Introduction to Maps

How does the size of the mapped area affect the amount of distortion?	• A map shows all or part of Earth's _____ on a _____.
	• _____ is the science of mapmaking.
	• The _____ the area mapped, the less _____ the map will be.
	
	• _____ is distance in degrees North and South of _____.
	  • _____ – imaginary lines that run east and west
	  • 1 _____ = 1/360 of Earth's circumference.
	  • The _____ of a degree of latitude does not _____ over the earth's surface.

What is Longitude & Latitude and how are they measured?	• _____ is the distance in degrees east or west of the _____ meridian
	  •A _____ is a north-south half circle
	  • The length of a longitude degree gets _____ toward the _____
	
	1 degree = 60 _____. 1 minute = 60 _____.
	
	• All maps of similar age show the same _____ and _____ for any point.

What is a great circle?	• A great circle's plane passes through the _____ of a _____
	  • The _____ is a great circle
	  • Great-circle routes are the _____ between 2 _____

What is magnetic declination?	• Most maps are drawn with _____ at the _____. • Magnetic _____ is the difference between magnetic north and _____ north
Describe Time Zones and how to convert between them	**Time Zones:** Every 15 degrees _____ = 1 hr Every degree = _____ minutes Starting at the _____ _____(Greenwich, England) you would set your clock back one _____ every _____ degrees traveling westward. International_____ _____: opposite the prime meridian – • cross westward= _____ one day • cross eastward= _____ one day

Types of Maps

Give some examples of map projections	**Map Projections:**
	
	• Many map _____have been developed.
	• All map projections have some kind of _____.
	  • _____ projection – world map showing _____ and parallels as straight lines intersecting at _____ angles.
	  • _____ projection – best for topographic maps – have _____ distortion
	  • _____ projection – shows shortest route between two points - (Great Circle Route)
	_____ Map – Is used to show the distribution, arrangement, and type of _____ located below the _____.

What are topographic maps used for? How do you read contour lines? What types of features are shown on a topographic map? How do you figure slope (gradient)? What is map scale?	**Topographic Maps** • Topographic maps show _____ using _____ lines • Contour lines show elevation, steepness and _____ of the land • All points of the same _____ are joined by a contour line • A contour interval is the change in _____ between two consecutive contour lines • A map showing large changes in elevation will have a _____ contour interval • *Contour lines show the difference in _____, not the distance across the ground* • Index Contour: Every _____ line is made heavier for easier reading • Elevation _____ moving away from bodies of _____. • craters or other _____ in the land will be shown by a depression contour • a bench mark is an elevation reference point for _____ • on a map benchmarks are seen as *BM*, a _____ or an X. • _____ _____ show special points of interest. • The U.S. Geological Survey has produced _____ maps for the entire country • Standard boundaries and scales for an area are put together on a map which shows 4 sections of 7 ½ minutes _____ and 7 ½ minutes _____ • _____ are standard on all maps • A point between a _____-ft contour line and a _____-ft contour line will be between 101 and 119 ft. • Each line represents height above _____ _____ • when contour lines are close together, the land is _____ • long, oval lines are _____ • lines showing river valleys bend in a _____ or _____ shape toward the _____. • average slope or gradient is _____ divided into change in elevation • plotting contour elevations _____ results in a _____ **Map Scales** • map scale is the ratio of distance on the map to distance on _____. • _____ Scales - "1 cm represents 50 km" • _____ Scales – a divided line • _____ Scales – 1:1,000,000 or 1/1,000,000 • the closer the map is to the size of land, the _____the scale

Remote Sensing

Give some examples of remote sensing	• Today most maps are made by _____ sensing. Equipment onboard aircraft or satellite collects data. • _____ -Mapping by aerial photographs. • Side-looking _____ provides more information about the relief. • _____– series of satellites that take false-color images based on reflected energy from earth's surface. Useful in studying climate change, _____, and natural _____. **Mapping the Ocean and Seafloor** **OSTM** stands for O_____ S_____ T _____ M_____ Uses high-frequency signals transmitted from satellite that reflect off the ocean surface to monitor changes in global sea levels. **SeaBeam.** Uses _____ to bounce sound waves off the ocean floor. A receiver picks up the returning sound waves and a _____ of the ocean floor is generated.

Define Key Terms

1. Cartography _____

_____

2. Contour interval _____

_____

3. Contour line _____

_____

4. Equator _____

_____

5. Map Scale _____

_____

6. Prime meridian _____

_____

7. Topographic map _____

_____

Latitude and Longitude

1. Use the world map to identify the city nearest the following rounded latitudes and longitudes.
    a. 41° N, 74° W _____
    b. 56° N, 38° E _____
    c. 12° S, 77° W _____
    d. 32° S, 116° E _____
    e. 42° N, 12° E _____
    f. 26° S, 28° E _____
    g. 49° N, 2° E _____
    h. 6° S, 107° E _____
    i. 40° N, 116° E _____
    j. 1° S, 37° E _____
    k. 35° S, 58° W _____
    l. 61° N, 150° W _____

2. To the nearest whole degree, estimate the latitude and longitude of the following cities. Be sure to include the correct compass directions (N, S, E, W) in your answer.
    a. Manaus (South America) _____
    b. Tokyo (Asia) _____
    c. Boise (North America) _____
    d. Sydney (Australia) _____
    e. Hammerfest (Europe) _____

3. The distance between each degree of latitude is 112 km. Hammerfest is approximately 97° of latitude due north of Johannesburg. Determine the distance in kilometers between the two cities.

