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HISTORY & GEOGRAPHY

STUDENT BOOK

9th Grade | Unit 9

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The Tools of the Geographer

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The Tools of the Geographer

Introduction

Geography is the science concerned with the study and description of the ways man adapts to conditions on the earth's surface. As a scientist, the geographer uses special tools to help him in his work. The geographer's tools include the globe, maps, graphs, charts, and a variety of other resource materials. The word *geography* comes from the Greek word *geographia*, which means *earth description.* The tools of the geographer, thus, help him to write about the earth. Geography is neither man-centered nor earth-centered; geography is God-centered. God created the world and has given man the ability to study it. Man's tools are merely "helps" in the exciting discovery of God's wonderful world. In the very beginning of time, God told man to subdue the earth (Genesis 1:28). To subdue or to conquer something, you must learn about it; to learn about something, you must have tools with which to explore it. The Christian studies geography to fulfill his Lord's command given in the garden of Eden. This LIFEPAC® will help you to learn about and to use effectively the geographer's tools..

Objectives

Read these objectives. The objectives tell you what you will be able to do when you have successfully completed this LIFEPAC. When you have finished this LIFEPAC, you should be able to:

1. Explain why the globe is the most accurate representation of the earth's surface.
2. Name the four hemispheres of the earth and the lines that divide them.
3. Explain the two uses of an analemma.
4. Measure distances on a map by using a scale of miles.
5. List the different kinds of maps.
6. Locate a position on a map using latitude and longitude.
7. State a purpose of graphs and charts.
8. List the different kinds of graphs.
9. Describe two qualities of an effective chart.
10. Identify three sources of geographic material found in a library.

Survey the LIFEPAC. Ask yourself some questions about this study and write your questions here.

1. THE EARTH IN MODEL FORM—THE GLOBE

Many classrooms are equipped with what appears to be a miniature world. Perhaps you have seen this miniature earth flattened into a map or describe statistically on a chart. The most realistic representation of our world is the globe. The globe is a marvelous invention, but it is only an invention. The globe is only a *model* of the real thing, the earth. As you study about the world, as represented by the globe, you will learn of the wisdom and power of a God who loved man enough to create a wonderful world for him. The globe helps to explain what happens in the world simply because the earth is spherical. As you consider the invention of the globe, you should understand the explanation for day and night, the explanation for the seasons of the year, the explanation for directional guidance, and the explanation for the forces, such as gravity, you feel acting upon you. How does the globe impress you? The appearance of the earth is breathtaking! As the United States astronauts were returning from the moon in 1969, they exclaimed they were overwhelmed with the sky blue sight of the rising earth. The appearance of the globe helps to explain the curvature of the earth, as well as its tilt, or inclination. Man has arbitrarily divided the globe into parts to help him navigate on the earth. Looking at a globe helps you to understand man's divisions of latitude lines, longitude lines, time belts, the International Date Line, and the **analemma**.

SECTION OBJECTIVES

Review these objectives. When you have completed this section, you should be able to:

1. Explain why the globe is the most accurate representation of the earth's surface.
2. Name the four hemispheres of the earth and the lines that divide them.
3. Explain the two uses of an analemma.

VOCABULARY

Study these words to enhance your learning success in this section.

analemma (an a˙ lem´ mȧ). A scale that is used to equate sun time and the location of the sun at noon on a given day.

arbitrary (är´ bu trer ē). Based on one's preference or whim.

axis (ak´ sis). A straight line about which an objects rotates.

distort (di stôrt´). To twist out of shape or misrepresent.

hemisphere (hem´ u sfir). Half of a sphere or globe; any of the halves (northern, southern, eastern, western) of the earth.

revolve (ri volv´). To move in an orbit.

rotate (rō´ tā t). To move or turn around, as a wheel.

sphere (sfir). Any round body; globe; ball.

Note: *All vocabulary words in this LIFEPAC appear in* **boldface** *print the first time they are used. If you are not sure of the meaning when you are reading, study the definitions given.*

Pronunciation Key: h**a**t, **ā**ge, c**ã**re, f**ä**r; l**e**t, **ē**qual, t**ė**rm; **i**t, **ī**ce; h**o**t, **ō**pen, **ô**rder; **oi**l; **ou**t; c**u**p, p**u̇**t, r**ü**le; **ch**ild; lo**ng**; **th**in; /*ŦH*/ for **th**en; /*zh*/ for mea**s**ure; /*u*/ represents /*a*/ in **a**bout, /*e*/ in tak**e**n, /*i*/ in penc**i**l, /*o*/ in lem**o**n, and /*u*/ in circ**u**s.

THE INVENTION OF THE GLOBE

The globe is an accurate representation of the world. In fact, the globe is more accurate than any other representation of the earth. The globe helps us to visualize what the world actually looks like. The globe can be used as a valuable guide for travel. The world that the globe represents exerts an influence in the way everyone lives. Certain events occur at certain times in certain ways because man lives on a circular surface. The invention of the globe has been a valuable tool for the geographer.

A picture of the earth today. Pretend to take a trip around the world. If you began walking to the west in a straight line and walked as far as you could go, would you ever arrive back where you started? What would happen if you started walking to the east in a straight line? To make such a trip on foot is impossible, but you can take such a trip on a globe. Put your finger on the globe, spin the globe to the east or west, and see whether your finger arrives where it began. The original location will return under your fingertip because of the circular shape of the earth. The globe represents the circular shape of the earth.

The earth can also be represented on flat maps but not as accurately as on a globe. Flat maps **distort** the true picture of the earth because the earth is a **sphere**; it is not flat. Distances, areas, and directions of round objects are often distorted when they are represented on flat surfaces. An orange can give you a good idea about the difficulties of representing a round object in a flat manner. Suppose that you were able to remove the insides of an orange without disturbing the outer peel. You would then have an object that looked like an orange but with nothing inside. Now suppose you wanted to glue that orange peel to a poster to show your classmates something about oranges. You want to expose every inch of that outer peel on a flat piece of paper. If you flattened the peel, would your end result look like an orange? Perhaps you can understand the difficulty of representing the spherical earth on a flat map. The globe is the most accurate model of the earth's surface.

