

Pushes and Pulls

Lesson 1 Pushes and Pulls

Lesson 2 Change in Movement

Lesson 3 Change Movement with
Pushes and Pulls

Next Generation Science Standards

K-PS2-1. Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.

K-PS2-2. Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.

K-2-ETS1-3. Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.



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VIDEO



eTEXT



INTERACTIVITY



SCIENCE SONG



GAME



ASSESSMENT

The
Essential
Question

What happens if you push
or pull an object?

Show What You Know

Put a box around a pull.

Wind Makes It Go

How can we use wind to push or pull something?



Hi, I'm Ms. Alvarez! I'm a sail designer. I think of ways to make sails to help things go faster. I need your help.

My friend wants to win a sail car race. Help me find the best shape for a sail for his car. It should help his car go fast in a big wind.

Follow the path. Do the steps to make your sail. Check off each one with

QUEST CHECK



OFF



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K-2-ETS1-3 Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.



VIDEO

Watch a video about a sail designer.

Quest Check-In Lab 2

Lesson 2 ●

Use what you learned to tell what happens when you blow on your sail.

Quest Check-In Lab 3

Lesson 3 ◆

Use what you learned to make the best sail.

Quest Check-In 1

Lesson 1 ■

Use what you learned to draw a sail for your car.

Quest Findings

Complete your Quest. What is a fun way to find the best sail shape?

START

FINISH

How do things *move*?

Car designers observe how cars move.
They ask questions.
How can you move things?

Procedure

- ☐ 1. Choose 4 objects.
- ☐ 2. Think of ways to move each object.
- ☐ 3. Move each object.
- ☐ 4. Draw one object in the box.
Use arrows to show how the object moves.

Materials

- 4 classroom objects

Science Practice

You **plan and conduct** an investigation to tell others what you learned.

Analyze and Interpret Data

5. Which object did you move?

Cause and Effect

Car designers understand cause and effect.
Read about what causes a bicycle to move.



GAME

Practice what you learn with the Mini Games.

A cause makes something happen.

An effect is what happens.

My Bike

I have a bike.

I can push the pedals quickly.

My bike goes fast.

I can push the pedals gently.

My bike goes slowly.



☒ READING CHECK Cause and Effect

Circle a cause. Underline an effect.

Lesson 1



VIDEO

Watch a video about pushes and pulls.

Pushes and Pulls

Vocabulary

push
pull

I can observe how objects move.

K-PS2-1

Jumpstart Discovery!

How are the dogs moving the toy?

How can you move something?



How can we make objects move?

Can you make objects move?
Try it and observe what happens.

Procedure

- ☐ 1. Think of ways to make the objects move.
- ☐ 2. **Observe** where the objects go.
- ☐ 3. **Show** where it goes.

Analyze and Interpret Data

4. **Explain.** How did the objects move?
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____

Suggested Materials

- pencil
- marker
- eraser
- book
- wood block

Science Practice

You **analyze data** from tests to tell if it works as you thought.



Pushes and Pulls

You can **push** an object to move it away from you.

You can **pull** an object to move it toward you.

Reading Check Cause and Effect

Underline the two words that make an object move.



Tell about the picture.

