



LG 3

Activity 2

EARTH SCIENCE GEOLOGY LOCATION OF EARTHQUAKE EPICENTRE

STUDENT EXERCISE

OBJECT: To locate an earthquake's epicentre using data based on magnitude and intensity.

BACKGROUND: Assume that you have woken up in the middle of the night to what sounds like thunder, but with massive and violent shaking. An earthquake is occurring; you and your family scramble for cover as the shaking continues for about 45 seconds, knocking over lamps, books and shelving, shattering windows and causing pictures to drop from their mounts as cracks open up in the drywall...

Over the next few hours, information pours in from all over. Included in that information: the quake registered 7.3 on the Richter scale; all other information, including intensity readings and data based on seismic wave measurements, is included in this activity.

MATERIALS: - maps of southwest B.C. showing the following locations:
1. New Westminster, 2. Victoria, 3. Bellingham, 4. Hope, 5. Nanaimo
- compass

PROCEDURE:

1. Examine Map 1. It shows earthquake intensity at various locations in southwest B.C. and Washington State. Draw contour lines of intensity on this map, using intervals of 2 for each line (i.e. 2, 4, 6...etc). Note: contour lines never cross or touch each other.
2. Examine Map 2. It shows the location of three seismograph stations where information on the earthquake was recorded. Using differences in P and S wave arrival times, the following distances from the earthquake to each location were determined:

Station A: 84 km
Station B: 140 km
Station C: 103 km

- a) Use a compass to draw the distance of the earthquake away from Station A. Note that the scale at the bottom of the map will be useful in this regard.
- b) Repeat 2(a) for each of the other two stations.
- c) Now you should have a location for the epicentre of the earthquake. Mark this location with a red 'X'.

QUESTIONS:

1. a) At which location(s) was the intensity of the earthquake the greatest.

- b) Why do you think these locations showed the greatest intensity?



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STUDENT EXERCISE

2. Can you accurately determine the epicentre location of an earthquake, using intensity data alone? Explain your answer.

3. a) Can you accurately locate the epicentre of an earthquake, using one seismograph station alone? Explain your answer.

- b) How many seismograph stations are needed to locate an earthquake's epicentre?

- c) Describe a situation where more stations would be needed than your answer to (b).

