

Geologic Mapping

Regional Tournament *Trial Event*

Team Name _____

A TEAM OF UP TO: 2

AVAILABLE TIME: 50 min

Required Materials: Each team MUST have a protractor, ruler, non-programmable calculator, colored pencils, and an equal-area projection stereonet with tracing paper and pin.

Permitted Materials: Each team is permitted to bring one three-ring binder (any size) containing information in any form from any source. The material must be 3-hole punched and inserted into the rings (notebook sleeves are allowable).

Scoring: All questions will have been assigned a predetermined number of points. The highest score wins. Selected questions having differentiated weights will be used to break ties.

Multiple Choice (2 points each)

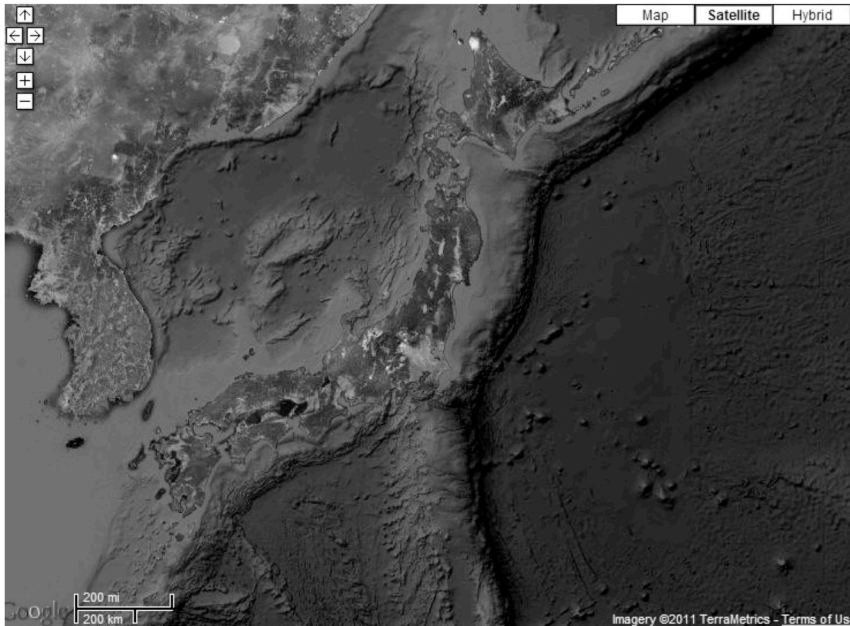
Circle the correct answer clearly.

1. Which of the following statements concerning a mid-ocean ridge is NOT true?
 - A) It is associated with composite volcanoes
 - B) It has a rift valley along its axis
 - C) It receives a steady supply of biogenic sediment
 - D) It is offset by transform plate boundaries
 - E) It is a broad, up-arched region of the ocean basin

2. Wherever the oceanic ridge has been sampled, the bedrock is
 - A) basalt
 - B) granite
 - C) andesite
 - D) rhyolite

3. Because of isostasy, the crust beneath a mountain belt undergoing rigorous erosion is likely to
 - A) remain at a constant level
 - B) break into blocks
 - C) rise
 - D) move laterally
 - E) sink

4. Identify the type of plate boundary indicated on the shaded relief map



- A) convergent
- B) divergent
- C) transform
- D) the indicated feature is not a plate boundary

5. The movement of lithospheric plates

- A) is so slow that it cannot yet be measured
- B) proceeds at rates of several kilometers per year
- C) proceeds at rates of several meters per year
- D) proceeds at rates of several centimeters per year

6. A fractional scale of 1:24000 means that 1 inch on the map is equal to

- A) 12 feet on the ground
- B) 2000 feet on the ground
- C) 24000 feet on the ground
- D) 24 feet on the ground
- E) 2400 feet on the ground