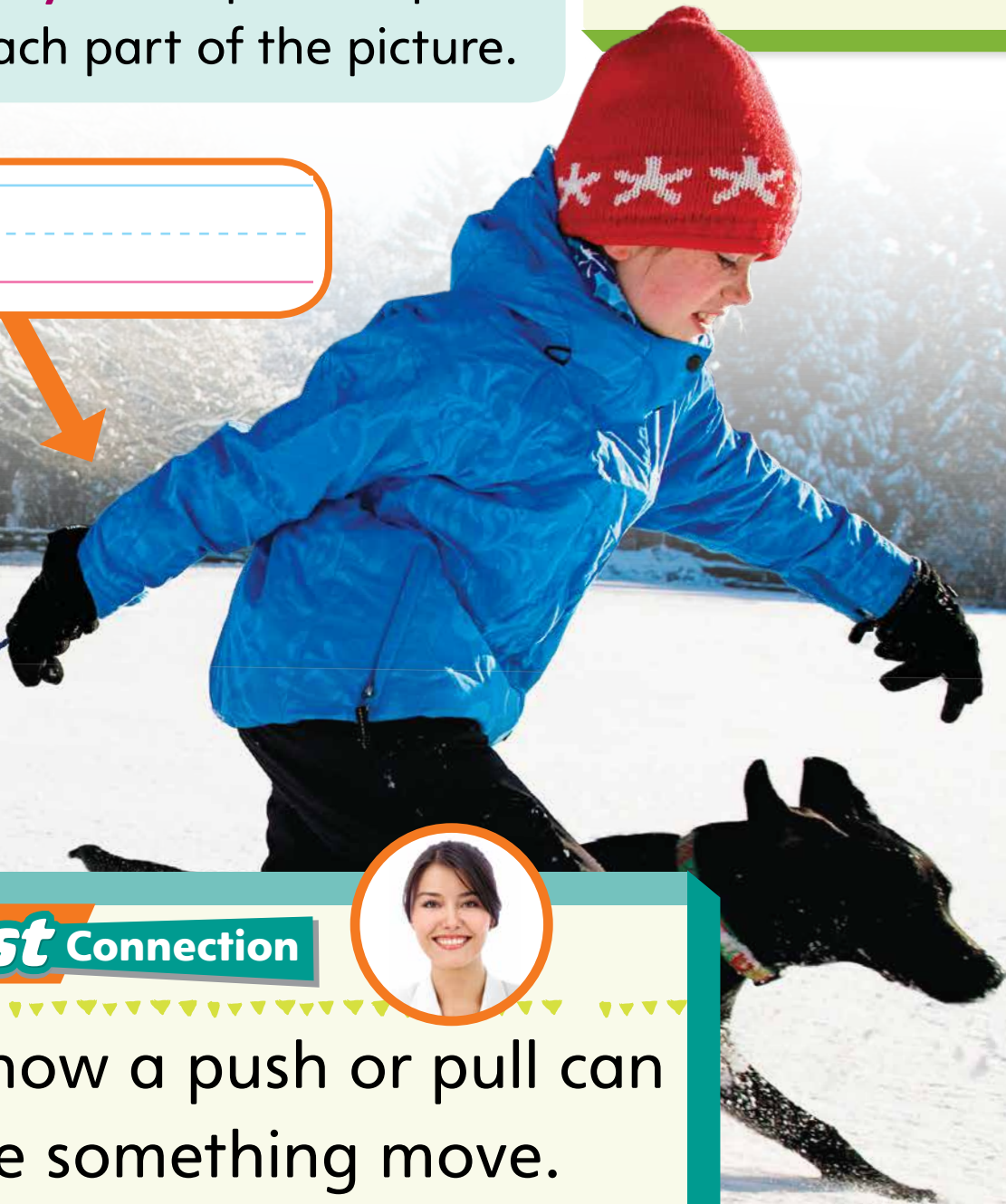
Does it show a push?

Does it show a pull?

Identify Write push or pull for each part of the picture.

Engineering ► Toolbox

Conduct an Investigation Stand blocks in a path. Push the first one. Tell what happens.



Quest Connection



Tell how a push or pull can make something move.



INTERACTIVITY

Compare a push and a pull.

Ways Objects Move

A push or pull can change the way an object moves.

The ball rolls to the boy.

The boy pushes it with a kick.

The ball moves away from the boy.

Identify Look at each picture.
Draw an arrow to show direction.



push



pull



Shapes of Sails

Wind pushes sails of all shapes.

The best shape will get more wind.

Draw a sail for your car.

Talk with a partner.

Tell why your sail shape is best.

Lesson 2

Change in Movement



VIDEO

Watch a video about changes in movement.