    _____

4. Is it possible for a city to be located at 120° S, 30° W? Explain your answer.

    _____

5. How many degrees of latitude separate Denver, CO and Austin, TX?
    (Use the United States Map). _____

6. What is the approximate latitude and longitude of MHHS? _____

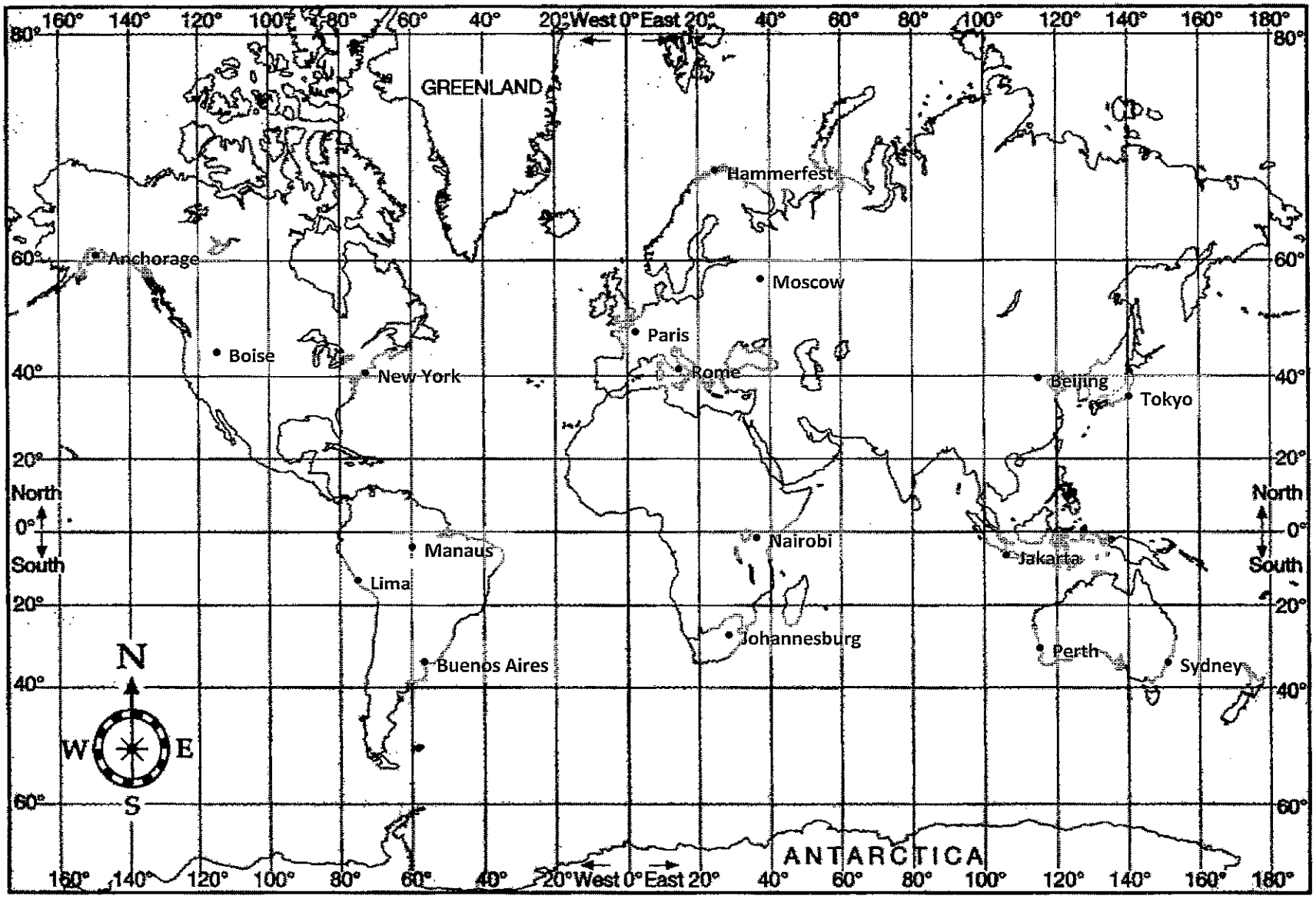
7. The antipode is the location directly on the opposite side of Earth from your location. It is the same distance south of the equator as you are north and 180° east or west of your location. Determine the latitude and longitude of the antipode of MHHS.

