

**SS Geography – E-Learning Activity 1**

**How are global mountain ranges formed by plate movement**

Name: \_\_\_\_\_ ( ) Class: \_\_\_\_\_

**Objective**

To explore and explain the relationship between the distribution of mountain ranges and plate boundaries around the world.

**A. What and where are the mountain ranges around the world?**

Steps in ArcGIS:

1. Visit: <http://esriurl.com/earthgeoenquiry9>
2. With the Details pane visible, click **Contents of Map**.
3. Turn on the layer, **Tectonic Boundaries**.



(i) Count the number of mountain ranges that are found near each type of plate boundary.

	Convergent plate boundary	Divergent plate boundary	Transform plate boundary
Number of mountain ranges			

(ii) Which type of plate boundary obtains the most amount of mountain ranges? Explain your answer.

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**B. Are there any exceptions?**

Steps in ArcGIS:

- Turn on the layer, **Ranges Away From Boundaries**.

(i) Identify 2 mountain ranges that are far away from plate boundaries.

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(ii) Suggest reason for these mountain ranges to be far away from plate boundaries.




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**C. What influences the height of the mountains?**

Steps in ArcGIS:

- Turn on the layer, **Plate Motions (mm/year)**.

(i) Match the speed of plate motion with the mountain ranges shown below:

	Himalayas	Rocky Mountains	Ural Mountains
			
Altitude (ft)	29000	14400	6200
Speed of plate motion (mm/year)			

(ii) What is the relationship between the speed of plate motion and altitude of mountain ranges? Explain your answer.

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**SS Geography – E-Learning Activity 2**  
**Effects of plate boundaries on volcanoes**

Name: \_\_\_\_\_ ( ) Class: \_\_\_\_\_

**Objectives**

- To contrast the characteristics of the two types of plates
- To observe the relationship between types of volcanoes and the plate boundaries

**A. How are the earth's two plates different?**

*Steps in ArcGIS:*

1. Visit: <http://esriurl.com/earthgeoinquiry8>
2. Click the pin on the Pacific Coast. Click the image in the pop-up to see more detail.



(i) Contrast the thickness of the oceanic plate and continental plate.

	Oceanic plate	Continental plate
Plate name		
Thickness		

(ii) Observe the distribution of volcanos. Deduce which of the above plate subducts beneath another.

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(iii) Why would one plate subducts beneath another?

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**B. What are the relationships between volcano type and the plate boundaries?**

*Steps in ArcGIS:*

1. Unclick the **Elevation Cross Sections** layer.

2. Turn on the **Plate Boundaries** and **Global Volcanoes** layer.
3. For question (i):
  - zoom in to the western coast of the USA, click on **Mount Rainier** to the south of Seattle; and
  - zoom in to south eastern part of Hawaii, click on **Mauna Loa**.

(i) Complete the following table

	Mount Rainier	Mauna Loa
		
Plate boundary nearby		
Height/ elevation (m)		
Frequency of eruption	Active	
Shape of volcano		
Erupted materials		

*Steps in ArcGIS:*

- Zoom out to reveal a general picture of volcano distribution around the world.

(ii) Which type of plate boundary has the highest number of volcanoes? Why? *(Hint: Refer to the key by clicking the first button on the left under each layer)*

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(iii) Which type of plate boundary has the highest number of shield volcanoes? Why?

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## SS Geography – E-Learning Activity 1

### How are global mountain ranges formed by plate movement

Name: \_\_\_\_\_ ( ) Class: \_\_\_\_\_

#### Objective

To explore and explain the relationship between the distribution of mountain ranges and plate boundaries around the world.

#### A. What and where are the mountain ranges around the world?

Steps in ArcGIS:

4. Visit: <http://esriurl.com/earthgeoinquiry9>
5. With the Details pane visible, click **Contents of Map**.
6. Turn on the layer, **Tectonic Boundaries**.



(i) Count the number of mountain ranges that are found near each type of plate boundary.

