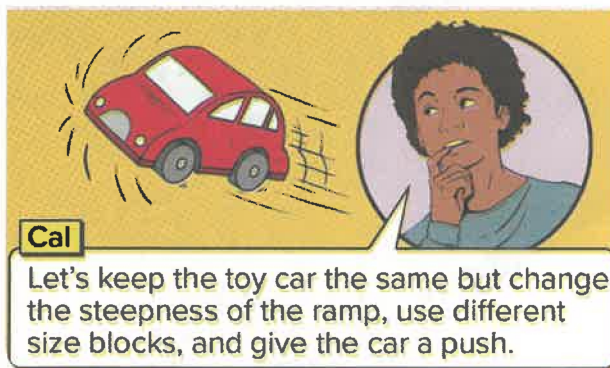
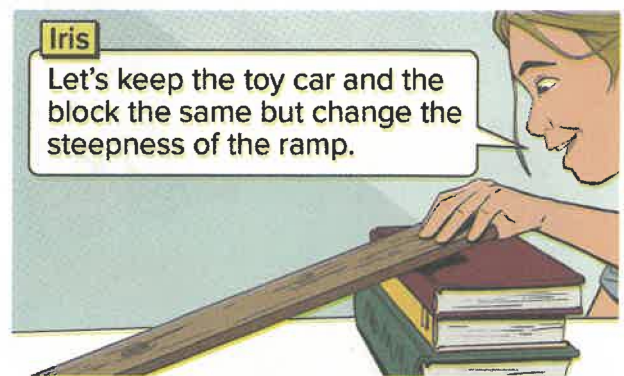
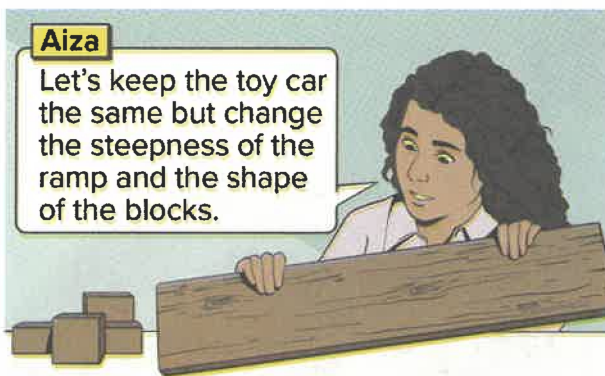
