the responsibility of the government to protect those rights.
- It establishes limitations on how those in government may use their power with regard to citizens' rights and responsibilities, the distribution of resources, and the control or management of conflict.
- It can be changed only with the consent of the citizens and according to established and well-known procedures.

What Kinds of Governments May be Constitutional Governments?

The Founders knew that constitutional government might take many forms. It is possible to have a constitutional government with one ruler, a group of rulers, or rule by the people as a whole as long as those in power must obey the limitations placed on them by the higher law of the constitution. Historically, constitutional governments have included monarchies, republics, democracies, and various combinations of these forms of government.

The problem for any constitutional government is to ensure that those in power obey constitutional limits. History provides many examples of rulers who ignored constitutions or tried illegally to increase their personal power. The Founders believed that direct democracy was more likely to ignore constitutional limits than representative government. Direct democracy makes it easy for momentary passions to inflame people and leads to passionate rather than reasoned judgments. The interests of the community, as well as the rights of individuals in the minority, may suffer as a result.

Content Enhancement:

CRITICAL THINKING EXERCISE

Examining Why the Founders Feared Government Abuse of Power

Given their knowledge of history and their experiences under British rule, it is not surprising that the Founders feared possible abuses of governmental powers.

Read the following three statements by famous American Founders. Then respond to the questions that follow.

> *"Give all power to the many, they will oppress the few. Give all power to the few, they will oppress the many."* — Alexander Hamilton, 1787
>
> *"There are two passions which have a powerful influence on the affairs of men. These are ambition and avarice; the love of power and the love of money."* — Benjamin Franklin, 1787
>
> *"From the nature of man, we may be sure that those who have power in their hands...will always, when they can... increase it."* — George Mason, 1787

1. What view of human nature is expressed in each of these statements?
2. If you agree with the views of human nature expressed in the statements, what kind of safeguards to prevent abuses of power would you include in a constitution?
3. Do you think the Founders' concerns about government are as valid today as they were in the 1700s? Why or why not?

Content Highlight:

WHAT DO YOU THINK?

1. How would you organize a government so that it would be fairly easy to remove and replace officials who violated the constitutional limitations on their powers?
2. What might happen in a government in which there were no agreed-on or peaceful means for removing officials? Give a recent example to support your answer.
3. Is it important that a constitution be written? What are the advantages and disadvantages of written constitution? Or an unwritten constitution?

Conclusion

In this lesson, you learned that the Founding generation of our nation looked at many ideas about government. They believed in a constitutional government and had many concerns about how to organize government to prevent abuses of power. Their ideas and those of the philosophers they read deeply influenced the kind of government we have today.

Lesson Check-up

- **What important lessons did the founding generation learn from political theory and political history?**
- **What is the difference between limited government and unlimited government? Do you think the difference is important? Why or why not?**
- **What is a constitution?**
- **What is a mixed constitution? Explain the advantages and disadvantages of this type of government.**
- **Why is a constitution in a constitutional government considered a higher law, and what are the major characteristics of a higher law?**

Philosophies of Civic Life

What You Will Learn to Do

Examine the ideas about civic life that informed the founding generation

Linked Core Abilities

- Apply critical thinking techniques
- Build your capacity for life-long learning
- Communicate using verbal, non-verbal, visual, and written techniques
- Do your share as a good citizen in your school, community, country, and the world
- Take responsibility for your actions and choices
- Treat self and others with respect

Learning Objectives

- **Describe** how and why natural rights philosophy differs from classical republicanism and how both systems of thought influenced the founding generation in America
- **Explain** the kinds of challenges that a society faces when it strives to preserve the rights to life, liberty, property, and "the pursuit of happiness" while at the same time promoting the common good and civic virtue

Key words

- civic virtue
- classical republicanism
- common good
- consent of the governed
- divine right
- inalienable rights
- natural rights
- political legitimacy
- popular sovereignty
- pursuit of happiness
- right of revolution
- social contract
- state of nature

Essential Question

What ideas about civic life informed the founding generation?

Learning Objectives (cont'd)

- **Evaluate**, take, and defend positions on the importance of civic virtue today and the role of political philosophy in thinking about government
- **Define** key words: civic virtue, classical republicanism, common good, consent of the governed, divine right, inalienable rights, natural rights, political legitimacy, popular sovereignty, pursuit of happiness, right of revolution, social contract, state of nature

Introduction

Figure 5.2.1

People frequently make judgments about governments or acts of governments, praising them as "good" or criticizing them as "bad." Those judgments may reflect ideas about human nature, the proper function and scope of government, the rights of individuals, and other values. Political philosophers have discussed these matters for thousands of years. This lesson examines concepts such as the **common good**, **civic virtue**, the **state of nature**, **natural rights**, consent, and the **social contract**. These concepts are central to discussions about government.

Key words

common good:
The good of the community as a whole, as contrasted with private interests that may conflict with public interest

civic virtue:
The dedication of citizens to the common welfare of their community or country, even at the cost of their individual interests

state of nature:
The condition of people living in a situation without government

natural rights:
The doctrine that people have basic rights, such as those to life, liberty, and property in a state of nature

social contract:
The agreement among all the people in a society to give up part of their freedom to a government in return for the protection of their natural rights by that government

What Values From Antiquity Influenced the Founding Generation?