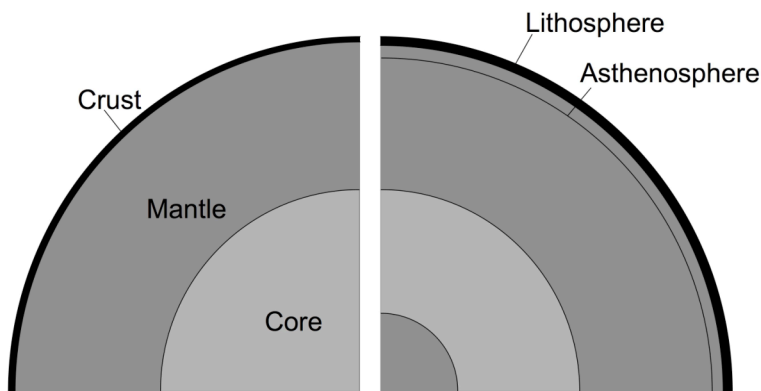
Short Answer

Complete each question according to the directions given. Point values are as indicated.

7. The figure below depicts two different methods for labeling the Earth's layers.

A) In 1-2 sentences, describe the difference between these two labeling schemes. (3 pts)

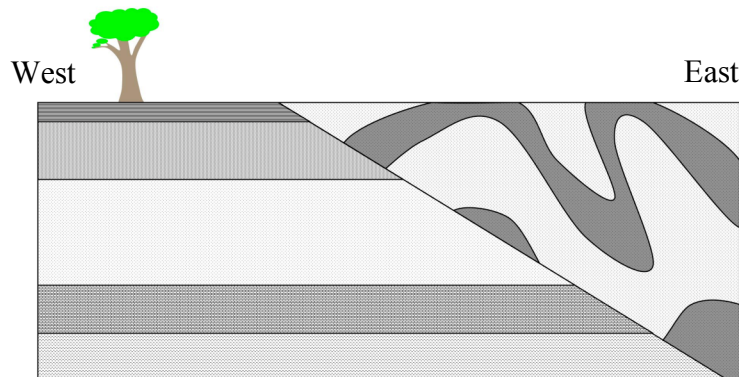
B) Which labeling scheme is more relevant to understanding plate tectonics? Why? (4 pts)



8. The cartoon below depicts the profile view of a fault. Imagine you are viewing this from a far cliff and reaching the fault is impossible. All you know is that the rocks to the west are sandstones and shallow marine sediments and those to the east are quartzites and schists. Based on what you know, what is the most likely type of movement across the fault plane (assuming dip-slip motion)? Defend your interpretation in 1-2 sentences.

Type of fault: (2 pts)

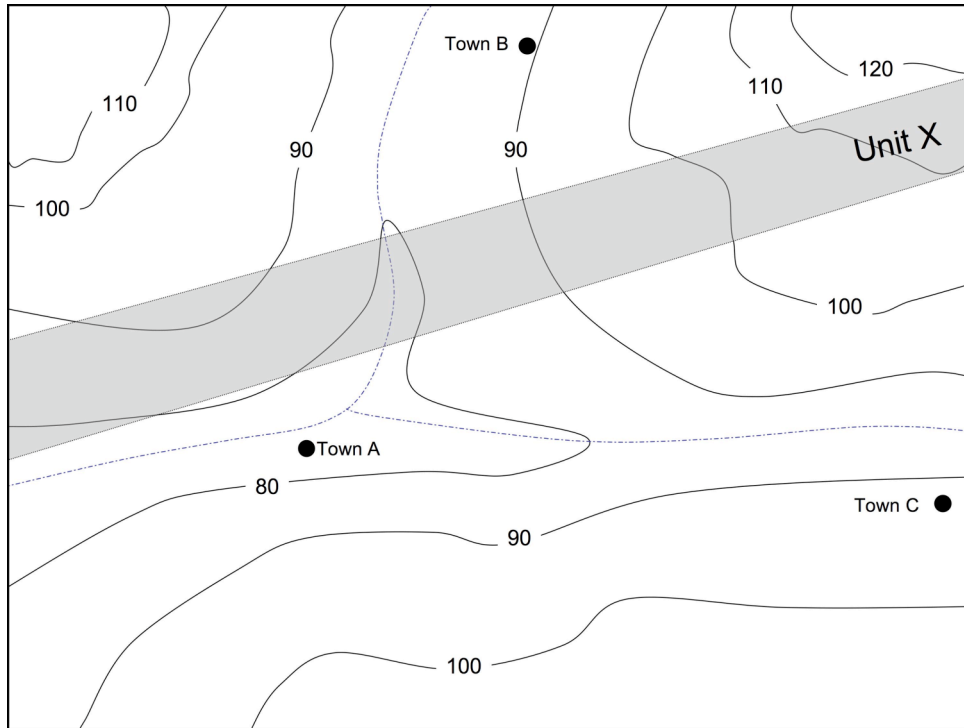
Defense of interpretation: (3 pts)



9. Below is a topographic map with the bedrock geology of Unit X, a fine-grained silt-stone, shown overlain on the topography.