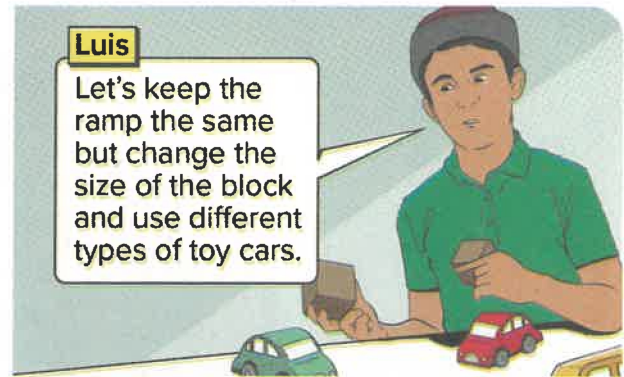
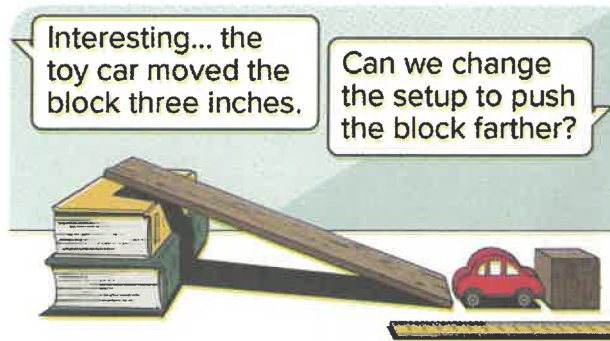
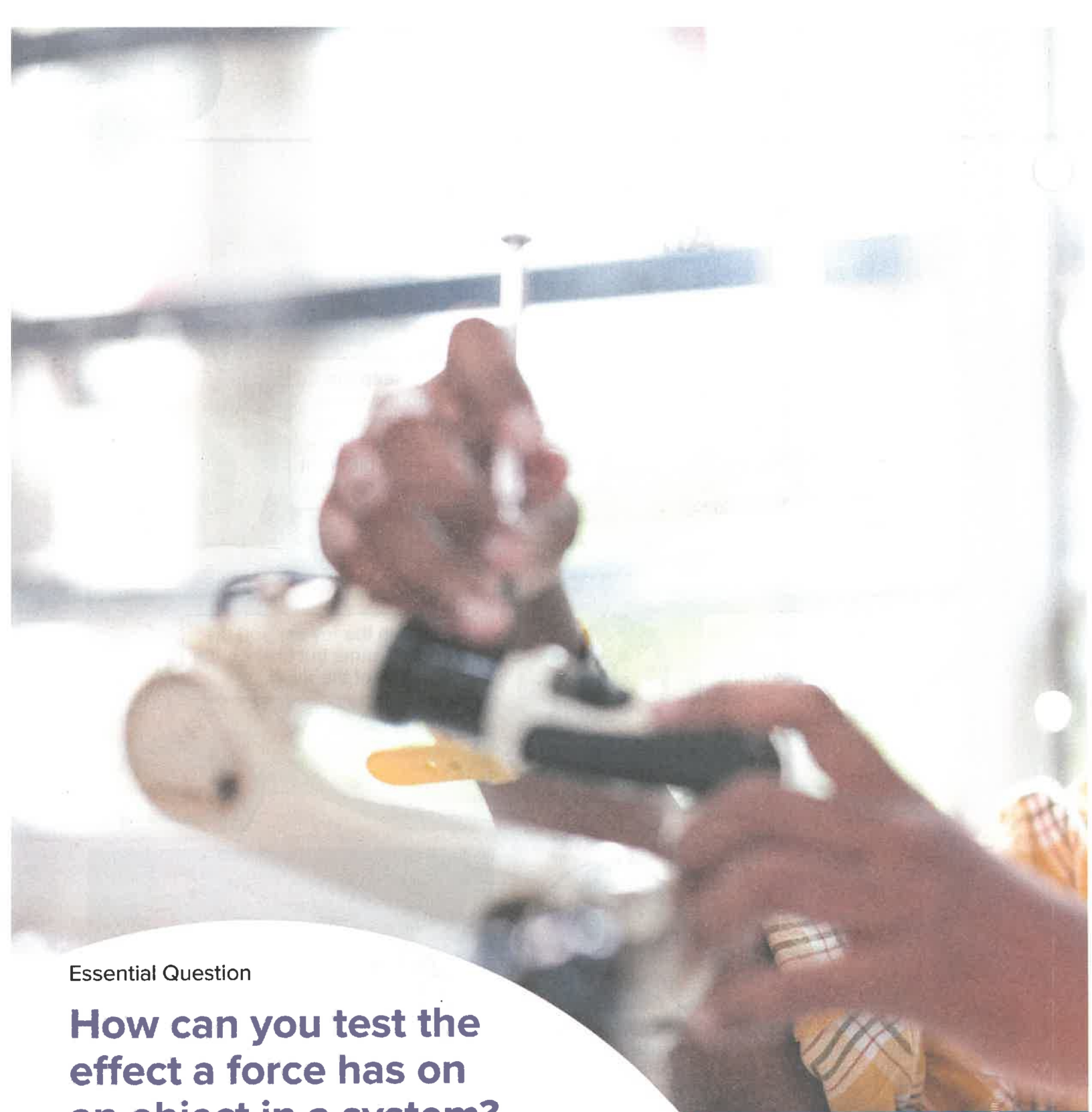




