21st CENTURY SKILLS

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STEAM Reading

High Elementary

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Beginner

Elementary

High Elementary

Video Experiments

Matthew Broadhurst

21st CENTURY SKILLS

STEAM Reading

High Elementary

Science Technology Engineering Arts Math

3

Matthew Broadhurst

HOW TO USE THIS BOOK

STUDENT BOOK

1 STEAM

2 I will learn... about reflection and refraction.

3 Scan for Audio

4 KEY WORDS

A Look, listen, and repeat. 37

phr. far away

5 *adv.* over

n. rainbow

n. wall

v. control

phr. come back

v. split

n. droplet

B Listen and number the words. 38

THE WONDER OF RAINBOWS

READING

Listen and read. 39

Scan for Video

Refraction and reflection are two ways of moving light.

Look at a bird with binoculars. It looks close even though it's far away. That's because of refraction. Binoculars bend and focus the light.

The birds fly over a lake. You can see them in the water. The light bounces off the water and is reflected.

Let's look at reflection and refraction at the same time. We will make our own rainbow!

1 STEAM

Units are grouped together in pairs. Each pair of units has lessons on the same subject. Every unit focuses on one or more aspects of STEAM (Science, Technology, Engineering, Arts, Math).

2 I WILL LEARN...

The academic objective of the unit is introduced to get students thinking.

3 QR CODES

Scan the audio QR CODE to listen to the key words and reading passages. In the experiment units, scan the video QR CODE to watch a video of a real experiment.

Video Experiments

Live-action videos take students step-by-step through all science experiments. This visual aid enhances their learning experience and makes the topic come alive.

Fill a transparent glass with water. Put the mirror in the water at an angle.

Place the glass near a window so the sun can shine on the mirror.

Check the reflection on the wall. Control the angle of the glass to make a rainbow on the wall.

How did this work?

The sunlight was refracted as it entered the water. It slowed down and changed direction. Then the light hit the mirror. It was reflected. It bounced off the mirror and came back. As it left the water, it was refracted again. Light is made of many colors. We usually see it as only white. When the light hit the mirror and left the water, the light was split up into different colors. We saw a rainbow.

In nature, we only see rainbows when the sun shines after it rains. There are water droplets in the air. Light is refracted and reflected like in the experiment.

Aren't rainbows amazing?

Read and choose.

1. What does It mean in the reading?
   a. the bird b. the light c. the rainbow
2. What does come back mean in the reading?
   a. go away from b. return c. stay away

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4 KEY WORDS
Every unit introduces new KEY WORDS that are necessary to understand the unit's topic. All key words are found in the READING and are illustrated with a photograph.

5 READING
Each READING is an introduction to the topic of the unit. The first unit in a pair introduces the subject through an experiment. The experiment is illustrated and easy to follow. The second unit features an engaging short story on the same topic.