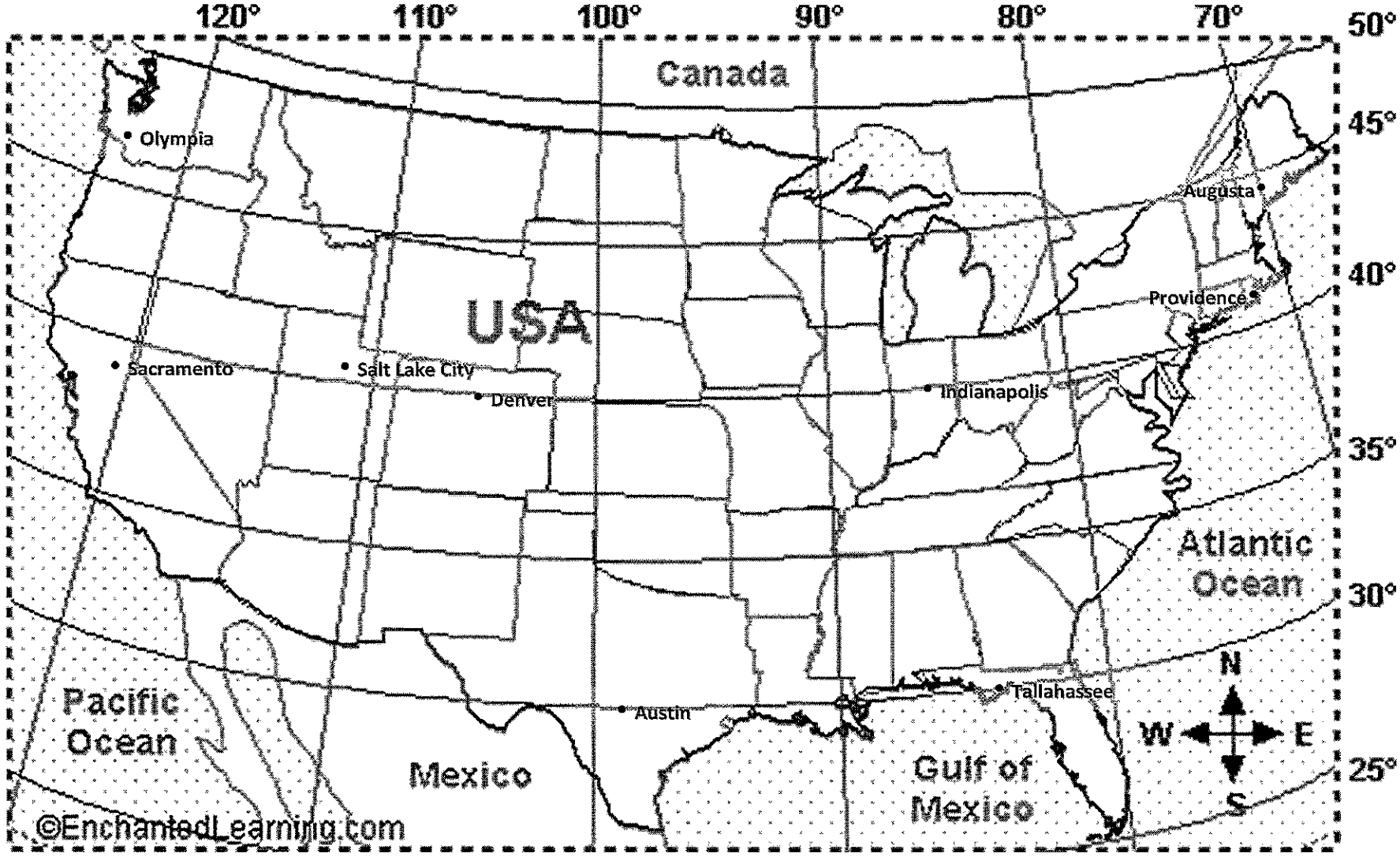
_____

8. Would you travel farther if you drove 2° due east from Olympia, WA, or from Austin, TX? Explain your answer. _____

_____

9. Using the United States Map, determine the city nearest to each of the following rounded latitudes and longitudes. Include the state in your answer.
   a. 38°N, 121°W _____
   b. 42°N, 71°W _____
   c. 30°N, 98°W _____
   d. 30°N, 84°W _____
   e. 44°N, 70°W _____
   f. 41°N, 112°W _____
   g. 47°N, 123°W _____
   h. 40°N, 105°W _____
   i. 40°N, 86°W _____


GREENLAND
Hammerfest
Anchorage
Moscow
Paris
Boise
New York
Rome
Beijing
Tokyo
North
South
Nairobi
Manaus
Jakarta
Lima
Johannesburg
Perth
Sydney
Buenos Aires
N
W
E
S
ANTARCTICA
160° 140° 120° 100° 80° 60° 40° 20° West 0° East 20° 40° 60° 80° 100° 120° 140° 160° 180°
80°
60°
40°
20°
0°


120°
110°
100°
90°
80°
70°
50°
45°
40°
35°
30°
25°
Canada
USA
Olympia
Sacramento
Salt Lake City
Denver
Augusta
Providence
Indianapolis
Tallahassee
Austin
Atlantic Ocean
Pacific Ocean
Mexico
Gulf of Mexico
N
W
E
S
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TIME ZONES

Using the time zones map, answer the following questions. Indicate whether the times are A.M. or P.M.

1) If it were noon in Chicago, what time would it be in London? _____

2) If it were 3:00 PM in New York what time would it be in Tokyo, Japan? _____
A day (earlier / later)

3) If it were 10:00 AM in St. Petersburg, Russia what time would it be in Anchorage, Alaska? _____
A day (earlier / later)

4) If it were 5:00 PM Rio de Janeiro, Brazil, what time would it be in Nuuk, Greenland? _____

5) If it were 7:00 PM at Mountain Home, what time would it be in Perth, Australia? _____
A day (earlier / later)

6) If it were midnight in Houston, Texas, what time would it be in Santiago, Chile? _____

7) If it were 11:00 AM in Abidjan, Ivory Coast, what time would it be in Auckland, New Zealand? _____

8) How long would it take you to travel half way around the Earth at the equator at a speed of one-half of the earth's rotation?