The men who drafted state constitutions and the U.S. Constitution were familiar with the ideas of antiquity when they thought about government. The Roman Republic, which lasted for almost five hundred years, from the sixth century to the first century BC, was the ancient society that exercised the greatest influence on the Founders. The laws of the Roman Republic established a complex system of offices, in which the common people had a voice but that also provided checks on the people's power. The Roman Republic was described as a mixed constitution because it had elements of monarchical power, aristocracy, and rule of the common people. It fostered and for a time achieved political stability. Many historians during our founding era believed that of all the governments they studied, the Roman Republic had done the best job of promoting the common good—that is, doing what was best for the society as a whole.

The devotion of citizens to the common good was a central feature of the political ideas that we now call **classical republicanism**. Classical republicanism placed the needs of people as a community above individual liberty and self-determination. Citizens were taught that they should work together to promote the good of the country, not work for private or selfish interests. Only by working together in a common effort to promote the good of all could citizens maintain their republic and keep it free from the domination of others.

Key words

classical republicanism: A theory that holds that the best kind of government is one that promotes the common welfare instead of the interests of one class of citizens. The Roman Republic was thought by the Founders to be one of the best examples of a society living under this theory of government

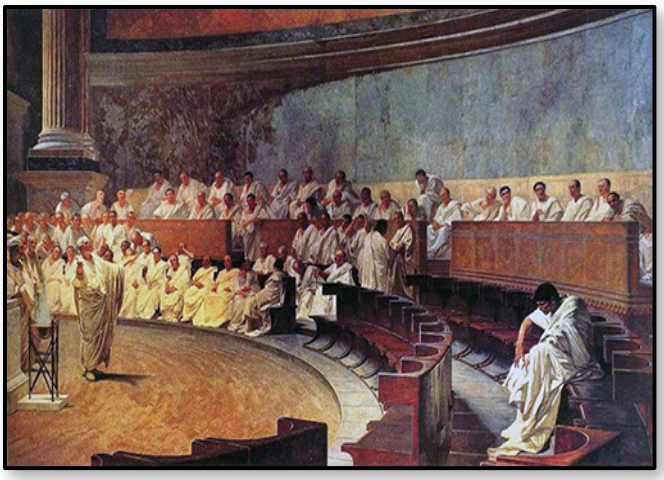


Figure 5.2.2

The history of the Roman Republic was both an example and a warning to America's founding generation. For centuries, Roman citizens displayed their commitment to the common good. Cicero (106–43 BC), a leader of the Roman Republic, viewed public life as the highest calling. Public life required dedicated citizens and leaders willing to make personal sacrifices for the sake of the common good. By Cicero's time, however, Rome had acquired a vast empire. During his lifetime, Roman citizens' selfishness and corruption would cost them their political freedom. Civil war ensued. In 48 BC, the Roman people accepted an autocratic master, Julius Caesar (c. 100–44 BC), who was appointed dictator in order to impose order and stability in the aftermath of the civil war.

Three aspects of classical republicanism were particularly influential for the founding generation of Americans: small, uniform communities; citizenship and civic virtue; and moral education.

SMALL, UNIFORM COMMUNITIES

Classical thinkers, such as Aristotle, observed that human beings are not self-sufficient and are always found living in association with one another in a form of political rule. Man is, he said, "a political animal." Humans need each other. They live together both for security and in order to live well. Good government is possible only in small communities, because in such communities people are able to know and care for one another and to discern the common good. Classical republican thinkers also believed that members of a political community must be fundamentally alike. Great disparities in wealth or differences in culture, religion, or morals cause conflict among people rather than encouraging them to work together for the common good.

What are some advantages of small, homogeneous communities? What are some disadvantages?

Figure 5.2.3

Classical republicans also feared the corrupting effects of luxury, making them wary of moneymaking and economic growth. Americans in the eighteenth century experienced many of the advantages of small communities and their devotion to the common good. Survival in early America depended on the ability of neighbors and townspeople to work together to overcome obstacles. Official or established religions also fostered homogeneity and a commitment to the common good as defined by that religion.

CITIZENSHIP AND CIVIC VIRTUE

Classical republicans emphasized the importance of the "office" of citizen and the duties associated with it. In most ancient societies slaves and noncitizens did most of the manual labor, freeing wealthier citizens to participate in civic affairs. Citizens were expected to set aside personal interests to promote the common good. Citizens also were expected to be well informed and engaged in community affairs. Virtuous citizens, classical republicans believed, should have the courage to do what was right even under trying circumstances.

From the classical perspective citizenship should emphasize duties, not rights. Most ancient republics did recognize what today we would call political rights, such as the right to vote, to express opinions about government, and to serve in public office. But most

placed limits on the exercise of individual freedoms. For example, there was little concern about protecting an individual's privacy or freedom of conscience or religion.

Why did the Founders consider Cincinnatus a model of civic virtue? What is the importance of civic virtue among leaders and citizens?

Figure 5.2.4

The founding generation admired the heroes of antiquity, such as the Roman patriot, orator, and writer Cato the Elder (234–149 BC) and the citizen-soldier Lucius Quinctius Cincinnatus (519–438 BC). Cincinnatus was twice called on to serve as dictator—in 458 and 439 BC. After defending Rome, each time he voluntarily relinquished political power to resume private life as a farmer. The Founders believed that such men were examples of civic virtue, and Americans should emulate them. Indeed, many admired George Washington as "our Cincinnatus," because he sacrificed his private pursuits to lead the nation in war and peace. He then voluntarily relinquished the presidency after two terms in office, though some would have made him an American monarch. Early Americans believed that Washington was an example of the civic virtue that should motivate all citizens.