A) Based on the map signature, what is the dip angle of Unit X beneath the surface? (2 pts)

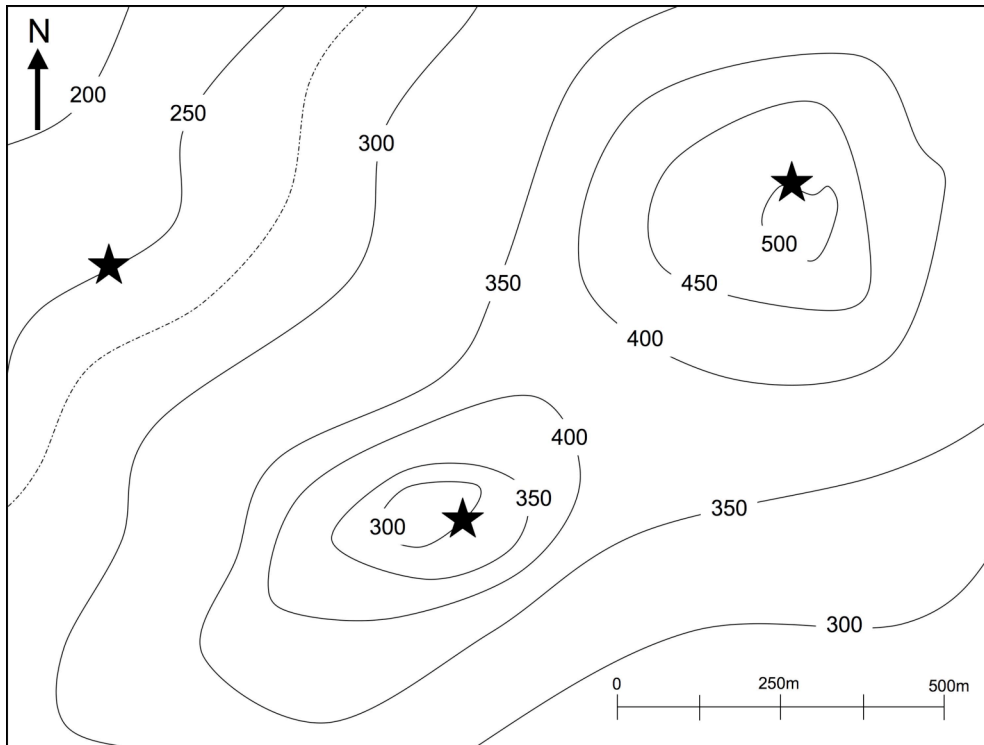
B) Of the three towns labeled on the map, which is at the greatest risk for flooding? (2 pts)