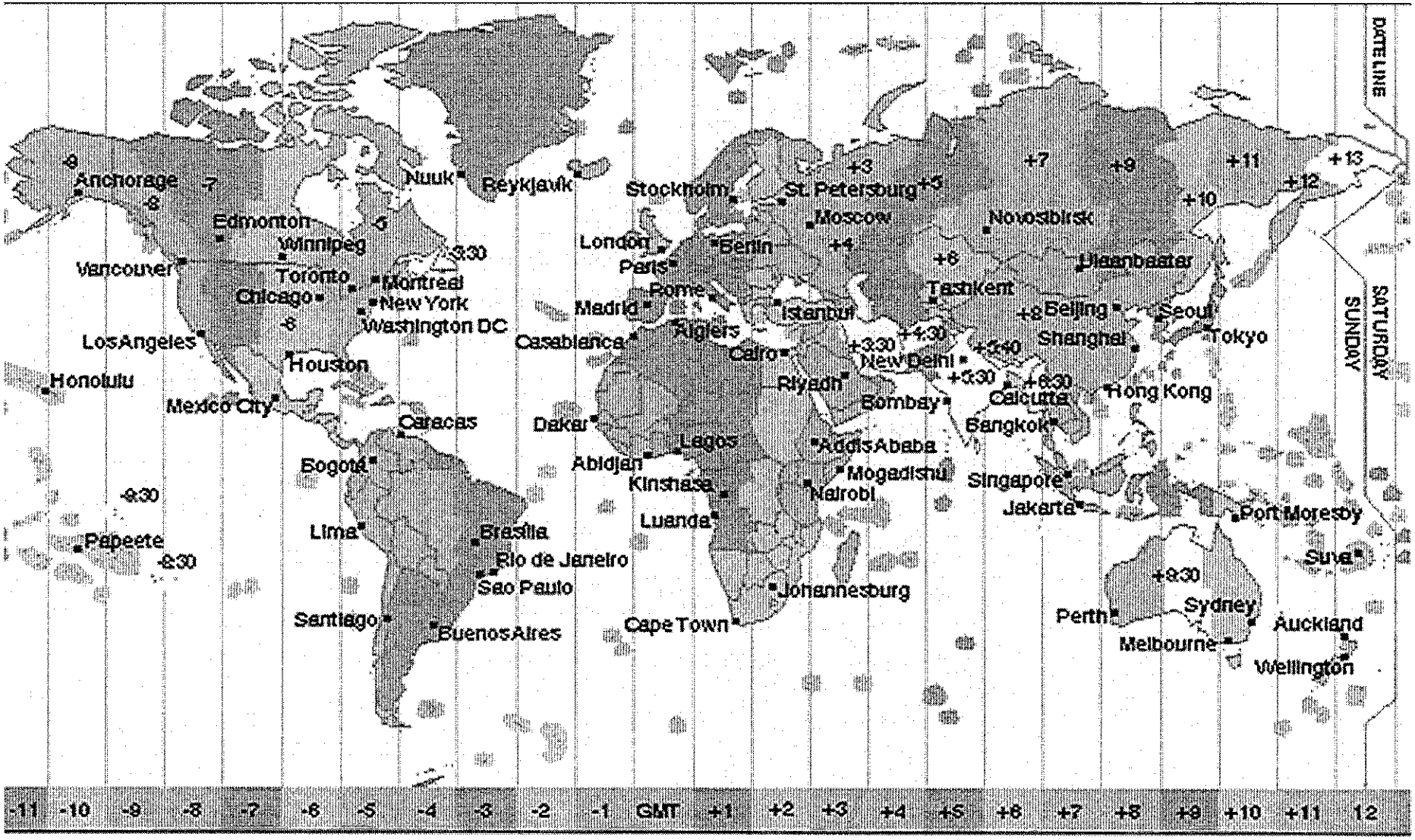
_____

9) Boise, Idaho and Denver, Colorado are in the same time zone.
Does this mean the sun will rise at the same moment in both cities? (Yes / No)

Why? _____

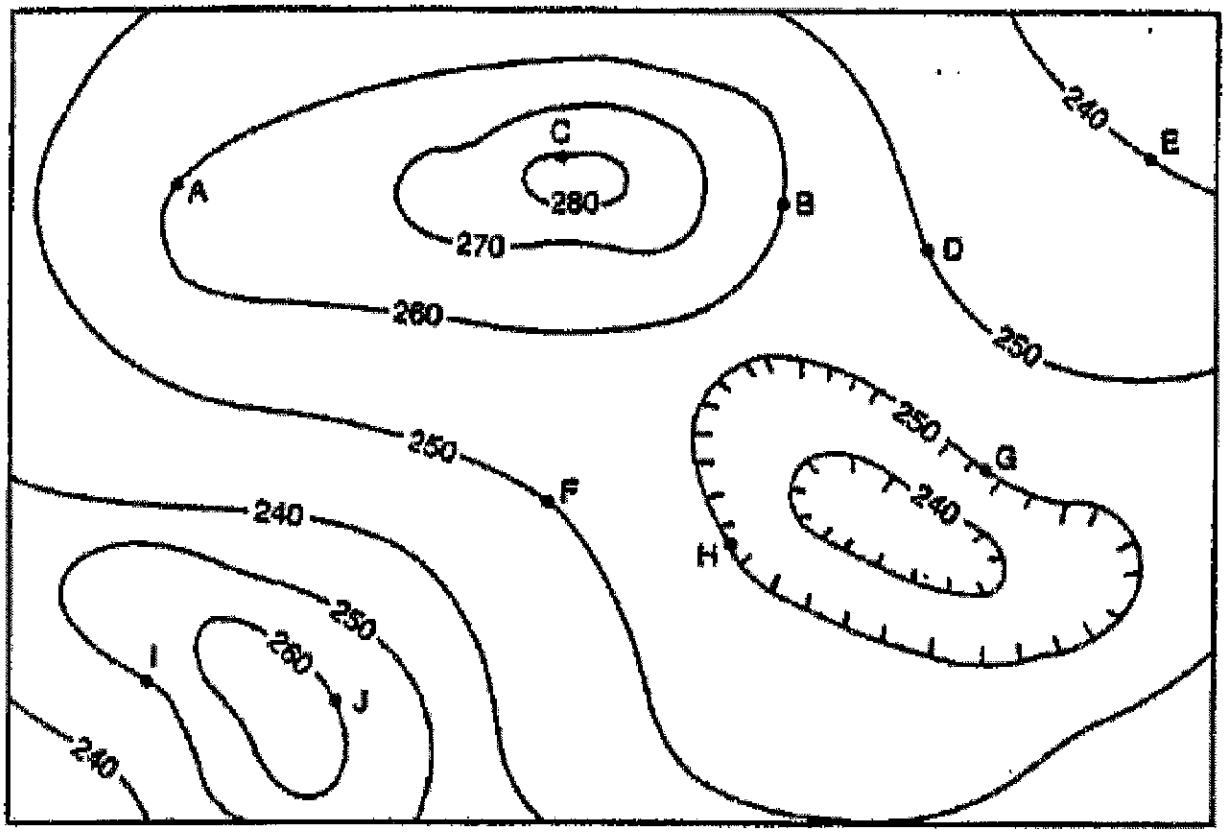
10) Why don't all time zones follow perfectly straight lines? _____

