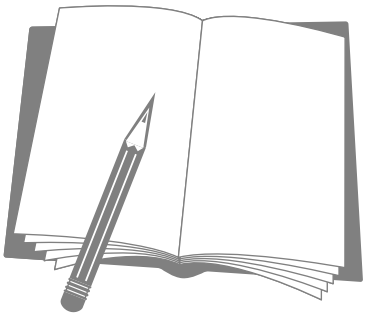


Student Booklet

LANGUAGE 2

EQAO
Education
Quality and
Accountability
Office

Section C

Wheels

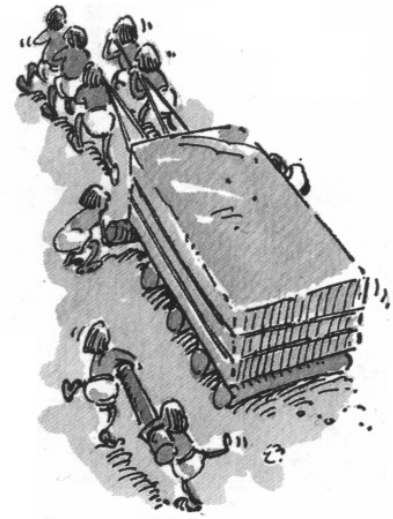
What do you think was the most important invention ever? Fire? A metal axe? Ice cream? How about the wheel? Without the wheel, you wouldn't have cups, plates and bowls made on a potter's wheel. There would be no cars, bicycles or roller skates. Like all circles, wheels have radial symmetry, and that's what makes them so useful.

Who invented the wheel? Cave dwellers drew wheel-shaped pictures on cave walls to represent the sun. But people didn't use wheels for anything practical until about 4000 B.C.E., when the potter's wheel and the wheeled cart were invented. The Aztecs of Mexico made pottery toys with wheels but they didn't use wheels for transportation. Why not? Because wheeled carts aren't much use unless there are some large, strong, tame animals to pull them. Since there were no horses or oxen in North and South America at that time, the Aztecs used llamas instead and loaded packs on their backs.

The inventor of the wheel figured out that it took less energy to roll something along the ground than to drag it. Wheels work by reducing friction—the result of one thing rubbing over another. Some friction is useful. Without it, your feet would slip out from under you as you walk. (People slip on banana peels because there's not enough friction between the shoe and the banana peel.) But too much friction wastes energy and slows movement. The wheel is the perfect friction beater.

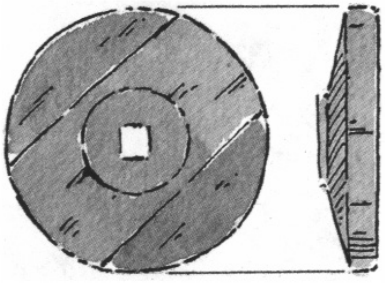
Rollers

Egyptian pyramid builders and the makers of Stonehenge used circular rollers to move huge stone blocks from the quarries to the building sites.



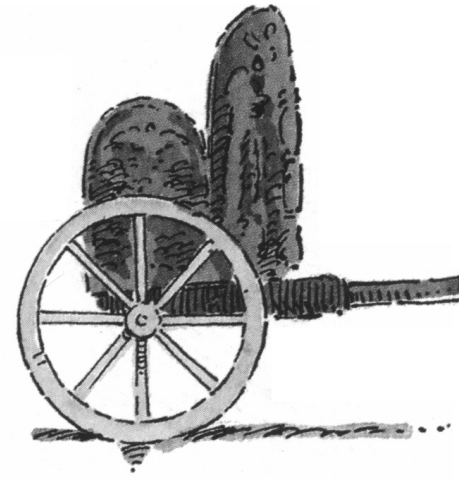
Solid Wheels

The first wheels were made of three rectangular boards fastened together into a square and then rounded off at the corners. Early people didn't make wheels from slices of logs because they didn't have metal saws. But cross-sections of logs wouldn't work very well as wheels anyway because they would split apart along the grain.



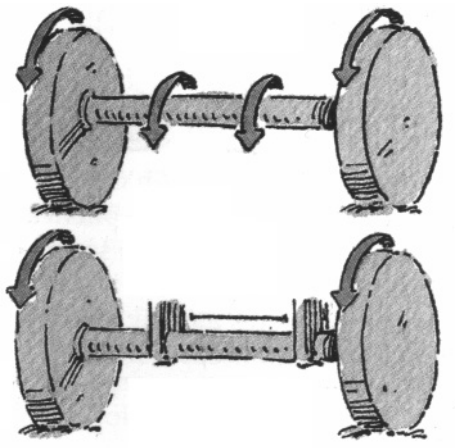
Spoked Wheels

Between 2000 B.C.E. and 1500 B.C.E. spoked wheels were invented and used for chariots. Made of a hub and rim connected by spokes, these wheels were lighter than solid wheels and provided a faster, smoother ride.