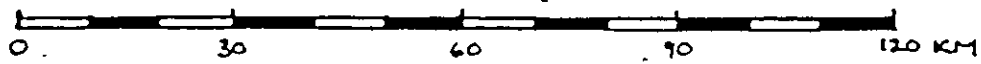
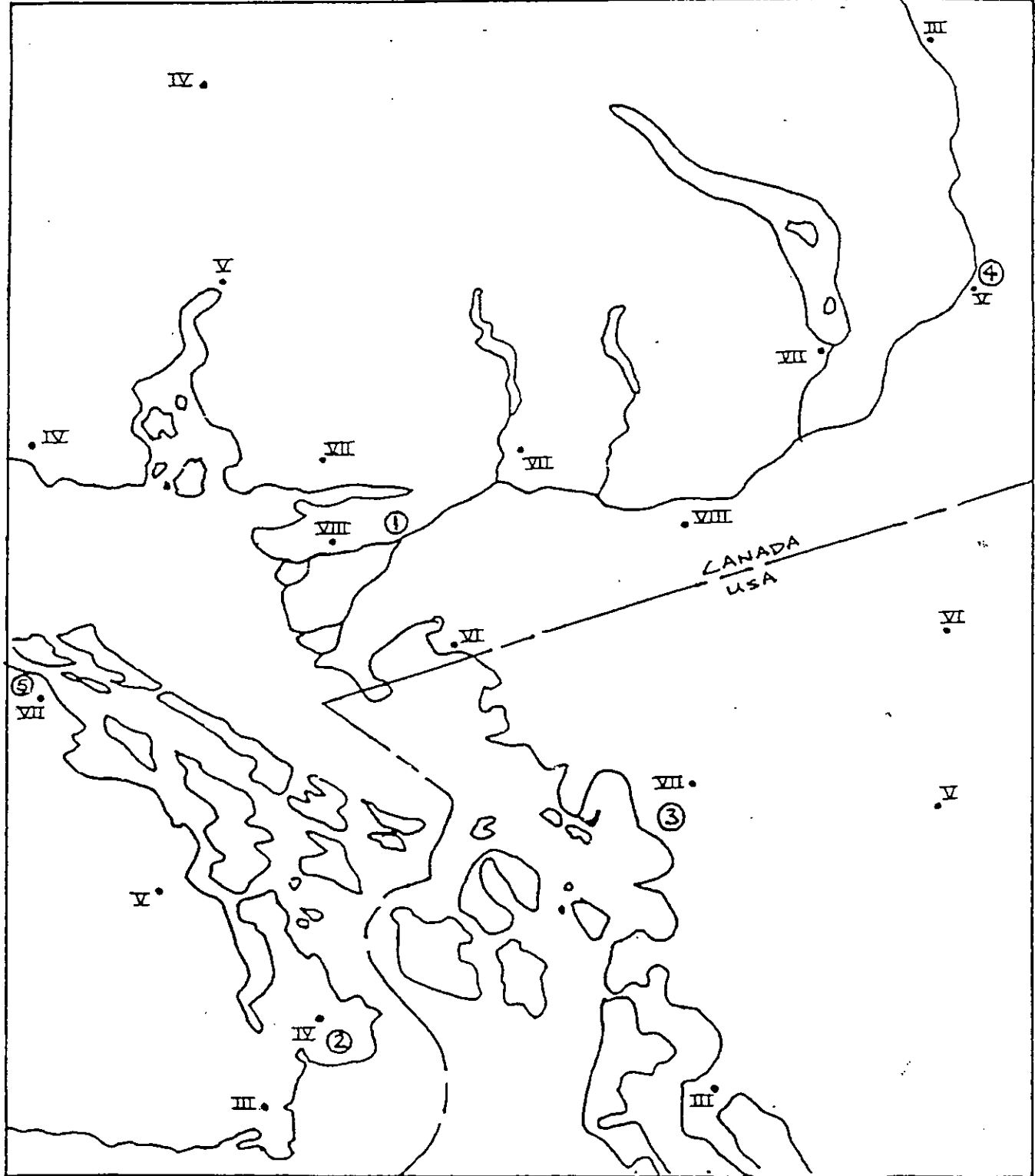
4. As your distance away from the epicenter of the earthquake increases, describe what happens to:

a) intensity. _____

b) magnitude. _____

MAP OF SOUTHWEST BRITISH COLUMBIA

MAP 1.



