TOPOGRAPHIC MAP ACTIVITIES 1, 2, and 3

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Grades 4-5 NMA Activities, Nevada State Science Education Standard Correlation. Referencing Science Standards 2005 http://www.doe.nv.gov/standards/standscience.html									
	N.5.A.2	N.5.A.3	N.5.A.4	N.5.A.5	N.5.A.6	N.5.A.7	N.5.B.1	N.5.B.3	E.5.C.3
Topographic Map Activity	X	X	X	X	X	X	X	X	X

PREFACE: In order to find our way around this world of ours, we often rely on maps. We use road maps when traveling, property maps to find boundary lines, and city maps to locate parks, offices, and other important features. Geologists, hydrologists, wildlife specialists, builders, and other professionals require many different types of maps that will suit their needs.

Our focus will center on TOPOGRAPHIC OR CONTOUR maps, a class of maps that show the shape or landscape of the earth around us. Topographic maps show mountains, valleys, rivers, canyons, plains, volcanoes, lakes, stream channels, and many other features.

PURPOSE: This series of three activities is designed to familiarize students with the features of a topographic map; to introduce the concept of looking at a two-dimensional object (a topographic map) in three dimensions; and to demonstrate how the varied and complex landforms on our earth are represented in map form.

SUBJECTS/SKILLS USED IN THESE ACTIVITIES:

- Reading
- Math, Science, Physics (measurements taken, view objects in 3-dimensions)
- Geography
- Art

TOPOGRAPHIC MAP ACTIVITY 1
BUILDING A 3-D TOPOGRAPHIC MAP MODEL

ACTIVITY PRODUCT: By following the instructions given below, students will be able to construct a 3-dimensional model from a 2-dimensional topographic map to show the actual shape of the landscape represented in the map.

MATERIALS NEEDED:

- 2-3 copies of Topographic Map Number 1 per student
- Thin cardboard or heavy poster board sheets
- Scissors
- Pencils
- Play-doh or clay

INSTRUCTIONS:

1. Pass out a copy of Topographic Map Number 1 to each student. Give them a chance to look at the map then ask them to describe what is shown. Ask them if they know what the solid, curved lines and other features represent. Explain the following:
   a. The solid curved lines are contour lines representing lines of equal elevation through the earth's surface.
   b. The number on each contour line represents its elevation above sea level.
   c. North is always toward the top of the map, unless otherwise specified – see North arrow on legend.
   d. Note the legend at the bottom of the map that describes various features shown on the map.
   e. Topographic maps contain natural and cultural features such as streams, vegetation patterns, roads, cities and towns, wells, buildings and various types of mine workings.
   f. The closer together contour lines are, the steeper the terrain. Conversely, the farther apart contour lines are, the flatter the terrain.
2. Let the students know that they are going to turn the map into a 3-dimensional model so they can see what the contour lines are really showing.
3. Pall out several pieces of cardboard or poster board, a pencil, scissors, a good-sized lump of clay, and an extra copy of the map to each student. (Have students work in pairs if time and materials are short.)
4. Trim off the borders along the top, bottom, and sides of one of the maps. Then cut the map apart **along the 120' contour lines only**. You should end up with three separate pieces: Two pieces with contour lines and a third piece with the stream on it. Set the stream piece aside, it will be used later.
5. Lay one of the large pieces of the **map** on a sheet of cardboard and trace its outline. Label it 120'. Then reduce the size of the **map** by cutting along the 140' contour line.
6. Trace this new, smaller **map** piece on another sheet of cardboard and label it 140'.

7. Continue cutting along contour lines representing progressively higher elevations. Each time trace the new, smaller piece and be sure to label the elevation represented by each piece.
8. Repeat the same process for the other section of **map** that has contour lines.
9. Cut out each of the cardboard or poster board tracings. You should end up with 12 pieces.
10. Using your second contour map as a guide, stack the pieces from lowest to highest elevation. You will be making two stacks of cardboard. As you stack the layers, stick several balls of clay between each layer. This will elevate each section of the model a little higher so the students can more easily see what the contours show.
11. Lay the stream piece between the two stacks.
12. When the students are finished making their 3-D models, they should be able to see the canyon that the stream runs through.
13. Explain that a skill map reader can look at a topographic map and instantly imagine what the landscape of the area looks like.

