Name: _____ Class: _____ Date: _____ ID: A

Mapping Short Study Guide

Multiple Choice
Identify the letter of the choice that best completes the statement or answers the question.

____ 1. What is the longitude of the prime meridian?
a. 0°
b. 90° east
c. 90° west
d. 180°

____ 2. Which of the following is used by navigators to plot great-circle routes?
a. Mercator projection
b. conic projection
c. gnomonic projection
d. topographic map

____ 3. Which of the following is used extensively for navigation by airplanes and ships?
a. depression contour line
b. Landsat satellite
c. Topex/Poseidon satellite
d. Global Positioning System

____ 4. What is the latitude of the north pole?
a. 0° north
b. 90° north
c. 180° north
d. 360° north

____ 5. Each degree of latitude or longitude is divided into 60 smaller units called ____.
a. meridians
b. grids
c. seconds
d. minutes

____ 6. Which statement about lines of longitude is true?
a. They converge at the equator.
b. They converge at the poles.
c. They are parallel.
d. They locate positions in north and south directions.

____ 7. All flat maps distort either the shapes or the areas of landmasses because ____.
a. the boundaries of landmasses are not known with certainty
b. such large structures cannot be drawn accurately
c. lines of latitude are not perfectly parallel
d. Earth is a curved, three-dimensional object

____ 8. On a topographic map, the difference in elevation between two side-by-side contour lines is called the ____.
a. contour interval
b. index contour
c. depression contour
d. hachure

____ 9. What is a graphic scale?
a. a statement that expresses distance, such as one centimeter equals one kilometer
b. a ratio that expresses distance, such as 1:50 000
c. a line broken into sections that represent units with each section representing a distance on Earth's surface
d. a diagram that shows the elevation of the hills and valleys of an area

____ 10. GPS satellites can relay information about all of the following except ____.
a. position
b. elevation
c. direction
d. weather

Matching

Match each item with the correct statement below.

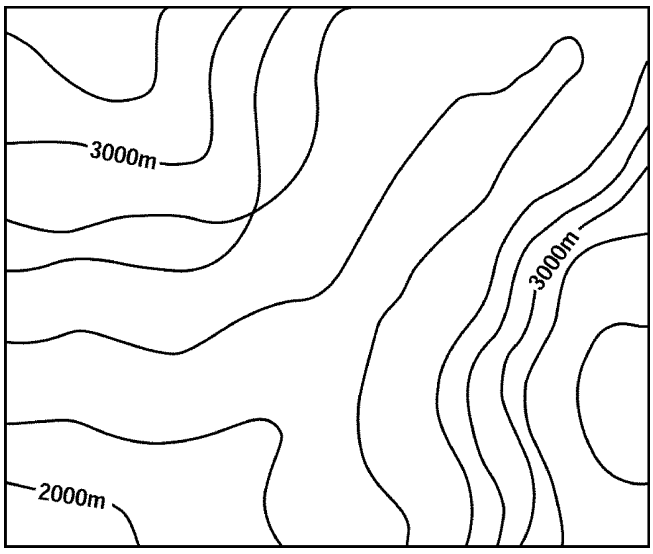
a. cartography
b. contour line
c. map legend
d. map scale
e. remote sensing
f. topographic map

____ 11. Explains what the symbols on a map represent
____ 12. The science of mapmaking
____ 13. Connects points of equal elevation on a map
____ 14. Type of map that shows changes in elevation of Earth's surface
____ 15. The ratio between distances on a map and actual distances on the surface of Earth

Short Answer

16. Contrast the distortion that is produced by a Mercator projection, a conic projection, and a gnomonic projection.

17. There is a mistake in the topographic map shown in the figure below. Identify the mistake and explain why it is wrong.



Compare and contrast each pair of related terms or phrases.

18. latitude, longitude

19. Time zone boundaries do not always line up perfectly with lines of longitude. Why?

20. Why does a Mercator projection exaggerate the areas of landmasses near the poles?

21. Why are map scales useful?

22. How does the *Topex/Poseidon* satellite collect data?

Use the table to answer the following questions.

City	Latitude	Longitude
Cape Town, South Africa	34°S	18°E
Pontianak, Indonesia	0°	109°E
Nome, Alaska	65°N	165°W
Quito, Ecuador	0°	79°W
Stockholm, Sweden	59°N	18°E
Wellington, New Zealand	41°S	175°E

23. Which city is closest to the International Date Line?

24. Which city is farthest from the equator?

25. Suppose you were given a topographic map that did not show index contours. What would the map indicate about the terrain of the area shown? What would the map not indicate?