_____


DATE LINE
SATURDAY
SUNDAY
-9
-7
-8
-6
-5
-3:30
-8
-9:30
-8:30
Anchorage
Nuuk
Reykjavik
Edmonton
Winnipeg
Vancouver
Toronto
Montreal
Chicago
New York
Washington DC
LosAngeles
Houston
Honolulu
Mexico City
Caracas
Bogotá
Lima
Papeete
Brasilia
Rio de Janeiro
Sao Paulo
Santiago
BuenosAires
+3
+5
+7
+9
+11
+13
+10
+12
+4
+6
+8
+5:30
+4:30
+3:30
+5:45
+5:30
+6:30
+8:30
Stockholm
St. Petersburg
Moscow
Novosibirsk
London
Berlin
Paris
Ulaanbaatar
Rome
Tashkent
Madrid
Istanbul
Beijing
Seoul
Algiers
Shanghai
Tokyo
Casablanca
Cairo
New Delhi
Riyadh
Bombay
Calcutta
Hong Kong
Bangkok
Dakar
Lagos
AddisAbaba
Abidjan
Mogadishu
Singapore
Kinshasa
Nairobi
Jakarta
Luanda
Port Moresby
Suva
Johannesburg
Perth
Sydney
Auckland
Cape Town
Melbourne
Wellington
-11
-10
-9
-8
-7
-6
-5
-4
-3
-2
-1
GMT
+1
+2
+3
+4
+5
+6
+7
+8
+9
+10
+11
12

Reading a Topographic Map

Directions: Use the simple topographic map below to answer the questions.



1. How many hills are on this map? _____
2. How many depressions are on this map? _____
3. What is the contour interval of this map? _____
4. List the elevation of each location:

   A _____ B _____ C _____ D _____ E _____

   F _____ G _____ H _____ I _____ J _____

5. Use a ruler and the map scale to determine an approximate distance between the following locations. Round to the nearest tenth.

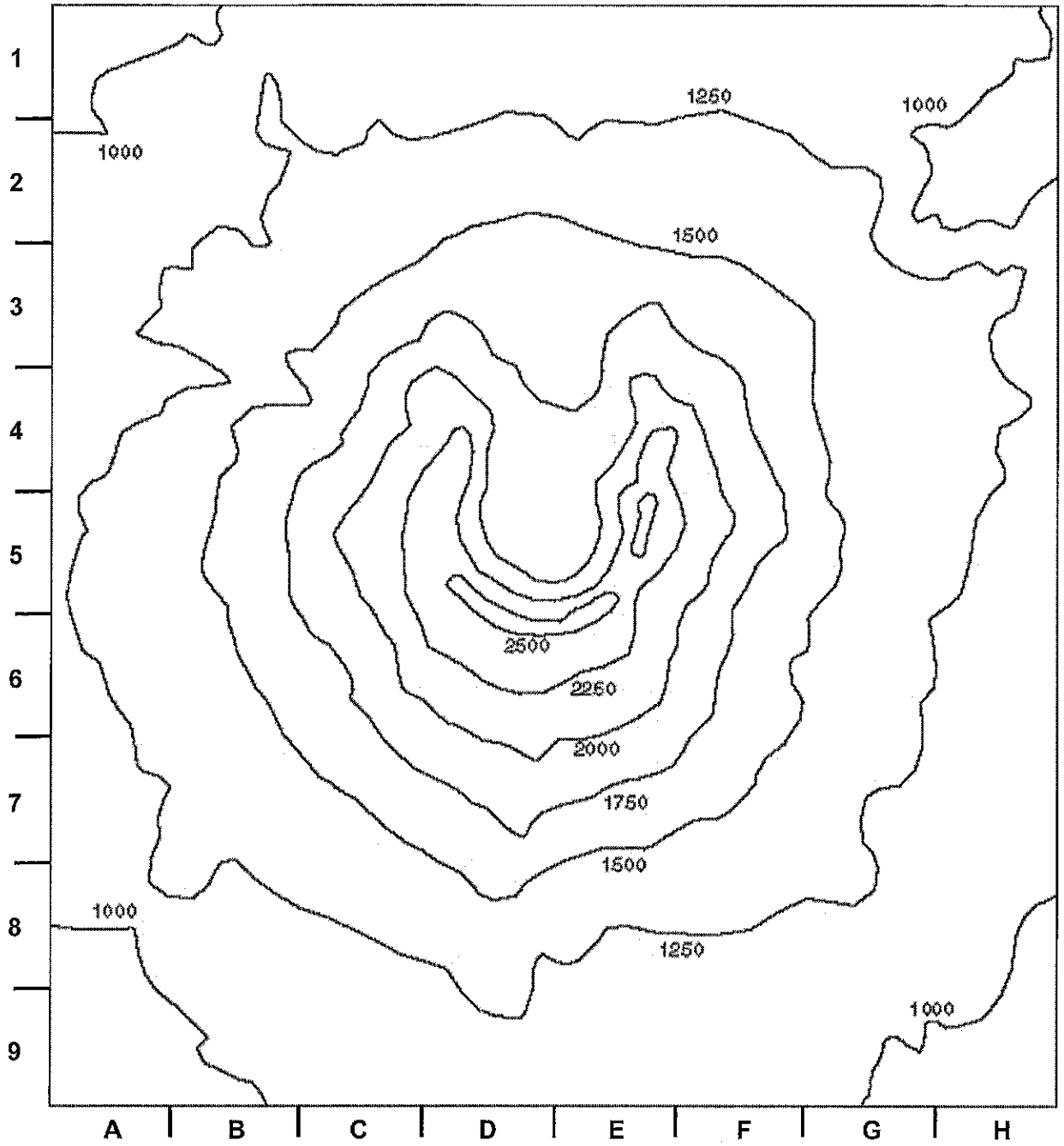
   A to B _____ G to F _____ D to E _____ E to G _____