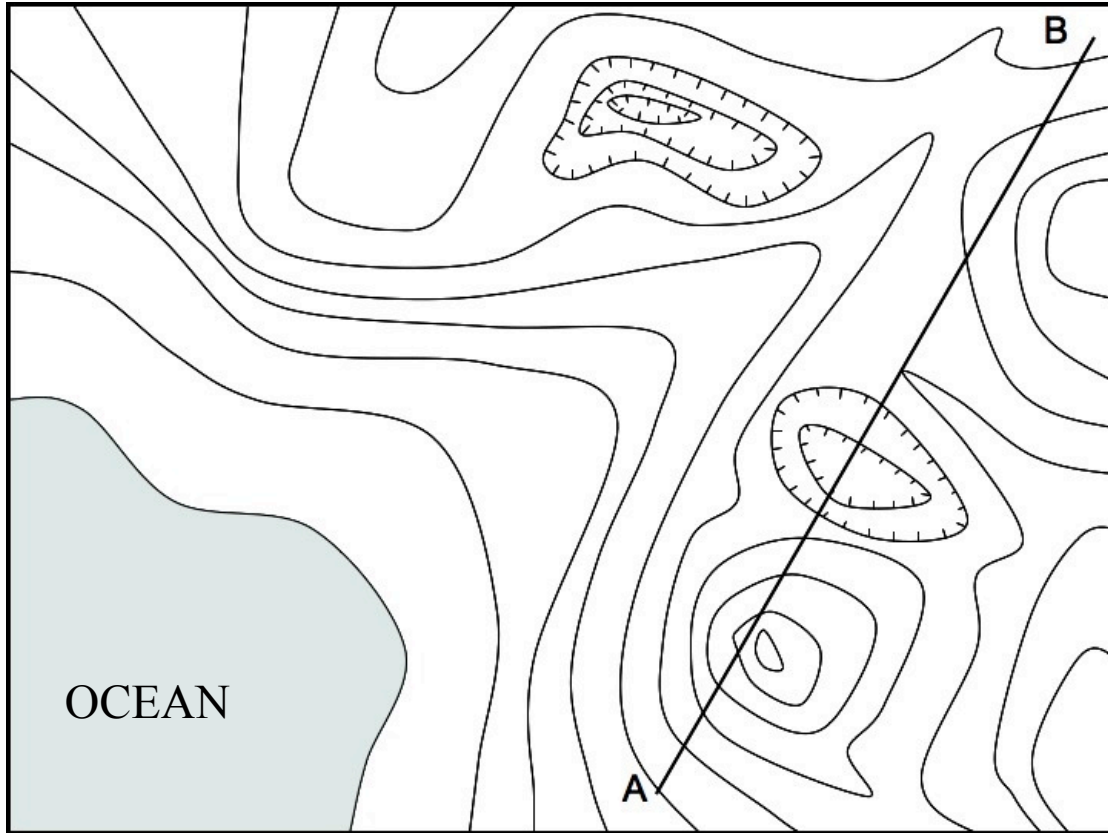
Problem Solving

Complete each question according to the directions given. Point values are as indicated.

10. A sandstone bed outcrops at the three locations marked with stars. This area is inaccessible by foot, so you must determine the orientation of the bed from the data you have. Determine the strike and dip of the bed and circle your final answer of an azimuth, dip angle in degrees, and dip direction. Use the space provided below for your calculations and **BOX YOUR ANSWER** (8 points).



11. The topographic map below has been drawn using 20m contour intervals.
- A) Label the contours with the appropriate elevations (3 points)
 - B) Mark the highest elevation point with a red star (2 points)
 - C) Construct a topographic profile on the line below the map, clearly marking elevations on the vertical scale (7 pts)