Testing How Forces Affect Motion



Who do you think has the best idea? Explain your thinking.



Essential Question

How can you test the effect a force has on an object in a system?



Watch *Ready, Set, Release!*



Why is testing the amount of force on an object important?



Jot down questions you have about planning experimental investigations.



Hands-On Investigation

Balloon Rocket

SC.5.N.1.1

SC.5.N.2.1



Get your notebook and go explore!



Investigating Forces



Claim, Evidence, Reasoning



How did the amount of force affect the distance the rocket traveled? Check your claim. Can you back it up? Keep reading and underline evidence.

A system is a group of parts that work together as a whole. A complex system has many parts that work together, but systems can also be quite simple with very few parts. For example, a toy car on a ramp is an example of a system and so are riders on a seesaw.

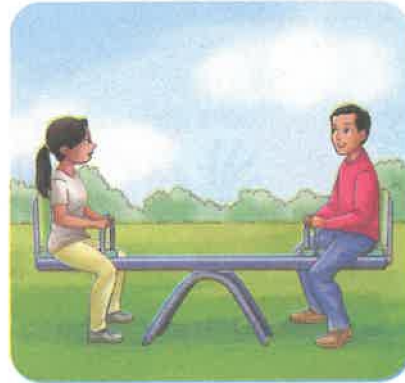
Forces help explain the interactions of parts in a system. An **interaction** is to have contact with something through touch or actions. When an interaction occurs between two or more forces, it can result in a change of motion. For example, the two young children on the first seesaw have about the same mass and weight, so each can affect the motion of the other.

On the second seesaw, the adult has much more mass and weight than the child. The seesaw is stuck and cannot move unless the adult gets off the seesaw! The downward force from the child is not great enough to lift the adult back up into the air.

There are two adults on the third seesaw. They each have about the same mass and weight, so they can move the system as well as the two children on the first seesaw.



What forces are at work in your everyday life? Think about how you got to school, the things you eat, and toys you play with.





Equipment at the school playground are examples of systems. With your teacher's help and permission, you can use scientific practices to plan and conduct investigations with them. To plan and conduct an experimental investigation, you must first ask a question and write a hypothesis. Consider the questions below to get started.

Does force affect the height of your swing? Try pushing a friend on a swing with different amounts of force. Have someone observe the height of each swing.

Does mass affect falling time? Try rolling balls of different masses down the slide and time how long they take to reach the end.

Does friction affect falling time? Compare the different amounts of time it takes for a ball to roll down a dry slide and a wet slide.



How else can you investigate forces on a playground?



Explore how mass changes motion in *Mass and Motion*.

SC.5.N.2.1

WORD LAB



Do you need practice?

