Clues in Stone

Use rock layers and breaks to reconstruct a sequence of events.

ESS.2B.2 "Apply different techniques (e.g., superposition, original horizontality, cross-cutting relationships, lateral continuity, principle of inclusions, fossil succession..."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline each observation that helps you determine relative age. Number S, T, and U from oldest to youngest based on their positions in the west cliff.

The Two Cliffs of Split Mesa

1. Geologists read a cliff like a record, but not every surface marks the same time. In an undisturbed stack, lower sedimentary beds formed before higher ones. A fracture or body of molten rock that cuts a bed must be younger than that bed. These rules give relative ages, not calendar dates. At the west cliff of Split Mesa, a gray shale bed called S lies beneath a tan sandstone bed called T. A fossil-rich limestone bed called U rests above T. All three beds are now tilted, but their order from bottom to top is still visible.

2. Across a narrow ravine, the east cliff shows a tan sandstone between gray shale and fossil-rich limestone. The sandstone on both sides has the same thin red seam and a set of ripple marks near its top. The ravine removed the rock between the cliffs, so the sandstone cannot be traced across the gap by eye. On the west cliff, fracture F offsets S, T, and U. A dark igneous dike D cuts through those beds and crosses F. The two edges of D meet cleanly at F, with no offset.

3. Above the tilted rocks, a nearly flat surface slices across S, T, U, F, and D. Rounded gravel bed G rests on that surface, and a thin ash bed H covers G. No break or shift can be seen where F would meet G or H. The gravel contains small pieces of limestone like U, but those pieces do not make G as old as U. Loose fragments existed before the sediment enclosing them was deposited. The flat surface marks missing time: older rock was exposed and worn down before the younger deposits accumulated.

2 ANSWER WITH EVIDENCE

Use the passage

1. List S, T, and U from oldest to youngest. Why does their tilt not change this order?

2. What evidence suggests that the sandstone at the east cliff continues the sandstone bed T at the west cliff?

3. Which formed first, fracture F or dike D? Use the place where they meet as evidence.

4. Give two different clues that gravel bed G is younger than limestone U.

3 YOUR TURN

Your own words

In a new roadcut, bed A contains pebbles from bed B, bed C lies above A, and crack K cuts all three beds. An erosion surface truncates K, and bed E rests on that surface. Write the beds and events from oldest to youngest, then justify your order with at least two different relative-age clues.

ANSWER KEY

Clues in Stone

PART 1 · READ AND MARK

Underline each observation that helps you determine relative age. Number S, T, and U from oldest to youngest based on their positions in the west cliff. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	List S, T, and U from oldest to youngest. Why does their tilt not change this order?	**S, T, U. They were deposited in that order before the beds tilted.**
2	What evidence suggests that the sandstone at the east cliff continues the sandstone bed T at the west cliff?	**Both sandstones lie between shale and limestone and have the same thin red seam and ripple marks near the top.**
3	Which formed first, fracture F or dike D? Use the place where they meet as evidence.	**F formed first. D crosses F without being offset, so the dike formed after the fracture.**
4	Give two different clues that gravel bed G is younger than limestone U.	**G rests above an erosion surface that cuts U, and G contains limestone pieces like U that existed before the gravel was deposited.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Oldest to youngest: B, A, C, crack K, erosion, E. Pebbles from B inside A show that B existed before A, while C lies above A and is younger. K cuts all three beds, so it formed later; erosion cut off K before E was deposited.

Accept equivalent wording for the age relationships. For the open task, look for the complete sequence and at least two distinct clues, such as inclusions, superposition, or cross-cutting.