Wheels and Axles

The earliest wheels were firmly attached to their axle—when the wheels turned, the axle turned too. About 100 B.C.E., a big improvement was the rotating wheel that spins freely on an axis that doesn't turn. This design cuts down on friction.



Inflatable Rubber Tires

John Boyd Dunlop patented the first "pneumatic" rubber tire in 1888 as a way to make bicycles ride more smoothly. Early bicycles were sometimes called "boneshakers" because their metal wheels gave such a bumpy ride, even when covered with solid rubber tires. Dunlop came up with the revolutionary idea of fitting the wheel with an inflatable rubber inner tube protected by a rubber tread.

1. Read the following sentence.

"What do you think was the most important invention ever? Fire? A metal axe? Ice cream?" (lines 1 to 3)

Which sentence best replaces the word "Fire"?

- **a** How was fire important?
- **b** Who found fire important?
- **c** Was fire the most important?
- **d** Why is fire the most important?

2. The main idea of the article is that

- **a** the wheel has radial symmetry.
- **b** wheels are used throughout the world.
- **c** the wheel is the most important invention.
- **d** cups, plates and bowls are made on potters' wheels.

3. Read the following sentence.

"Wheels work by reducing friction—the result of one thing rubbing over another." (lines 27 to 29)

The words after the dash (—) are used to

- **a** tell the purpose of wheels.
- **b** provide an example of work.
- **c** add to the meaning of "reducing."
- **d** explain the meaning of "friction."

4. Which word from the article means "craters from which people get stone"?

- **a** axles
- **b** quarries
- **c** chariots
- **d** pyramids

5. Read the sentence below:

> The wheel was an important invention.

Explain why you agree or disagree with this statement. Use information from the text and your own experiences to support your answers.

6. Describe two important ways in which wheels were used in ancient civilizations.

Probing the Earth's Deepest Secrets

John Buchanan, a university geology professor, has lived this adventure. Most geologists study the surface of the earth, but John prefers to look underground. When he was thirteen years old, he liked to read about caves, yet he never dreamed he'd one day crawl through them. But his teachers urged him to study hard and follow his interests, so that's what he did. Now each spring, he travels to the Central American country of Belize to explore Petroglyph Cave.

"Some people say I have too much fun with my research," laughs John, "because much of what I do is like an Indiana Jones movie. On our way to Petroglyph, we've run into poisonous snakes, scorpions, bad-tempered monkeys—and that's before we even get to the entrance! Once inside, we need to look out for bloodsucking beetles, sudden drop-offs and flooded passageways. It's dangerous work, and nobody should explore a cave alone or without experience. But the effort and risk are well worth the sights we see inside."

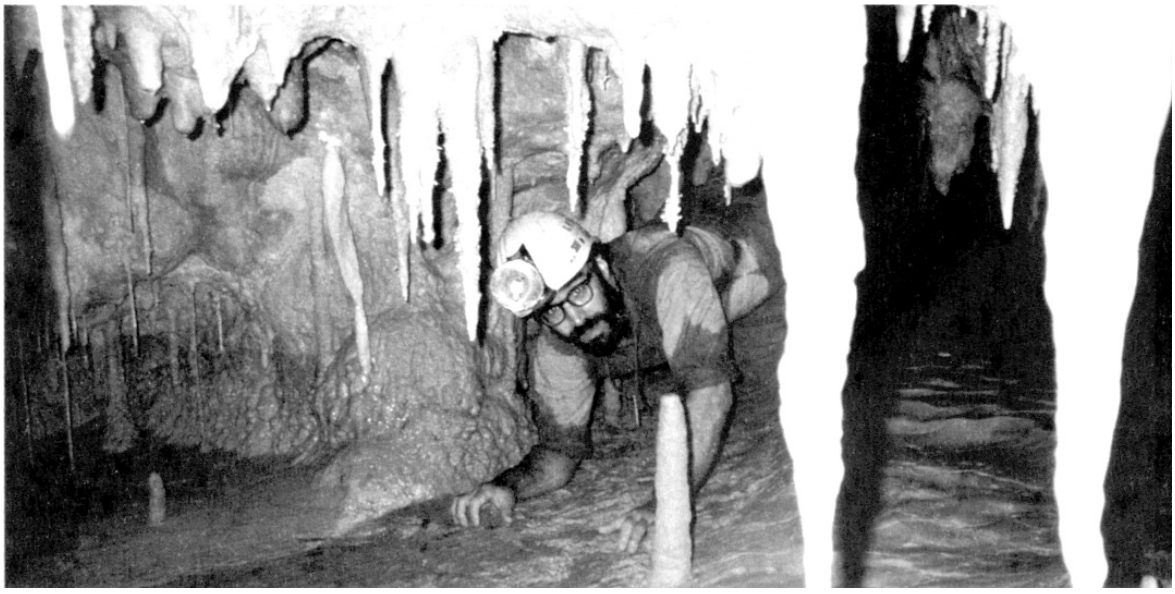
John's found a lot of exciting things. In April 1996, he and fellow explorers discovered two formations he thinks nobody has seen before. One was a hump of limestone rising from the floor, which they called a camelback stalagmite. The other was a raised and rippled area on the floor, which could be the result of animals passing through the cave over hundreds of years. John and another geologist, Tom Miller, are studying how both these formations were made. They hope their research will help explain how wind, rain and animal life can affect the growth of geological features below and above the earth.

