Clues Across the Ridge

Use rock ages, magnetism, and depth to investigate seafloor spreading.

MAQ.3 "Students will understand the principles of plate tectonics, sea floor spreading, and physical features of oceanic zones. Use geospatial data to analyze, explain..."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the measurements that match on opposite sides of the ridge. Circle the depth values, then number the sample locations from youngest rock to oldest rock.

A Crossing of the Mid-Atlantic Ridge

1. A research ship crosses the Mid-Atlantic Ridge, an underwater mountain chain where two plates pull apart. Molten rock rises, cools, and becomes new ocean crust. As the plates move, that crust travels away from the ridge. Seafloor spreading predicts that rock farther from the ridge will usually be older than rock at its crest.

2. The ship samples rock at equal distances west and east of the ridge. Its instruments measure age and magnetic polarity, the direction recorded by iron minerals as lava cooled. Earth's magnetic field has reversed many times. Matching polarity bands on opposite sides can help scientists test whether crust formed at a ridge and moved outward.

3. Echo soundings also give the water depth above each sample. A ridge crest rises above its flanks because newly formed crust is hot and relatively buoyant. As crust cools and moves away, it generally sinks. Farther out, broad, relatively flat parts of the deep seafloor are called abyssal plains. Compare all three measurements before making a claim.

ROCK SAMPLES ALONG THE RIDGE CROSSING

Location	Distance from ridge (km)	Rock age (million years)	Magnetic polarity	Water depth (m)
West	200	10	Normal	4,300
West	100	5	Reversed	3,500
Ridge crest	0	0	Normal	2,600
East	100	5	Reversed	3,400
East	200	10	Normal	4,200

2 ANSWER WITH EVIDENCE

Use the passage

1. Compare rock ages at 100 km and 200 km on both sides of the ridge. What pattern supports seafloor spreading?

2. Using the west-side samples, how many kilometers did the crust move per million years between ages 5 million and 10 million years? Show your calculation.

3. How do the paired magnetic polarity readings at 100 km and 200 km support the idea that crust formed at the ridge and moved outward?

4. How does water depth change from the ridge crest to 200 km east, and what process in the passage helps explain that change?

3 YOUR TURN

Your own words

A crew plans to sample 300 km east of the ridge. Predict the rock's age and whether the water is likely to be shallower or deeper there than at 200 km east. Explain both predictions with at least two numbers from the table, and name one measurement that could challenge your prediction.

ANSWER KEY

Clues Across the Ridge

PART 1 · READ AND MARK

Underline the measurements that match on opposite sides of the ridge. Circle the depth values, then number the sample locations from youngest rock to oldest rock. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Compare rock ages at 100 km and 200 km on both sides of the ridge. What pattern supports seafloor spreading?	**On both sides, rock is 5 million years old at 100 km and 10 million years old at 200 km. Age increases with distance from the ridge.**
2	Using the west-side samples, how many kilometers did the crust move per million years between ages 5 million and 10 million years? Show your calculation.	**(200 km − 100 km) ÷ (10 million years − 5 million years) = 20 km per million years.**
3	How do the paired magnetic polarity readings at 100 km and 200 km support the idea that crust formed at the ridge and moved outward?	**Both 100 km samples have reversed polarity, and both 200 km samples have normal polarity. The matching pattern on opposite sides supports outward movement from the ridge.**
4	How does water depth change from the ridge crest to 200 km east, and what process in the passage helps explain that change?	**Water depth increases from 2,600 m to 4,200 m. Crust generally sinks as it cools and moves away from the ridge.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

At 300 km east, I predict the rock will be about 15 million years old. East-side age rises by 5 million years for each 100 km. I expect water deeper than 4,200 m because east-side depth rises from 3,400 m at 100 km to 4,200 m at 200 km. A measured age of 3 million years at 300 km would challenge my age prediction.

Accept reasonable age estimates based on extending the table's trend. Depth is a likely prediction, not a certainty, because local seafloor features can change water depth.