Forces in Motion

Use force arrows to explain a rolling ball's path.

P.5.6.3 "Develop and use models to explain how the amount or type of force, both contact and non-contact, affects the motion of an object."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline each place where a force changes the ball's motion. Circle the words that tell you whether each force is stronger or weaker.

Nia's Rolling Ball

1. At a science table, Nia rolls a steel ball across a smooth tray. Her finger touches the ball to start it moving. In a model of this motion, an arrow can show the direction of a force. A longer arrow can show a stronger force. The ball moves farther after a firm tap than after a gentle tap, even though both taps point the same way.

2. Next, Nia holds a magnet near the rolling ball without touching it. When the magnet is beside the ball, the ball's path bends toward the magnet. A magnet farther from the ball bends its path less than the same magnet held close, if everything else stays the same. Nia draws an arrow from the ball toward the magnet to show the magnetic pull.

3. Nia tries one more test. She rolls the ball toward a magnet held in front of it, and the ball speeds up as it approaches. Then she rolls the ball away from the magnet, and its pull slows the ball instead. The tray also rubs against the moving ball. This contact force, called friction, acts against the ball's motion. Nia uses arrows to show which way each force acts.

2 ANSWER WITH EVIDENCE

Use the passage

1. Nia models a gentle tap and a firm tap with force arrows. How should the arrows compare, and how does the ball's motion compare?

2. A magnet is beside the rolling ball. Which way should a magnetic-force arrow point, and how does the ball's path change?

3. Nia moves the same magnet farther from the ball. How should her magnetic-force arrow change, and what happens to the ball's path?

4. The ball rolls right, away from a magnet on its left. Which way should arrows for magnetic pull and friction point, and what happens to the ball's speed?

3 YOUR TURN

Your own words

Imagine a toy cart with a steel paper clip attached. In two panels, model a light finger push and a strong magnetic pull on the cart. Label each force, use arrows of different lengths to show direction and strength, and write one sentence in each panel predicting the cart's motion.

ANSWER KEY

Forces in Motion

GRADE 5 · P.5.6.3

PART 1 · READ AND MARK

Underline each place where a force changes the ball's motion. Circle the words that tell you whether each force is stronger or weaker. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Nia models a gentle tap and a firm tap with force arrows. How should the arrows compare, and how does the ball's motion compare?	**Both arrows point the way Nia taps, but the firm tap has a longer arrow. The ball moves farther after the firm tap.**
2	A magnet is beside the rolling ball. Which way should a magnetic-force arrow point, and how does the ball's path change?	**The arrow points toward the magnet. The ball's path bends toward it.**
3	Nia moves the same magnet farther from the ball. How should her magnetic-force arrow change, and what happens to the ball's path?	**The arrow should be shorter because the magnetic pull is weaker. The path bends less.**
4	The ball rolls right, away from a magnet on its left. Which way should arrows for magnetic pull and friction point, and what happens to the ball's speed?	**Both arrows point left, against the ball's motion. The ball slows down.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Panel 1: A short arrow points right from a finger to the cart, labeled "light contact push." The cart starts moving slowly to the right. Panel 2: A long arrow points left from the cart toward a magnet on its left, labeled "strong non-contact pull." The cart starts moving faster to the left.

Accept other arrow directions if each arrow matches the force shown and the predicted motion. The magnetic pull must act without contact, and the stronger force must have the longer arrow.