

Earth Science

Chapter 3 - Models of the Earth

Section 3 – Types of Maps

E.Q.: *What are the different types of maps, how are elevation and topography represented, and how are they used?*

STANDARDS:

SCSh3. Students will identify and investigate problems scientifically.

c. Collect, organize and record appropriate data.

SCSh6. Students will communicate scientific investigations and information clearly.

Write clear, coherent laboratory reports related to scientific investigations.

d. Participate in group discussions of scientific investigation and current scientific issues.

SCSh9. Students will enhance reading in all curriculum areas by:

d. Establishing context

Explore life experiences related to subject area content.

Discuss in both writing and speaking how certain words are subject area related.

Determine strategies for finding content and contextual meaning for unknown words.

Objectives

- Explain how elevation and topography are shown on a map.
- Describe three types of information shown in geologic maps.
- Identify two uses of soil maps.

Topographic Maps

- One of the most widely used maps is called a topographic map, which shows the surface features of Earth.
- topography the size and shape of the land surface features of a region
- elevation the height of an object above sea level

Advantages of Topographic Maps

- Topographic maps provide more detailed information about the surface of Earth than drawings

Elevation on Topographic Maps

- On topographic maps, elevation is shown by using contour lines.
- contour line a line that connects points of equal elevation on a map
- The difference in elevation between one contour line and the next is called the *contour interval*. The contour interval is selected based on the relief of the area being mapped.

- relief the difference between the highest and lowest elevations in a given area
- Every fifth contour line is darker than the four lines one either side of it. This *index contour* makes reading elevation easier.

Landforms on Topographic Maps

- The spacing and direction of contour lines indicate the shapes of the landforms represented on a topographic map.
- Closely spaced contour lines indicate that the slope is steep.
- Widely spaced contour lines indicate that the land is relatively level.
- A contour line that bends to form a V shape indicates a valley. The bend in the V points toward the higher end of the valley; this V points upstream, or in the direction from which the water flows, if there is a stream.
- Contour lines that form closed loops indicate a hilltop or a depression. Closed loops that have short straight lines perpendicular to the inside of the loop indicate a depression.

The diagram below shows how topographic maps represent landforms.



Reading Check

Why do V-shaped contour lines along a river point upstream?

Water moves from areas of higher elevation to areas of lower elevation. Because the V shape points toward higher elevation, it points upstream.

Topographic Map Symbols

- Symbols are used to show certain features on topographic maps.
- Symbol color indicates the type of feature. Constructed features, such as buildings, are shown in black. Highways are shown in red.

Bodies of water are colored blue, and forested areas are colored green.

- Contour lines are brown or black.

Geologic Maps

Section 3 Types of Maps

- Geologic maps are designed to show the distribution of geologic features, such as the types of rocks found in a given area and the locations of faults, folds, and other structures.

Rock Units on Geologic Maps

- On geologic maps, geologic units are distinguished by color. Units of similar ages are generally assigned colors in the same color family, such as different shades of blue.
- In addition to assigning a color, geologists assign a set of letters to each rock unit. This set of letters symbolizes the age of the rock and the name of the unit or the type of rock.

Other Structures on Geologic Maps

- Other markings on geologic maps are contact lines. A *contact line* indicates places at which two geologic units meet, called *contacts*.
- The two main types of contacts are faults and depositional contacts.
- Geologic maps also indicate the strike and slip of rock beds. *Strike* indicates the direction in which the beds run, and *dip* indicates the angle at which the beds tilt.

Soil Maps

- Scientists construct soil maps to classify, map, and describe soils, based on surveys of soils in a given area.

Soil Surveys

- A soil survey consists of three main parts: text, maps, and tables.
- The text includes general information about the geology, topography, and climate of the area.
- The tables describe the types and volumes of soils in the area.
- The maps show the approximate locations and types of the different soils.

Reading Check

Why do scientists create soil maps?

Scientists create soil maps to classify, map, and describe soils.