MORAL EDUCATION

Classical republican thinkers believed that civic virtue must be learned. Moral education included instruction in "civil religion"—the symbols, rituals, and values of the society. Moral education also required that children develop proper habits, including generosity, self-control, respect, fairness, and courage—all of which were necessary for speaking and reasoning well. Moral education entailed learning to admire the achievements and civic virtue of the heroes described in history, literature, poetry, and music. Young people also needed to learn the importance of participating in political debate and performing military service.

An important component of moral education was instilling in children the importance of developing and preserving a good reputation. People needed

In colonial America, who was responsible for the moral education of children?

Figure 5.2.5

to be able to trust one another in the conduct of their daily affairs, and so they needed to behave morally. Civic virtue included supervising and nurturing the next generation of citizens. Classical republicans believed that the entire community was responsible for the moral education of the young.

In colonial America, small, homogeneous communities and churches assumed responsibility for instilling proper habits and practices. The founding generation believed that if individualism and self-interest were allowed to flourish unchecked, then community life would suffer. Small, uniform communities that emphasized civic virtue and moral education, as the classical republics of antiquity had done, appealed to some of the Founders as means of tempering selfishness and corruption.

Content Highlight:
WHAT DO YOU THINK?

1. Identify someone living today who you believe shows civic virtue. Explain the reason for your choice.
2. What did classical republicans believe should be the goal of education? Do you agree? Why or why not?
3. What civic virtues are important for young people to have today and why?
4. What similarities and differences are there between your ideas about rights and those of the classical world?
5. What might be the consequences to individuals and a society of too great an emphasis on the common good at the expense of individual rights?

What is the Role of Philosophy in the Study of Government?

Consider these words:

> *We hold these Truths to be self-evident, that all Men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty, and the* ***Pursuit of Happiness****—That to secure these Rights, Governments are instituted among Men, deriving their just Powers from the* ***Consent of the Governed****, that whenever any Form of Government becomes destructive of these Ends it is the Right of the People to alter or to abolish it, and to institute new Government.*
>
> *—Declaration of Independence, 1776*

This excerpt from the Declaration of Independence explains why so many Americans felt justified in separating from Great Britain. It also includes some of the most important philosophical ideas underlying our government. These ideas were familiar to most of the intellectual leaders in the American colonies long before the Revolutionary War. They had

Key words

pursuit of happiness: An "unalienable" right of people to pursue personal fulfillment in their own way, so long as they do not infringe on the rights of others

consent of the governed: Agreement by citizens to obey the laws and the government they create

Key words

divine right:
The idea prevalent in early modern Europe that monarchs derive their authority directly from God

been preached in churches, written in pamphlets, and debated in public and private. They had been developed and refined by political philosophers beginning in the 1600s, a century of revolution and civil war in Europe, in an attempt to repudiate the theory of **divine right** of kings. Divine right was the idea that monarchs derive their authority from God. Thus to disobey them or to attempt to replace them or limit their powers is contrary to the will of God. Contrary to divine right, the belief became prominent that self-government is required to lay the foundations for social peace and a just society.

What are some of the most important philosophical ideas in the Declaration of Independence?

Figure 5.2.6

The theory of government set forth in the second paragraph of the Declaration of Independence is from natural rights philosophy. This philosophy begins by imagining what life would be like in a state of nature. A state of nature is any situation in which there is no government—that is, no recognized authority to make and enforce rules and manage conflicts.

Thinking about what life would be like in a state of nature is a useful way to explore some of the most basic questions of political philosophy. Such questions include:

- What is human nature? That is, what traits of personality and character, if any, do all people have in common? Are people selfish? Do they have the capacity to care for the good of others?
- What should be the purposes of government?
- Where should people in positions of power get their authority to govern?
- How should a government be organized?
- What kinds of government should be respected and supported?
- What kinds of government should be resisted and fought?

Content Enhancement:

CRITICAL THINKING EXERCISE

Thinking like a Political Philosopher

Why do people need society and government? If society and government are necessary, what makes them legitimate? What makes them good?

To explore these questions, imagine that you and others have been taken to a place where no one has ever lived. When you arrive, there is no government. There are no laws or controls over how you live. Everyone is free—that is, no one is under an obligation to obey a constituted authority because there is none. You have no means of communicating with people in other parts of the world.

Discuss your responses to the following questions. Think about how your responses reflect your views as a political philosopher.

1. What would life be like if there were no government, rules, or controls? Would people in the situation described above have rights or duties? If so, how would those rights and duties be enforced?
2. What might happen if some people were stronger or smarter than others? Why?
3. What might weaker or less sophisticated people try to do? Why?
4. Why might people in the situation described above choose to trade some or all of their freedom to live in society or form a government?

What Values From Natural Rights Philosophy Influenced the Founding Generation?