6 SHORT ACTIVITIES
Short activities focus attention on the KEY WORDS and check understanding.

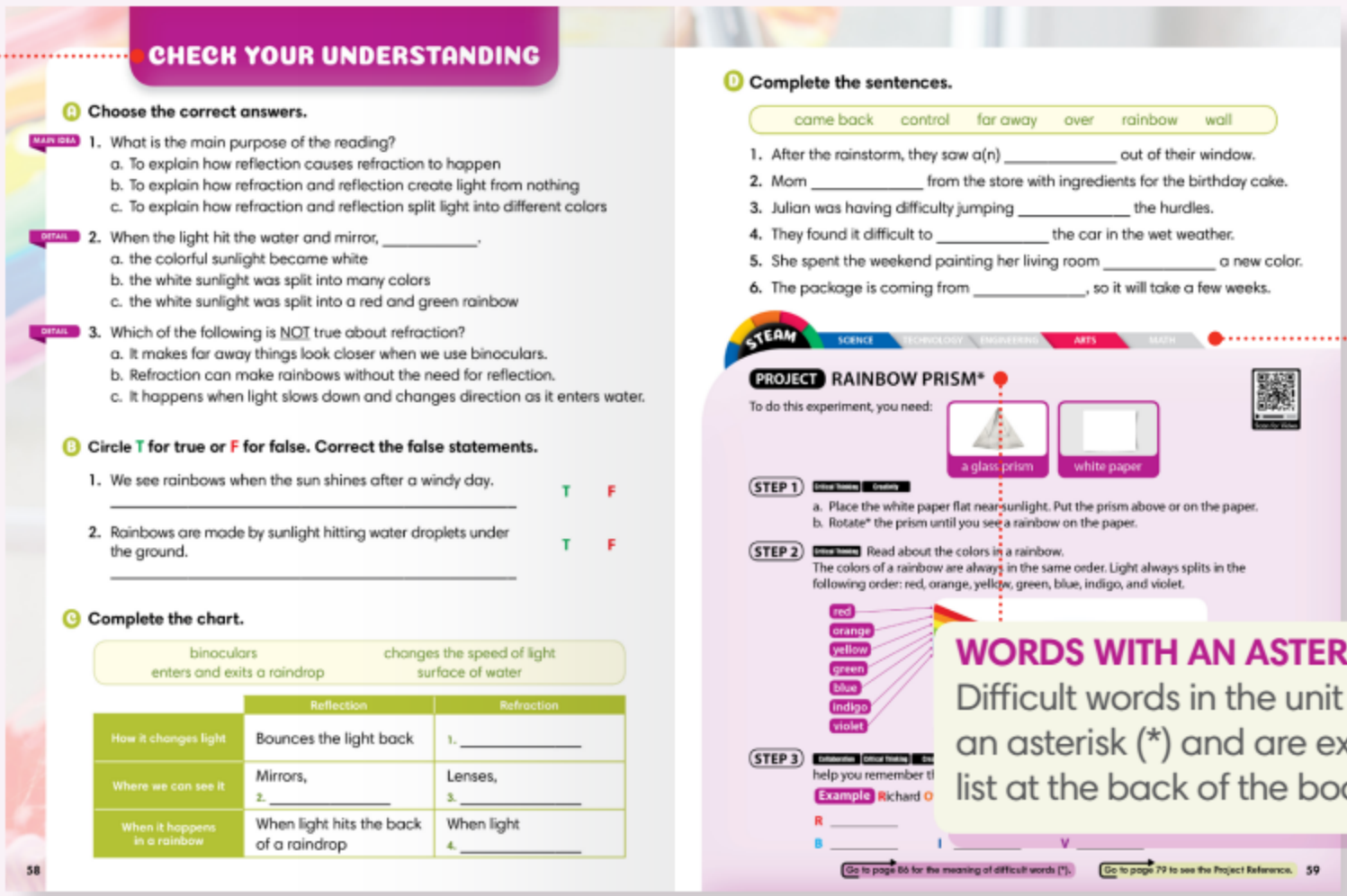
HOW TO USE THIS BOOK

CHECK YOUR UNDERSTANDING

This section features a range of activities to check both reading comprehension and understanding of the unit vocabulary.

STEAM PROJECT

The STEAM PROJECT ends the unit with a fun and interactive project that encourages individual creativity as well as collaboration. Project types include experiments, math problems, and arts & crafts. Experimental projects have a video available via QR code. Further explanation for certain projects can be found in the PROJECT REFERENCE at the end of the book.



CHECK YOUR UNDERSTANDING

A Choose the correct answers.

MAIN IDEA 1. What is the main purpose of the reading?
a. To explain how reflection causes refraction to happen
b. To explain how refraction and reflection create light from nothing
c. To explain how refraction and reflection split light into different colors

DETAIL 2. When the light hit the water and mirror, _____.
a. the colorful sunlight became white
b. the white sunlight was split into many colors
c. the white sunlight was split into a red and green rainbow

DETAIL 3. Which of the following is NOT true about refraction?
a. It makes far away things look closer when we use binoculars.
b. Refraction can make rainbows without the need for reflection.
c. It happens when light slows down and changes direction as it enters water.

B Circle T for true or F for false. Correct the false statements.

1. We see rainbows when the sun shines after a windy day. T F
_____

2. Rainbows are made by sunlight hitting water droplets under the ground. T F
_____

C Complete the chart.

binoculars | enters and exits a raindrop | changes the speed of light | surface of water

	Reflection	Refraction
How it changes light	Bounces the light back	1. _____
Where we can see it	Mirrors, 2. _____	Lenses, 3. _____
When it happens in a rainbow	When light hits the back of a raindrop	When light 4. _____

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D Complete the sentences.

came back | control | far away | over | rainbow | wall

1. After the rainstorm, they saw a(n) _____ out of their window.
2. Mom _____ from the store with ingredients for the birthday cake.
3. Julian was having difficulty jumping _____ the hurdles.
4. They found it difficult to _____ the car in the wet weather.
5. She spent the weekend painting her living room _____ a new color.
6. The package is coming from _____, so it will take a few weeks.