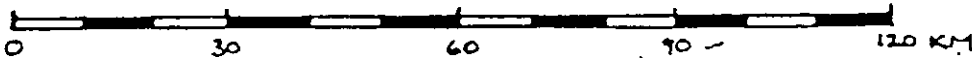
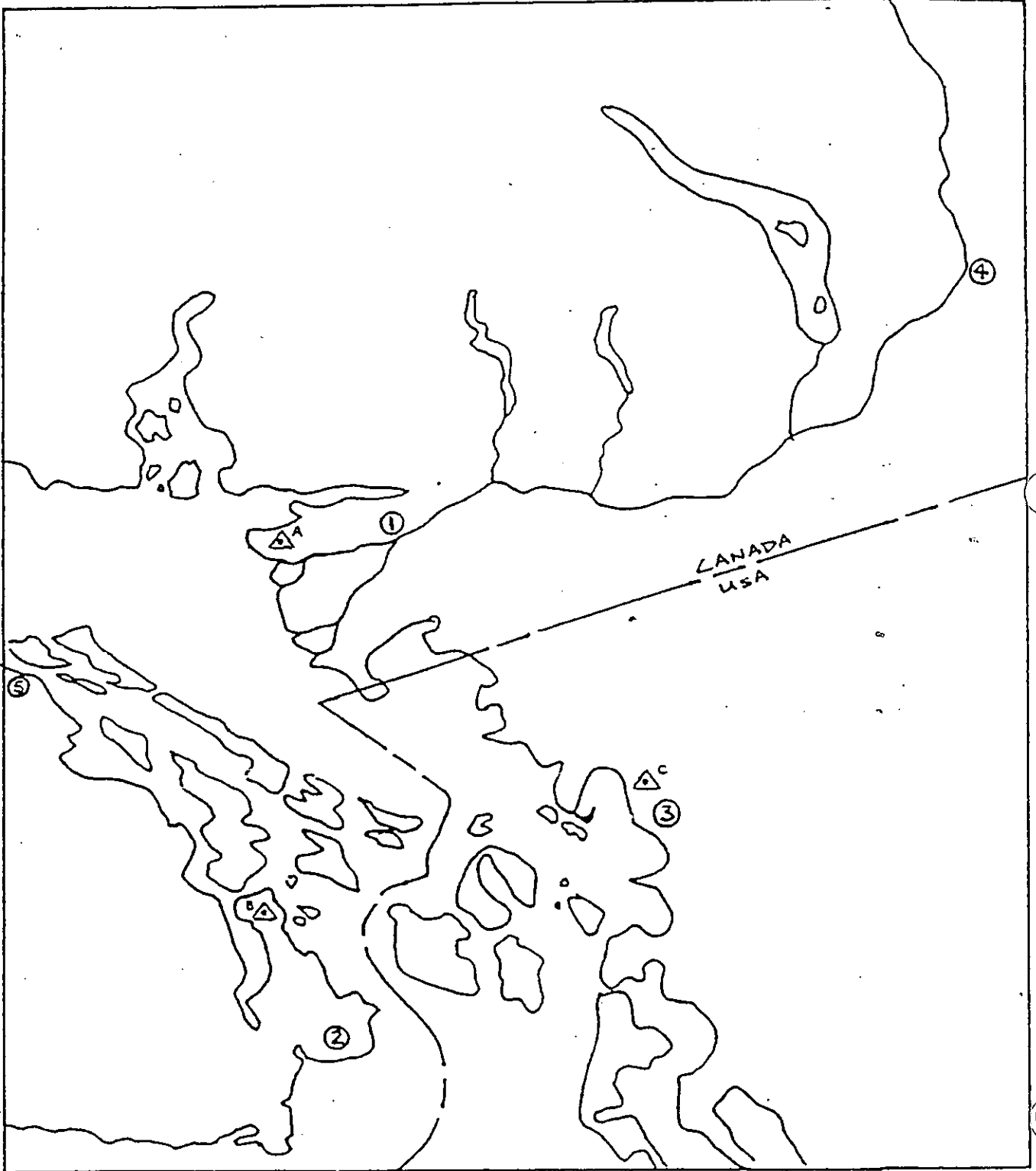
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MAP OF SOUTHWEST BRITISH COLUMBIA

MAP 2.



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Table 14.3 A comparison of the Richter and Mercalli scales

Richter	Mercalli	Annual occurrence	Approx. energy	Ground motion at 100 km	Distance felt (km)
0	0	many	small car falling from a bridge	0.000000003 m	-
1	1	many	small dynamite charge	0.00000003 m	3
2	1.5	300 000+	1 t dropped from 2 km	0.0000003 m	7
3	2	49 000	20 t TNT	0.000003 m	15
4	4	6 200	1 t dropped from 2000 km	0.00003	30
5	6	850	Hiroshima bomb	0.0003 m	70
6	7	120	small hydrogen bomb	0.003 m	125
7	9	18	20 megaton hydrogen bomb	0.03 m	250
8	11	1	600 megaton bomb	0.3 m	450
9	12	0	1 million t dropped 2000 km	3 m	1000 km +
10		none ever recorded	1 billion t from 2000 km — all rock would disintegrate	30 m	worldwide

