

The Torn Map: Which Fit Do the Fossils Allow?

Investigation question: Five torn card shapes fit together by shape in more than one way. Which arrangement do the fossil, rock-belt and ice-scratch clues allow, and which clue decides it?

Evidence-based mystery

Groups of 4

1 session

Setup 5 · Activity 40 · Cleanup 5 min

MS-ESS2-3 · assesses

Name _____

Group _____

Date _____

Your role today

- ☐ **Fitter:** Tries every tab-and-notch combination and lays out each arrangement that works by shape. Sketches each one on the recording sheet before any evidence is checked.
- ☐ **Scorer:** Reads the markings on both sides of each join, applies the scoring rules out loud, and records matches, mismatches and conflicts.
- ☐ **Checker:** Re-scores every join independently without looking at the Scorer's numbers; the two must agree before a total is written.
- ☐ **Reporter:** Writes the group's decision and the evidence ranking, and presents the deciding clue to the class in one minute.

Safety

- Card cutting with scissors or a craft knife is done by the teacher during prep, not by students. If students help cut, use blunt-tipped scissors and cut away from fingers.
- Sticker backings and card scraps are a slip hazard on hard floors; collect them as you go.
- No chemicals, heat or glass; the only materials students handle are card, paper and a ruler.

Procedure

1. Lay the five cards on the desk with every TOP label facing up and the same way. Do not open the reveal envelope. Read the scoring rules on the recording sheet together before you touch the cards.
2. Shape round (Fitter leads): find every way the cards can be joined so that each tab sits fully inside a notch of the same width and the two edges lie flush. Never rotate or flip a card; every TOP label stays up. A card may sit higher or lower than its neighbor. Each time you find a complete arrangement that uses all five cards, sketch it in the 'Arrangements found by shape' table. Stop when you are sure you have them all. There are more than one.
3. Before scoring, predict: write which arrangement your group thinks is right and why, in one sentence, in the prediction box.
4. Evidence round, arrangement 1 (Scorer leads, Checker scores independently): for each join, compare the markings on the two touching edges. A MATCH is the same symbol on both sides within 1 cm of the same position along the join, and for arrows, pointing the same way. A MISMATCH is a symbol on one side with nothing of the same kind opposite it within 1 cm. A CONFLICT is a pair of arrows pointing toward each other. Record counts for each join in the scoring table.

5. Repeat the evidence round for arrangement 2. Scorer and Checker compare numbers; if they disagree on any join, re-examine that join together until they agree.
6. Compute each arrangement's score: matches minus mismatches minus two times conflicts. Write the totals and circle the winning arrangement.
7. Evidence ranking: for each kind of marking (green dot, red dot, blue dot, brown stripe, arrow), decide whether it helped tell the two arrangements apart, and write a one-line reason. Then draw the winning arrangement on the recording sheet and draw each clue as a continuous line or dot pair running across the join.
8. Open the reveal envelope. Read which real landmass each card stands for. Look at the globe and compare the positions of those five landmasses today with the arrangement on your desk. Write the one biggest difference you notice.
9. Answer the analysis questions individually, then compare within the group. The Reporter prepares a one-minute summary naming the deciding clue.

Record your observations

Lab 1 recording sheet: The torn map

Scoring rules — Compare the two edges that touch at each join. **Match** (+1): the same symbol on both sides within 1 cm of the same position; arrows must point the same way. **Mismatch** (−1): a symbol on one side with nothing of the same kind within 1 cm opposite it. **Conflict** (−2): two arrows pointing toward each other. Score = matches − mismatches − 2 × conflicts.

green dot

Fossil of Glossopteris, an extinct seed plant with tongue-shaped leaves.

red dot

Fossil of Mesosaurus, a small reptile that lived in shallow water and could not cross an ocean.

blue dot

Fossil of Lystrosaurus, a pig-sized land animal.

brown stripe

A belt of old mountain rock with a particular type and age of rock layers.

black arrow

Scratches left by an ancient glacier; the arrow points the way the ice was flowing.

Arrangements found by shape (write which card touches which edge)

Arrangement	Card on B's left edge	Card on B's right edge	Card under B	Card on D's right edge
1				
2				
3 (if any)				

Prediction before scoring: which arrangement do you think is right, and why?

Evidence score for each join

Arrangement and join	Matches (+1 each)	Mismatches (–1 each)	Conflicts (–2 each)	Join score
Arr. 1: card on B's left				
Arr. 1: B's right with C				
Arr. 1: B's bottom with D				
Arr. 1: card on D's right				
Arrangement 1 TOTAL				
Arr. 2: card on B's left				
Arr. 2: B's right with C				
Arr. 2: B's bottom with D				
Arr. 2: card on D's right				
Arrangement 2 TOTAL				

Evidence ranking: could this clue tell the two arrangements apart?

Clue	How many cards carry it?	Helped decide? (yes/no)	Why
Green dot (Glossopteris)			
Red dot (Mesosaurus)			
Blue dot (Lystrosaurus)			
Brown stripe (rock belt)			
Black arrow (ice scratches)			

-  Draw the winning arrangement with all five cards labeled. Draw each clue as a line or pair of dots that runs across the join it belongs to, and draw the ice arrows so the flow direction is continuous.



1. Which arrangement won, by how many points, and which single clue did the most to separate the two arrangements?

2. After the reveal: name the biggest difference between the arrangement on your desk and where those five landmasses are on the globe today.

Analysis questions

3. Green dots appear on every join in both arrangements. Explain why a clue that is found everywhere cannot help you choose between arrangements, even though it is real evidence that the lands were once connected.

4. The red dot (Mesosaurus) appears on only two cards. Why does a small shallow-water reptile found on exactly two landmasses make such a strong clue? What would weaken it?

5. In the decoy arrangement, two ice-scratch arrows point toward each other across a join. Explain why that is a conflict and not just a mismatch. What does it mean physically for the ice?

6. Suppose a sixth card, F, had a 3 cm tab that also fit B's left notch, but F carried no markings at all along that edge. Would F be ruled in or ruled out, and by what rule? Explain.

7. Wegener had this kind of evidence in 1912, and many scientists still did not accept that the continents had moved. Using what you did today, explain what this evidence can show and what it cannot show.

8. Real continental edges are not tabs and notches, and real fossils are found in areas, not along edges. Name two ways the card model is unlike the real evidence, and say whether each difference makes the real case stronger or weaker than the model.
