Clues in the Cliffs

Use rock layers and index fossils to build a relative timeline.

E.8.7.1 "Use scientific evidence to create a timeline of Earth's history that depicts relative dates from index fossil records and layers of rock (strata)."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the bottom-to-top layer lists for both cliffs. In those lists, circle each mention of species A and B, then number the circled fossil layers 1 or 2 to show which came first.

Two Cliffs, One History

(1) At a windy coast, two sea cliffs expose stacks of sedimentary rock. Each stack formed as sediment accumulated, hardened, and was later lifted above the water. In an undisturbed stack, lower layers formed before the layers above them. Scientists can use that order to build a relative timeline, even when no calendar dates are known. An index fossil is the remains of a species that lived for a short span of geologic time but spread widely. Finding the same index fossil in separated layers helps match their ages.

(2) At Cove Cliff, four layers are visible. From bottom to top, they are a gray claystone with no fossils, a pale limestone containing ammonite species A, a dark shale containing ammonite species B, and a tan sandstone with plant fragments. Ammonites were shelled sea animals, and A and B are two different species. Field reports from many distant cliffs show that each species was widespread but lived for a short span of geologic time. The cliff layers are still in their original order, with no folding or overturning.

(3) Across the bay, Point Cliff has three undisturbed layers. From bottom to top, they are a coarse sandstone containing species A, a fine shale containing species B, and a siltstone with animal burrows. The two cliffs do not have identical rock types or numbers of layers. Waves can remove rock, and deposits can vary from place to place. A fossil match can connect layers even when their rocks differ. Fossils and layer order show which events came earlier or later, but neither gives an exact age in years here.

2 ANSWER WITH EVIDENCE

Use the passage

1. Which Cove Cliff layer is oldest? What evidence from the layer order supports your choice?

2. Which Point Cliff layer matches Cove Cliff's pale limestone in relative age? Explain why the different rock types do not change your match.

3. Did Point Cliff's coarse sandstone form before or after Cove Cliff's dark shale? Use both fossil species to explain.

4. Can you tell whether Cove Cliff's top sandstone or Point Cliff's top siltstone is younger? Explain what the evidence does and does not show.

3 YOUR TURN

Your own words

At a third cliff, an undisturbed stack has a species A layer, an ash layer, then a species B layer, from bottom to top. Write a five-step timeline from oldest to youngest using Cove Cliff's bottom claystone and top sandstone plus all three layers at the third cliff. Add one sentence explaining how the fossils place the ash relative to Cove Cliff's fossil layers.

ANSWER KEY

Clues in the Cliffs

GRADE 8 · E.8.7.1

PART 1 · READ AND MARK

Underline the bottom-to-top layer lists for both cliffs. In those lists, circle each mention of species A and B, then number the circled fossil layers 1 or 2 to show which came first. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Which Cove Cliff layer is oldest? What evidence from the layer order supports your choice?	**The gray claystone is oldest because it is the bottom layer in an undisturbed stack.**
2	Which Point Cliff layer matches Cove Cliff's pale limestone in relative age? Explain why the different rock types do not change your match.	**Point Cliff's coarse sandstone matches the pale limestone because both contain ammonite species A, an index fossil. Matching fossils can link layers with different rock types.**
3	Did Point Cliff's coarse sandstone form before or after Cove Cliff's dark shale? Use both fossil species to explain.	**It formed before the dark shale. The sandstone contains species A, which lies below species B in the undisturbed layers at both cliffs.**
4	Can you tell whether Cove Cliff's top sandstone or Point Cliff's top siltstone is younger? Explain what the evidence does and does not show.	**No. Both layers are above species B, but the passage gives no fossil match or other evidence that orders the two top layers relative to each other.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

1. Cove Cliff's gray claystone.
2. Third cliff's species A layer, matching Cove Cliff's pale limestone.
3. Third cliff's ash layer.
4. Third cliff's species B layer, matching Cove Cliff's dark shale.
5. Cove Cliff's tan sandstone.

The fossil matches place the ash after Cove Cliff's species A limestone and before its species B shale.

Accept equivalent layer names and timelines that preserve the same order. Matching index fossils support relative placement, not an exact age in years.