TOPOGRAPHIC MAP ACTIVITY 2
MAKING A TOPOGRAPHIC CROSS-SECTION

ACTIVITY PRODUCT: Students will produce a vertical cross-section through a topographic map to visualize the shape of the map landscape along a given line.

MATERIALS NEEDED:

- Copy of **topographic map with cross-section**
- Pencil
- Ruler

INSTRUCTIONS:

1. Pass out copies of the map with cross-section. Have students take a few moments to look at the topographic map. Note and discuss the features shown on the map including contour lines (lines of equal elevation), stream channel, road, building, north arrow and marsh land area.
2. Note especially the heavy black line across the upper portion of the map labeled A-B. This line indicates the area along which your cross-section will be drawn. **A cross-section is simply a vertical slice that you will create between the two given points A-B that will show what the topography or elevation differences look like along the line A-B**. To the right of the topographic map is a box labeled “cross-section.” This is where your drawing will be made.
3. Beginning at Point A on the map, use the ruler to measure the distance to where the 180' contour line intersects (crosses) line A-B. Go to the cross-section and measure that same distance from Point A on the bottom line of the cross-section. Place a heavy pencil dot at that point. Now, draw a vertical line straight up from that point until you intersect the 180' elevation line. Place a heavy dot on the intersection point.
4. Refer back to the topo map and measure the distance from Point A to where the 160' contour line crosses line A-B. As before, measure that distance from Point A on the bottom line of the cross-section and mark the point. Draw a vertical line up to the intersection point with the 160' elevation line and place a heavy dot at the intersection point.
5. Repeat this process for all of the contours on the map that intersect Line A-B.
6. Measure from Point A on the map to where the stream channel intersects line A-B. Go to the cross-section and measure that distance from Point A on the bottom line. Mark the point with an “X”.
7. Connect the lots that you have places on the elevation lines of the cross-section. Starting on the left side nearest to Point A, connect the 180' dot to the 160' dot; the 160' dot to the 140' dot; and so on across the cross-section.
8. Discuss the following:
   a. If you were actually out on the land surface and were walking along Line A-B, what would your hike be like starting at Point A? (A steep downhill walk to the stream channel, a short, nearly flat trek across the stream channel, then up and over another fairly steep hill.)

b. Is the area between the two 120' elevation poins totally flat or could it actually go below the 120-foot elevation? (The area between the 120-foot contour lines will go below the 120-foot elevation but not as far as the next 20-foot contour interval which would be 100'. Students could show the area between the 120-foot contours as a U-shaped depression with a small “V” cut into it where the stream channel intersects the section line.)

c. Is the area between the two 240-foot elevation points on the hill flat and straight across or could it extend above the 240' elevation line? (The area between the two points is left to the students’ imaginations. It could be a flat-topped “mesa” or could extend, in just about any shape, above the 240' line as long as it stays below the next higher elevation line, which would be 260'.)

TOPOGRAPHIC MAP ACTIVITY 3
SKETCH A TOPOGRAPHIC MAP LANDFORM

NOTE: Recommend students be given this activity only after having completed activities 1 and 2.