Because the globe gives a true picture of the location of land and water, it can be used to explain a variety of events that occur on earth. Many years ago the sun was assumed to have **revolved** around the earth. We know now that the earth revolves around the sun. We also know that the earth is tilted on its **axis**. This tilt causes the seasons on our planet. When the northern part of the world is tilted toward the sun, it receives more hours of sunlight and grows warmer, creating summer. Six months later, the northern hemisphere is pointing away from the sun, receiving fewer hours of sunlight, and causing winter. (The seasons are opposite each other in the northern and southern halves of the globe).

The earth **rotates** on its axis once every twenty-four hours. When your home is on the side of earth away from the sun, your area will be dark. When your home is toward the sun, your home will be in the daylight hours. The earth takes 365¼ of these twenty-four hour days to make one trip around the sun.

The Greeks were the first to use the globe. More than sixteen hundred years before the time of Columbus, scientists were certain that the earth was round rather than flat. These Greek scientists reproduced the earth in the form of a globe in approximately 150 BC Of course, much of their work was guesswork. They assumed the existence of many of the countries around the Mediterranean Sea. They believed that the globe had to be balanced; and this belief, ironically, led to their prediction of the existence of the Americas and of Australia.

Although many different types of globes exist, the most common is the political globe. This globe shows the countries of the earth and uses a color scheme to show the various depths of the oceans and heights of the land.

Answer true or false.

1.1 ______________ The globe represents the spherical shape of the earth.

1.2 ______________ The earth's shape is not distorted by a flat map.

1.3 ______________ The globe is not the most accurate representation of the earth's surface.

1.4 ______________ The earth takes 365¼ days to make one trip around the sun.

1.5 ______________ The earth rotates once every twenty-four hours.

Complete these statements.

1.6 The first people to use the globe to represent the earth were the __________________________ .

1.7 The globe was first produced in the year __________________________ .

1.8 The early globe predicted the existence of two great continents, a. __________________________ and b. __________________________ .

1.9 The most common type of globe is the __________________________ globe.

1.10 Depths of oceans and heights of land are represented on certain globes by the use of __________________________ .

A guide in travel. Most people travel only short distances and, thus, use only a flat map to plan their trip. Although all of the earth's surface is curved, it appears to be flat when we travel only a short distance. When we desire to travel great distances, such as halfway around the world, the globe becomes a better guide for travel than a map. When curved surfaces are represented on flat surfaces, distances are distorted. An example of such distortion occurs when traveling from the continental United States to Hawaii, the fiftieth state. Only two methods of travel to Hawaii are available, by air and by water. To get a true picture of how to get there, the globe would give the most accurate information. Although both a flat map and a globe reveal where Hawaii is located, only a globe does not distort the distance involved.

A knowledge of the globe helps us in our day to day travels. If you travel toward the east in the early morning hours, you will have difficulty seeing because the sun rises in the east. We often talk about the sun rising, but the sun does not really move. The movement of the earth causes differences to exist in the sun's position making it appear to rise.

People who are involved with global travel, such as pilots and navigators, must be well acquainted with the round shape of the earth. A flight from New York to London could become a very long one if routes were planned using a flat map instead of the globe. To plan the shortest trip using a flat map, the plane would leave New York, cross the Atlantic Ocean just south of Newfoundland, and arrive in London. Using the globe to plan the flight, the plane leaves New York, flies directly over Newfoundland, and arrives in London. Which flight is shortest? Although the flat map appears to indicate otherwise, the flight directly over

Newfoundland is really shorter. You can see the route differences by stretching a piece of string from New York to London. The string must be curved to the south to follow this route. You will find that you need to use more string when following a path that bypasses Newfoundland. The globe is a valuable aid in understanding world travel.

Write the letter for the correct answer.

1.11 When traveling a short distance, most people use only a ____________ to plan their trip.
a. globe   b. light   c. map   d. color scheme

1.12 When curved surfaces are represented on flat surfaces, distances are ____________ .
a. forgotten   b. distorted   c. estimated   d. used

1.13 The sun always rises in the ____________ .
a. north   b. south   c. west   d. east

1.14 Understanding world travel is greatly aided by the ____________ .
a. globe   b. map   c. sun   d. plane

A force in everyday life. Simply knowing that we live on a large globe helps us to understand why things happen as they do on earth. We make adjustments almost unconsciously for living on a circular surface. Have you ever wondered why grapes are more often planted in north-south rows than in east-west rows? Have you ever wondered why poultry houses generally face south in the United States? Have you ever wondered why rooms that face north in an apartment house in Buenos Aires, are more desirable to tenants? Have you ever wondered why students wear white arm bands as safety precautions in Anchorage, Alaska, when going to and from school in the dark? All of these accommodations are made by people living in various places around the world because of the global nature of the earth. Can you find anything that is done in a certain way in your community simply because you live in a special place on the earth's surface? You may have to think carefully and to look diligently because we do so many things without thinking about them. Just ask yourself, "Would we be doing things any differently if we lived on an entirely flat world?"

Answer these questions.

1.15 How many sides would a flat world have? ______________________________

1.16 What are some changes that a flat world would make? ______________________________

____

____

THE IMPRESSION OF THE GLOBE

The globe is a model of the earth. When you examine a globe, you may discover that it was not as round as you thought. You may discover that the model does not stand as erect as you thought, but is, instead, tilted as it revolves and rotates. Rather than studying the model as a whole, you may decide to break the model into halves to learn more about it. Finally, you may want to learn how you could represent the model to someone else who is not able to view the model.