Vocabulary

speed
direction

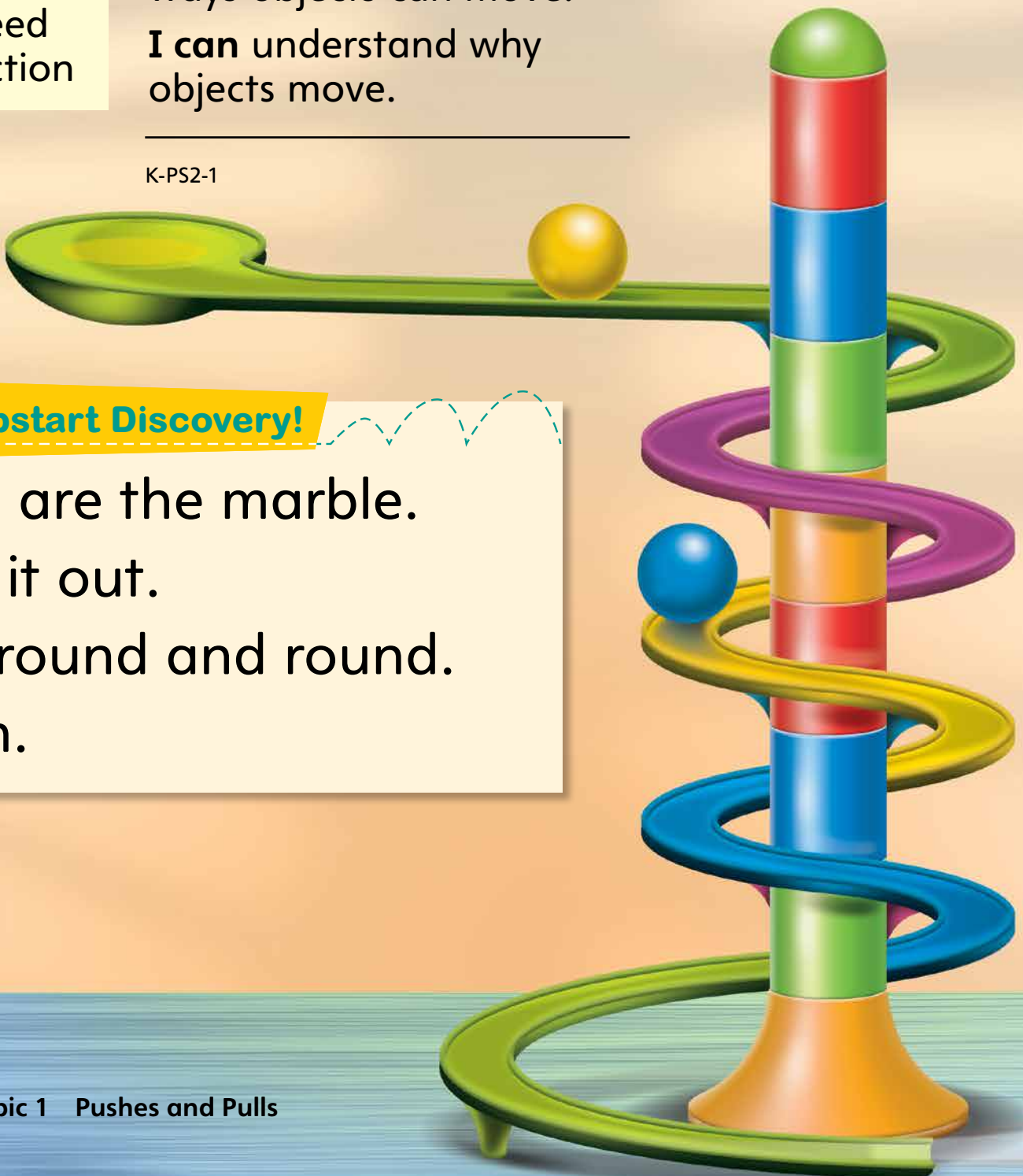
I can observe different ways objects can move.

I can understand why objects move.

K-PS2-1

Jumpstart Discovery!

You are the marble.
Act it out.
Go round and round.
Spin.





How do objects **move** ?

Tell how objects around you move in different ways.

Procedure

- ☐ 1. Think of ways you can move an object.
- ☐ 2. Test and observe.
- ☐ 3. Move each object a new way.

Materials

- ball
- ruler
- top
- button on a string

Science Practice

You **explain** when you tell how something happens.

Analyze and Interpret Data

- 4. **Tell** how each object moves.
- 5. **Tell** a word from the word bank for each object you tested.

fast slow roll spin slide wobble





INTERACTIVITY

Use the interactivity to answer the question, "How do things move?"

Different Ways to Move

Objects move in different **directions**.

They can move back and forth.

They can move up and down.

They can move round and round.