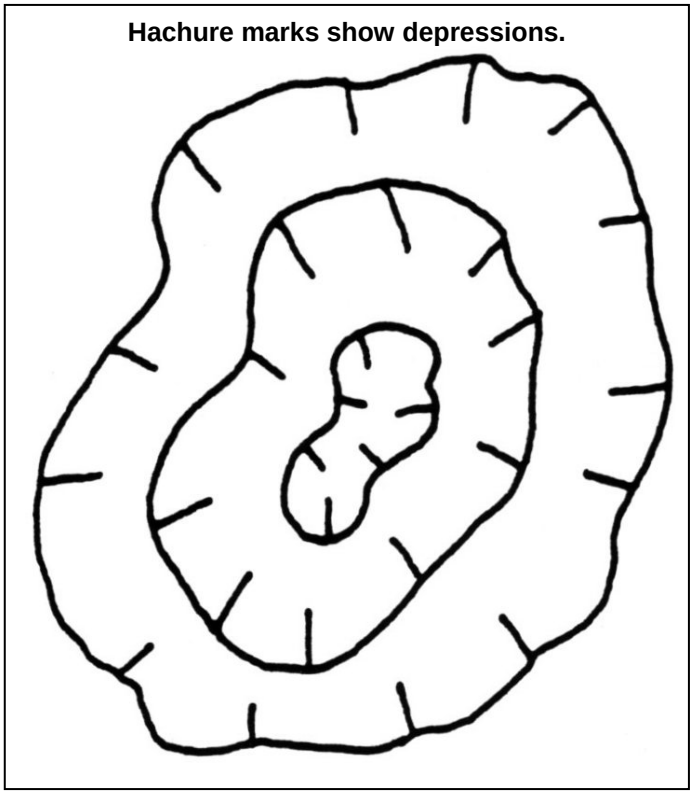
ACTIVITY PRODUCT: Given two topographic maps, students will use their artistic abilities and acquired knowledge of topographic maps to sketch the land forms represented by the maps.

NOTE 2: Contour lines represent lines of equal elevation on a topographic map. It is possible to show a depression on a topo map using hachured contour lines. See the example below.

MATERIALS NEEDED:

- Copies of Contour Maps 1 and 2
- Pencils, colored pencils, fine point marking pens, etc.

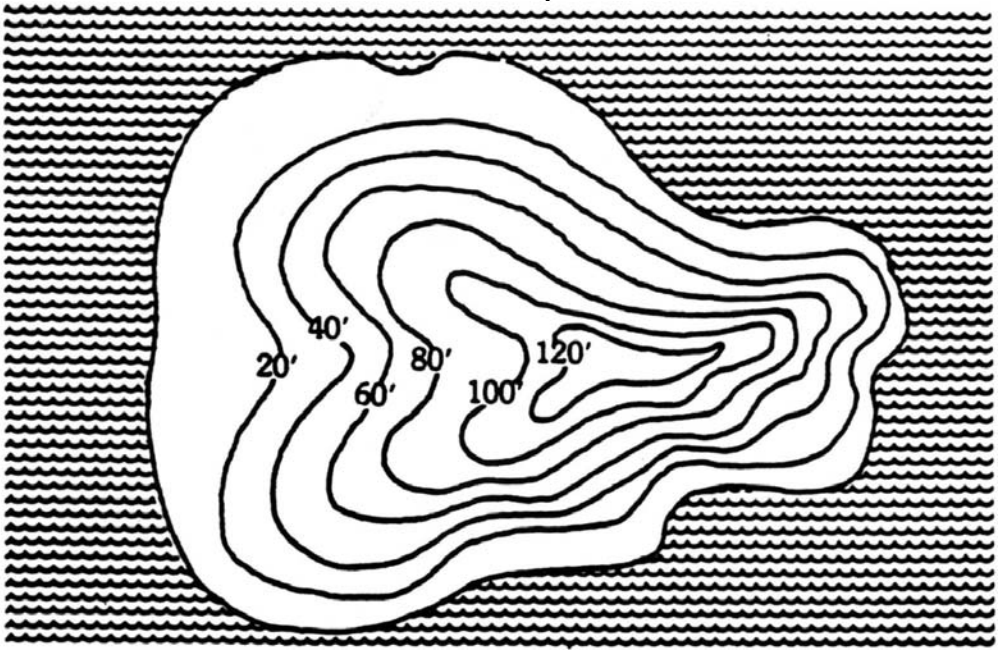
INSTRUCTIONS:
Provide each student with copies of Contour maps 1 and 2, and the pencils or pens of their choice. Under each contour map is space for them to sketch the landform shape they visualize in looking at the map.