The shape of the earth. The earth is a huge sphere, having more water surface than land surface. At the top of the globe in the northernmost position is the North Pole; it is on water. At the bottom of the globe in the southernmost position is the South Pole; it is on land. Contrary to appearances, the earth is not perfectly round. Pictures from the orbiting Vanguard satellite showed that the earth is not a round sphere slightly flattened at the poles. Instead, the Vanguard showed that the earth is pear-shaped. The earth bulges almost fifty feet in depth at the South Pole. The earth is, therefore, a slightly pear-shaped sphere. However, these variations are so slight as to be almost unnoticeable. The variations are only fifty feet each over a north-south diameter of the earth of about seven thousand, nine hundred miles!

Write true or false.

1.17 ______________ The globe is not a model of the earth.

1.18 ______________ The earth has more land surface than water surface.

1.19 ______________ The North Pole in on water.

1.20 ______________ The earth is slightly pear-shaped.

1.21 ______________ The South Pole is on water.

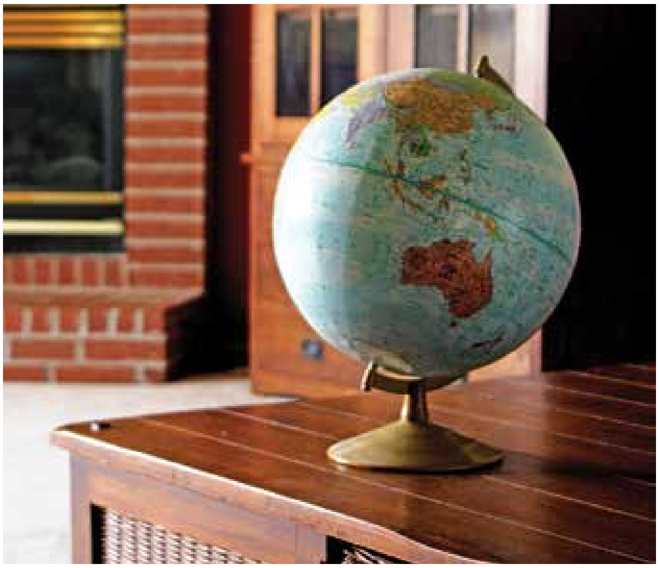
1.22 ______________ The Vanguard is an orbiting satellite of the earth.

1.23 ______________ The earth is flattened at both poles.

1.24 ______________ The north-south diameter of the earth measures only 7,900 feet.

1.25 ______________ The earth has never been photographed from outer space.

The position of the earth. Perhaps you have noticed that a globe is never straight up and down, but is always in a tilted, or slanted, position. The **axis** of the earth is also tilted in the same position and always points toward the north. If the earth did not tilt on its axis, the days and nights would be equally long throughout the year everywhere on the earth. This condition would change some of the ways in which we live. Tilting and rotation of the earth (spinning on its axis, always from west to east) determine the different amounts of daylight present in various areas of the world. Tilting and revolution of the earth (orbiting around the sun) determine the seasonal changes that occur in the world.



Follow these directions and answer this question. Put a check in the box when each step is completed.

☐ Make three columns on a sheet of paper, and head the columns "Date," "Time of Sunrise," and "Time of Sunset."

☐ Determine how many hours of sunshine your city enjoys each day by finding the difference between the time of sunrise and the time of sunset. The hours of sunrise and sunset should be listed in your daily paper.

☐ Find a weekly average of the number of sunshine hours by totaling the number of daylight hours in a week and then dividing by the number of days in the week.

☐ Maintain your record for four weeks.

1.26 Did the average number of daylight hours per week increase or decrease over the four-week period? ____

____

Complete these statements.

1.27 The earth always rotates from a. ________________ to b. ________________ .

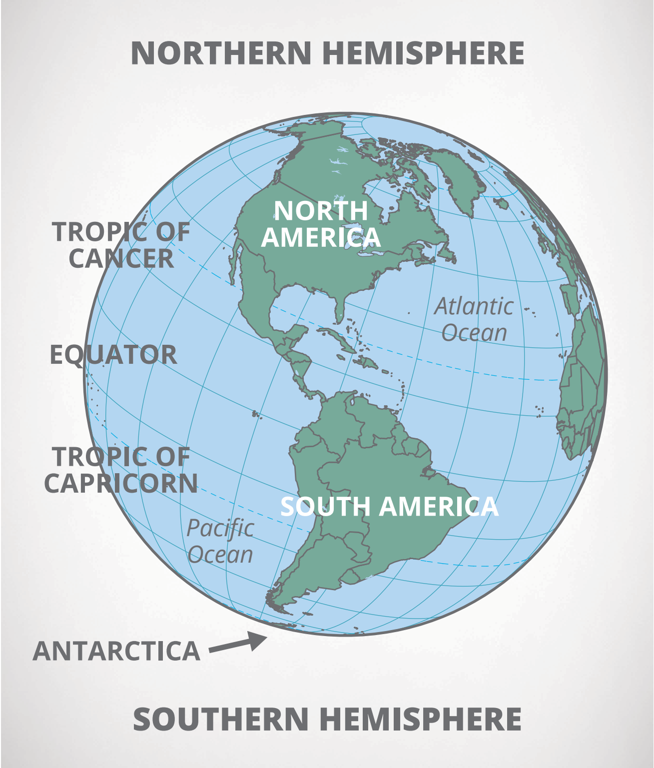
1.28 When the earth rotates, it spins on its ________________ .

1.29 The earth revolves by orbiting around the ________________ .

1.30 Seasonal changes are determined by a. ________________ and b. ________________ .

The halves of the earth. Man has drawn an imaginary line around the earth that divides it into two equal parts—a northern part and a southern part. This imaginary line is the equator. The equator is midway between the North Pole and the South Pole. Each half of the earth is a **hemisphere**. The earth is divided into four hemispheres—northern, southern, western, and eastern. The equator divides the Northern Hemisphere from the Southern Hemisphere, and another imaginary line runs from pole to pole and divides the Western Hemisphere from the Eastern Hemisphere. Because the earth is one sphere, to divide it equally produces two half-spheres, or hemispheres.