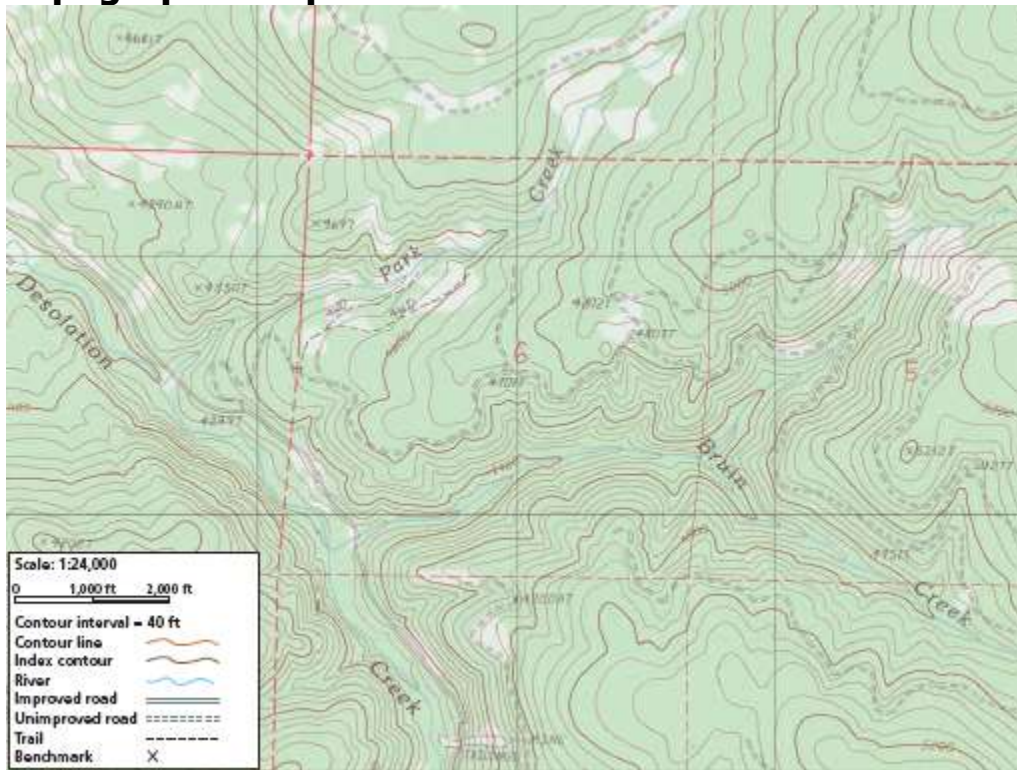
Uses of Soil Maps

- Soil maps are valuable tools for agriculture and land management.
- Soil maps are used by farmers, agricultural engineers, and government agencies.
- The information in soil maps and soil surveys helps developers and agencies identify ways to conserve and use soil and plan sites for future development.

Other Types of Maps

- Maps are useful to every branch of Earth science.
- Maps that show topography and rock and soil types are only one useful type of map.
- Some Earth scientists use maps to show the location and flow of both water and air.
- Other types of Earth scientists use maps to study changes in Earth's surface over time.

REVIEW QUESTIONS for Sections 1-3: Maps in Action Topographic Map of the Desolation Watershed



How can you determine whether the contours on a topographic map show a gradual slope?

Look for V-shaped contour lines.

Look for widely spaced contour lines.

Look for short, straight lines inside the loop.

Look for tightly spaced, circular contour lines.

B. Look for widely spaced contour lines.

2. How far apart would two successive index contours be on a map with a contour interval of 5 meters?

5 meters

10 meters

20 meters

25 meters

25 meters

3. What part of a road map would you use in order to measure the distance from your current location to your destination?

- A. latitude lines**
- B. map scale**
- C. longitude lines**
- D. map legend**

B. map scale

4. Meteorologists use isobars on a weather map in order to?
show changes in atmospheric air pressure.
connect points of equal temperature.
plot local precipitation data.
show elevation above or below sea level.

F. show changes in atmospheric air pressure.

5. What is the angular distance, measured in degrees, east or west of the prime meridian?

- latitude**
- longitude**
- isogram**
- relief**

B. longitude

6. At what location on Earth does each new day begin at midnight?

International Date Line

7. What is the latitude of the North Pole?

90°N

8. What is the latitude of the South Pole?

90°S

Read the passage below. Then, answer questions 9–11.

Map Projections

Earth is a sphere, and thus its surface is curved. When a curved surface is transferred to a flat map, distortions in size, shape, distance, and direction occur. To limit these distortions, cartographers have developed many ways of transferring a three-dimensional curved surface to a flat map. On Mercator projections, meridians and parallels appear as straight lines. These lines cross each other at 90° angles and form a grid. On gnomonic projections, there is little distortion at one contact point on the map, which is often one of the poles. But distortion in direction and distance increases as distance from the point of contact increases. On conic projections, the map is accurate along one parallel of latitude. Areas near this parallel are distorted the least. However, none of these maps is an entirely accurate representation of Earth's surface.