	Convergent plate boundary	Divergent plate boundary	Transform plate boundary
Number of mountain ranges	25	6	8

(ii) Which type of plate boundary obtains the most amount of mountain ranges?

Explain your answer.

Convergent plate boundary. At convergent plate boundaries, magma currents converge, generating huge compressional force. Large scale folding of crust in parallel to the convergent plate boundaries occur, forming fold mountain ranges.

#### B. Are there any exceptions?

Steps in ArcGIS:

- Turn on the layer, **Ranges Away From Boundaries**.

(i) Identify 2 mountain ranges that are far away from plate boundaries.

Brazilian Highlands/ Siberian Highlands/ Scandinavian Range/ Appalachian Mountains/ Urals Mountains

(ii) Suggest reason for these mountain ranges to be far away from plate boundaries.




Many of these ranges formed from old plate boundaries that are no longer active.

#### C. What influences the height of the mountains?

Steps in ArcGIS:

- Turn on the layer, **Plate Motions (mm/year)**.

(i) Match the speed of plate motion with the mountain ranges shown below:

	Himalayas	Rocky Mountains	Ural Mountains
			
Altitude	29000 ft	14400 ft	6200 ft
Speed of plate motion (mm/year)	50	25	18

(ii) What is the relationship between the speed of plate motion and height of mountain ranges? Explain your answer.

The faster the plate motion, the higher the mountain ranges.

The higher velocity of converging plate, the higher the energy provided (compressional force) for mountain formation.

**SS Geography – E-Learning Activity 2**  
**Effects of plate boundaries on volcanoes**

**Objectives**

- To contrast the characteristics of the two types of plates
- To observe the relationship between types of volcanoes and the plate boundaries

**A. How are the earth's two plates different?**

Steps in ArcGIS:

3. Visit: <http://esriurl.com/earthgeo inquiry8>
4. Click the pin on the Pacific Coast. Click the image in the pop-up to see more detail.



(i) Contrast the thickness of the oceanic plate and continental plate.

	Oceanic plate	Continental plate
Plate name	Juan de Fuca Plate	North American Plate
Thickness	10000 ft (~3km)	30000 ft (~9km)

(ii) Observe the distribution of volcanos. Deduce which of the above plate subducts beneath another.

The volcanos are distributed along the western edge of continental plate. Such distribution is an evidence of Juan de Fuca Plate subducting beneath North American Plate. As the oceanic crust subducts, extra amount of magma is created in the asthenosphere. Violent volcanism thus creates volcanos at the western edge of the continental plate.

(iii) Why would one plate subducts beneath another?



The oceanic plate contains denser minerals (e.g. magnesium), thus subducts as it collide with the less denser continental plate.

**B. What are the relationships between volcano type and the plate boundaries?**

Steps in ArcGIS:

4. Unclick the **Elevation Cross Sections** layer.
5. Turn on the **Plate Boundaries** and **Global Volcanoes** layer.
6. For question (i):
  - zoom in to the western coast of the USA, click on **Mount Rainier** to the south of Seattle; and
  - zoom in to south eastern part of Hawaii, click on **Mauna Loa**.

(i) Complete the following table

	Mount Rainer	Mauna Loa
		
Plate boundary nearby	Destructive plate boundary	Hot spot
Height/ elevation (m)	4392	4170
Frequency of eruption	Active	Active
Shape of volcano	Cone	Shield
Erupted materials	Composite (Ash and viscous lava)	Less viscous lava

Steps in ArcGIS:

- Zoom out to reveal a general picture of volcano distribution around the world.

(ii) Which type of plate boundary has the highest number of volcanoes? Why? (Hint: Refer to the key by clicking the first button on the left under each layer)

Destructive plate boundary. Pressure increases in the asthenosphere as plates are subducted. This favours extrusive volcanism.

(iii) Which type of plate boundary has the highest number of shield volcanoes? Why?

Constructive plate boundary and hot spots on oceanic crusts. Compare to continental crust, oceanic crust is of lower silica content. This creates less viscous lava. Thus, lava spreads farer from the vent, creating shield volcanoes.