STEAM SCIENCE TECHNOLOGY ENGINEERING ARTS MATH

PROJECT RAINBOW PRISM*

To do this experiment, you need:

a glass prism | white paper

STEP 1 Critical Thinking Creativity
a. Place the white paper flat near sunlight. Put the prism above or on the paper.
b. Rotate* the prism until you see a rainbow on the paper.

STEP 2 Critical Thinking Read about the colors in a rainbow.
The colors of a rainbow are always in the same order. Light always splits in the following order: red, orange, yellow, green, blue, indigo, and violet.

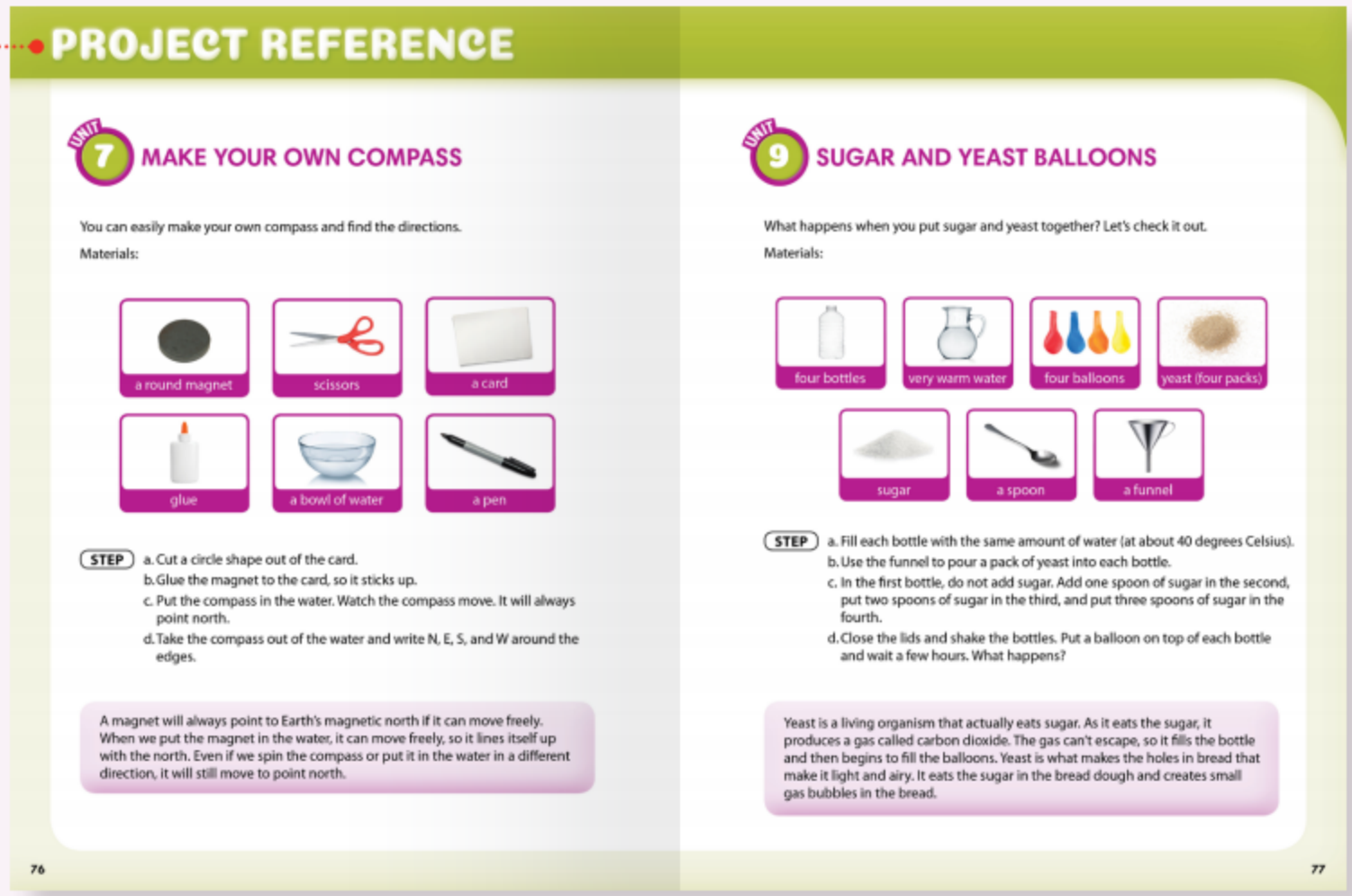
red | orange | yellow | green | blue | indigo | violet