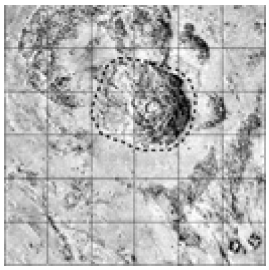
Problem

Mapping techniques can be used on other planets besides Earth. In 1996, the National Aeronautics and Space Administration (NASA) launched a satellite called the *Mars Global Surveyor* toward Mars. One of the purposes of the satellite was to collect data about the surface of Mars. The satellite reached Mars in 1997 and then gradually slowed into a low, circular orbit around the planet. It finally began mapping the surface of Mars in 1999, a process that was scheduled to last nearly two years.

The *Mars Global Surveyor* carries a camera that can distinguish objects on the surface of Mars that are less than 1.5 m across. It also has an instrument that measures surface elevation as well as sensors that analyze the heat radiating from the planet's surface. These sensors provide data about the composition of different areas of the planet. All of the information collected by the *Mars Global Surveyor* is transmitted to Earth in the form of radio waves. The satellite will continue to orbit Mars for at least 50 years after its mission is completed. It does not carry enough propellant to return to Earth.

26. The distance from Earth to Mars ranges between 78 000 000 km and 380 000 000 km, depending on the time of year. The speed of light is 300 000 km/s. Calculate the minimum and maximum time it takes for data transmitted by the *Mars Global Surveyor* to reach Earth.

This map was prepared from data collected by the *Mars Global Surveyor*. The dashed lines on the map surround the base of the Martian volcano Olympus Mons.



27. The circumference of Mars is 21 200 km. What is the approximate distance of each degree of latitude on Mars?

28. How far does the base of Olympus Mons stretch from north to south? (Hint: Use your answer from question 5 to convert degrees to kilometers.)

29. Can you estimate how far the base of Olympus Mons stretches from east to west with the same accuracy? Explain why or why not.

30. The top of Olympus Mons is the highest point on Mars. It is 27 km above the average elevation on Mars. (Because Mars has no oceans, its elevations cannot be defined with respect to sea level.) By comparison, the highest point on Earth, Mt. Everest, is 8850 m above sea level. How many times higher than Mt. Everest is Olympus Mons?

Mapping Short Study Guide
Answer Section

MULTIPLE CHOICE

1. A
2. C
3. D
4. B
5. D
6. B
7. D
8. A
9. C
10. D

MATCHING

11. C
12. A
13. B
14. F
15. D

SHORT ANSWER

16. In a Mercator projection, the areas of landmasses near the poles are exaggerated. In a conic projection, there is very little distortion along one line of latitude, but the areas and shapes of landmasses near the top and bottom of the projection are distorted. In a gnomonic projection, the direction and distance between landmasses are distorted.
17. Two contour lines cross in the upper left part of the map. This is wrong because each contour line should represent one elevation. If two lines cross, it means that the point where they cross has two elevations, which is impossible.
18. Both are used to precisely locate positions on Earth. Latitude is the distance in degrees north or south of the equator. Longitude is the distance in degrees east or west of the prime meridian.
19. The boundaries are adjusted in local areas to avoid the confusion that would result if, for example, a city was split by a time zone.
20. Lines of longitude converge as they approach the poles, but a Mercator projection shows these lines as being parallel. Making the lines parallel stretches the area between them, especially near the poles.
21. They show the relationship between distances on a map and actual distances on the surface of Earth, which enables the map reader to measure distances.

22. The satellite sends radar waves to the ocean's surface and picks up the echo that is reflected off the water. The distance to the water's surface is calculated using the speed of light and the time it takes the signal to reach the surface and return. Variations in time indicate the presence of certain features on the ocean floor.
23. Wellington, New Zealand
24. Nome, Alaska
25. The map would indicate which points on the map were higher than others and which areas were steeper. It would not indicate the actual elevation of any point.

PROBLEM

26. Minimum: 78 000 000 km ÷ 300 000 km/s = 260 s
    Maximum: 380 000 000 km ÷ 300 000 km/s = 1267 s
27. 21 200 km ÷ 360° = 58.9 km/°
28. The base stretches approximately 10° from north to south. 10° × 58.9 km/° = 589 km
29. No; lines of longitude get closer together as they approach the poles, but this map shows the lines as being parallel. Therefore, the map distorts distances in the east-west direction.
30. 8850 m = 8.850 km; 27 km ÷ 8.850 km = 3; Olympus Mons is three times higher than Mt. Everest.