BIG SCIENCE 4

STUDENT BOOK

ALWAYS LEARNING

PEARSON

Scope and Sequence

	Units	Lessons
Science, Engineering, and Technology	**Unit 1: Technology and the Design Process** **How can technology affect our lives?**	Lesson 1: What is a machine? Lesson 2: What is the design process?
Life Science	**Unit 2: Plants** **How do plants change and grow?**	Lesson 1: How do plants use roots and stems to grow? Lesson 2: How do plants use flowers and cones to reproduce?
	Unit 3: Living Things **How do living things grow and change?**	Lesson 1: What are the life cycles of some animals? Lesson 2: How can you classify animals?
	Unit 4: Ecosystems **How do living things interact?**	Lesson 1: What is an ecosystem? Lesson 2: How do living things get energy? Lesson 3: How do ecosystems change?
	Unit 5: Body and Illness **How can I keep my body healthy?**	Lesson 1: What causes different diseases? Lesson 2: How can you avoid getting diseases?
Earth Science	**Unit 6: Earth and Weather** **How do forces cause changes on Earth's surface?**	Lesson 1: What is the water cycle? Lesson 2: How do we describe features of Earth's surface? Lesson 3: What are weathering and erosion?
	Unit 7: Earth and Our Universe **How do objects in space affect one another?**	Lesson 1: What are Earth's patterns? Lesson 2: What is known about the moon?
Physical Science	**Unit 8: Energy and Its Forms** **How can energy change?**	Lesson 1: What are some forms of energy? Lesson 2: What are heat and light energy?
	Unit 9: Forces and Motion **What forces cause motion?**	Lesson 1: What is motion? Lesson 2: How does force affect motion? Lesson 3: What is gravity?

I will learn...	Key Words
• about simple and complex machines.	• *work, wheel and axle, wedge, lever, inclined plane, pulley, screw*
• the steps of the design process.	• *design process, engineer, research, prototype*
• how plants use roots and stems to grow.	• *roots, stems, ground, leaves, nutrient, cactus*
• how some plants use flowers and cones to reproduce.	• *reproduce, pollen, pollinate, germinate, cones, life cycle*
• the life cycles of different animals.	• *larva, pupa, metamorphosis, amphibian, gills, lungs*
• how to classify animals.	• *trait, vertebrate, scales, cold-blooded, warm-blooded, invertebrate, arthropod*
• what an ecosystem is.	• *ecosystem, habitat, population, community*
• how living things get energy.	• *producer, consumer, decomposer, food chain, herbivore, carnivore, omnivore*
• how ecosystems change.	• *resources, drought, adaptation*
• what causes some diseases.	• *infectious disease, microorganism, noninfectious disease, abnormal, pathogen, toxin, immune system, allergen*
• how to avoid getting some diseases.	• Salmonella, *antibiotic, vaccine, antibodies, symptoms, chronic*
• about the water cycle.	• *water cycle, evaporation, condensation, precipitation*
• features and changes on Earth's surface.	• *landform, landslide, volcano, lava, earthquake, faults*
• about weathering and erosion.	• *weathering, erosion, mudflow, rockslide*
• what causes daytime, nighttime, and the seasons.	• *axis, rotation, revolution, seasons, shadow*
• what causes the phases of the moon.	• *moon phase, telescope, crater, new moon, full moon*
• about different forms of energy.	• *energy, electrical energy, mechanical energy, sound energy, potential energy, kinetic energy*
• what heat and energy are.	• *matter, particles, thermal energy, spacecraft, solar panel, generator*
• what motion is.	• *position, motion, speed*
• how force affects motion.	• *force, friction, magnetism, iron, magnet, steel*
• what gravity is.	• *gravity, weight, matter, mass*

Unit 1 Technology and the Design Process

How can technology affect our lives?

I will learn

- about simple and complex machines.
- the steps of the design process.

1 **Look and label.**

can opener axe scissors
seesaw wheel screw

2 **What are each of the machines used for? Discuss with a partner.**

3 **How can machines help you solve problems? Discuss as a class.**

Think!

How will this tiny robot help people in the future?

Lesson 1 · What is a machine?