Also in Petroglyph, John and other explorers found signs of a 2000-year-old Mayan community, perhaps the same community whose rock carvings give the cave its name. They discovered bits of pottery and tools along with the bones of Mayans buried in the cave. And in banks of fine clay, they've found samples of ancient pollen. "On the surface of the earth, flooding and erosion usually destroy that sort of evidence. But below the ground, it is preserved. By looking at such samples, a botanist might be able to discover what crops the ancient Mayans grew or whether they slashed and burned the rain forests they lived in." John believes that discoveries like these may help us better understand the day-to-day lives of the Mayans.

Some of Petroglyph's treasures are geological features that formed over thousands of years as dripping water left behind small bits of limestone. In some places, the mineral-rich water caused stalactites to descend from the ceiling or stalagmites to rise from the ground. There are also rare cave pearls, little marbles of limestone that form when drops of calcium-rich water fall from stalactites and cause a spinning motion in the shallow pools below.

Besides these delicate rock formations, caves like Petroglyph also conceal rare species of animal and insect life. Some of these creatures, such as cave fish, are blind, and others, like bats, are equipped with special radar to compensate for the total darkness of their habitat.

"What's exciting about caves," John says, "is that new discoveries are always out there waiting for you."



7. A geologist is a person who studies

   a insect life.

   b ancient crops.

   c rock formations.

   d poisonous snakes.

8. The information in this article is most likely accurate, because the writer

   a studied plants.

   b read about geology.

   c visited Central America.

   d interviewed John Buchanan.

9. John Buchanan became interested in caves when

   a he visited Central America.

   b he saw an Indiana Jones movie.

   c he read about caves as a teenager.

   d he met a geologist named Tom Miller.

10. How did Petroglyph Cave get its name?

   a It was named for the animals and crops found nearby.

   b It was named for the Mayan rock carvings found there.

   c It was named for the delicate rock formations found there.

   d It was named for the Mayan pottery and tools found nearby.

11. In your own words, state the main idea of paragraph two. Include details from the text to support your answer.

12. John Buchanan discovered stalactites and stalagmites in Petroglyph Cave.

Explain how these formations are different, using information from the text to support your answer.

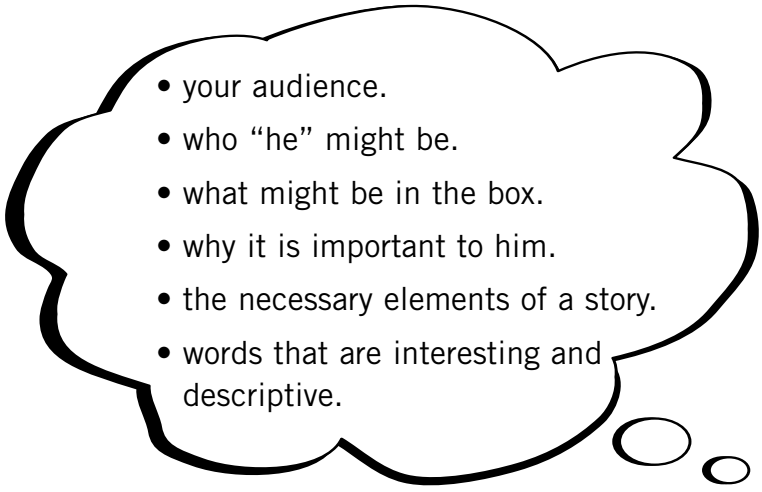
Section D

13. Stories are hiding everywhere, just waiting to be uncovered. Your imagination can create a story from just one small piece of information.

He felt the little box in his pocket and smiled.

Imagine a **story** to write, using this sentence. The sentence must be included at some point in your story.

On your own, think about

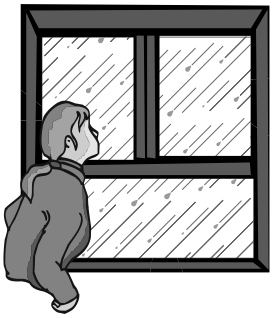


Ideas for My Story

Remember:
- **Write on every line.**
- **Check over your work.**
- **Check your spelling, grammar and punctuation.**

Now write your story.

14. It is the first day of summer holidays, and you awaken to a grey, rainy day. Not to let the weather get you down, you set out to make this the best rainy day ever!



Imagine that you are ready for bed and that you write in your **journal** before you go to sleep.

Ideas for My Journal Entry

Remember:

- **Check over your work.**
- **Check your spelling, grammar and punctuation.**

Now, write your journal entry, **The Best Rainy Day Ever.**