The seventeenth century was a period of intellectual and social revolution in England. Classical republican theories about the purpose of society and government seemed unable to provide guidance in a century of rapid change. English philosophers, such as Thomas Hobbes (1588–1679) and John Locke (1632–1704), thought that political philosophy needed a fresh start, one that focused on the rights of individuals. They originated the way of thinking about human nature and politics that we know as natural rights philosophy. This philosophy argued that humans are not naturally social and traced government to an imaginary state of nature.

Hobbes argued that a state of nature gives rise to a "war of every man against every man," in which individuals fear violent death at the hands of others. Perpetual war in the state of nature would make life "solitary, poor, nasty, brutish, and short." The ensuing chaos would cause

Which of Hobbe's ideas do you find most interesting? Why?

Figure 5.2.7

humans to agree to leave the state of nature by entering into a social contract. Through that contract, Hobbes argued, they would consent to an authoritarian state that Hobbes called "Leviathan," named for a mythical sea monster mentioned in several passages in the Hebrew Bible (Old Testament). Thus to maintain order, stability, and peace, according to Hobbes, the Leviathan state must rule largely by fear.

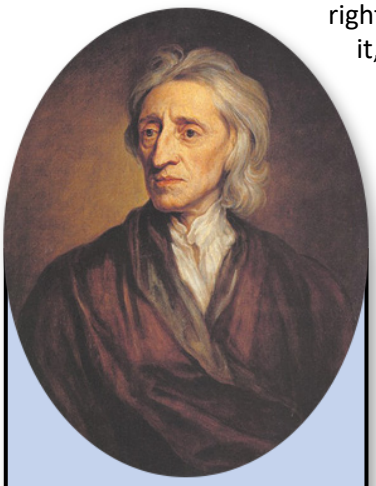
Why do you think Hobbes believed that an authoritarian state must rule largely by fear?

Figure 5.2.8

Locke argued that in a state of nature all people are free, equal, and rational. Each individual possesses **inalienable rights** to "life, liberty, and estate [property]." In a state of nature, each person also has the right to punish those who do not follow reason and respect the rights of others. People could not survive in the state of nature because most people would seek personal advantage. To secure their natural rights, people would agree through a "social contract" to leave the state of nature and form a civil society. To protect natural rights, a second agreement—to form government—also would be needed. Locke argued that if government fails to protect individual rights, then the people are entitled to replace it, if necessary by revolution. This idea became a key argument of the Declaration of Independence.

Key words

inalienable rights: Fundamental rights that every person possesses and that cannot be taken away by government or another entity



Which of Locke's ideas do you find most interesting? Why?

Figure 5.2.9

Natural rights philosophy found fertile ground in early America, where vast resources, huge expanses of land, and the great distance from England allowed freedom and materialism to flourish. Consequently, several aspects of natural rights philosophy influenced the founding generation, including the following:

INDIVIDUAL RIGHTS

Natural rights philosophy emphasizes the existence of inalienable rights of each person, regardless of wealth, social status, or birth. Americans in the founding generation were keenly aware of their rights. Before the Revolution they thought of themselves as British citizens who enjoyed the rights of subjects as those rights had evolved over the centuries in England. During the revolutionary crisis they came to think of their rights more in Lockean terms, as personal, inherent, and inalienable. As you will learn in more detail in later lessons, social conditions in America contributed to this shift in thinking.

POPULAR SOVEREIGNTY/GOVERNMENT BY CONSENT

According to natural rights philosophy, government is created and derives its authority from the agreement of the people, which is called **popular sovereignty**. If people must give their consent to be governed—by agreeing to a social contract or joining a society that already has been established—then it follows that they can withdraw that consent because sovereignty, or ultimate governing authority, rests with the people. Thus natural rights philosophy includes the **right of revolution** and the people's right to create whatever form of government they believe best suits their needs.

Does this cartoon illustrate Hobbes's or Locke's view of the state of nature? Why?

Figure 5.2.10

LIMITED GOVERNMENT

By focusing on the individual and on social contract theory as sources of **political legitimacy**, Locke and other writers laid the foundation for limited government. From this new perspective the purpose of government is to serve private ends, especially protection of individual life, liberty, and property. Those who exercise governmental power may not make and enforce laws on all subjects or focus on the needs of the community to the exclusion of individuals. Rather, their authority is limited by the purpose for which government is created. The distinction between society, which is formed by the social contract, and government, which is created to reflect the needs of society, further supports the idea that governmental power should be limited. Government is the creature and the creation of society. The sovereign people own their government and control it through elections and other means. Because it is theirs, they can terminate it when it does not guard their interests and meet their expectations.

HUMAN EQUALITY

Locke argued that in a state of nature all people are free from one another's control and are equal to one another. All are born with equal

Key words

popular sovereignty: The natural rights concept that ultimate political authority rests with the people

right of revolution: The right of the sovereign people of any democratic state or regime to depose a government after it has attacked citizens' basic rights for a significant period of time

political legitimacy: Acceptance by the governed that the claim to authority by those who govern is justified

political rights. Neither God nor nature makes some people rulers and other people subjects. In colonial America, more people enjoyed social mobility than they had possessed in Europe or England. Nonetheless, human inequalities persisted in the colonies. For example, slavery was introduced in Virginia in 1619, and by 1776 every colony legally sanctioned this institution. Women remained legally dependent on men and did not fully participate in political life. However, natural rights philosophy and its commitment to human equality ultimately would become a weapon in the attack on slavery and other inequalities in America.