6. Which of the following represents a profile of the area between H and G? _____

7. Which location on the map would be best for a radio antenna? _____

Topographic Map Symbols

Using the topographic map symbols from Page 908 label the following on the topographic map below:

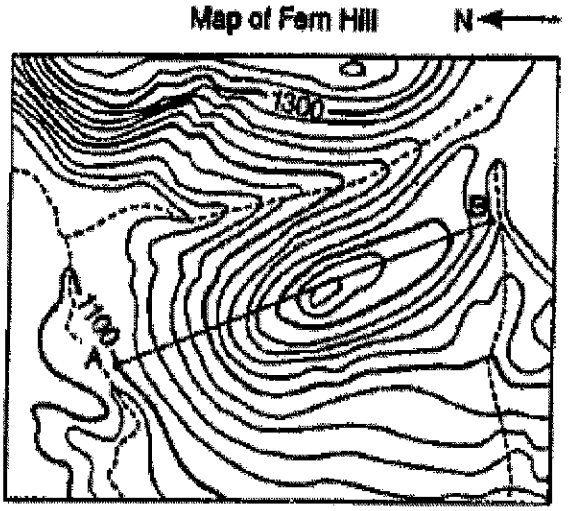


1. Draw a stream from the top of the hill to the southeast corner
2. Place a building at E-3
3. Place a school at H-6
4. Place a marsh at A-9
5. Draw a highway running east to west along coordinate 2
6. Draw a railroad running north to south along coordinate C
7. Draw a water tank near the intersection of the highway and railroad at an elevation of 1250
8. Draw a quarry at B-5 at an elevation of 1500
9. What is the change in elevation between the quarry and the water tank? _____

DRAWING PROFILES

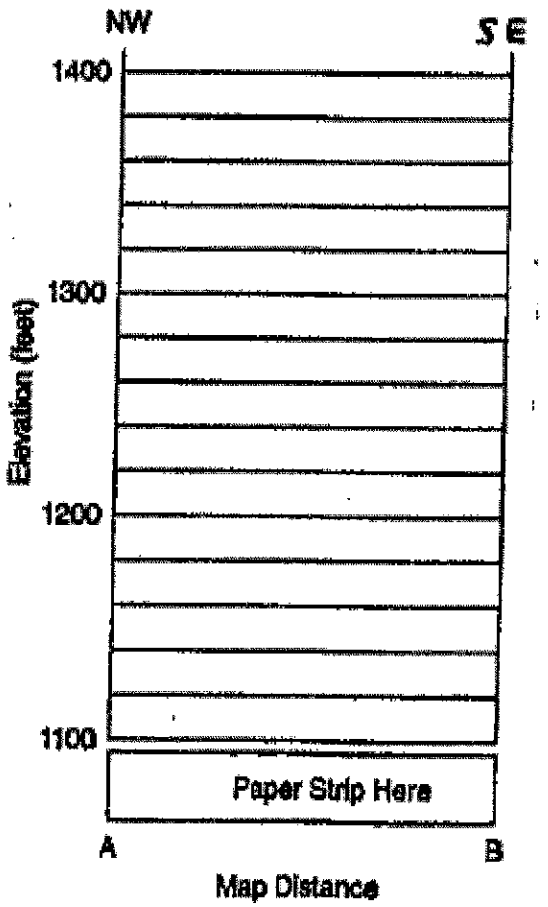
NAME _____

When a topographic map shows features, contours, and distances, it is still just a flat model of a given area. When a more detailed portrayal of the elevations and the features across the map is required, a profile is made.



PART ONE: 1. Practice drawing a profile of Fern Hill pictured to the right. Begin a profile of Fern Hill by laying a strip of paper along line A-B on the map. Mark and label the position of points A and B on the paper strip. At each point where a contour line crosses line A-B, mark the contour's position on the edge of the paper strip and label the elevation.

2. When you have marked all the contour lines, your paper strip becomes your horizontal axis. Plot the elevation of each mark according to the vertical axis. Connect the points with a smooth curve.



ANSWER THE FOLLOWING:

1. Which side of Fern Hill has a more even, continuous slope, the northwest or the southeast?

_____

2. The scale along the vertical axis of the graph has been stretched out, or exaggerated, in comparison to the horizontal map scale. How would the profile look different if you had used a vertical scale equal to the horizontal scale?

