PULL (or Push) Harder!

Would you expect a bunt in baseball to go out of the park? Why or why not?

Active Reading As you read, circle the sentences that explain the relationship between the size of a force and motion.

▶ Use forces to explain why the boy can't ring the bell.

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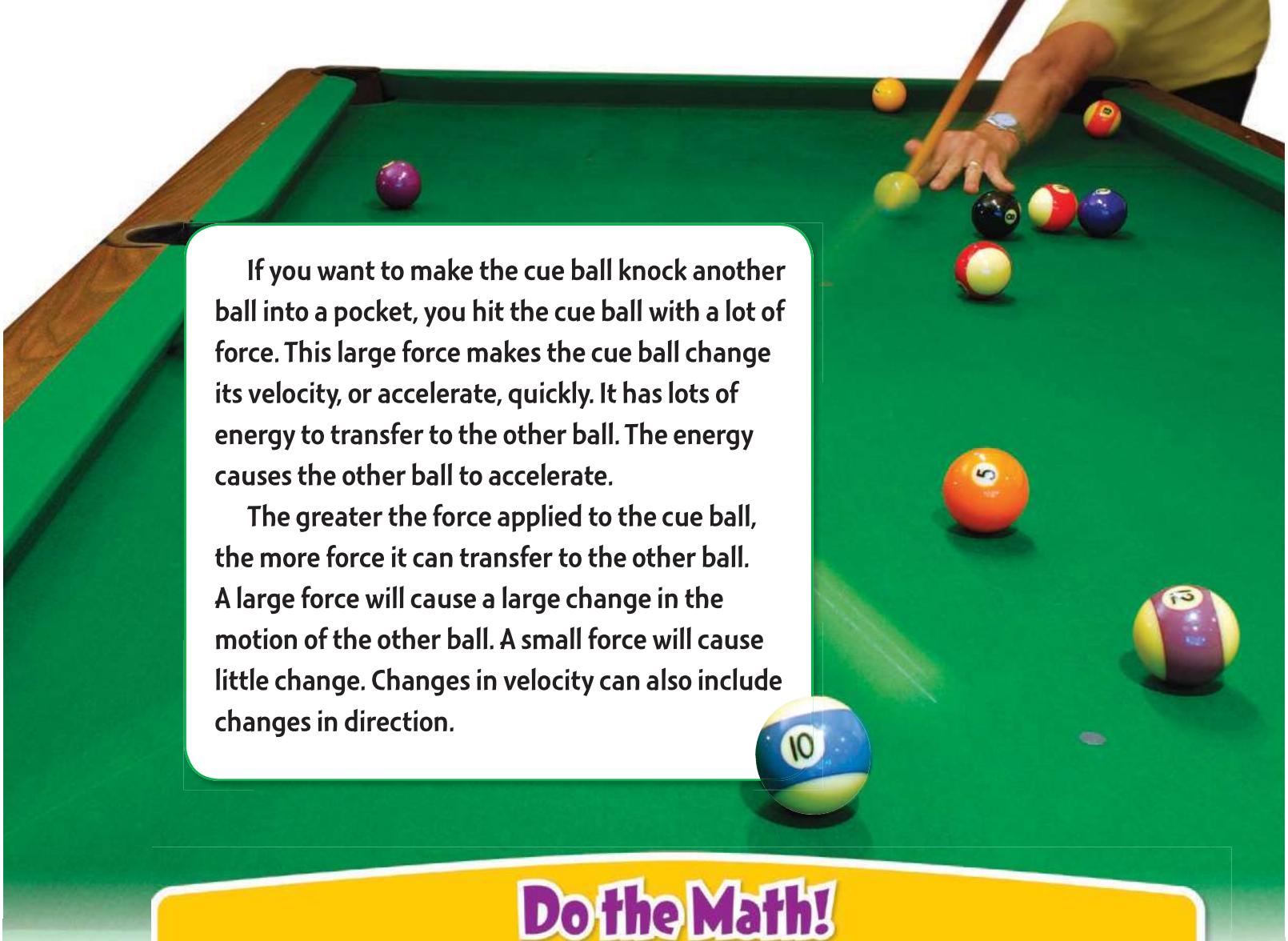
_____

When the man swings the hammer, he exerts a force on a plate. The plate transfers the force to a piece of metal that rises up the column and rings the bell.

The boy swings the same kind of hammer at the same kind of machine. Why doesn't the metal hit the bell?



If you want to make the cue ball knock another ball into a pocket, you hit the cue ball with a lot of force. This large force makes the cue ball change its velocity, or accelerate, quickly. It has lots of energy to transfer to the other ball. The energy causes the other ball to accelerate.

The greater the force applied to the cue ball, the more force it can transfer to the other ball. A large force will cause a large change in the motion of the other ball. A small force will cause little change. Changes in velocity can also include changes in direction.

Do the Math!

Display Data in a Graph

Use the data in the table to make a graph that shows the relationship between the force applied to an object and its acceleration.

Force (N)	Acceleration (m/sec^2)
1	0.5
2	1.0
5	2.5
8	4.0
10	5.0

I'M NOT Moving!