Content Highlight:

WHAT DO YOU THINK?

Revisit your responses to the Thinking like a Political Philosopher Critical Thinking Exercise earlier in this lesson. How do your answers compare to the values of classical republicans and natural rights philosophers?

Conclusion

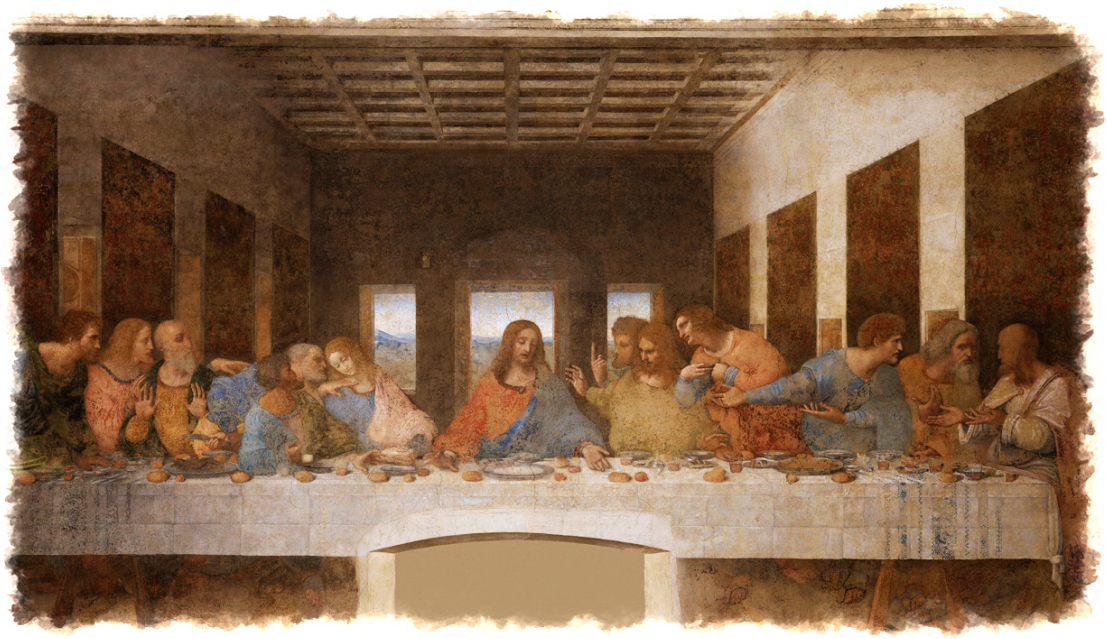
In this lesson, you learned some important ideas about civic life and the different philosophies that shaped the way our Founders viewed civic life. You also examined ideas such as the common good, civic virtue, the state of nature, natural rights, consent, and the social contract. These concepts and how people think about them continue to shape our society today.

Lesson Check-up

- **What is civic virtue? How is it fostered in small, uniform communities? In large, diverse communities?**
- **What are the advantages and disadvantages of using the state of nature to explain society and politics?**
- **How would you describe the differences between classical republicanism and natural rights philosophy? How are those differences important in thinking about the purposes and goals of government?**
- **What is meant by social contract? How is it connected to the idea that government derives its authority from the consent of the governed? What is the significance of the idea that society and government are based on agreements rather than occurring naturally?**
- **If you were asked to create a government that reflects principles of both classical republicanism and natural rights philosophy, which elements of each would you use? Why?**
- **What might be the consequences for individuals and society of too great an emphasis on the rights of individuals over the common good?**
- **Do Hobbes's ideas about the establishment of authoritarian states to promote order, security, and peace have any relevance today? Why or why not?**

LESSON 3

Influences on Individual Rights



Key words

- capitalism
- city-state
- feudalism
- Judeo-Christian
- nation-state
- private morality
- public morality

What You Will Learn to Do

Examine the historical developments that influenced modern ideas of individual rights

Linked Core Abilities

- Apply critical thinking techniques
- Build your capacity for life-long learning
- Communicate using verbal, non-verbal, visual, and written techniques
- Do your share as a good citizen in your school, community, country, and the world
- Take responsibility for your actions and choices
- Treat self and others with respect

Learning Objectives

- **Explain** the differences between classical republican and Judeo-Christian ideas about the importance of the individual

Essential Question

What historical developments influenced modern ideas of individual rights?

Learning Objectives (cont'd)

- **Explain** how certain historical developments influenced modern ideas about government, constitutionalism, and individual rights
- **Evaluate**, take, and defend positions on approaches to theories of morality, the importance of the rise of capitalism, and how the Enlightenment inspired the Founders
- **Define** key words: capitalism, city-state, feudalism, Judeo-Christian, nation-state, private morality, public morality

Introduction

The previous two lessons explored ideas that shaped the Founders' thinking about constitutional government and civic life. This lesson examines several important historical developments that also influenced their ideas.

How Did the Judeo-Christian Heritage Contribute to the Founders' Understanding of Human Rights?

Classical republican ideas and natural rights philosophy influenced the political ideas of the Founders. Another important influence on their thinking was the **Judeo-Christian** religious tradition. The Founders were familiar with the teachings of the Bible, but they also knew that differing religious beliefs had caused serious political conflicts.

