Reading the Roadcut

Use rock layers, intrusions, fossils, and dates to reconstruct a sequence.

ESS.5 "Obtain, evaluate, and communicate information about major events in Earth's history. a. Analyze and interpret data to sequence events in Earth's history, including relative and absolute dating techniques..."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the clues that show which rock features formed before or after others. Circle each numerical age, then number the four features in the table from oldest to youngest.

A Roadcut's Hidden History

1 Imagine opening a rock record like a notebook. In an undisturbed stack of clay and gravel beds, lower beds formed before higher ones. Magma filling a crack formed after the rocks the crack cuts. Those relationships provide relative ages. Radioactive decay in certain minerals provides numerical ages. Fossils can help connect rock layers across separate sites.

2 At a fictional roadcut, a lower sandstone lies beneath a middle shale, which lies beneath an upper limestone. A dark igneous dike slices through the sandstone and shale. The limestone covers the eroded top of the dike. Thin volcanic ash beds occur in the sandstone and limestone. The table reports ages measured from minerals in those ash beds and the dike.

EVIDENCE FROM THE FICTIONAL ROADCUT

Feature	Observation	Measured age
Middle shale	Contains an ammonite fossil	Not directly dated
Upper limestone	Contains a volcanic ash bed	Ash: 70 million years
Lower sandstone	Contains a volcanic ash bed	Ash: 120 million years
Igneous dike	Cuts sandstone and shale	90 million years

3 An ammonite fossil occurs in the shale. Ammonites were marine animals, so this fossil supports a past marine setting at the site. The dike contains no sedimentary fossils. Unlike a fossil, an ash bed can be dated using radioactive minerals. Use the dike's position and the measured ages together to test your sequence of events.

2 ANSWER WITH EVIDENCE

Use the passage

1. List the four features from oldest to youngest. What evidence places the dike where you put it?

2. Between what two measured ages did the middle shale form? Use its position and the dike to explain.

3. Why does the upper limestone's 70-million-year-old ash bed not give an exact age for every part of the limestone?

4. What does the ammonite fossil suggest about the shale's setting? What age information can the dated ash provide that the fossil cannot?

3 YOUR TURN

Your own words

Suppose a second dike cuts all three rock layers, including the limestone, and is dated to 60 million years ago. Write four sentences placing this new dike in the roadcut's history, using both crosscutting and measured ages as evidence.

Reading the Roadcut

PART 1 · READ AND MARK

Underline the clues that show which rock features formed before or after others. Circle each numerical age, then number the four features in the table from oldest to youngest. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	List the four features from oldest to youngest. What evidence places the dike where you put it?	**Lower sandstone, middle shale, igneous dike, upper limestone. The dike cuts the first two layers, and the limestone covers its eroded top.**
2	Between what two measured ages did the middle shale form? Use its position and the dike to explain.	**The shale formed after the sandstone's 120-million-year-old ash bed and before the 90-million-year-old dike that cuts it.**
3	Why does the upper limestone's 70-million-year-old ash bed not give an exact age for every part of the limestone?	**The measurement dates the ash bed within the limestone. Other parts of the limestone may have formed at different times.**
4	What does the ammonite fossil suggest about the shale's setting? What age information can the dated ash provide that the fossil cannot?	**The shale formed in a marine setting. The dated ash provides a numerical age, while the fossil does not.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

The new dike formed after the limestone because it cuts through that layer. Its measured age of 60 million years is younger than the limestone's 70-million-year-old ash bed. It also formed after the first dike, which is dated to 90 million years ago. Both the crosscutting evidence and the measured ages place the new dike last among these features.

Accept equivalent descriptions of the sequence and evidence. The 120- and 70-million-year measurements date ash beds within rock layers, not every part of those layers.