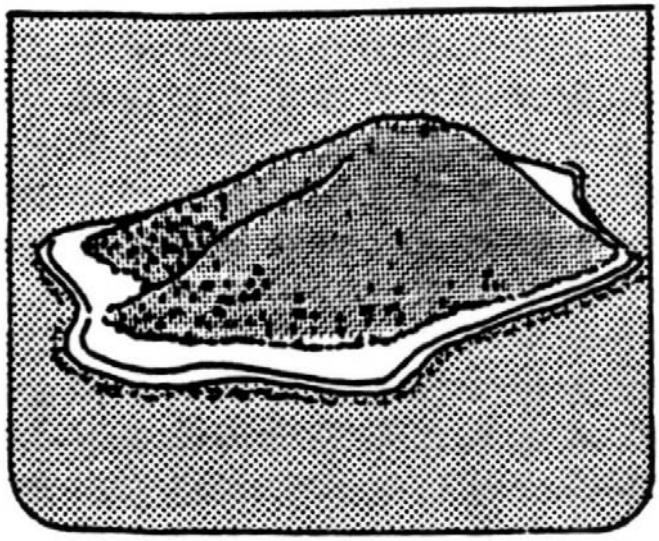
Teachers' Explanation - Contour Map 1:

Map 1 is an island in the ocean. It rises gently from the West (left side) to a fairly steep hill on the east (right side). There is a gully or stream channel on the west side that is shown on the contour map by the "vee-shaped" bend the contour lines make toward higher or increasing elevations. A ridge is shown on a contour map by the “vee-shaped" bend the contour lines make toward lower or decreasing elevations.

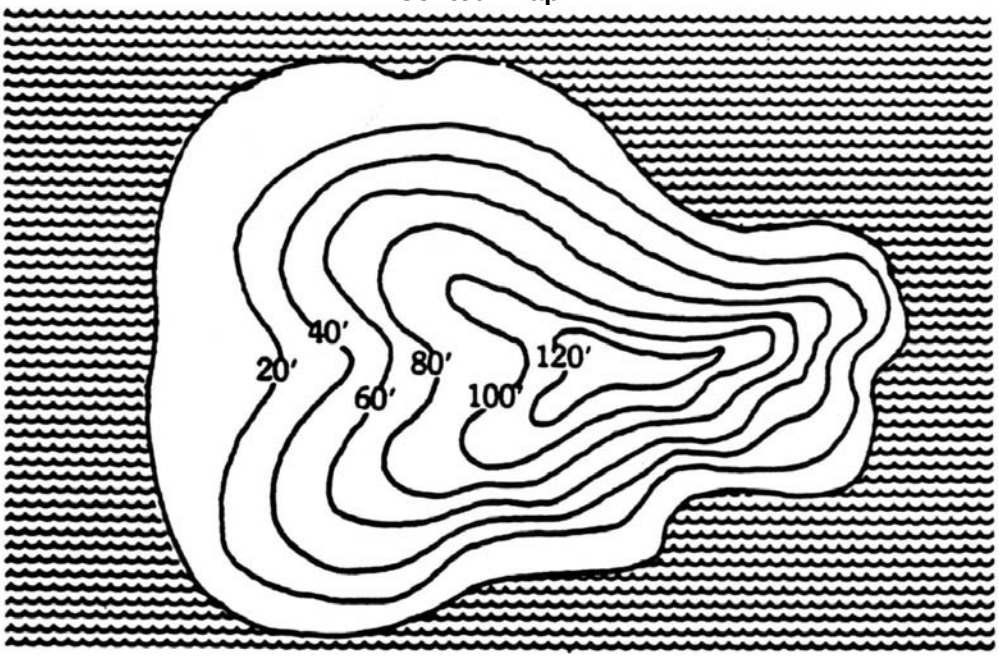
Contour Map #1



Contour map #1 should look something like this.