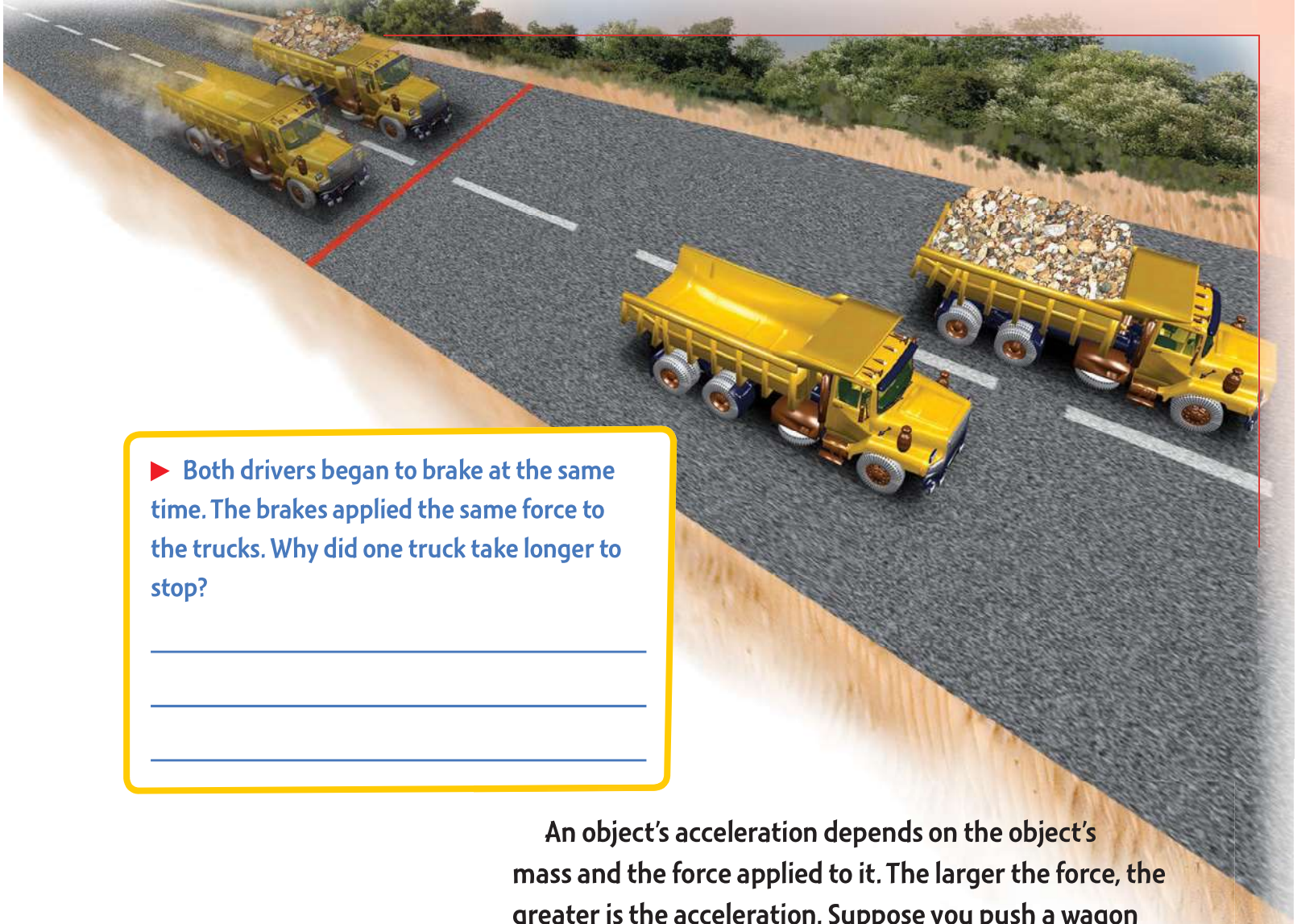
It's easy to lift your empty backpack off the ground. Could you use the same force to lift it when it's full of books?

Active Reading As you read these pages, circle cause-and-effect signal words, such as *because*, *so*, or *therefore*.

The springs in the pictures all exert the same force on the balls, causing them to roll across the page. The ball with the least mass accelerates the fastest. Therefore, it travels the farthest. The same force has a greater effect on an object with a small mass than an object with a larger mass.

▶ Rank the balls by writing *greatest*, *middle*, or *least* in the six blanks.

Foam Ball	Baseball
mass: _____	mass: _____
acceleration: _____	acceleration: _____



▶ Both drivers began to brake at the same time. The brakes applied the same force to the trucks. Why did one truck take longer to stop?

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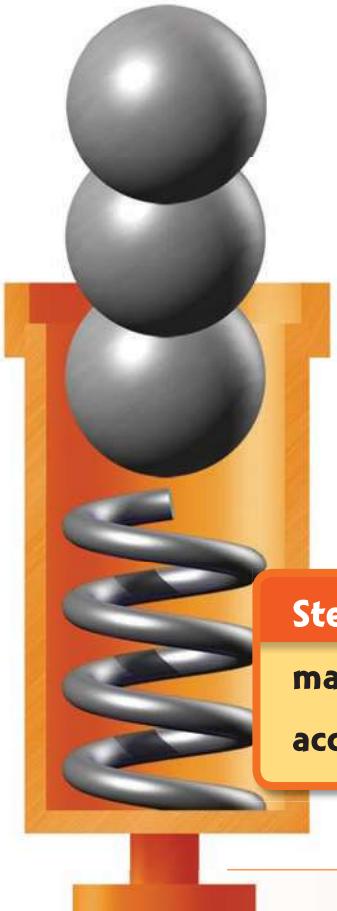
An object's acceleration depends on the object's mass and the force applied to it. The larger the force, the greater is the acceleration. Suppose you push a wagon gently. The wagon speeds up slowly. If you use more strength to push, then the wagon's speed changes quickly.

The less an object's mass is, the less force is needed to change its motion. It's easier to push an empty shopping cart than a full one. Light cars are used in drag races because a car with less mass speeds up faster than a car with more mass.

If you want to slide a heavy box across the floor faster, you have two options. You could take some items out of the box, which decreases its mass. Or you could have a friend help you, which increases the force you apply.



Steel Ball

mass: _____

acceleration: _____