

# Determining the Speed of Crustal Plate Movement

Name:

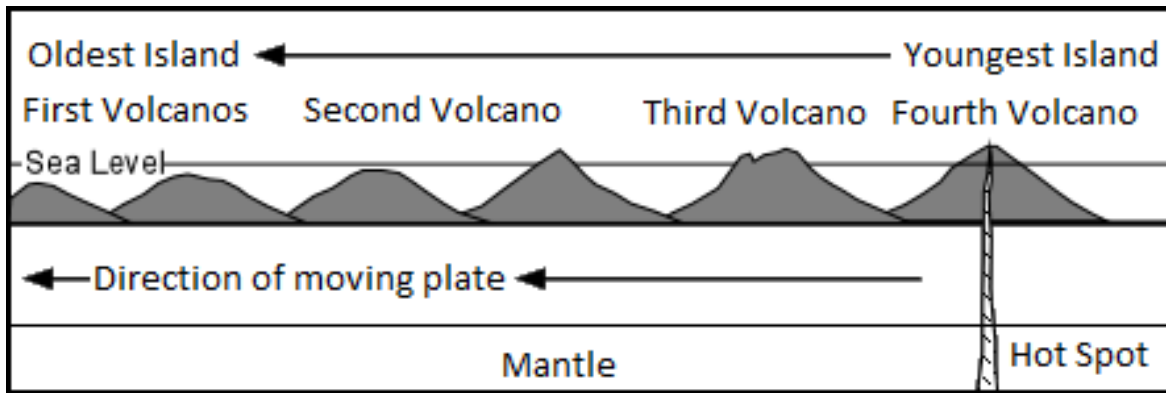
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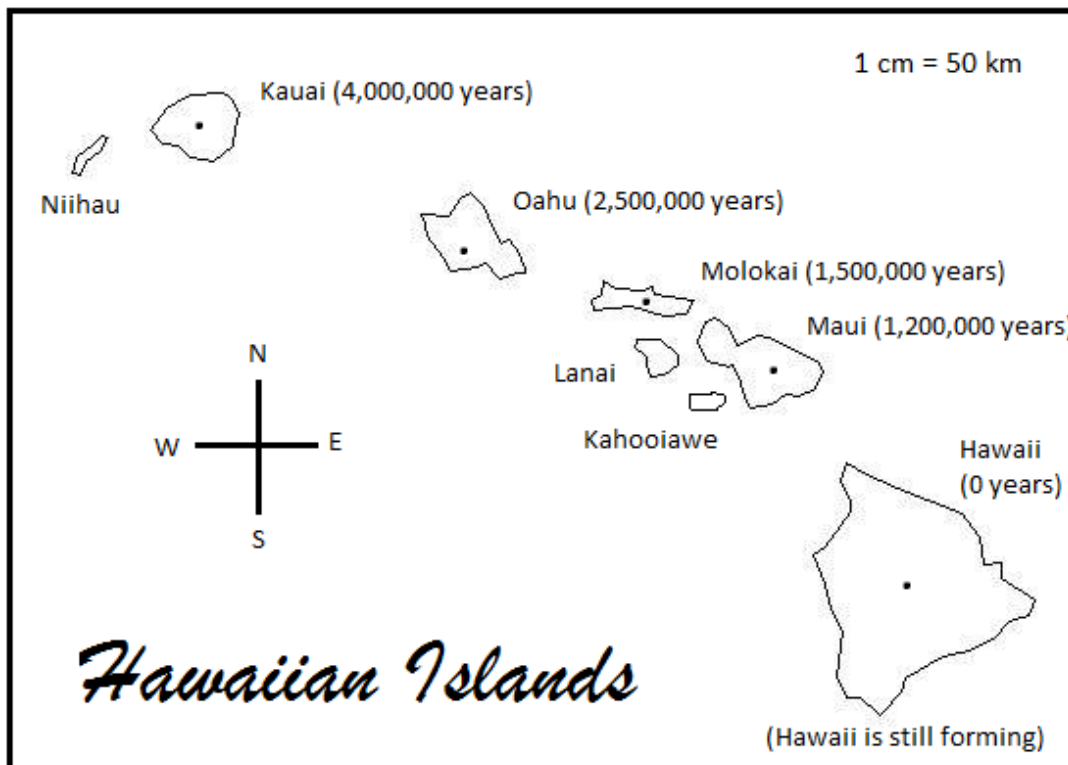
## Background:

Scientists believe that the earth's crust is broken into pieces, much like the cracked shell of a hard-boiled egg. These pieces are called crustal plates and are thought to be moving across the mantle. The mantle is the layer of the earth located directly under the crust.

The diagram below illustrates how scientists believe lines of volcanic islands are produced as superheated molten material rises upward from deep within the mantle. The molten material breaks through weak places in the crustal plate as the plate moves over the stationary hot spot in the mantle. In the diagram, the first volcano is the oldest while the second and third get progressively younger. The fourth volcano is the youngest because it is still located over the hot spot in the mantle. Because these volcanoes are formed in the ocean, they are called a chain of volcanic islands.



Using the idea that chains of volcanic islands are formed as crustal plate moves over a hot spot in the mantle, it is possible to calculate the average speed at which the crustal plate is moving. The following diagram illustrates the eight main islands of the Hawaiian chain. The approximate age is given for the larger islands.



**Questions:**

- Using the scale on the diagram (50km = 1 cm) of the island chain, determine the distance between the five major islands and enter your answers in the appropriate spaces on the following data table. Measure the distance between the dots placed at the center of the major islands.
- Convert each distance from kilometers to centimeters (1000m =1km, 100cm=1m). Enter the new data in the appropriate spaces on the data table.
- Calculate the approximate age difference between the islands and enter the data in the table below.

Islands	Distance measured with ruler on map (cm)	Actual Distance between the Two islands		Difference in Approximate Ages of the Two Islands
		(in kilometers)	(in centimeters)	
Hawaii & Maui				
Maui & Molokai				
Molokai & Oahu				
Oahu & Kauai				

- Using the following formula, calculate the approximate speed at which the crustal plate was moving between the times that each of the islands was formed. Enter your data in the following data table.

$$\text{Speed of crustal movement (cm/yr)} = \frac{\text{Distance between the two islands (cm)}}{\text{Difference in approximate ages of the two islands (yrs)}}$$

Islands	Approximate Speed of Crustal Movement Between the Times That the Two Islands Formed (cm/yr)
Hawaii & Maui	
Maui & Molokai	
Molokai & Oahu	
Oahu & Kauai	

- Now calculate the average speed of crustal movement: \_\_\_\_\_ cm/yr
- In which direction was crustal plate apparently moving during the time the Hawaiian Islands were formed? Explain.
- According to your data, did the crustal plate always move at the same speed? Explain.