What is life like in the Northern Hemisphere, the Southern Hemisphere, or on the equator? For lands near the equator the sun is almost directly overhead at noon, and days and nights are nearly equal in length. As you move from the equator into the Northern Hemisphere between the Tropic of Cancer and the Arctic Circle, the noontime sun appears in the southern sky. In the Northern Hemisphere a definite difference exists between the winter and the summer seasons. The summer occurs in June, July, and August. As you move from the equator into the Southern Hemisphere, the noontime sun appears in the northern sky. In this area between the Tropic of Capricorn and the Antarctic Circle, a winter and a summer season



also occur. However, summer in the Southern Hemisphere occurs during December, January, and February. Although great differences exist between the Northern Hemisphere and the Southern Hemisphere, some similarities also exist. Because the equator receives the sun's rays most directly, it tends to be extremely warm. When you travel away from the area surrounding the equator, whether north or south, you will find cooler regions.

Write the letter of the correct answer in the blank.

1.31 The line that divides the earth into a Northern Hemisphere and a Southern Hemisphere is the ______________ .
a. equator b. circle c. midway d. half-line

1.32 The earth has ______________ hemispheres.
a. 2 b. 0 c. 4 d. 3

1.33 The line dividing the earth in half is ______________ .
a. real b. imaginary c. thick d. blue

1.34 Another term for half-sphere is ______________ .
a. equator b. midway c. pole d. hemisphere

1.35 The Northern Hemisphere and the Southern Hemisphere are ______________ in size.
a. unequal b. equal c. gaining d. decreasing

Write true or false.

1.36 ______________ The sun is nearly directly overhead at noon at the equator.

1.37 ______________ No similarities exist between the Northern Hemisphere and the Southern Hemisphere.

1.38 ______________ Summer in the Southern Hemisphere occurs in December, January and February.

1.39 ______________ The Tropic of Capricorn is in the Southern Hemisphere.

1.40 ______________ No summer season occurs in the Northern Hemisphere.

1.41 ______________ Days and nights are of equal length at the equator.

1.42 ______________ The Tropic of Cancer is in the Northern Hemisphere.

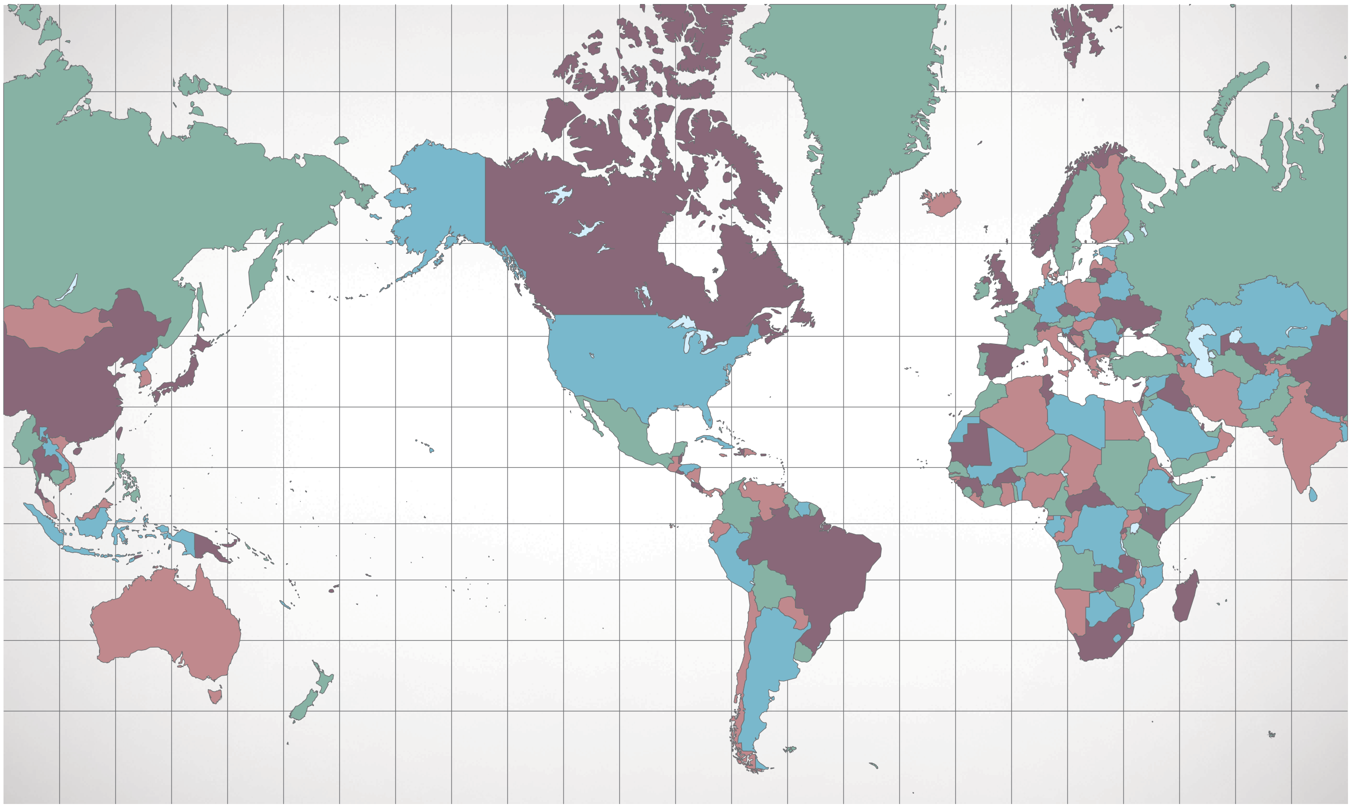
1.43 ______________ The Antarctic Circle is in the Northern Hemisphere.