Interactive

Word

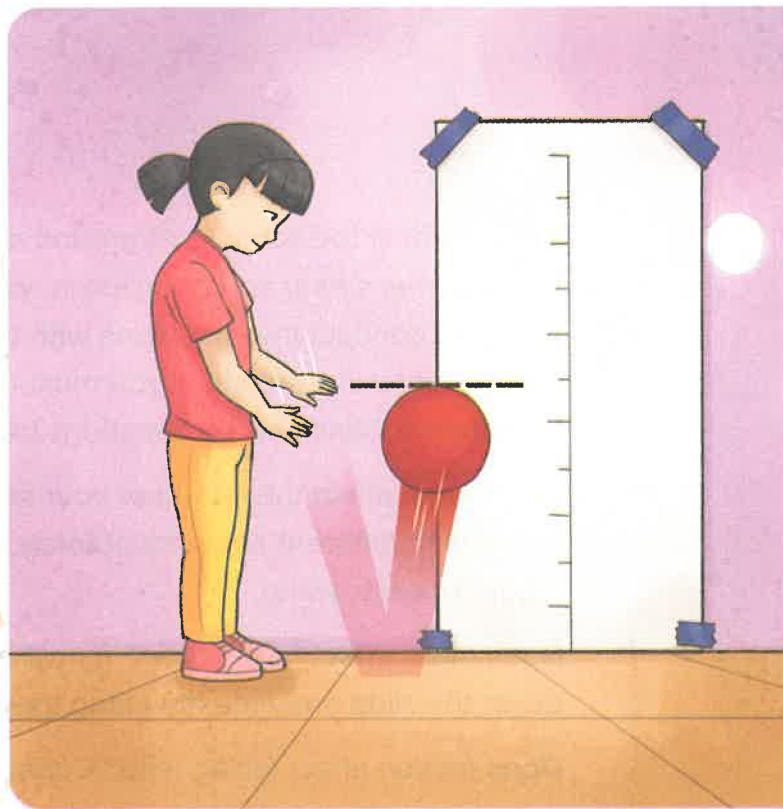
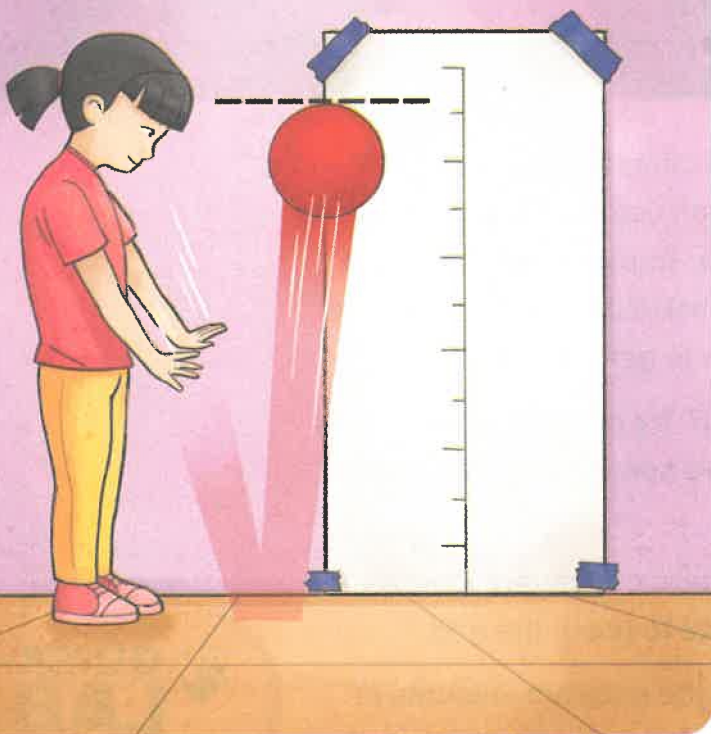
Wall

Remember to update your graphic organizer!

Testing Variables

A simple experimental investigation should test only one variable, or feature that could change. In science, to **test** is to find out the nature or quality of something, and scientists can perform tests to prove a hypothesis. In the Balloon Rocket investigation, you tested to see how far a balloon rocket would travel. In this simple experiment, the one variable you changed was the amount of air in the balloon. The results clearly showed how only one variable—the amount of air in the balloon—affected the distance the rocket traveled.

Read the Infographic: Examine each experimental investigation pictured along with its hypothesis. Name the variable that each experiment is testing.



Hypothesis: A stronger force in the bounce results in a higher bounce.