Identify Label how each object is moving.



swing



seesaw

Different Speeds

Objects move at different **speeds**.

Push hard.

A carousel spins fast.

Push softly.

A carousel spins slowly.

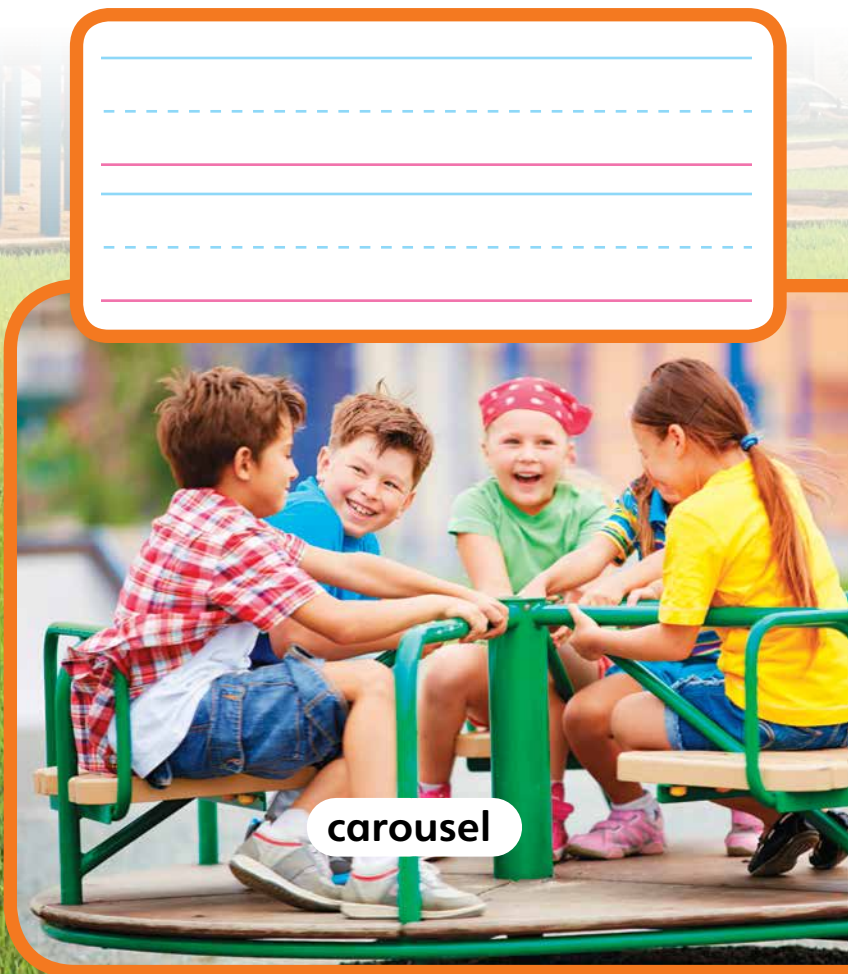
Crosscutting Concepts ▶ Toolbox

Cause and Effect

A push or a pull is a cause. The way a push or a pull moves an object is the effect. How do you move on a swing? How do you move on a seesaw?



Handwriting practice lines (dashed blue line, solid blue line, solid pink line) for writing.



carousel

How can you **build** your **sail car**?

It is time to make your sail.
Design your sail car.
Build it.
Then test it.



Suggested Materials

- plastic lids, foam pieces
- plastic cups
- paper bake cups
- tissue paper
- toothpicks
- tape
- ruler
- fan

Design and Test

- ☐ 1. Choose the materials for your sail car.
- ☐ 2. Draw your car with the sail.
- ☐ 3. Tell how the sail will push the car.
- ☐ 4. Test your sail in the wind.

Engineering Practice

Engineers **test** what they build.





Evaluate Your Solution

5. What worked?

6. What did not work?

7. What would you change?



VIDEO

Watch a video about engineers designing tools.

Maze Craze!

Have you walked through a maze?

There are a lot of turns.

