Where Next?

Use an orbit model to predict future positions

ES.ESS1.4 "Use models to determine patterns that can be used to predict the motion of orbiting objects in the Solar System."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Circle the two orbit times in paragraph 1, then underline the sentences that begin "First," "Next," and "Finally," and number them 1, 2, and 3 to mark the prediction steps.

Two Paths Around the Sun

1 In a simplified model, two objects orbit the Sun counterclockwise in circles. Their locations are compass directions measured from the Sun, as if viewed from above its north pole. Object A completes one orbit in eight months. Object B completes one orbit in sixteen months. Both start north of the Sun.

2 The table lists locations every two months. From one row to the next, A moves a quarter of its orbit, while B moves an eighth. These steady changes represent average motion in a simplified model, not the varying speeds of real objects in elliptical orbits. Compass directions describe positions, not distances from the Sun.

POSITIONS IN THE ORBIT MODEL

Month	Object A	Object B
0	North	North
2	West	Northwest
4	South	West
6	East	Southwest
8	North	South

3 First, find the object's location at a listed month. Next, count forward in two-month steps, moving a quarter orbit for A or an eighth orbit for B each step. Finally, check that the predicted direction fits the object's repeating cycle. This model predicts where each object lies relative to the Sun, but not where it appears in Earth's sky.

2 ANSWER WITH EVIDENCE

Use the passage

1. Where does the model predict A will be at month 10? Explain using a location in the table.

2. Where does the model predict B will be at month 12? Explain how you counted forward from month 8.

3. Predict both objects' directions at month 14. What pattern did you use for each?

4. After month 0, what is the first month when the model predicts both objects will be north again? Explain why.

3 YOUR TURN

Your own words

A third object, C, starts north of the Sun at month 0 and moves a quarter orbit counterclockwise every four months. Write C's directions at months 4, 8, 12, 16, and 20, then explain how its repeating orbit checks your month 20 prediction.

Where Next?

PART 1 · READ AND MARK

Circle the two orbit times in paragraph 1, then underline the sentences that begin “First,” “Next,” and “Finally,” and number them 1, 2, and 3 to mark the prediction steps. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Where does the model predict A will be at month 10? Explain using a location in the table.	**West. A is north at month 8 and moves a quarter orbit counterclockwise in two months.**
2	Where does the model predict B will be at month 12? Explain how you counted forward from month 8.	**East. From south at month 8, B moves an eighth orbit every two months, reaching southeast at month 10 and east at month 12.**
3	Predict both objects' directions at month 14. What pattern did you use for each?	**A is east because month 14 repeats its month 6 position after one eight-month orbit. B is northeast because it moves three eighths of an orbit counterclockwise from south at month 8.**
4	After month 0, what is the first month when the model predicts both objects will be north again? Explain why.	**Month 16. A completes two orbits and B completes one, so both return north.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

At months 4, 8, 12, 16, and 20, C is west, south, east, north, and west, respectively. C completes an orbit in 16 months, so its direction at month 20 must match its direction at month 4.

Accept equivalent compass directions and explanations that use the stated counterclockwise motion. For C, the full cycle is 16 months.