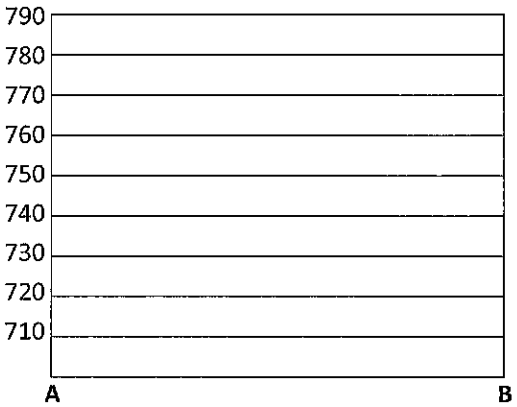
_____

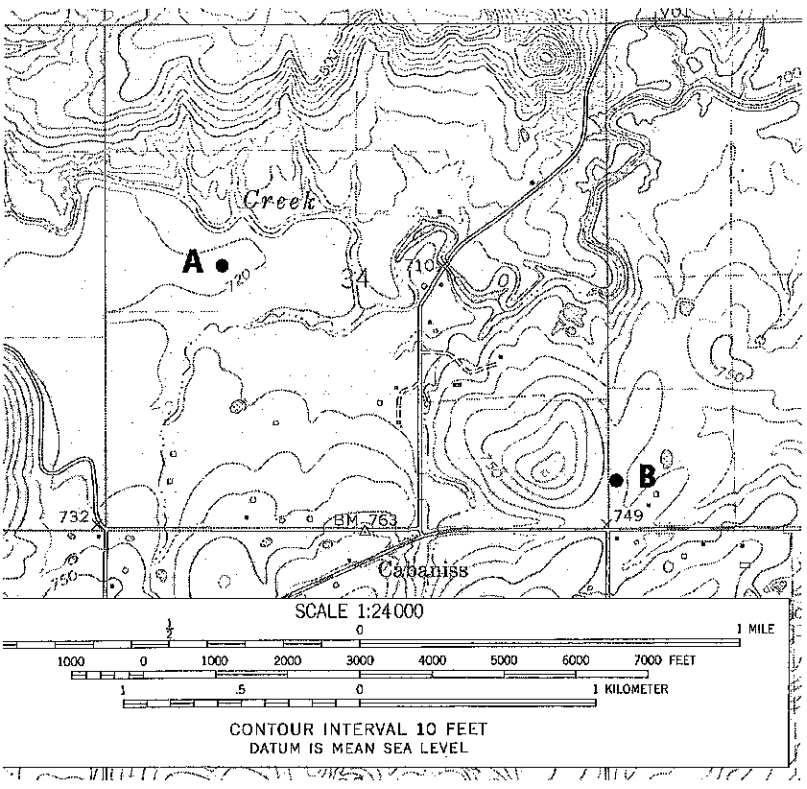
_____

PART TWO: **1.** Locate Points **A** and **B** on the topographic map on page 49. To construct a profile of the landscape between these two points, lay a paper strip on the map so that one edge of the strip forms a line connecting the points.

2. Profile the area between points **A** and **B** by using the method outlined in Part One. Label elevations next to the marks on your paper strip.

3. Draw your profile on the graph provided below.





Answer the following using the map on page 49:

1. How many roads does the profile between **A** and **B** cross?

   _____

2. What is the spot elevation where the PIPELINE crosses the road?

   _____

3. What is the highest elevation benchmark (BM) on the map? (Near the JEEP TRAIL)

   _____

4. What is a close estimate for the elevation of the Gravel Pit located in the Northwest corner of the map?

   _____

5. Using the map scale, about how many miles are between points **A** and **B**?

   _____

TOPOGRAPHIC MAP EXERCISE

I) Use the Harrisburg, Pennsylvania Map to answer the following questions.

1) What is the fractional scale of this map? _____

2) What is the contour interval on this map? _____

3) What is the contour interval between index (darkened) contour lines? _____

4) What color is used to represent water? _____

5) What is the name of the largest river on this map? _____

6) What color is used to represent densely settled areas? _____

7) What color is used to represent structures built by people? _____

8) What do the purple parts of the map represent? _____

9) What is the elevation of the Bench Mark (BM) located near the east side of the Rockville Bridge? _____

10) How many miles is the actual length of the region (north to south) shown on this map? _____
Measure the length with a ruler. Measure the length of a mile in the map scale. Divide the length of the map with the length of a mile.

11) How many miles is the actual width of the region (east to west) shown on this map? _____
Measure the width with a ruler. Measure the length of a mile in the map scale. Divide the width of the map with the length of a mile.

12) What is the total area of the region shown on this map, in square miles? (length x width) _____

13) Is the WTPA TV tower on Blue Mtn. in the line of sight from Enola?_____ from Summerdale?_____ from Perdix?____

14) What is the highest possible elevation of McCormicks Island? _____
Hint: look again at the contour interval.

15) What is the slope (gradient) of the western side of Fishing Creek? _____ ft/mi
Find 2 points where a labeled contour line crosses the creek. Find the change in elevation between the 2 points. Measure the distance in miles between the 2 points using the map scale. Divide the change in elevation by the distance.

II) Use the Phantom Ranch (Grand Canyon) Map to answer the following questions.

16) What is the depth of the Grand Canyon from Mather Pt. to the Heliport by the river? _____

17) Find the Quarry within the Southwestern quadrant of the map. What is the distance in miles from the Quarry to Mather Point? _____. What is the distance in kilometers? _____. *Use the map scale.*

18) What compass direction is the Colorado River flowing? _____
Hint: The Colorado River drains into the Pacific Ocean, which direction is that?