STEP 3 Collaboration Critical Thinking
help you remember t
Example Richard O
R _____
B _____ I _____ V _____

Go to page 86 for the meaning of difficult words (*). Go to page 79 to see the Project Reference. 59

WORDS WITH AN ASTERISK (*)

Difficult words in the unit are marked with an asterisk (*) and are explained in a word list at the back of the book.



PROJECT REFERENCE

UNIT 7 MAKE YOUR OWN COMPASS

You can easily make your own compass and find the directions.

Materials:

a round magnet | scissors | a card | glue | a bowl of water | a pen

STEP a. Cut a circle shape out of the card.
b. Glue the magnet to the card, so it sticks up.
c. Put the compass in the water. Watch the compass move. It will always point north.
d. Take the compass out of the water and write N, E, S, and W around the edges.

A magnet will always point to Earth's magnetic north if it can move freely. When we put the magnet in the water, it can move freely, so it lines itself up with the north. Even if we spin the compass or put it in the water in a different direction, it will still move to point north.

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UNIT 9 SUGAR AND YEAST BALLOONS

What happens when you put sugar and yeast together? Let's check it out.

Materials:

four bottles | very warm water | four balloons | yeast (four packs) | sugar | a spoon | a funnel

STEP a. Fill each bottle with the same amount of water (at about 40 degrees Celsius).
b. Use the funnel to pour a pack of yeast into each bottle.
c. In the first bottle, do not add sugar. Add one spoon of sugar in the second, put two spoons of sugar in the third, and put three spoons of sugar in the fourth.
d. Close the lids and shake the bottles. Put a balloon on top of each bottle and wait a few hours. What happens?

Yeast is a living organism that actually eats sugar. As it eats the sugar, it produces a gas called carbon dioxide. The gas can't escape, so it fills the bottle and then begins to fill the balloons. Yeast is what makes the holes in bread that make it light and airy. It eats the sugar in the bread dough and creates small gas bubbles in the bread.

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PROJECT REFERENCE

PROJECT REFERENCE pages go into further detail of the concepts behind the project.

WORKBOOK

VOCABULARY PRACTICE
This checks students' understanding of the key words introduced in the Student Book unit.

COMPREHENSION PRACTICE
These questions focus on a passage from the reading and check students' understanding of the text.

3 LIGHT ENERGY

VOCABULARY PRACTICE

A Match and write.

1.  axis
   • Old planes had _____ that moved them through the air.
2.  chemical
   • _____ the lettuce into the small pieces and add to the salad.
3.  propellers
   • Kara's mom works in a lab and experiments with _____ reactions.
4.  tear
   • Earth spins on a tilted _____.

B Choose the correct words.

1. A person running in a race is using _____ energy.
   a. solar b. kinetic c. sonic
2. Eric went to the counter to _____ his points into cash to spend in the store.
   a. convert b. power c. tear
3. Jenny took her car to the mechanic to take a look at the _____.
   a. lens b. piece c. motor
4. After making a smoothie, Wanda cleaned the _____ in her blender.
   a. blades b. propellers c. clips

COMPREHENSION PRACTICE

Read the following passage and choose the correct answers.