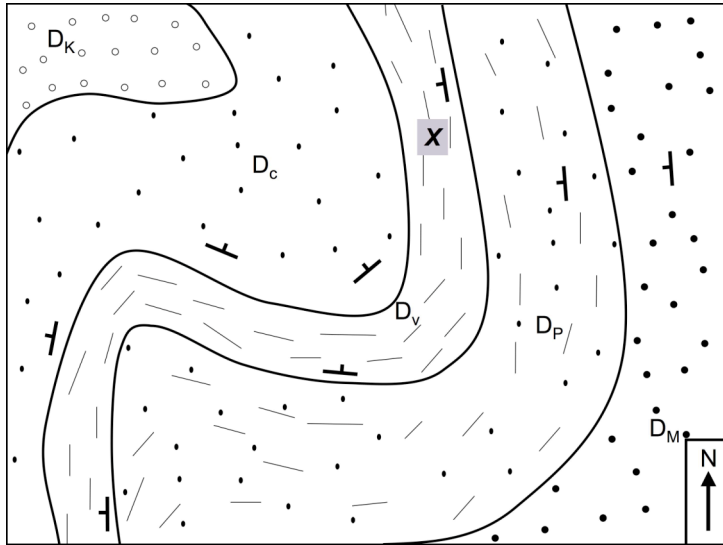


A ————— B

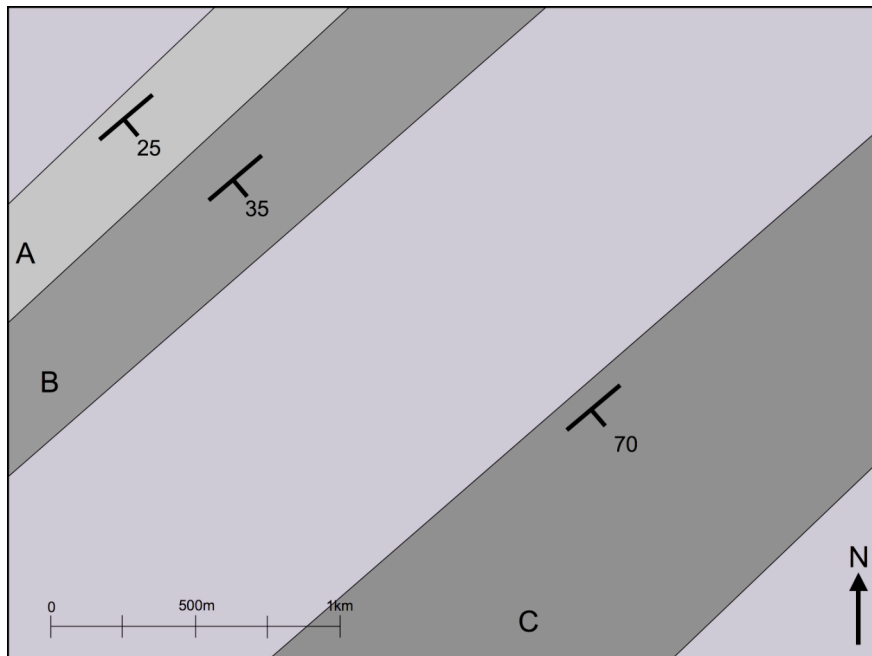
12. Use the geologic map below to answer the following questions.

A) On the map, draw the appropriate map symbols that most accurately represent the geologic structures depicted. (3 pts)

B) If you owned property at the point indicated with an X on the map, what formation would you encounter at depth after drilling through D_v ? (2 pts)



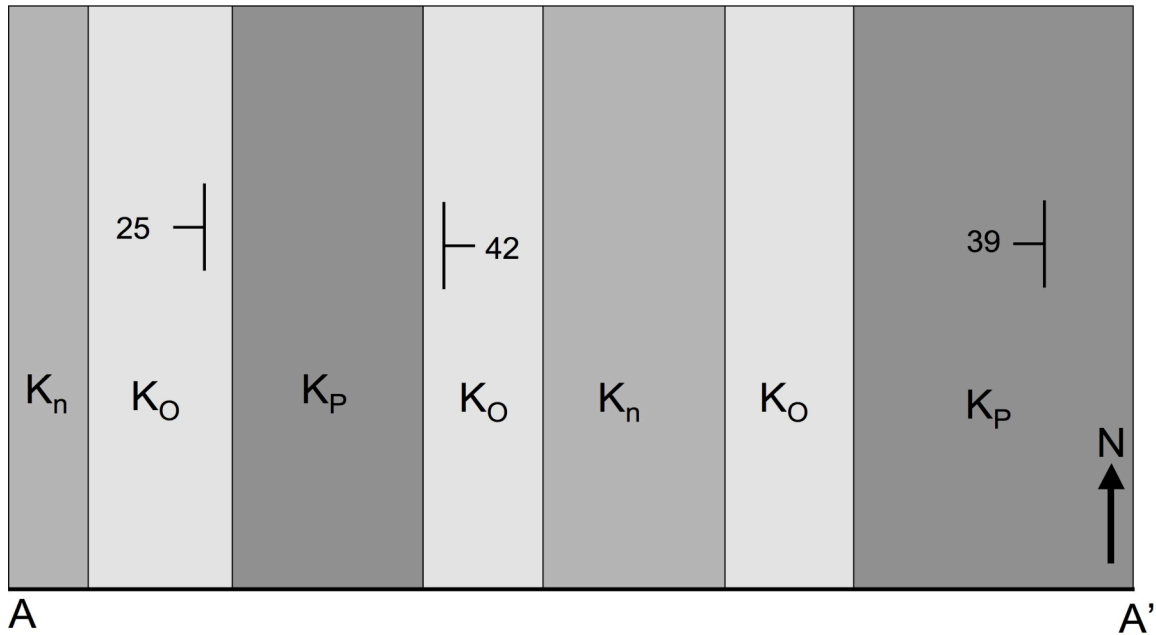
13. Calculate the bed thicknesses of units A, B, and C. Do calculations in the space provided (9 points)