III) Use the Atlanta East Map to answer the following questions.

19) What is the fractional scale of this map? _____

20) What is the contour interval of this map? _____

21) Determine the slope (gradient) of Leggitt Creek _____ ft/mi
Find 2 points where a labeled contour line crosses the creek. Find the change in elevation between the 2 points. Measure the distance in miles between the 2 points using the map scale. Divide the change in elevation by the distance.

22) What is the elevation of the surface of Leggitt Lake? _____

IV) Use the Shasta Map to answer the following questions.

23) What is the fractional scale of the Shasta map? _____

24) What is the contour interval on this map? _____

25) What do the blue lines near the peak of Mt. Shasta represent? _____

26) What is the lowest elevation reached by any glacier? _____

27) What is the name of this glacier (from #26)? _____

28) What is the height of Mt. Shasta? _____

29) Why is much of this map colored green? _____

V) Use the Crater Lake Map to answer the following questions.

30) What is the contour interval on this map? _____

31) What are the coordinates of the southeast corner of this map? _____

32) What is the elevation of the surface of Diamond Lake? _____

33) How deep is the deepest point in Crater Lake? (to the nearest foot) _____

34) What peak is located near 43 degrees north and 122 degrees west? _____

35) What is the name of the hill located near 42 degrees 43 minutes north latitude and 122 degrees 10 minutes west longitude? _____

36) What are the coordinates of Red Cone?

Map Review Questions

Choose the one best response.

_____ 1. The latitude of the equator is:

a. 0° b. 90° c. 180° d. 360°

_____ 2. On a Mercator projection, the greatest distortion is produced:

a. at the equator b. at the poles
c. along the prime meridian d. midway between the poles

_____ 3. Great circles are shown as straight lines on which type of map projection?

a. Gnomonic b. Mercator c. Polyconic d. Conic

_____ 4. On a topographic map, rapid increases in elevation are represented by:

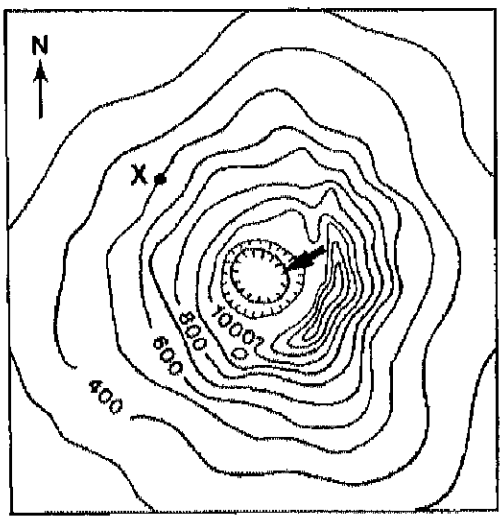
a. depression contours
b. V-shaped contour lines
c. contour lines forming closed loops
d. closely spaced contour lines

_____ 5. The elevation difference between two contour lines on a map is called the:

a. map scale b. contour interval
c. map projection d. index contour

_____ 6. Contour intervals are most likely to be smallest on maps of:

a. hilly areas b. flat areas
c. high-altitude areas d. low-altitude areas



_____ 7. At what elevation is the point labeled X on the map?

a. 400 m b. 450 m c. 500 m d. 600 m

_____ 8. Which feature is indicated by the arrow?

a. peak b. valley c. stream d. depression

_____ 9. One degree of latitude equals

a. 1/90 the earth's circumference
b. 1/100 the earth's circumference
c. 1/360 the earth's circumference
d. 1/720 the earth's circumference

_____ 10. A point halfway between the equator and the South Pole has a latitude of

a. 45° N
b.45° S
c. 45° E
d. 45°

_____ 11. The distance in degrees east or west of the prime meridian is

a. latitude
b. longitude
c. declination
d. projection

_____ 12. The relationship between distance on a map and actual distance on the earth is called the

a. legend
b. scale
c. elevation
d. relief

_____ 13. On a topographic map, elevation is shown by means of

a. great circles
b. contour lines
c. verbal scale
d. fractional scale

_____ 14. Closely spaced contour lines indicate a

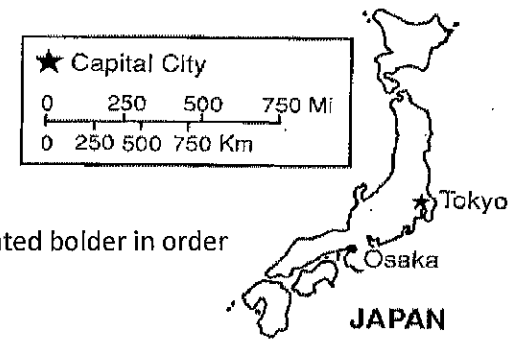
a. gradual slope
b. flat area
c. steep slope
d. valley

True or False

_____ 15. According to this map, Osaka is a capital city

_____ 16. On topographic maps, contour lines connect points having the same elevation.

_____ 17. Index contours are contour lines that are printed bolder in order to make map reading easier



Complete each statement by writing the correct term or phrase in the space provided

18. An imaginary line that divides the earth into equal halves is called a _____

19. The line of longitude selected to be 0° is called the _____

20. A degree of latitude consists of 60 equal parts called _____

Critical Thinking
Read each question or statement and answer it in the space provided.

21. What is wrong with the following location: 135° N, 185° E?

_____

22. As you move from point A to point B in the Northern Hemisphere, the length of a degree of longitude progressively decreases. In which direction are you moving?

_____