9. Which of the following appears as a straight line on a gnomonic projection, where the point of contact is the North Pole?

great circles

parallels

the equator

coastlines

great circles

10. Which of the following statements about Mercator projections is true?

F. Because latitude and longitude form a grid, plotting great circles can be done by using a straight-edged ruler.

G. Because latitude and longitude form a grid, finding specific locations is easy on a Mercator map projection.

Mercator maps often show the greatest distortion where the projection touched the globe.

Mercator maps often show polar regions as being much smaller than they actually are.

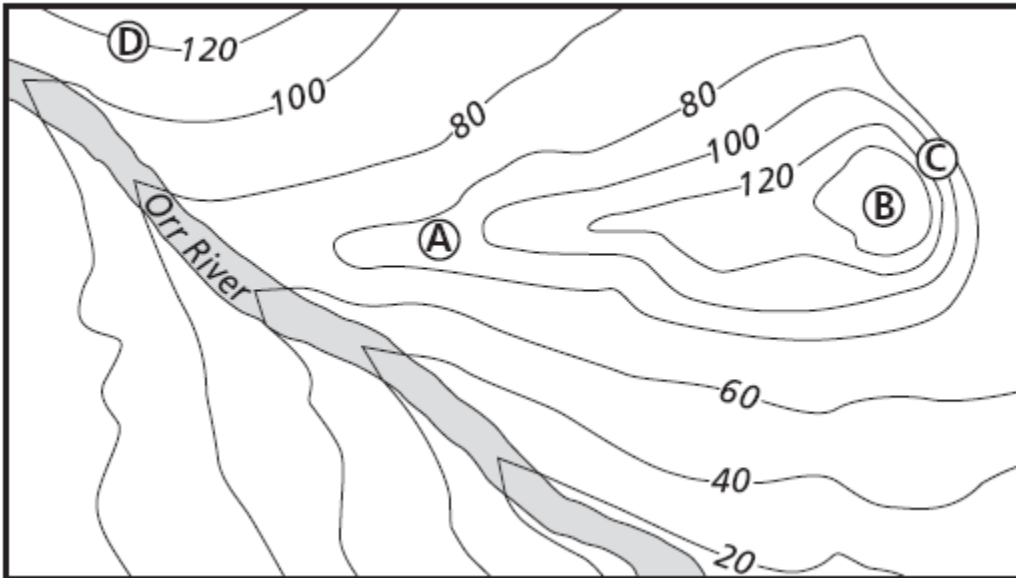
G. Because latitude and longitude form a grid, finding specific locations is easy on a Mercator map projection.

11. Why does each map described display some sort of distortion?

Any time a curved surface is mapped on a flat surface, distortion occurs. This distortion can take different forms and each map type produces different amounts of distortion.

Use the figure below to answer questions 12–13. The figure shows the topography of the an area surrounding the Orr River.

Topographic Map of the Orr River



12. What location on the map has the steepest gradient?

- location A
- location B
- location C
- location D

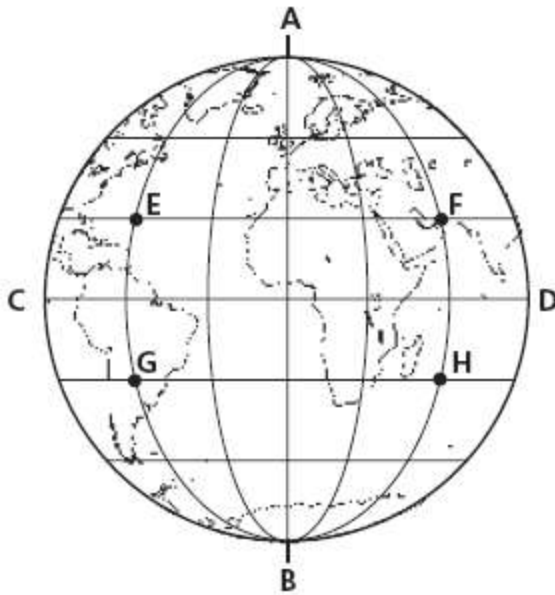
location C

13. In which direction is the river in the topographic map flowing? What information on the map helped you determine your answer?

Answers should include the following: The river is flowing from northwest to southeast; the contour lines near the river form V shapes, and the tips of the Vs point upstream; the Vs in the map point to the northwest.

Use the figure below to answer questions 14–15. The figure shows Earth’s system of latitude and longitude lines. Lines are shown in 30° increments.

Latitude and Longitude



Interpreting Graphics

14. Which point is located at 30°N , 60°E ?

- point E
- point F
- point G
- point H

G. point F

15. The distance between two lines of latitude that are 1° apart is about 111 km. What is the approximate distance between points G and E?

$$\underline{111 \text{ km}/1^{\circ} \times 60^{\circ} = 6660 \text{ km}}$$