Judeo-Christian morality was different from Greek and Roman ideals of civic virtue. Instead of **public morality** (the virtues that are important for acting in the community), it emphasized **private morality**, meaning the virtues of inner faith and obedience to God's law. These were expressed

Key words

Judeo-Christian: Ideas, beliefs, and practices that have their historical roots in Judaism and Christianity

public morality: The values and principles of right and wrong pertaining to public policies and actions

private morality: An individual's ideas about right and wrong to be practiced in one's personal life

in biblical teachings, such as the Ten Commandments and the Sermon on the Mount. Christian teachings gave special importance to duties such as goodwill and loving others.

The Christian view of the individual also differed from that of classical republicans. Christian teachings stressed the dignity and worth of each human being. Much of the Founders' commitment to liberty and individual rights sprang from their belief in such ideals.

Christianity spread rapidly through the Roman Empire in spite of the government's attempts to suppress it. Christians began receiving relief from persecution when the Roman Emperor Constantine (c. 272–337) came to power. Within a few years Christianity became the official religion of the Roman Empire. Even after the Roman Empire collapsed in the West near the end of the fifth century, the Christian faith survived to shape European society. In fact, the Roman Catholic Church—often referred to simply as the Church—became an extremely powerful political force during the Middle Ages (fifth century to early fifteenth century). Bishops, who were regional church officials, often were as powerful as the princes or barons in their territories. In some places, bishops held governmental power.

The Church was the one unifying social institution in Europe during the Middle Ages. Its spiritual leader was the pope, whose seat was the old imperial capital, Rome. Most Europeans identified with this "universal" Church in terms of religion, but political loyalties were local. People looked to local rulers for protection, and they trusted people more than institutions. There were no nations, in the modern sense, to compete for their loyalties.

How did Judeo-Christian ideas about the individual differ from the classical republican view?

Figure 5.3.1

How did Christianity become a powerful political force in Europe during the Middle Ages?

Figure 5.3.2

What Were European Concepts of the Individual and Society During the Middle Ages?

Apart from the unifying element of the Church, medieval European society was highly fragmented. Europe was divided into many isolated communities. Communication and travel were dangerous, slow, and difficult. People lived and worked within their own communities and typically had little contact with outsiders. The Church was the authority on all matters.

Why might people in the Middle Ages have looked to local rulers for protection rather than the church?

Figure 5.3.3

Government in the Middle Ages generally followed a hierarchical pattern known as **feudalism**. Feudalism was based on the principle of land for service. Those who lived on a lord's land were known as his vassals. They served their lord and in return were entitled to his protection. Feudalism created a political structure in which the feudal contract defined duties and rights. People were loyal to their lord, rather than to a country or to fellow citizens.

Even though Christianity accepted every believer as the equal of all others, certain medieval ideas about society and government were similar to those of classical republicanism. Medieval thinkers borrowed the classical idea of harmony between each individual and the whole of society, which they called Respublica Christiana—"Christian Republic." They also borrowed ideas from the Greek philosopher Plato (429–347 BC), who compared society to a human body. Plato suggested that some parts of society, like some parts of the human body, are more important than others; but all are necessary for the good of the whole.

- Society was divided into different classes and groups, such as royalty, nobility, clergy, tradesmen, craftsmen, peasants, and serfs. Each class or group had certain rights and responsibilities.
- Society was hierarchical—that is, classes and groups were ranked from the most powerful, royalty and nobility, at the top to the least powerful, serfs, at the bottom. No equality existed among groups and classes.
- Social relationships were thought to be permanent and hereditary. A person was generally not free to leave the class into which they had been born. Property—specifically real estate—could not be freely bought and sold. It could only be obtained or passed on through inheritance. Usually the eldest son was the principal heir. Inheriting property meant inheriting its responsibilities, such as service or protection.
- Rights and duties were tied to group membership or to particular grants of land. There was no concept of natural rights belonging to all individuals.

Key words

feudalism:
A system of social, economic, and political organization in Europe from the ninth to about the fifteenth century in which a politically weak monarch shared power with the nobility

Content Highlight:

WHAT DO YOU THINK?

1. How did Judeo-Christian morality differ from Greek and Roman ideals of civic virtue?
2. What are the advantages and disadvantages of viewing rights and responsibilities as being possessed by individuals rather than groups?
3. If the ideas about rights that prevailed during the Middle Ages were dominant today, how would they affect your life?

What Were the Renaissance and the Reformation, and How Did They Contribute to Ideas About Rights?

The term renaissance means "rebirth." The Renaissance is the name given to the period marked by a revival of intellectual life that began in Italy around the fourteenth century and spread throughout Europe. During this period cities developed, commerce began to flourish, and education started to become more widespread. The invention of the printing press using movable type in the fifteenth century increased communication and the spread of knowledge. Learned people rediscovered ancient Greek and Roman history, literature, and art, as well as medieval Arabic philosophy and mathematics. These discoveries inspired a view of the world and humanity very different from that of medieval Christianity.

During the Renaissance some people began to place greater importance on the individual than on the class or group into which they had been born. In the volatile **city-state**s of Renaissance Italy and later in northern Europe, people found that they could move from one social position to another. Growing possibilities for individual opportunity helped lead to an increased interest among philosophers and jurists in the rights of individuals. This interest contributed to a reexamination of the individual's relationship to religious institutions and governments.