Design It

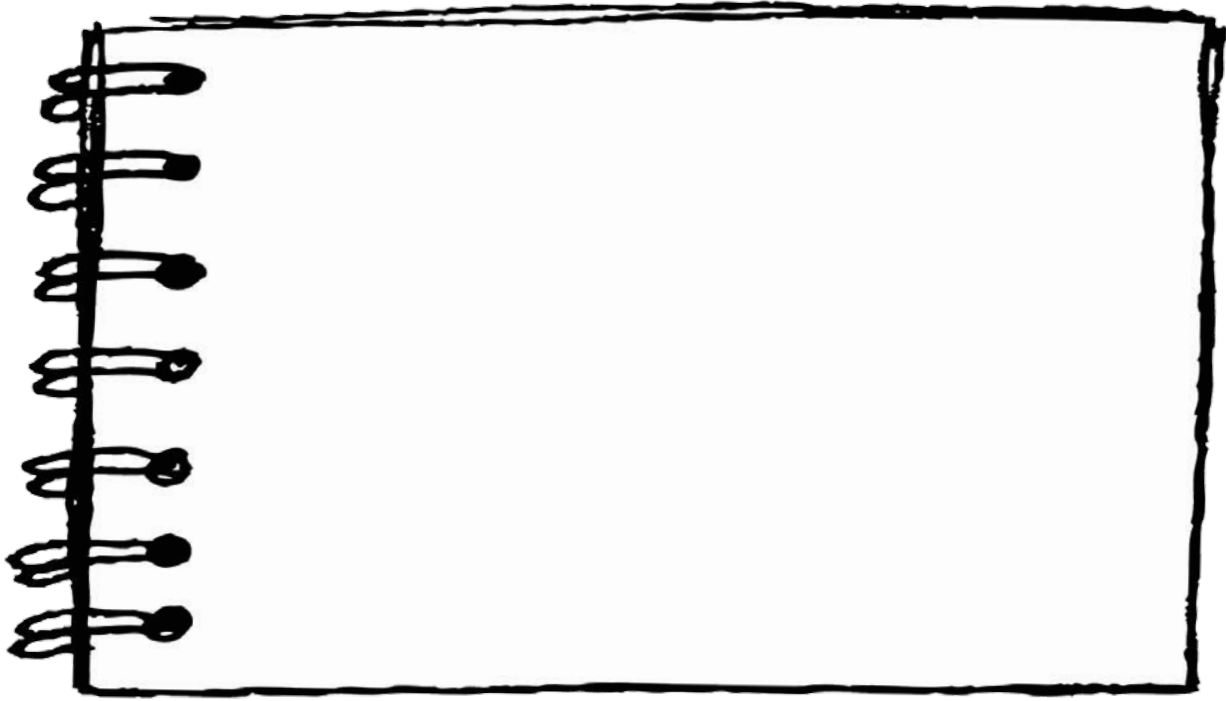
Build a maze.

Roll a little ball inside it.

What makes the ball change direction?



- ☐ 1. Draw a picture of your maze.



- ☐ 2. Build the maze on a table.
- ☐ 3. Try it out with a ball.
- ☐ 4. Make changes.
- ☐ 5. Have a friend try your maze.

➔ Design It

Which part of your maze did not work?
Tell how you would fix it.

Lesson 3



VIDEO

Watch a video about changes in movement.

Change Movement with Pushes and Pulls

Vocabulary

motion

I can investigate how objects move.

K-PS2-2, K-2-ETS1-3

Jumpstart Discovery!

Tell ways that a push can move a ball.

Act them out.

How do **you** roll?

Scientists study how objects move.
How does the strength of a push
affect the way an object moves?

Materials

- balls
- tape
- blocks

Science Practice

You plan your **investigation** before you begin.

Procedure

- ☐ 1. Work with a partner.
- ☐ 2. Make the balls go in a straight line.
- ☐ 3. Make the balls change direction.
- ☐ 4. Make the balls change speed.

Analyze and Interpret Data

5. Draw what happens when the balls hit each other.



INTERACTIVITY

Use the interactivity to make a bike travel in different directions.

Objects Change Motion

Use a push or a pull.

Make an object move.

This is its **motion**.

A push or pull can stop its motion.

Cause and Effect You used a push to throw the toy to the dog. Tell what will stop the motion of the toy.



How Objects Fall

Some objects bounce when they fall.

Some objects just fall.

They do not bounce back up.

Predict You push the ball off a table.

Will it fall and bounce?

Will it just fall?