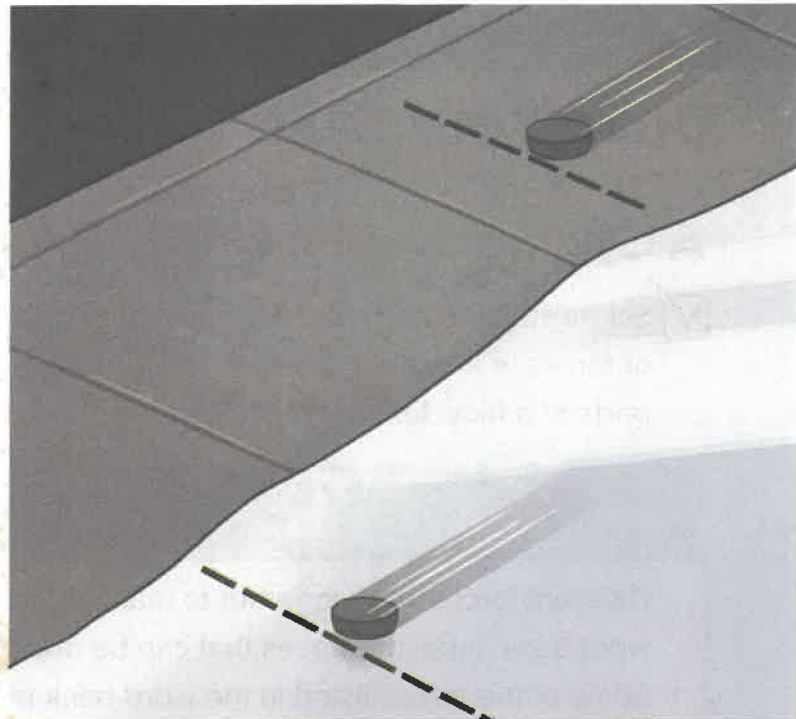
Variable: _____



Investigation Connection

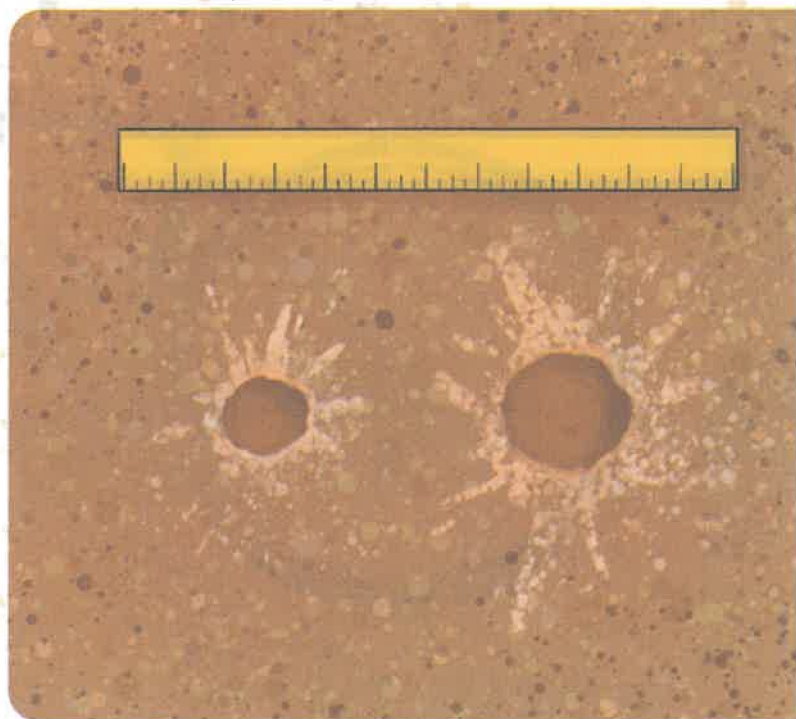


During the investigation, how did force, gravity, and friction affect the balloon? Discuss evidence from the investigation with a partner.



Hypothesis: A hockey puck will slide farther on ice than on pavement.

Variable: _____



Hypothesis: When dropped from the same height, both rocks will produce a different sized crater.

Variable: _____



Claim, Evidence, Reasoning



Now add your reasoning. I think _____,
because _____.

