

# Motion in Action

Read how forces and energy change moving objects.

**5.3** “The student will investigate and understand that there is a relationship between force and energy of moving objects. Key ideas include moving objects have kinetic energy; motion is described by an object’s direction and speed...”

NAME \_\_\_\_\_ DATE \_\_\_\_\_

## 1 READ AND MARK \_\_\_\_\_ Read it twice

**YOUR JOB** Underline each sentence that tells how an object's motion changes. Circle the words that name a force or energy, then number the forces 1, 2, and 3.

### A Ball on the Blacktop

- ① At the school playground, Maya rolls a soccer ball across the blacktop. Because the ball is moving, it has kinetic energy, or energy of motion. She describes its motion by telling its direction and speed. The ball travels toward the fence at a steady speed. A faster-moving ball has more kinetic energy than the same ball moving more slowly.
- ② Later, Maya gently kicks the ball, and its speed increases. Her foot pushes it in the direction it moves, so the forces on the ball are not balanced. The net force changes the ball's motion. If Maya and a friend push two wagons from rest with the same net force for the same time, the wagon with more mass changes speed less. Mass affects how much motion changes when a net force acts.
- ③ Near the fence, the rolling ball bumps a resting plastic cone. During the collision, each object pushes on the other. Contact forces transfer some energy from the moving ball to the cone. The cone starts moving, and the ball slows or changes direction. As either object slides, friction from the blacktop opposes its motion. Friction can slow a moving object and change its kinetic energy.

**2 ANSWER WITH EVIDENCE** \_\_\_\_\_ Use the passage

**1** What two details describe the soccer ball's motion as it rolls across the blacktop?

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**2** Why does the ball's speed increase after Maya kicks it?

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**3** Two wagons start at rest and receive the same net force for the same time. Which wagon changes speed less, and why?

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**4** What happens when the ball collides with the cone, and what does friction do afterward?

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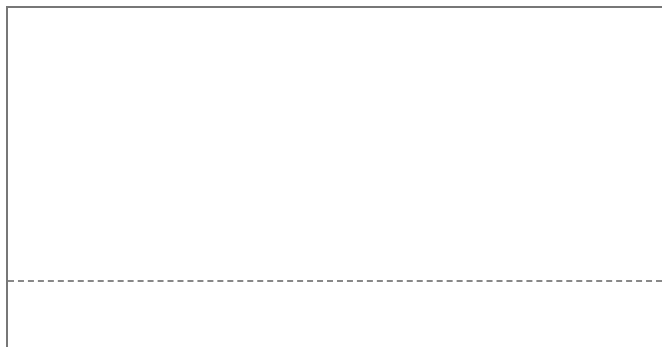
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**3 YOUR TURN** \_\_\_\_\_ Your own words

Draw a two-panel story of a moving toy car colliding with a resting block on a rough floor. Use arrows to show direction before and after, label the contact force and friction, then write exactly two sentences explaining how energy transfer and friction change the motion.

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**PART 1 • READ AND MARK**

Underline each sentence that tells how an object's motion changes. Circle the words that name a force or energy, then number the forces 1, 2, and 3. Accept any marking that follows this job and points at the right text.

**PART 2 • ANSWERS**

| # | QUESTION                                                                                                            | ANSWER                                                                                                                                                                                              |
|---|---------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | What two details describe the soccer ball's motion as it rolls across the blacktop?                                 | <b>It travels toward the fence at a steady speed.</b>                                                                                                                                               |
| 2 | Why does the ball's speed increase after Maya kicks it?                                                             | <b>Maya's foot pushes the ball in the direction it moves, creating a net force that changes its motion.</b>                                                                                         |
| 3 | Two wagons start at rest and receive the same net force for the same time. Which wagon changes speed less, and why? | <b>The wagon with more mass changes speed less. With equal net forces acting for the same time from rest, greater mass means a smaller speed change.</b>                                            |
| 4 | What happens when the ball collides with the cone, and what does friction do afterward?                             | <b>Contact forces transfer some energy from the ball to the cone. The cone starts moving, while the ball slows or changes direction. Friction opposes motion and can slow either moving object.</b> |

**PART 3 • YOUR TURN (SAMPLE ANSWER)**

Panel 1: a toy car arrow points right toward a resting block; Panel 2: a block arrow points right, a shorter car arrow points right, contact force is labeled between them, and friction arrows point left. The moving car transfers energy to the block during the collision, setting the block in motion. Friction slows both moving objects.

Accept equivalent descriptions of direction, speed, kinetic energy, net force, mass, contact forces, and friction that match the passage. For the open task, accept any accurate two-panel collision that shows energy transfer, changed motion, and friction opposing motion.