1.44 ______________ The Arctic Circle is in the Southern Hemisphere.

The representation of the earth. The globe is the best and most accurate representation of the surface of the earth. Sometimes all of the earth must be represented on the flat surface of a map. Whenever the earth's curved surface is represented on a flat map, distortion occurs. The map may distort true directions, distances, or sizes of land masses. Attempting to correct one type of distortion only creates another. Map projections of the earth's surface are used to fulfill an intended purpose of the map and not to accurately represent the earth in every detail. A projection is a method that transfers portions of the globe to a flat map.

One of the most common maps of the earth's surface is the Mercator projection. This projection shows the surface of the earth on a rectangular map. This map is useful because a line drawn between any two points shows the correct compass direction between the points. Navigators find this feature especially helpful. The greatest disadvantage of this projection is that areas far from the equator are badly distorted and appear much larger than they actually are.

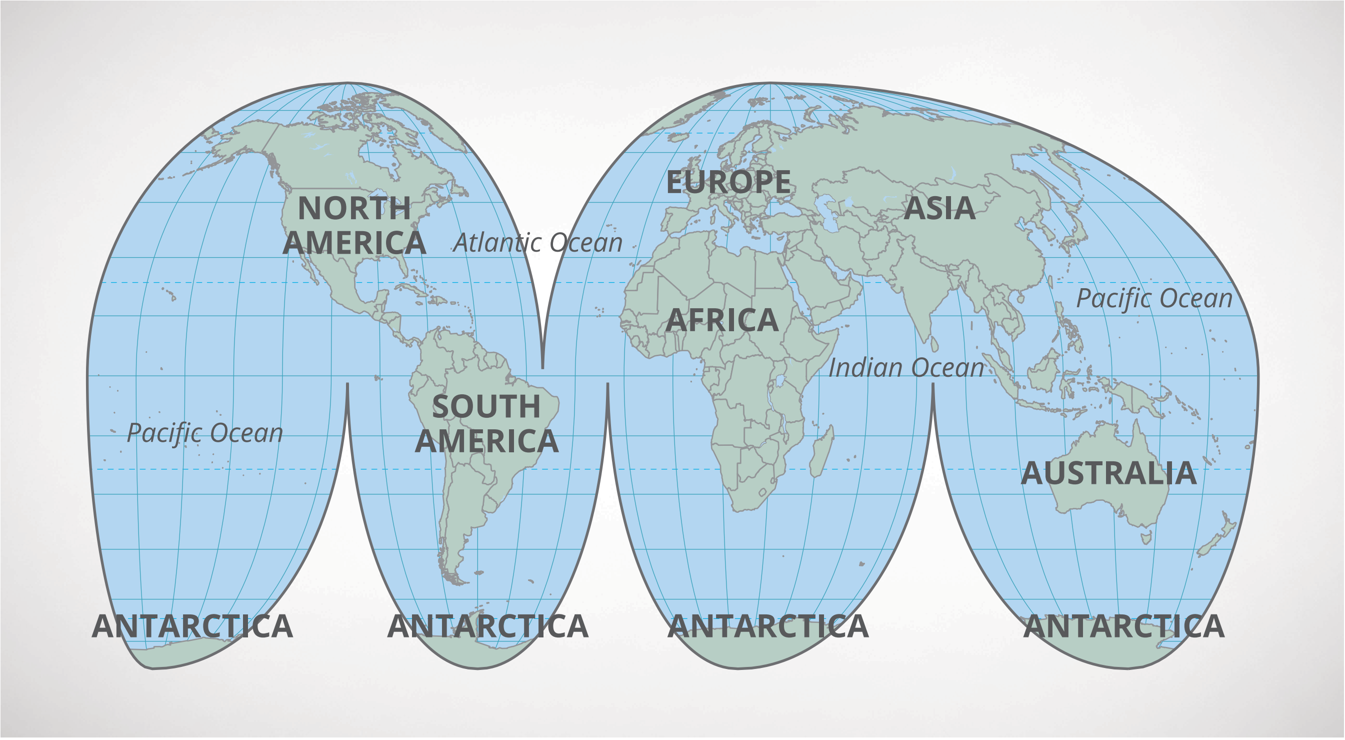
An important tool for calculating the distance from one point on the earth's surface to another by air is the azimuthal equidistant projection map. When the North Pole or the South Pole is placed at the center of this map, it is then referred to as a polar projection. Sometimes this projection is called an "air-age map." Any point of the earth's surface can be chosen as the center of this map. Air distances are calculated by measuring the distance from the center of the map to any other point on the map. Lands close to the center of this projection are shown in true size and shape. Air routes use this type of map because routes are indicated more accurately than on other maps. As with other maps, distortion is also this map's greatest disadvantage. The size and shape of land masses becomes more distorted the farther they are located from the center of focus.



| Mercator Projection

The azimuthal equidistant projection has been greatly used by jet-age navigators. A straight line connecting the center of the map with any other point becomes part of a great-circle route around the world. The straight line will give the exact distance to that point. A great-circle route is the shortest and most direct route between any two points on the earth's surface. The drawing of a great-circle route divides the earth into two equal parts. The equator is an example of a great circle around the earth. Great-circle routes have been used by ships for many years, but airplanes make more extensive use of the routes. Unlike ships, planes can fly over any of earth's obstacles, thus following the great circle. However, current political boundaries may prevent planes from taking the shortest possible route. Air rights are required to fly over certain foreign countries and are sometimes difficult to obtain. A great-circle route can be seen by taking a string and stretching it around the globe. The string divides the globe into two equal parts. If the string were uniformly marked, it could be used to show mileages between points along a great-circle route.

| AZIMUTHAL EQUIDISTANT PROJECTION



| INTERRUPTED-AREA PROJECTION

Another important projection of the earth is the interrupted-area projection. To prevent distortion of the continents, blank areas are inserted in the map. These interruptions in the map are usually made in the water surface of the earth. This type or map allows areas to be studied with little distortion. This projection is also useful for showing characteristics of regions. Such characteristics could include natural resources, population, and distributions.