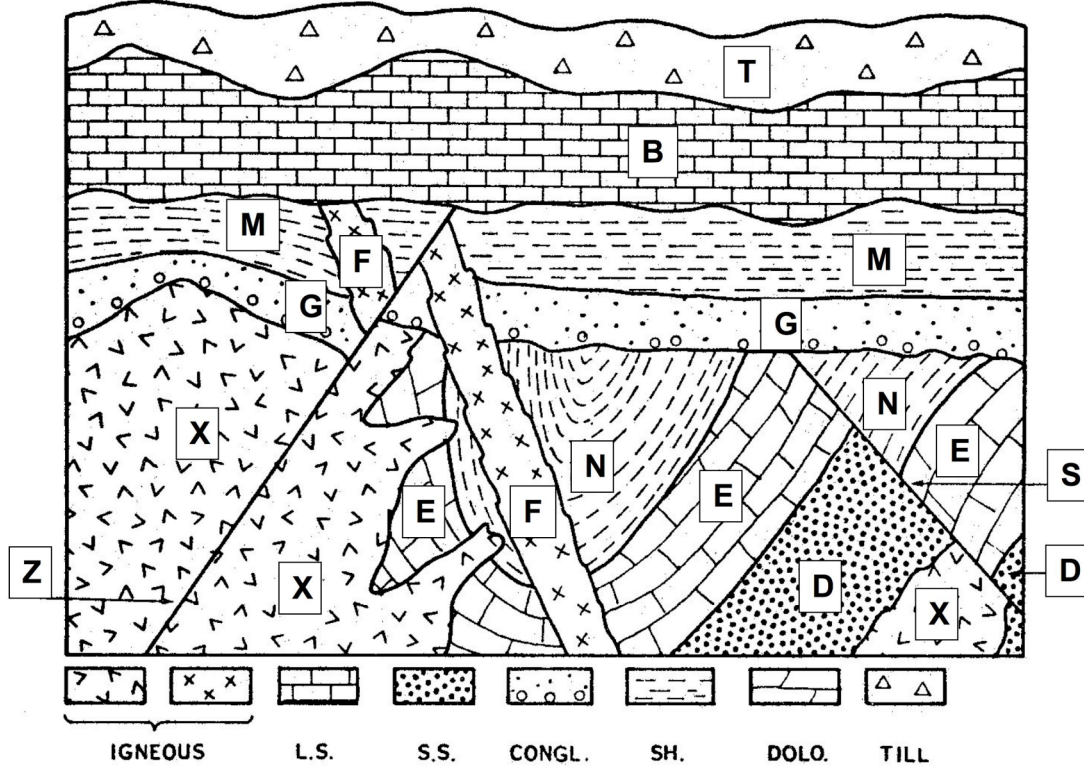
14. Perform the following tasks on the geologic map below.

A) Using the information given on the geologic map below, draw a cross-section from A to A'. Assume no faulting, as none are indicated on the map. Be sure to label the units (8 points)

B) Draw the appropriate map symbols for the structural features found on the map (2 points).



15. Using basic, geologic principles, determine the order of events depicted in the cross-section below. Labels include depositional units, intrusions, faulting, and erosional horizons. Place the letters in order in the column to the right from oldest (bottom) to most recent (top) (11 points)



Youngest _____

Oldest _____

16. You are standing in a very remote area with a large canyon between you and the outcrops you need to measure. Because you cannot reach the rocks, you cannot find the true strike and dip of the bed in question, but you are able to find two apparent dips. Using a sheet of tracing paper and the stereonet below, use the strikes and apparent dips to determine the true strike and dip of the bed. Turn in the tracing paper with the exam (7 pts).

Apparent dips: $245^{\circ} 32'$ and $041^{\circ} 60'$

What are the true strike, dip, and dip direction?

LAMBERT EQUAL-AREA PROJECTION