Key Words

- work
- wheel and axle
- wedge
- lever
- inclined plane
- pulley
- screw

1 **Read and complete the graphic organizer. Write details about work.**

Work

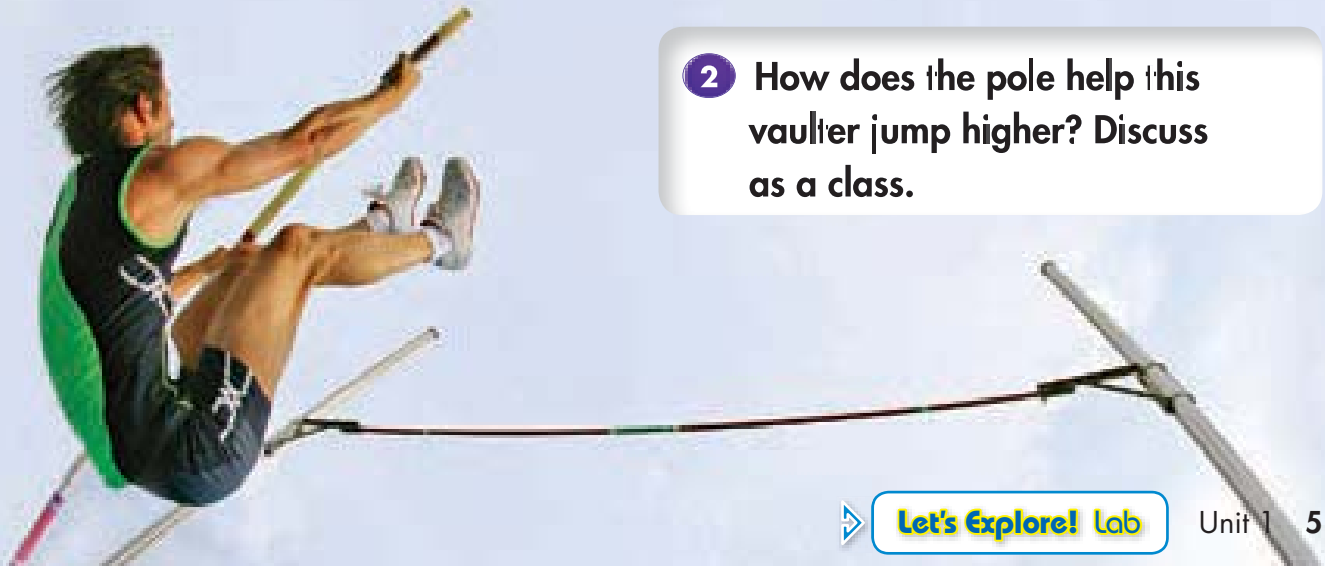
Is kicking a soccer ball work? To a scientist it is. In science, **work** means the use of a force to move an object across a distance. You do work when you rake leaves, pedal a bike, or kick a soccer ball.

It may be hard to solve a math problem. But it is not work. You may push hard to move a large rock. But it is not work if the rock does not move. You only do work when you move an object. The amount of work you do depends on how much force you use and how far you move the object.

Main Idea

Work is the use of a force to move an object across a distance.

Detail	Detail	Detail
You do work when you move an object.	_____ _____	_____ _____



2 **How does the pole help this vaulter jump higher? Discuss as a class.**

A **wheel and axle** is made of a round object, a wheel, attached to a post, called an axle. Turning the wheel causes the axle to turn. The axle turns a small distance as the wheel turns a greater distance.

3 **Read and write the names of the six machines shown on pages 6 and 7.**

Simple Machines

Do you recognize any of the objects in the pictures? They are all simple machines. Simple machines have just one or two parts. These machines do not lessen the amount of work you do, but they help make work easier. Six kinds of simple machines help you do work.