Complete these statements.

1.45 When the earth's curved surface is represented on a flat surface, such as a map, ______________________________ occurs.

1.46 A method that transfers portions of the globe to a flat map is a ______________________ .

1.47 The map that shows the earth's surface on a rectangular presentation is the _____________ ________________ projection.

1.48 A map helpful in charting great-circle routes is the ______________________________ .

1.49 An example of a great circle around the earth is the ______________________________ .

1.50 A great circle divides the earth into ______________________________ equal parts.

1.51 A map that prevents the distortion of continents by inserting interruptions is the ____________________________________ .

Write the letter of the correct answer in the blank.

1.52 Attempting to correct one distortion on a map serves to ___________ another.
a. solve b. hide c. destroy d. create

1.53 Great-circle routes have been used by ___________ for years.
a. ships b. camel trains c. kites d. trains

1.54 To fly over some foreign countries, ___________ are required.
a. passports b. credit references c. air rights d. visas

Complete this activity.

1.55 Using a globe and a piece of string, locate the great circle that goes through your city and Addis Abba, Ethiopia. Write the names of two other cities located on that great circle but not located in the United States.

TEACHER CHECK __________ initials __________ date

THE INSTRUCTION OF THE GLOBE

The study of the globe is a lifelong process; you will never finish learning about the globe. You can be instructed about certain aspects of the globe and then begin to build upon these fundamental concepts. One important skill to learn is the use of latitude and longitude to locate a certain position on the globe. The two lines are the only means available to communicate an exact position on the earth's surface. To more fully understand the world in which we live, we must become aware of time belts that span the globe and of the International Date Line.

The world is rapidly becoming a smaller place in which to live. Jet travel allows us to step from one continent to another in the afternoon. Space travelers orbiting the earth can see every country in the world in about the same amount of time that most of us take to eat lunch. Unless we are aware of what is involved in becoming a world traveler, we shall never be at home on our own planet. Did you know, for instance, that in the course of world travels you could live the same day twice? Did you know that you could skip an entire day while traveling, never living one moment of it?

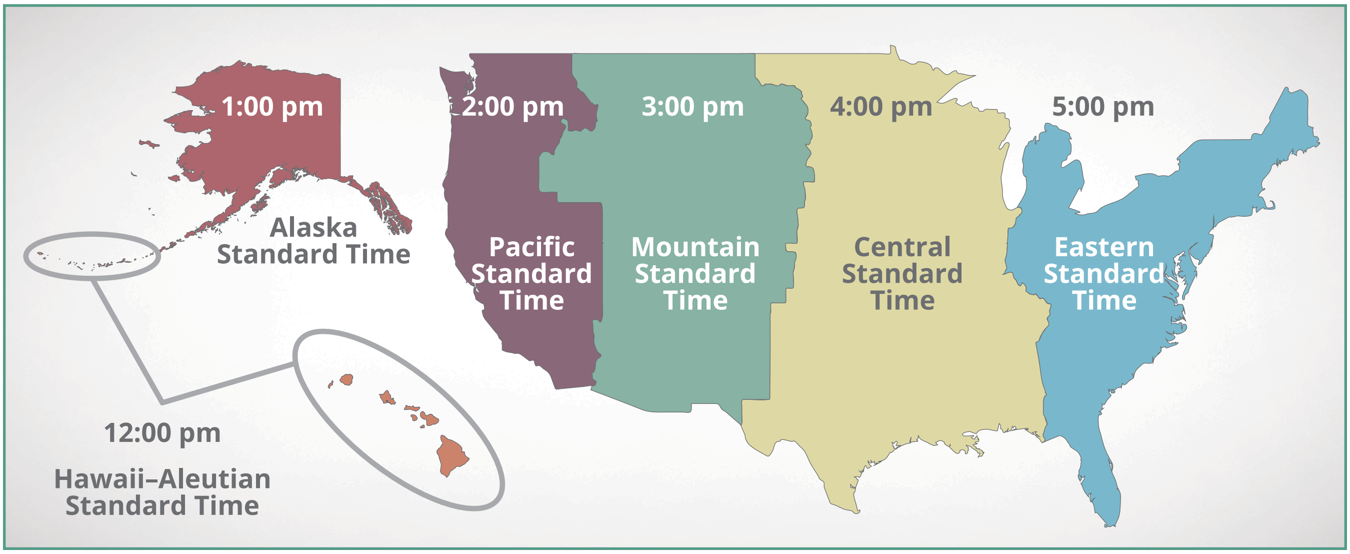
The globe is a unit of instruction all by itself. You can become skillful in the use of the globe by learning to read and use the symbols printed on it. One such helpful tool is the analemma, found on every physical-political classroom globe. Let the globe become your guide to learning more about the wonderful world in which we live.

Latitude and longitude. You can locate any point on the earth's surface by the use of lines of latitude and longitude. The earth was **arbitrarily** divided by man with these lines just as a city is divided by streets and avenues.

Latitude lines are sometimes called parallels because they are parallel to the equator and to each other. Longitude lines are often referred

to as meridians. Lines of longitude extend from the North Pole to the South Pole, and they meet as they approach the poles. Because lines of latitude run the same way as the equator, they are measured in degrees north or south of the equator. The equator is 0 (zero) degrees latitude, and both poles are 90 degrees. Longitude lines are measured in degrees in terms of being east or west of the prime meridian. The prime meridian is the first meridian that was arbitrarily established by man. Scientists determined that the first, or prime, meridian would pass through Greenwich, England. Greenwich is, therefore, listed as 0 degrees longitude.