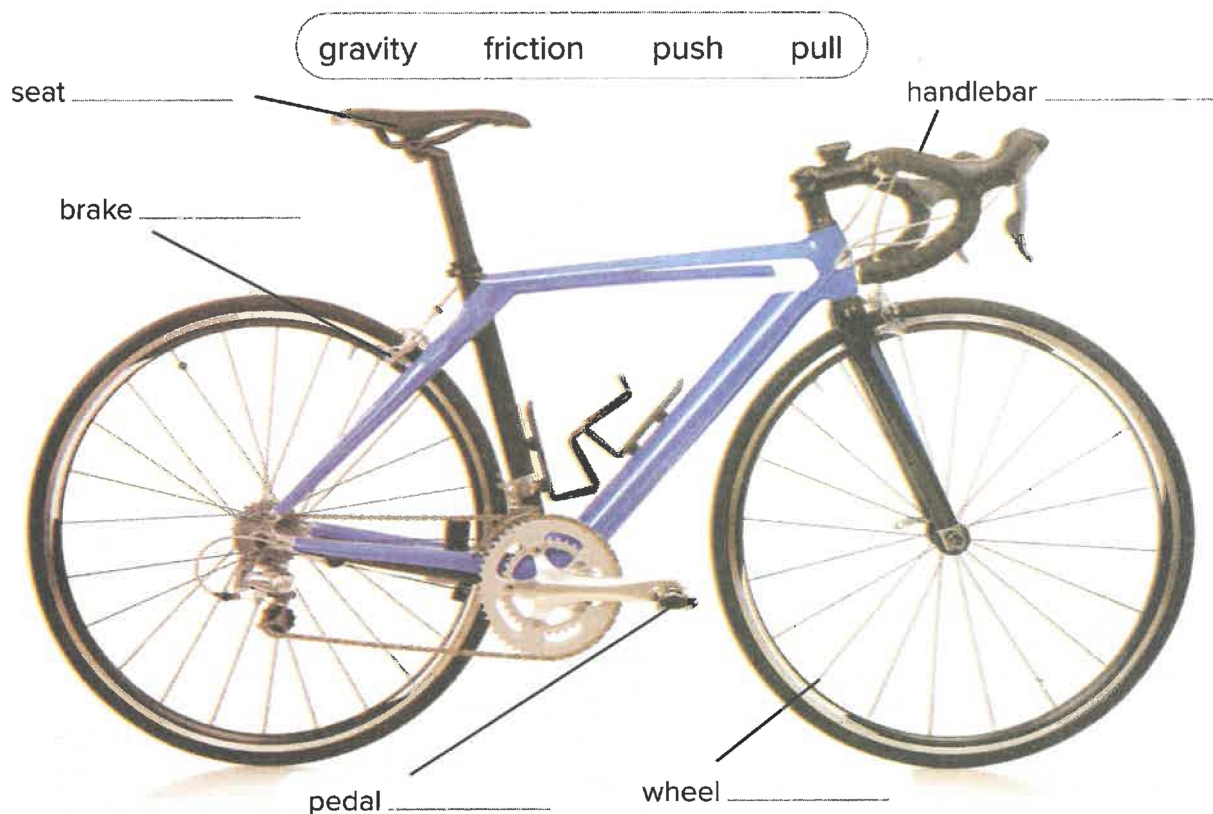
Build Your Skill

A Cycling System SC.5.N.1.1 SC.5.N.2.1

- ✓ Scientists plan and conduct investigations to test the safety and reliability of forces in a system. Scientists use models to represent objects, like the parts of a bicycle.

Apply It

Different forces work together to make bicycles move. Using words from the word bank, label the forces that can be observed when riding the bicycle. Some of the forces listed in the word bank may be used more than once.



Write About It! ELA.K12.EE.5.1

Imagine you are a scientist investigating forces at work on a bicycle. How can you plan an investigation to test the safety of a bicycle part? Choose one part of the bicycle and plan an investigation that tests its safety.