

Gravity's Curved Paths

Use models to trace how gravity shapes motion in space.

MS-ESS1-2 "Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system. Clarification Statement: Emphasis for the model is on gravity as the force that holds together the solar system and Milky Way..."

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Underline each sentence that tells how gravity affects motion, and circle each detail that a model should show. Use your marks to identify how a model explains an orbit.

A Pull That Guides Motion

- ① Gravity is a pulling force between objects with mass. In the solar system, the Sun has far more mass than any planet, so its gravity pulls strongly on the planets. A planet also has forward motion. Instead of flying straight into space or falling into the Sun, it keeps curving around the Sun. This curved path is an orbit. Gravity changes the planet's direction again and again, holding the solar system together while the planets move.
- ② A scale model can make these motions easier to picture. Imagine the Sun as a grapefruit placed at the center of a large field. Earth, shown by a tiny bead, would be far away on the field, not beside the grapefruit. Draw a curved arrow around the grapefruit to show Earth's orbit. The arrow represents Earth's changing direction as the Sun's gravity pulls it inward. A straight arrow pointing away from the grapefruit would not show a stable orbit.
- ③ Gravity works on a much larger scale in the Milky Way galaxy. The galaxy contains stars, gas, dust, and a large amount of matter that cannot be seen directly. Their combined gravity helps hold the galaxy together. Our solar system orbits the center of the Milky Way, just as planets orbit the Sun. The galaxy is not a solid disk. Its parts move through space, but gravity keeps many of them from drifting away. A model can use dots and curved arrows to show these motions.

2 ANSWER WITH EVIDENCE Use the passage

1 How do gravity and a planet's forward motion work together to create an orbit?

2 What two features should a scale model include to show Earth's motion around the Sun accurately?

3 What comparison does the passage make between motion in the solar system and motion in the Milky Way?

4 A model shows stars in the Milky Way with straight arrows moving outward. What important role of gravity is missing from this model?

3 YOUR TURN Your own words

On blank space, draw a two-panel model. In Panel 1, show the Sun and one planet. In Panel 2, show the Milky Way's center and the solar system. Use curved motion arrows and inward gravity arrows in both panels, then write two sentences explaining how gravity controls each orbit.

PART 1 • READ AND MARK

Underline each sentence that tells how gravity affects motion, and circle each detail that a model should show. Use your marks to identify how a model explains an orbit. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	How do gravity and a planet's forward motion work together to create an orbit?	Gravity continually changes the planet's direction as it moves forward, making it curve around the Sun instead of flying away or falling into it.
2	What two features should a scale model include to show Earth's motion around the Sun accurately?	It should place Earth far from the Sun and use a curved arrow to show Earth's orbit.
3	What comparison does the passage make between motion in the solar system and motion in the Milky Way?	Planets orbit the Sun, and the solar system orbits the center of the Milky Way. Gravity helps hold both systems together.
4	A model shows stars in the Milky Way with straight arrows moving outward. What important role of gravity is missing from this model?	It does not show gravity keeping many parts of the galaxy from drifting away or moving in curved orbital paths.

PART 3 • YOUR TURN (SAMPLE ANSWER)

In Panel 1, Mars has a curved arrow around the Sun and an inward arrow labeled "Sun's gravity," showing that gravity bends its path into an orbit. In Panel 2, the solar system has a curved arrow around the Milky Way's center and an inward arrow labeled "galaxy's gravity," showing that gravity keeps it from moving straight away.

Accept models with correctly labeled objects, curved orbital-motion arrows, and inward gravity arrows in both panels. Students may choose any planet if their explanation shows that gravity changes motion and helps hold the solar system and galaxy together.