_____

_____

_____

_____

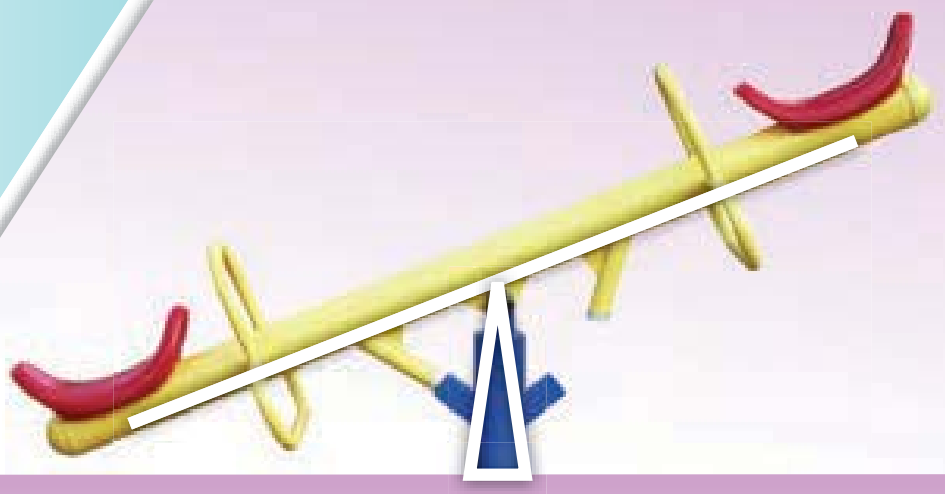
_____

A **wedge** is a simple machine made from two slanted sides that end in a sharp edge. As a wedge is pushed through material such as wood or food, it cuts or splits the material.

4 **What is the common name for the wedge you use to cut a cake? Discuss with a partner and write its name.**

_____

A **lever** is a stiff bar that rests on a support. A lever is used to lift and move things. When you push down on one end, the other end lifts up.



5 **Look at this shape ▼. Draw an ✘ on the simple machine that has this shape. How does the shape help this machine work? Discuss with a partner.**

6 **Which simple machine would you use for each task below? Discuss with a partner.**

A. Raise a flag on a pole. _____

B. Open a can of paint. _____

C. Cut an apple. _____

7 **How is a jar lid a screw? Discuss as a class.**

A **screw** is an inclined plane wrapped around a center post. Screws can be used to hold things together and to raise and lower things.

A **pulley** can make work easier in two ways. It can decrease the amount of force needed to move an object. It can also change the direction that the force is applied.

An **inclined plane,** or a ramp, is a slanted surface. It connects a lower level to a higher level. Less force is needed to move an object over a longer distance.

8 **Read and look at the machines on pages 6 and 7. Complete the captions with words from the box.**

Complex Machines

Simple machines are often put together to do bigger jobs. These complex machines are made up of simple machines that work together.

The can opener below is a complex machine. Find the simple machines that it is made of. These simple machines work together to grip, turn, and slice through a can lid.

wedge axle levers

9 **Write a list of three complex machines that you and your family have used this week. With a partner, compare your lists.**