Key words

city-state:
A politically independent community consisting of a city and its surrounding territory

The Protestant Reformation was another powerful stimulus to modern individualism. The Reformation was a religious reform movement that began in the early sixteenth century in Western Europe. Religious reformers, studying the Bible and other ancient religious texts, began to challenge the doctrines, traditions, and practices of the Roman Catholic Church. The reform-minded clerics believed that the medieval church had become corrupt and had lost sight of the original truths of Christianity.

How might the ability to read the Bible in one's own language have contributed to greater freedom of conscience and individualism?

Figure 5.3.4

Some of these critics attempted to reform the church from within. Other reformers, such as Martin Luther (1483–1546) in Germany and later John Calvin (1509–1564) in France, obtained official government support, or establishment, for their breakaway churches. These reformers and their followers were called Protestants. The term protestant is derived from the Latin protestatio, meaning "declaration," which Martin Luther made when he and his supporters dissented from an edict against the Reformation in the 1520s. The secular rulers who supported these new churches saw the Reformation as an opportunity to free themselves from the Catholic Church's political influence.

The Reformation was aided by the invention of a printing press with movable type, which allowed for more rapid and economical printing. For centuries the Bible had been available only in Latin, which few people other than priests could read. During the Reformation, Bibles were printed in English, German, French, Italian, and Spanish. Individuals were encouraged to read the Bible in their native language and to determine for themselves what it meant.

Being able to read the Bible for oneself encouraged greater freedom of conscience, or the freedom of individuals to decide about their own religious beliefs. Protestant religious doctrine emphasized a direct relationship between each believer and God. Luther argued for the "priesthood of all believers," which had the effect of decentralizing religious authority and empowering— and placing responsibility on—individual believers. All individuals were seen as equal in the eyes of God. Individuals were free to interpret the word of God, but God also was viewed as holding individuals accountable for their actions.

The spirit of free inquiry and individual conscience that the Reformation inspired contributed to the development of modern individualism. Ultimately it also posed a threat to most established institutions and authority. Some religious reformers, in fact, began to question the authority of the newly established Protestant churches. In England, for example, certain reformers attacked the Church of England during the Elizabethan period—principally the reign of Queen Elizabeth I from 1558 to 1603—for not being sufficiently Protestant. They were called Puritans, because they wanted to "purify" the church. Many American colonies were settled by people, including Puritans, seeking to worship in their own way, free from the requirements of established Protestant churches.

How might the freedom to believe as one wishes lead to dissent, individualism, and a desire to reform existing institutions?

Figure 5.3.5

How Did the Nation-State Arise?

By the end of the Middle Ages rulers were beginning to expand their areas of control and to form new and larger states. The Renaissance and the Reformation helped to speed up this process. But the changes were not easy. During the Reformation, Europe was torn apart by religious wars. In some places, one-third to one-half of the population was killed in this warfare. In 1648, the Peace of Westphalia ended the Thirty Years' War, which had been fought since 1618 mainly on ground that today is located in Germany. The conflict involved most of the continent's powers at one time or another and was one of the bloodiest conflicts that Europe had known. The Peace of Westphalia often is regarded as

Key words

nation-state:
As currently used, a country; the standard unit of political organization in the world

capitalism:
An economic system in which the means of producing and distributing goods are privately owned and operated for profit in competitive markets

marking the beginning of the modern system of **nation-state**s. This settlement recognized national sovereignty, the right of each nation-state to an independent existence. It also provided that each nation-state would respect the independence or sovereignty of the others. And it confirmed that nation-states could choose their own institutions, including religion.

The rise of the nation-state was important to the development of modern ideas about government and rights. People began to think of themselves as citizens of a particular nation or country, with public rights and duties. In addition to the nation-states there were many independent city-states that practiced self-government by a rising class of merchants, tradesmen, and nobles. This development was in contrast to the old feudal system, in which people's rights and duties were defined in personal terms. Political thought began to focus on the question of what kind of government would be best for these states.

How did the Peace of Westphalia of 1648 contribute to the development of nation-states?

Figure 5.3.6

What Was the New Economic System of Capitalism?

Among the forces that helped to break up medieval society and to pave the way for the Renaissance was the increase in commercial trade and its expansion over greater distances. Eventually this growth produced a new economic system called **capitalism**. Capitalism is an economic system in which the means of producing and distributing goods are privately owned and operated for profit in competitive markets. Unlike in feudal relationships, in capitalism goods and services are freely exchanged.

Capitalism allowed more people to choose their own occupations, to start their own businesses, and to buy and sell property. People also were able to pay more attention to their private interests than to the common good. They were encouraged to work to gain property and to improve their economic position. As a result, in parts of Europe political and economic power began to shift to a newly developing class of successful citizens who gained wealth through commerce and away from the upper classes that derived their wealth from the land.

Natural rights philosophy and Protestant religion both contributed to the rise of capitalism. Natural rights philosophers believed that government existed to secure people's property. Protestant religious groups, especially those in the tradition of John Calvin, saw wealth as a sign of God's grace.

Content Highlight:

WHAT DO YOU THINK?

1. You have learned that in some parts of Europe, political and economic power began to shift from wealthy, upper-class landowners to people who became wealthy from commerce; that is, from buying and selling goods and services.
    - What rights of individuals were necessary for this change to take place?
    - What impact might the right to property have on the establishment or exercise of other rights?
2. With the development of capitalism people began to view the individual differently than they had in the classical republics or during the Middle Ages. What was this different view and why did it come about?
3. How were the rise of the nation-state and capitalism related to individualism? What effect did these developments have on the common good?