The electric energy from the battery powered the motor. ① The electric energy became kinetic energy when the propeller turned. So, light energy turns into electric energy. ② We can't see the energy change forms because it happens so quickly. ③

1. What is the main idea of this passage?
   a. How solar energy turns the propeller
   b. How gravitational energy turns the energy
   c. How energy is converted and then turns the propeller
2. What is the best place for the sentence below?
   Then electric energy turns into kinetic energy.
   a. ① b. ② c. ③
3. What does turn mean in the passage?
   a. convert b. move c. change

SUMMARY

Complete the summary. One word is not used.

chemical convert electricity energy kinetic motor powered solar

Sunlight is a great source of power. Plants need it to grow. They 1. _____ light energy from the sun into 2. _____ energy. This helps them grow big and strong. In the same way, solar batteries turn light energy into electric energy. In the experiment, we connected a(n) 3. _____ battery to a motor and a propeller. Light energy from the sun 4. _____ the solar battery. The battery turned this into electric energy. The electric energy then powered the motor. Finally, the 5. _____ turned electric energy into 6. _____ energy and turned the propeller. The conversion of 7. _____ happens quickly and invisibly.

8 9

SUMMARY
This is a recap of the unit's reading passage. Students are able to check their understanding of the ideas introduced in the unit.

TABLE OF CONTENTS

• Project Reference / Page 74 • Word List / Page 80

STEAM 1

I will learn... about how muscles move bones.

MUSCLES MOVE OUR BODIES

Scan for Audio

WARM-UP

Close your fist. Stretch out your fingers. What makes your hand move?

KEY WORDS

A Look, listen, and repeat. 01

v. stretch

n. muscle

adj. locomotive

n. organ

n. structure

n. lung

v. surround

v. extend

B Listen and number the words. 02

READING

Listen and read. 03

Scan for Video

Write a letter to a friend. Run fast to catch the bus for school. Stand up and stretch after watching too much TV. What's the connection between these actions? They all use our bones and muscles!

The bones and muscles which help us move are called "locomotive organs." Bones form the structure of our body. They support our body, too. They also protect important organs like our heart, lungs, and brain. Muscles surround the bones. They extend and flex to make the body move. Let's see how muscles work to move bones.

Flatten two straight straws using a pencil. Push a paper fastener through one end of each straw.

Put a bendy straw into a plastic bag. Tie the opening of the bag to the straw so no air can get out.

Tape both sides of the bag to both straws, front and back. You can tape a drawing of a hand to the front straw.

Blow air into the plastic bag through the bendy straw. What happens?

When you blew air, the plastic bag swelled up. It got thicker and shorter, and it made the front straw lift up. This is how arms move.

Our muscles are connected to our bones. When the muscles in our arms flex, they get thicker and bend our arms. When our muscles extend, they get flatter and straighten our arms again.

Thanks to our bones and muscles moving together, we are able to move. Without them, we wouldn't be able to do simple things, like turn the pages of this book!

C Read and choose.

1. Which is the opposite of extend?
   a. stretch b. shrink c. move
2. What does them mean in the reading?
   a. bones b. muscles c. bones and muscles

CHECK YOUR UNDERSTANDING

A Choose the correct answers.

MAIN IDEA

1. What is the main purpose of the reading?
   a. To explain how bones move muscles
   b. To explain how muscles move bones
   c. To explain how many muscles we have in our bodies

DETAIL

2. Bones and muscles that help us move _____.
   a. are called locomotive organs
   b. are known as structural organs
   c. are referred to as surrounding organs

DETAIL

3. Which of the following is NOT true about when muscles stretch?
   a. They get longer and flatter.
   b. The bones move with them.
   c. They get thicker and shorter.

B Circle T for true or F for false. Correct the false statements.

1. Muscles are surrounded by bones. T F

   _____

2. Bones protect important organs like the heart, lungs, and brain. T F

   _____

C Complete the chart.

bones connected flex longer muscles

Topic — Muscles are 1. _____ to bones.

Muscles 2. _____: they get thicker and shorter. → 3. _____ move with them. ↓ Muscles extend: they get flatter and 4. _____. ← Bones move with the 5. _____ again. ↑

D Complete the sentences.

extended locomotive lungs muscles stretched surrounded

1. We breathe in air through our _____.
2. After taking a nap, the cat _____ its back.
3. Bones and muscles which help us move are _____ organs.
4. George's pants were too short, so his mom _____ them.
5. Mike wanted to have a hot bath to soothe his tired _____.
6. After buying ice cream at the beach, Fiona found herself _____ by hungry seagulls.