1. _____
2. _____
3. _____

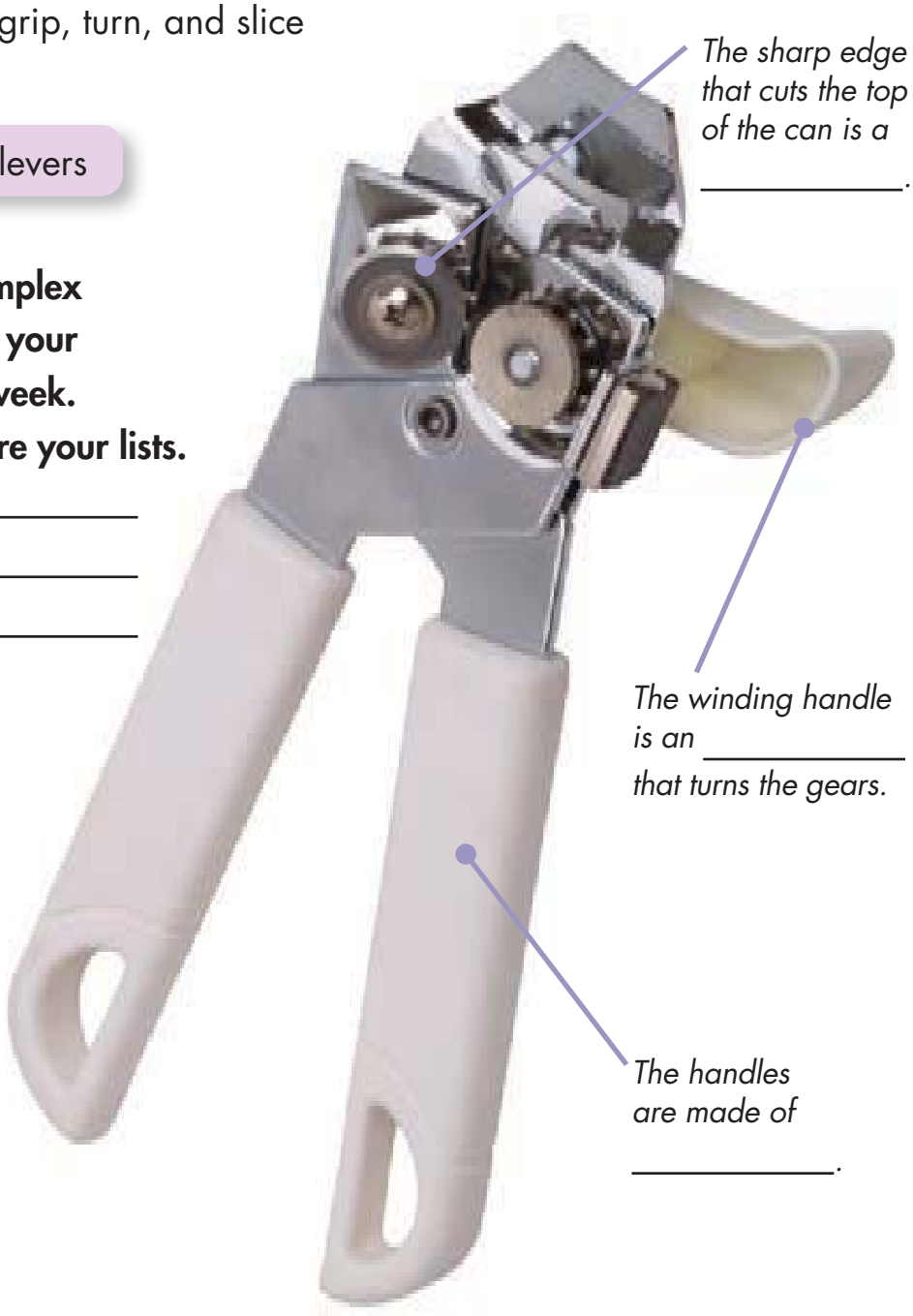
Think!

How do you know when a complex machine is at work?

At-Home Lab

Complex Machines

Search your home for one complex machine. Draw and label the complex machine. Identify each simple machine in the complex machine.



The sharp edge that cuts the top of the can is a _____.

The winding handle is an _____ *that turns the gears.*

The handles are made of _____.

10 **Read. Where would you find a wedge inside a lawn mower? Discuss with a partner and write your answer.**

Lawn Mowers

Engineers design and develop large and small machines. These machines are made of simple and complex machines. A simple machine can be a lever, wheel and axle, pulley, wedge, inclined plane, or screw.

Simple machines are often put together to make a complex machine, such as a lawn mower. It is made of different parts. Some of these parts are simple machines, such as a wheel and axle. A wheel and axle is used in a lawn mower to help it move. A screw is another simple machine. Screws are used to hold the lawn mower pieces together. Lawn mowers have wedges that end in sharp edges. Where would you find a wedge inside a lawn mower?

Bicycles

The bicycle is a complex machine, too. What simple machines make it up? How does each simple machine help make the bicycle work?

11 **Draw a line from each simple machine to its correct part on the bicycle.**

A. lever

B. pulley

C. wheel and axle

Lesson 2 · What is the design process?

Key Words

- design process
- engineer
- research
- prototype

1 **Look at the pictures. How are the two computers similar? How are they different? Discuss with a partner.**

Design Process

When people design something new, they follow the steps of the design process. The **design process** is a step-by-step method used to solve a problem.

People use the design process to find a solution. A solution is an answer to a problem. The design process allows **engineers** to produce and test possible solutions. An engineer is any person who designs new technologies.

2 **Why is it important for engineers to follow the steps of the design process? Discuss as a class and write the answer.**