Quest Connection



You want to move your sail car.

Tell how you can start its motion.

Direction and Motion

A moving object goes in a direction.

Another object can push or pull it.

The push or pull will change its direction.

Visual Literacy

Tell a story about the cars. Draw what happens next.



4



How does wind move my sail car?

Find out how your sail car works in wind. You may need to change some parts.



Materials

- sail car
- hair dryer or fan

Suggested Materials

- plastic lids, foam pieces
- plastic cups
- paper bake cups

Improve Your Design

- ☐ 1. Look at your sail car.
- ☐ 2. Make it better.
- ☐ 3. Decide what to use for wind.
- ☐ 4. Get your car to go faster. Get it to change direction.

Engineering Practice

You **test** a design to see if it works.

Evaluate Your Design

- 5. Tell what would make your sail car move better in the wind.

Add Numbers

The symbol $+$ tells you to add two or more numbers.

Count the red bikes.

How many do you see?

Count the blue bikes.

How many do you see?

Count Add the red bikes and the blue bikes.

How many bikes do you count?



Red Bikes

Blue Bikes

Red and
Blue Bikes

$+$

$=$



Apply what you learned in the Quest.

Wind Makes It Go

How can we use wind to move something fast?

Think about the shape of your sail.

Tell why your sail will work the best in a big wind.



Show What You Found

Race your car with your group.
Which sail works best? Why?



Sailboat Designer

This man makes sailboats. He learns about wind and water. He looks at how boats move. His boats are safe for people. They go fast, too!

Write one fact you know about boats.



The Essential Question


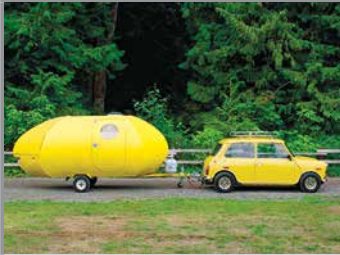

What happens if you push or pull an object?

Show What You Learned

Tell a partner what you learned about motion.



1. Each photo shows a push or a pull. Fill in the chart. The first one is done for you.

	Push	Pull
	X	
		
		

2. How is the ball moving?

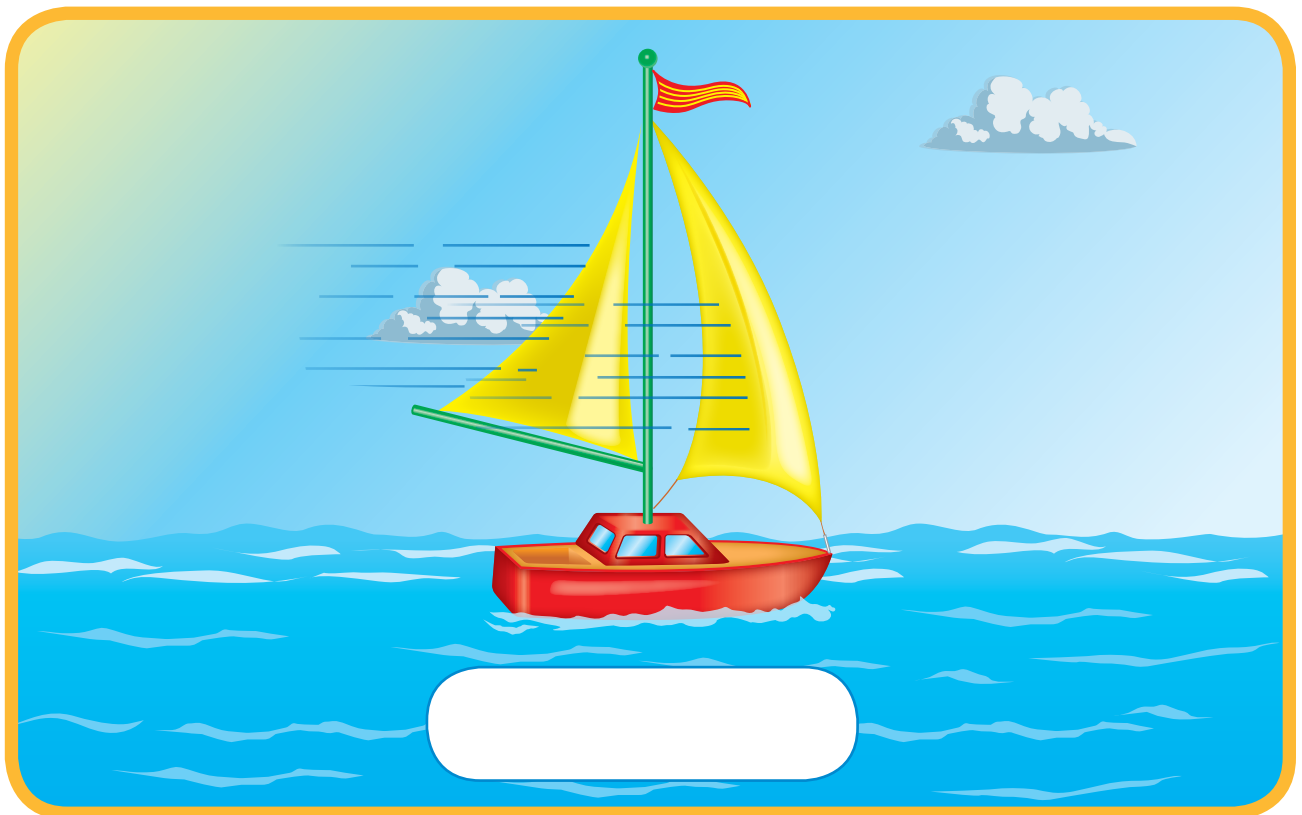
- a. up and down
- b. zigzag
- c. curved
- d. back and forth