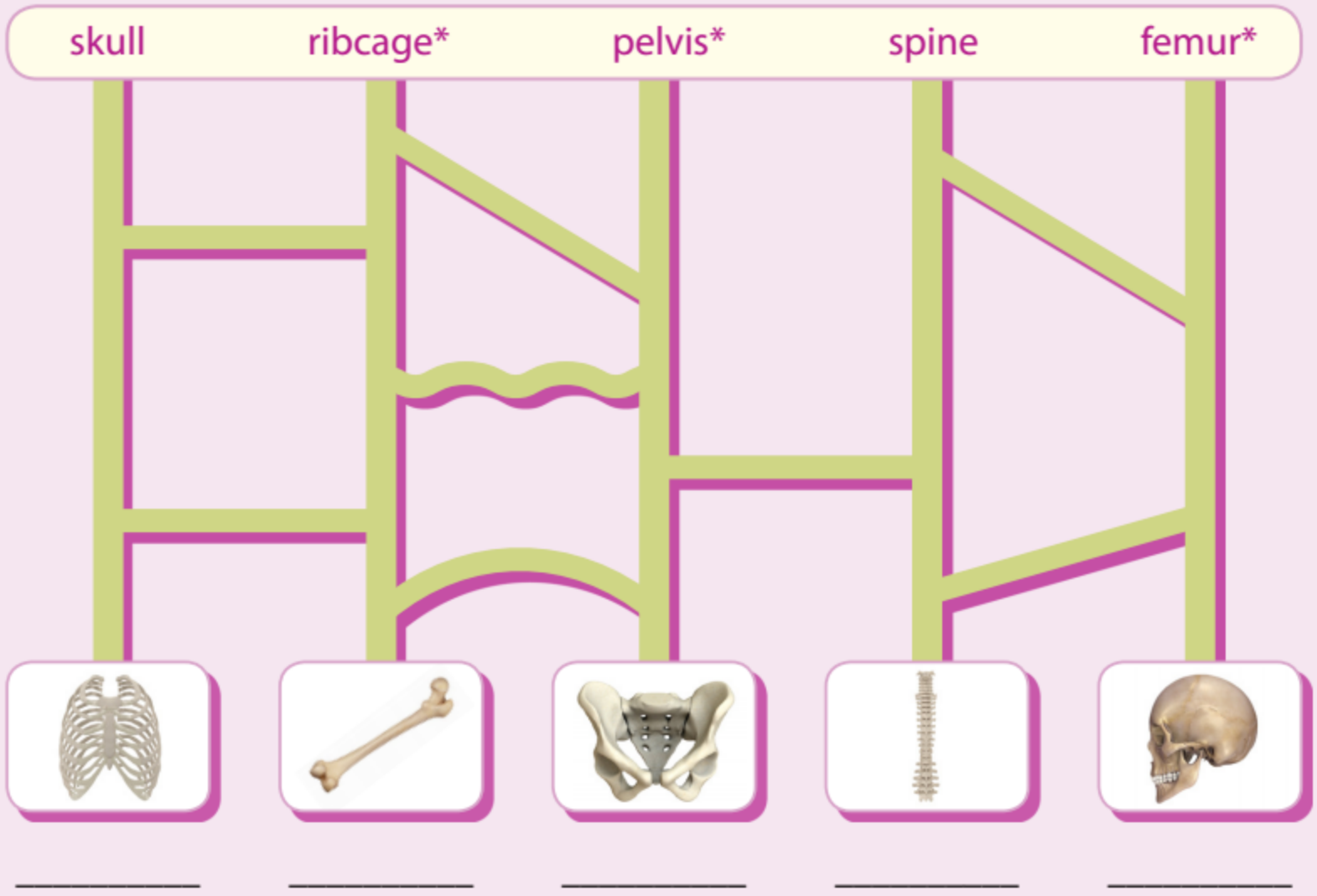
STEAM SCIENCE TECHNOLOGY ENGINEERING ARTS MATH

PROJECT BONE GHOST LEG GAME

The adult human body is made up of 206 bones. They protect our organs and give structure to our body.

STEP 1 Critical Thinking Follow the lines to match the bone names to their images. Write their names.

skull ribcage* pelvis* spine femur*



_____ _____ _____ _____ _____

STEP 2 Creativity Communication Make your own ghost leg game. Write the names of the bones and draw them. Share it with a friend.

Go to page 80 for the meaning of difficult words (*).