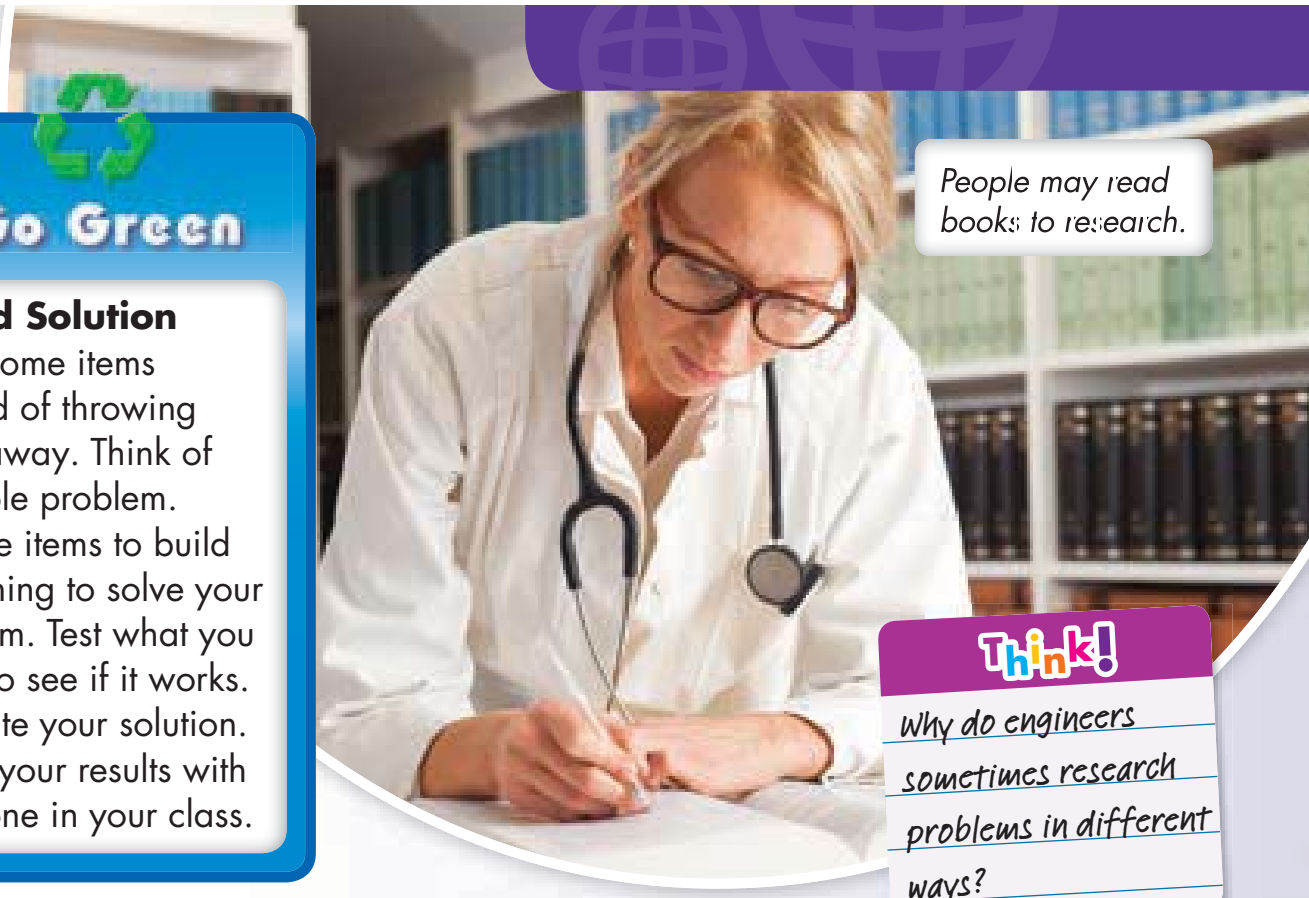
_____

_____

_____

_____

_____



People may read books to research.

Go Green

Saved Solution

Save some items instead of throwing them away. Think of a simple problem. Use the items to build something to solve your problem. Test what you build to see if it works. Evaluate your solution. Share your results with someone in your class.

Think!

Why do engineers sometimes research problems in different ways?

3 **Read and complete the information related to Kramer's invention. Check your answers with a partner.**

Identify the Problem

Engineers identify the problem during the first step of the design process. Before producing a design, engineers consider if there is a need for it. In 1979, there were only large music players that needed tapes or records to play music. British inventor Kane Kramer identified this as a problem. Kramer wanted to design a smaller music player that did not need tapes or records. His idea led to the invention of the digital audio player.

Do Research

The next step is to research the problem. **Research** means to look for facts about something. People can research problems in different ways. Some engineers research by talking to other people and reading articles. Kramer researched ways to make a digital audio player. Kramer took notes about what he learned.

1. **Problem:**

_____

_____

_____

_____

2. **Research:**

a. _____

_____

_____

b. _____

_____

_____