Content Enhancement:

CRITICAL THINKING EXERCISE

Understanding the Effects of the Renaissance and the Reformation on Ideas About Rights

In previous lessons you studied the ideas of the natural rights philosophers concerning individual rights and the purpose of government. You also learned about classical republican ideas of civic virtue and the common good. Now working in small groups, consider what you have learned in this lesson about the Judeo-Christian tradition, the Middle Ages, the Renaissance, the Reformation, and the rise of the nation-state and capitalism.

1. Were any ideas prevalent during one of these periods with which people who believe in natural rights might not agree? What are these ideas? Why might some people disagree with them?
2. Do you think that ideas about the importance of the individual, individual rights, and the common good that emerged during these historical periods have influenced your thinking about the nature and purpose of government? If so, explain how.

How Did the Enlightenment Inspire the American Founders?

The worldly interests inspired by the Renaissance stimulated natural science—that is, the study of the natural world and the laws that govern it. Commercial expansion and voyages of discovery beyond Europe also encouraged this study. These voyages brought back new knowledge about the natural world and about other cultures.

Science and technology advanced rapidly. People began to believe that humans could solve many problems, such as how to treat diseases that once had been accepted simply

as misfortunes in life. By the eighteenth century this flourishing scientific and intellectual movement would become known as the Age of Enlightenment.

An important early figure in this movement was the English philosopher Francis Bacon (1561–1626). Bacon believed in the power of human reason and observation, not only to understand nature but also to control it for humanity's purposes. The end of scientific study, he said, is the "enlarging of the bounds of human empire, to the effecting of all things possible." His goal was to subdue nature for the benefit of humanity. Discoveries by scientists, such as astronomers Nicolaus Copernicus (1473–1543) from Poland, Galileo Galilei (1564–1642) from Italy, and Isaac Newton (1643–1727) from England, seemed to confirm Bacon's faith in people's ability to understand nature.

How did advances in scientific thought and reasoning reflected in the work of Francis Bacon and others influence people's ideas about human nature and government?

Figure 5.3.7

Benjamin Franklin was a major figure in the American Enlightenment. In what ways, if any, do you think an understanding of science might be useful in creating a government?

Figure 5.3.8

This belief in science and reason also influenced the study of human nature and government. Living in the midst of intense scientific research and discovery in seventeenth-century England, philosophers Thomas Hobbes and John Locke, introduced previously, embraced scientific reasoning. Locke himself was an inventive physician. And Hobbes visited French philosopher René Descartes (1596–1650)—often called the Father of Modern Mathematics and the Father of Modern Philosophy—in Paris and Galileo in Florence. Their ideas about the state of nature and the basis for government were founded on the notion that human behavior could be understood, predicted, and controlled.

What ideas from the Enlightenment are contained in the Declaration of Independence?

Figure 5.3.9

In the next century came Montesquieu (1689–1755), who was discussed in Lesson 1. This important Enlightenment political philosopher argued that the form of a society's government corresponds to the social, economic, and geographic conditions of that society. Therefore the best government for any nation is one tailored to the unique circumstances of that nation.

The American Founders belonged to the Age of Enlightenment. They believed that reason and observation, complemented by the study of history and writers such as Locke and Montesquieu, would enable them to understand the workings of governmental and social institutions. They thought that this understanding could generate what the Founders called the "new science of politics." This new science would help the Founders construct a government for the new United States.

Conclusion

Classical republicanism and Judeo-Christian philosopher had different ideas about the importance of the individual. In this lesson, you learned about how those ideas shaped modern individual rights. You also saw that historical developments, such as capitalism, contributed to the way societies thought about the individual.

Lesson Check-up

- **How would you describe the difference between the classical republican idea of civic virtue and Judeo-Christian ideas of morality?**
- **How did the Judeo-Christian heritage contribute to the Founders' understanding of human rights?**
- **What features of society in the Middle Ages contributed to the view that rights belonged to groups rather than to individuals?**
- **How did feudalism contribute to the idea that government is based on contractual relationships?**
- **What modern ideas about rights were developed during the Renaissance? How did the Reformation contribute to the development of these ideas?**
- **How did the rise of nation-states help to stimulate thinking about principles of government such as constitutionalism, individual rights, and republicanism?**
- **How did the development of capitalism encourage new thinking about the individual and society?**
- **Why was the invention of the printing press with movable type important in promoting the spirit of individualism?**

LESSON 4

British Origins of American Constitutionalism

Key words

- common law
- Magna Carta
- precedent
- redress of grievances
- rights of Englishmen
- rule of law
- stare decisis
- writ of habeas corpus

What You Will Learn to Do

Explore the differences between British and American constitutionalism

Linked Core Abilities

- Apply critical thinking techniques
- Build your capacity for life-long learning
- Communicate using verbal, non-verbal, visual, and written techniques
- Do your share as a good citizen in your school, community, country, and the world
- Take responsibility for your actions and choices
- Treat self and others with respect

Learning Objectives

- **Explain** how rights and representative government evolved in England and how this evolution influenced the Founders
- **Identify** the origins of some of Americans' most important constitutional rights