3. Sam has a toy sailboat.

The wind blows on the sail.

Draw an arrow where the boat will go.



Read and answer questions 1-4.

Jenna is on a kickball team.

She is the pitcher.

She rolls the kickball to Robert.

She uses a hard push to make the ball go fast.

Robert kicks the ball.

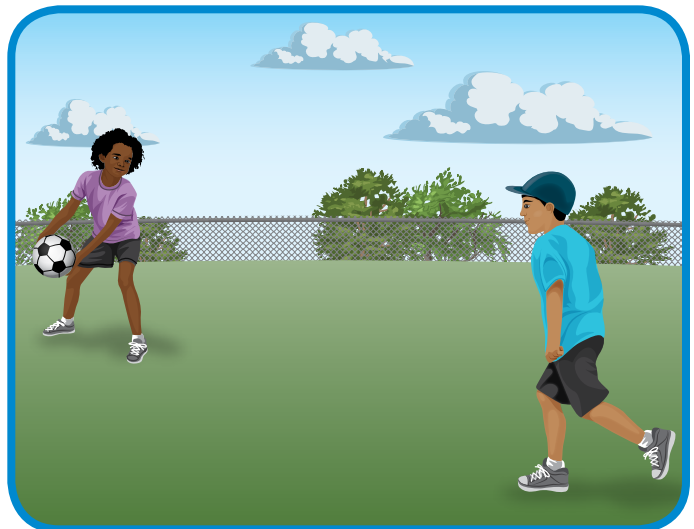
The ball flies up in the air.

Jenna catches it!

Jenna's coach cheers.

1. How did the ball move to Robert?

- a. with a push
- b. with a pull
- c. with a kick
- d. with a bat



2. What kind of push does the pitcher use?
- a. zigzag
 - b. hard
 - c. soft
 - d. up and down
3. Robert kicks the ball.
Who stops the ball's motion?
- a. Robert
 - b. Jenna
 - c. the coach
 - d. a fence
4. Jenna rolls the ball to Robert.
Draw an arrow to show where the ball will go.



How do objects change their motion?

Objects can move with a push or a pull.
Use what you learned to tell how
objects move.

Procedure

- ☐ 1. Choose an object.
- ☐ 2. Make it move.
- ☐ 3. Push it while it moves.
- ☐ 4. Observe what happens.
- ☐ 5. Choose a different object.
- ☐ 6. Make a plan to change the motion with a pull.

Suggested Materials

- string
- balls
- crayons
- toy cars
- feathers
- blocks

Science Practice

You **plan and conduct** an investigation to tell others what you learned.





Observations

Object	What Happened

Analyze and Interpret Data

7. Tell what made each object change its motion.