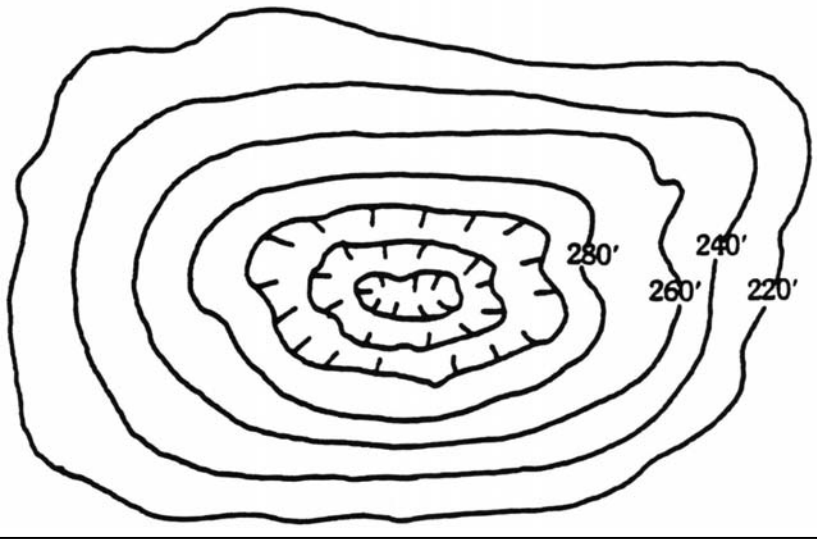
Contour Map #1



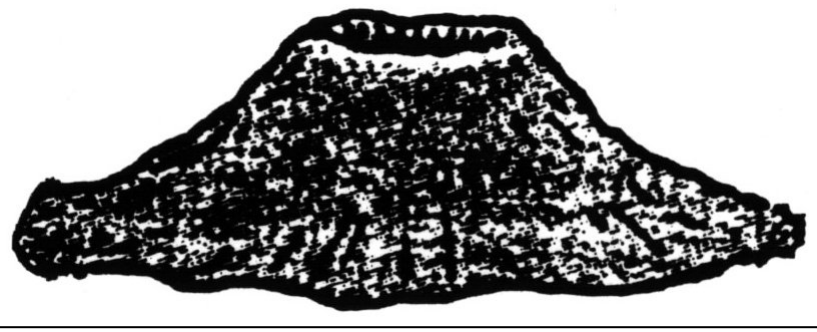
Teachers' Explanation - Contour Map 2:

Map 2 represents a volcano with gentle slopes at the fringe quickly building up to steep sides and a depression at the top or summit.