Any feature or location on the earth's surface can easily be described in terms of latitude and longitude. Lines of latitude allow the location to be described as being either north or south of the equator, and lines of longitude reveal how far east or west the location is from the prime meridian.



| TIME BELTS IN THE UNITED STATES

Time belts. Before 1883 the United States and Canada used fifty-three different time systems. With the invention of more rapid means of travel, such as the train, something had to be done to make time systems more uniform. The United States was divided into four time zones, and Canada was divided into five zones. The entire earth is divided into twenty-four time belts, or zones. Each zone is 15 degrees of longitude wide. (A circle contains 360 degrees; 360 degrees divided by twenty-four time belts equals 15 degrees for each belt.)

The time changes by one hour each 15 degrees of longitude you travel to the east or to the west. To avoid splitting cities or states into two time belts, the boundaries of the time zones were made slightly irregular. Therefore, the time in the time belt just west of where you are now, is always an hour earlier, and the time in the time belt to the east is an hour later. The United States used to have only four time zones; but, with the admission of Alaska and Hawaii, the United States now extends through six time zones. Those six zones include *Eastern, Central, Mountain, Pacific, Alaska,* and *Hawaii-Aleutian*. A five-hour difference exists between the easternmost city in the United States (Eastern Standard Time) and the west-ernmost city in the United States (Hawaii-Aleutian Time).

Complete these statements.

1.56 Before 1883 the United States and Canada had ________________ time belts.

1.57 Each time zone around the world is ____________________ degrees of longitude wide.

1.58 The United States extends through _____________________ time belts.

1.59 You can locate any point on the earth's surface by the use of lines of

a. ______________________________ and b. ___________________________ .

1.60 Before the admission of Alaska and Hawaii, the United States extended through

________________ time zones.

International Date Line. The earth is divided into twenty-four time zones, each zone one hour different from the zone on either side of it. As the time zones spread to the east and the west away from the Prime Meridian, they meet exactly halfway around the world at the 180th meridian (180 degrees east or west longitude). This line where the time belts meet is the International Date Line. By crossing the International Date Line to the west you gain, or add, one day (all twenty-four time zones). By crossing the International Date Line to the east you lose, or subtract, one day (all twenty-four time zones). When the time is noon on Saturday of June 1 on the east side of the International Date Line, the time is noon on Sunday of June 2 on the west side of the line. Suppose you were on a ship that left the West Coast of the United States, heading for the Orient. You are traveling straight west and the date is Friday, May 31. You can hardly wait until tomorrow because your birthday is June 1. During the night while you are sleeping, the ship crosses the International Date Line. When you awaken in the morning, you discover that the date is now Sunday, June 2! The day Saturday, your birthday, was skipped, or lost. On your return trip to the United States, you will gain back the day you lost. The International Date Line does not follow exactly the 180th meridian. By agreement the line has been made somewhat irregular to help cities and countries through which the 180th meridian passes. Much confusion would result from having two separate dates existing at the same time on one island! For this reason the International Date Line has been moved to the east or west of places to avoid dividing communities into two different days.

| International Date Line

Write true or false.

1.61 ______________ The earth is divided into twenty-four time zones.

1.62 ______________ Each time zone is two hours wide.

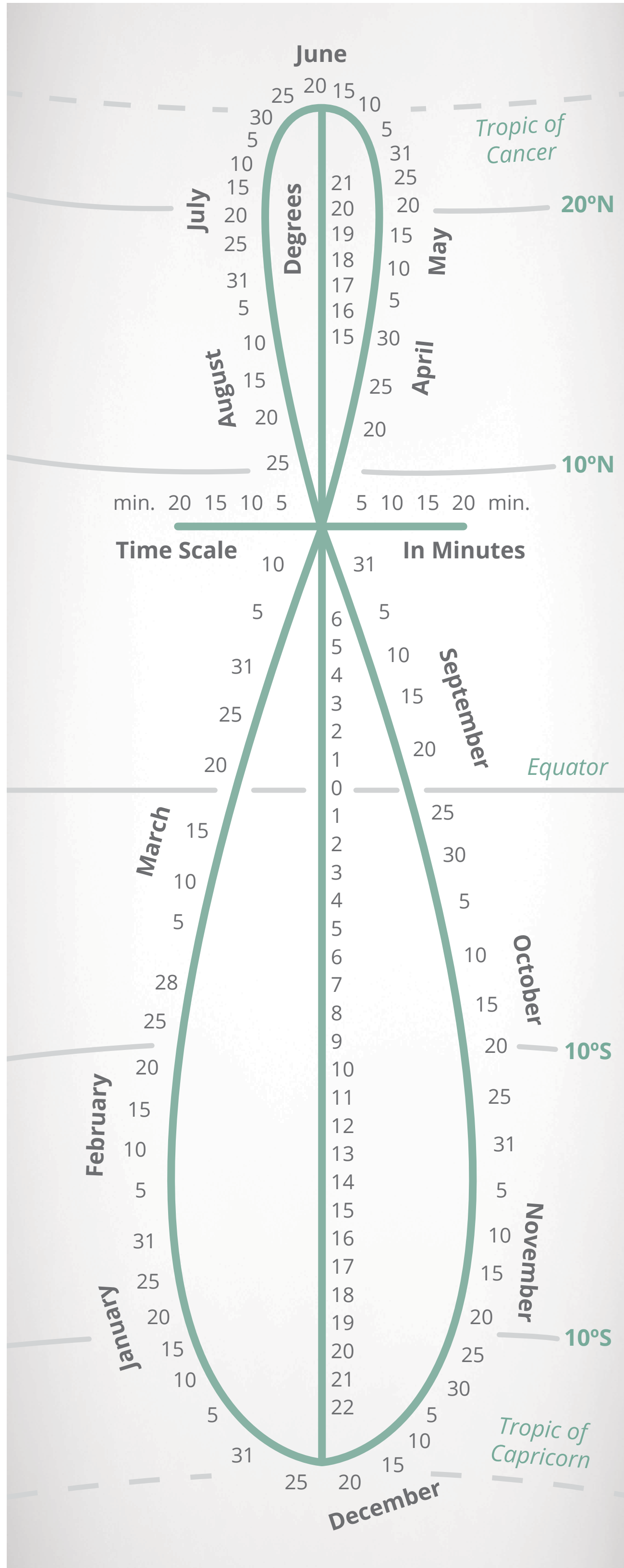
1.63 ______________ You lose a day when you cross the International Date Line traveling west.