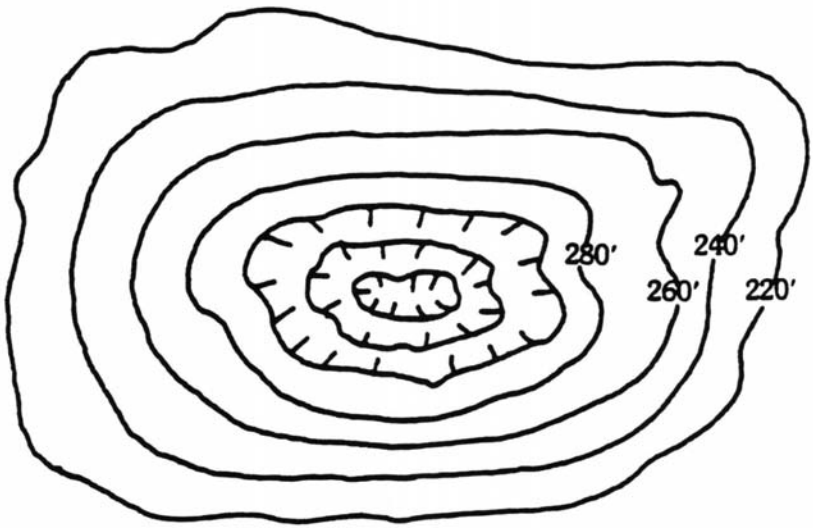
Contour Map #2

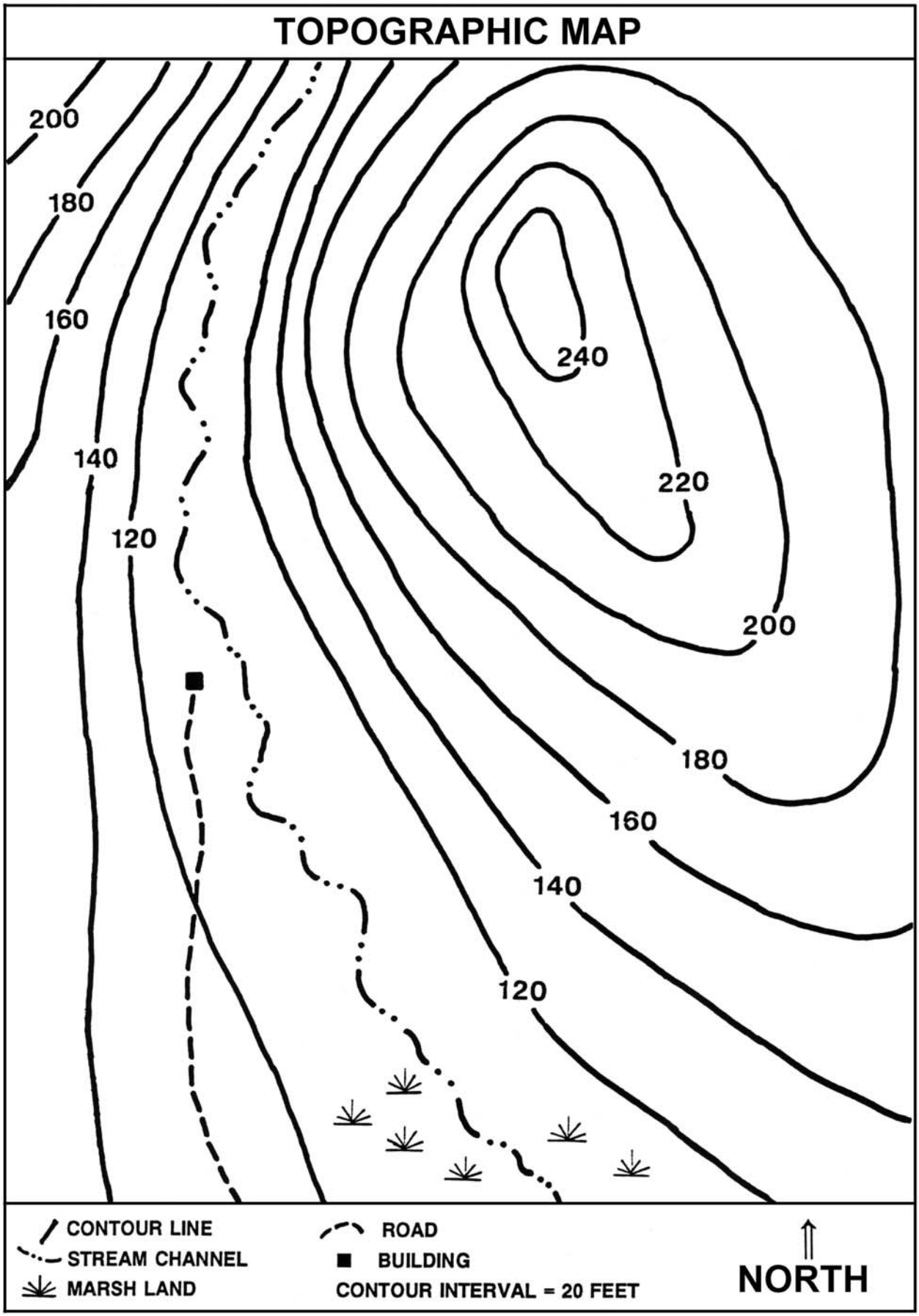


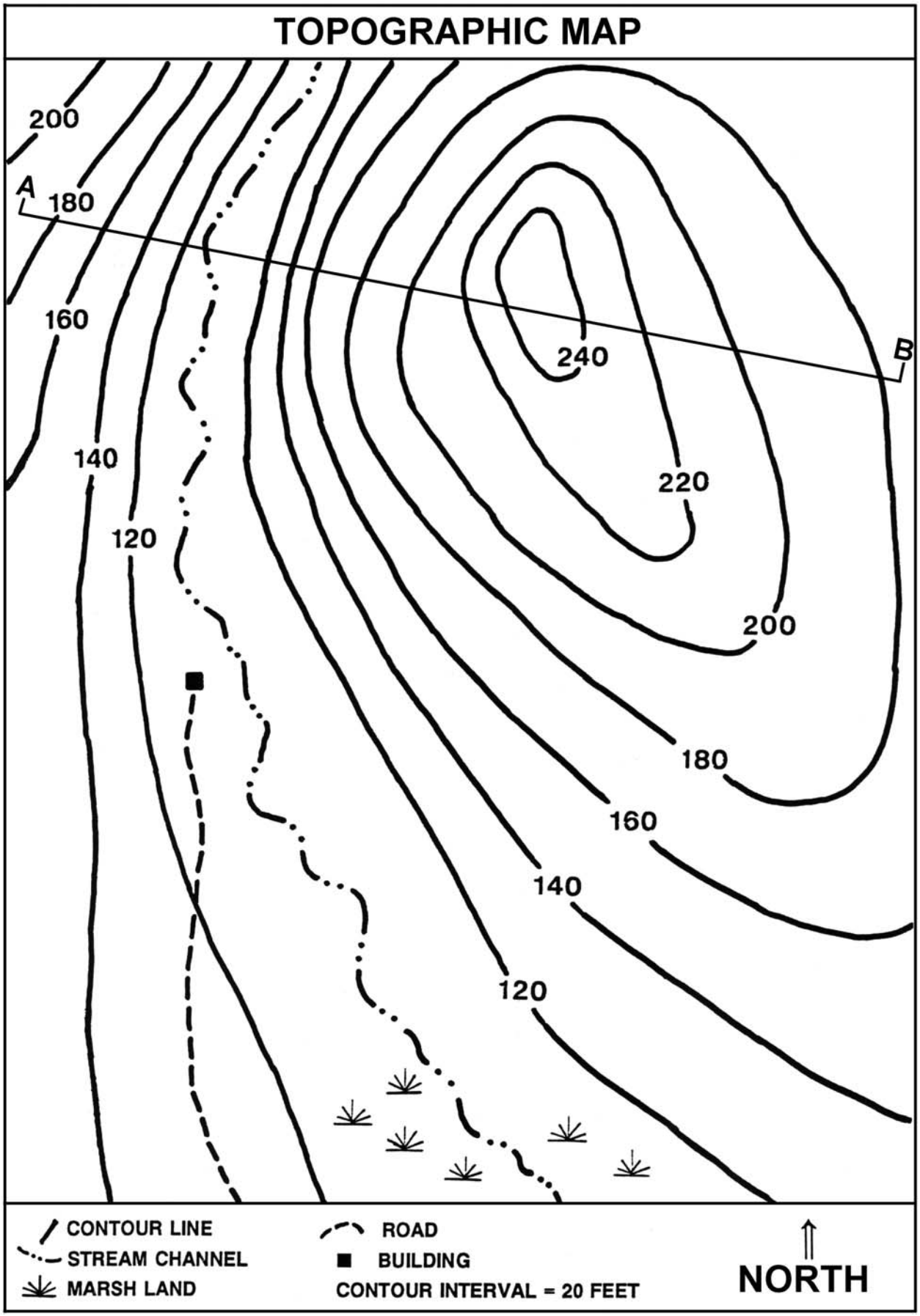
Contour Map #2 should look something like this.



Contour Map #2




TOPOGRAPHIC MAP
200
180
160
140
120
240
220
200
180
160
140
120
CONTOUR LINE
STREAM CHANNEL
MARSH LAND
ROAD
BUILDING
CONTOUR INTERVAL = 20 FEET
NORTH


TOPOGRAPHIC MAP
200
180
160
140
120
240
220
200
180
160
140
120
A
B
CONTOUR LINE
STREAM CHANNEL
MARSH LAND
ROAD
BUILDING
CONTOUR INTERVAL = 20 FEET
NORTH

Cross-Section