1.64 ______________ The International Date Line follows exactly the 180th meridian.

The analemma. When studying the globe, perhaps you have noticed the device that looks like a figure eight in the east central Pacific Ocean. It is called the analemma, meaning *sundial*. It is a very precise instrument that shows two facts. One, it shows the latitude at which the sun will be directly overhead at noon on specific dates. Two, it shows the difference between man's clock time and sun time. This difference is called the equation of time.

Between the Tropic of Cancer and the Tropic of Capricorn, the sun's rays shine directly down at noon on any particular spot during two days of the year. The analemma helps you to determine what those two days are for any latitude between the Tropic of Cancer and the Tropic of Capricorn. If you want to find those two days for a particular location, follow the location's parallel to the analemma. Where the parallel intersects, the analemma gives those dates when the sun's rays will be directly overhead. For example, on February 10th the sun will be overhead at 14° south latitude.

The scale in the center of the analemma is used to compute the difference between sun time and clock time. A solar day is measured from the sun noon of one day to the sun noon of another day. If we measured our days by solar day measurement, very few days would be of the same length. Man measures his days by clock time so that all the days are uniform in length. The analemma can help you to find the difference on any given day between these two means of measuring time. First, find the day you are interested in on the analemma. With a piece of paper, measure the distance from the day perpendicular to the axis running through the center of the analemma. After marking these points, lay them on the time scale that crosses the analemma. Counting the minutes between the two points will reveal the difference in minutes between the solar time and the clock time. For example, on the fifth of July the sun time will be approximately 5 minutes off of clock time. The clock is slow if the date falls to



| The Analemma

the right of the axis. The clock is fast if the date falls to the left of the axis.

God has promised (Revelation 21:1) that He would provide "...a new heaven and a new earth...." As Christians we are excited about the future, for we know that God is in control of everything. Someday even time as we know it will pass away, and we shall experience the reality of 2 Peter 3:8, "...One day is with the Lord as a thousand years, and a thousand years as one day." We must be faithful to be instructed in His world of today so that we shall be able to praise Him during all eternity for the wonderful world He created. Our praise will then be multiplied as our Father in heaven continues to make great things even greater!

Answer these questions.

1.65 What two things does the analemma show?

a. ____

____

b. ____

____

1.66 What is the difference between sun time and clock time for March 26? ______________________

____

1.67 Is the clock fast or slow for March 26? ______________________________

TEACHER CHECK ____________ initials ____________ date

Review the material in this section in preparation for the Self Test. The Self Test will check your mastery of this particular section. The items missed on this Self Test will indicate specific areas where restudy is needed for mastery.

SELF TEST 1

Complete these statements (each answer, 3 points).

1.01 The earth rotates once every ____________________ .

1.02 The most accurate representation of the earth's surface is the ________________ .

1.03 The first people to use the globe were the ___________________ .

1.04 The four hemispheres of earth are the a. __________________ , b. _______________ , c. ___________________ , and d. ___________________ .

1.05 The earth always rotates from a. ___________________ to b. ____________________ .

1.06 Three types of global maps are the a. ___________________ , b. ________________ , and c. ____________________ .

1.07 Two lines that help locate any position on the earth's surface are a. ___________________ and b. ___________________ .

1.08 The original four time zones of the United States, from east to west are a. ___________________ , b. ___________________ , c. ___________________ , and d. ___________________ .

Match these items (each answer, 2 points).

1.09	_______	axis	a.	orbit
1.010	_______	hemisphere	b.	distort
1.011	_______	equator	c.	great circle
1.012	_______	revolution	d.	rotate
1.013	_______	180th meridian	e.	half of earth
1.014	_______	analemma	f.	International Date Line
1.015	_______	prime	g.	globe
1.016	_______	sphere	h.	sun time
1.017	_______	map	i.	0 degrees
1.018	_______	Vanguard	j.	distract
			k.	satellite

Write true or false (each answer, 1 point).

1.019 ____________ The earth is not straight but tilted.

1.020 ____________ The equator is a real, not an imaginary line.

1.021 ____________ Great-circle routes are no longer used for travel.

1.022 ____________ A time belt, or zone, is 15 degrees of longitude wide.

1.023 ____________ The earth is divided into thirty-three time zones.

1.024 ____________ The International Date Line is not longer used.

1.025 ____________ The analemma is used to determine how far a country is located from the equator.

Write the letter for the correct answer (each answer, 2 points).

1.026 The north-south diameter of the earth is ____________________ .
a. 9,700 miles b. 7,900 miles c. 180 miles d. 360 degrees

1.027 Tilting and revolution determine the earth's ____________________ .
a. meridians b. axis c. shape d. seasons

1.028 When curved surfaces are represented on flat surfaces, distances are __________ .
a. shortened b. lengthened c. distorted d. unchanged

1.029 A method that transfers portions of the globe to a flat map is __________________ .
a. impossible b. curving c. a dilemma d. a projection

1.030 The earth revolves once every ____________________ .
a. 365¼ days b. twenty-four hours c. 180 degrees d. season

Answer this question (each part, 5 points).

1.031 What two things does the analemma show?

a. ____

____

b. ____

____

81/101 **SCORE** ____________ **TEACHER** ____________ ____________
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