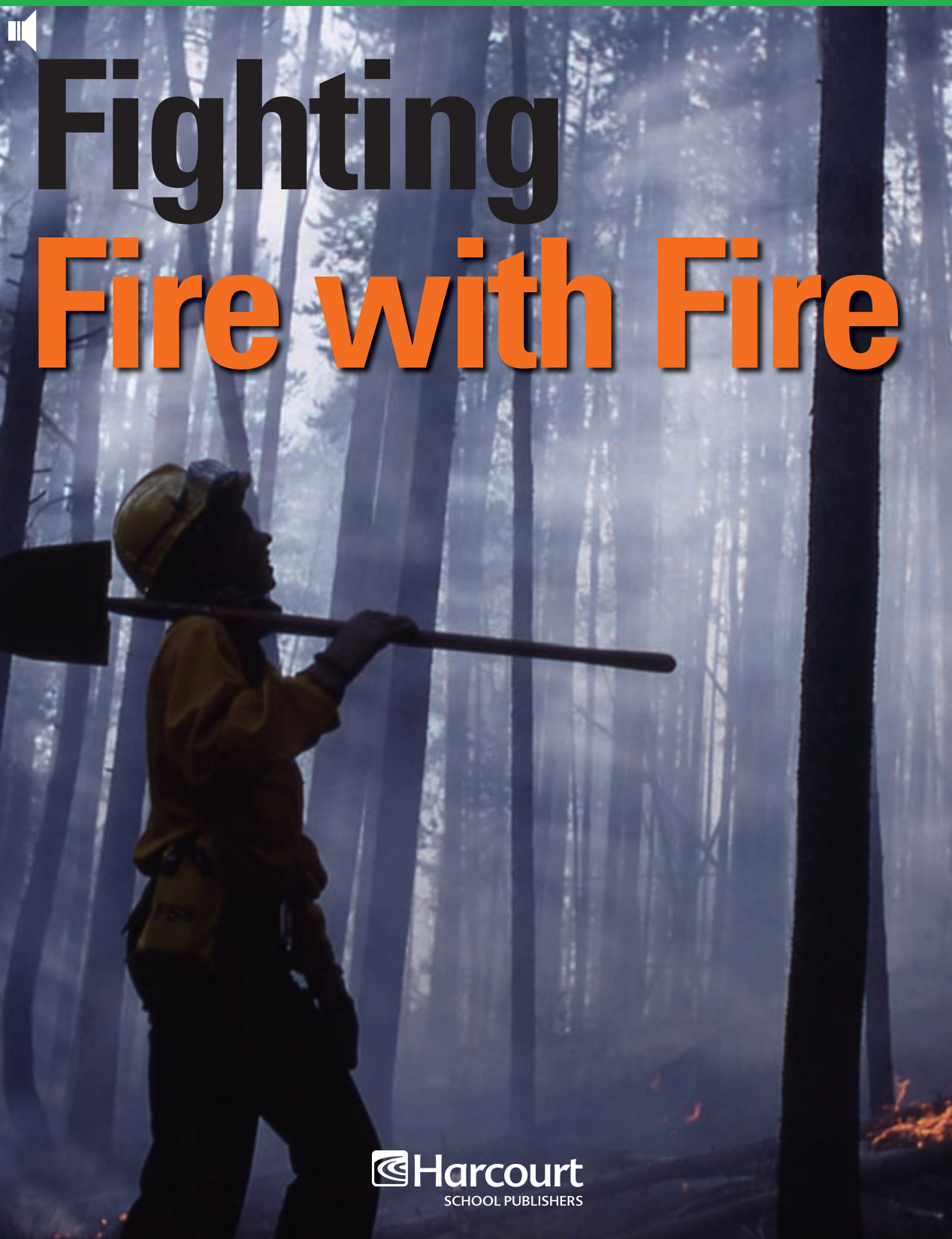
Math Concept Reader

Fighting Fire with Fire



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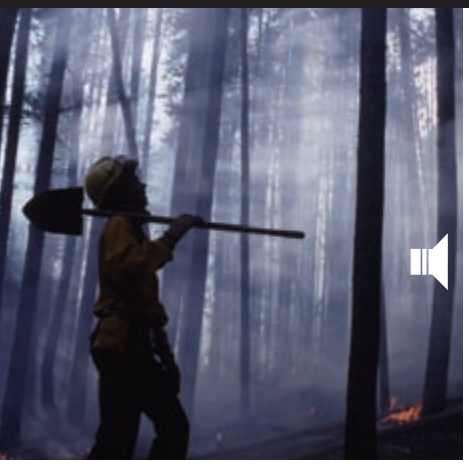

Fighting Fire with Fire

by Sarah Mastrianni

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Printed in the United States of America

ISBN 13: 978-0-15-360194-1
ISBN 10: 0-15-360194-9

1 2 3 4 5 6 7 8 9 10 179 16 15 14 13 12 11 10 09 08 07

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Chapter 1:

Fire: A Necessary Part of Life

Rocky Mountain Lodgepole Pines are amazing trees. They are tall and very thin. They grow in many different environments, from wet bogs to dry soil.

Long ago, local Native American tribes stripped the bark from Lodgepole Pines to use it for medicine and to bake bread. Today, people use this pine to make furniture and fence posts, among other things.

This tree has one more amazing quality, though. The seeds within the pinecone of a Rocky Mountain Lodgepole Pine are only released in extremely hot temperatures.

In fact, the temperatures must reach between 113 and 120 degrees Fahrenheit. In most places, only fire can create temperatures this hot.

Rocky Mountain Lodgepole Pine trees need the very high heat of fire to release seeds from their pinecones.

Fire has many benefits. It can create new growth. New growth provides food for forest animals. Deer eat the grass that grows after a fire. Fire can create shelter for wildlife. Some insects lay eggs in burned trees. Burning the leaves and plants that shade the ground opens the forest up to sunlight. This improves chances for new plant growth.

Certain fires, called *prescribed fires* or *controlled burns*, help prevent the spread of wildfires by naturally thinning out the overcrowded forest and reducing the fire fuel build-up. Dead wood, unhealthy trees, and thick layers of pine needles provide fuel for fires. Native Americans were some of the first people to use *prescribed fires*.

A burn boss talks to his crew of firefighters about a prescribed fire.

Natural causes can ignite a fire. A set fire is planned and monitored by burn bosses in charge of the fire. The main responsibility of a burn boss is to determine the section of land to be burned and carefully figuring out the perimeter of a planned burn.

Perimeter has more than one meaning to a burn boss. Perimeter may mean the boundary, or edge, of a fire. It also may mean the actual distance around the fire.

It is important for a burn boss to figure out the perimeter of a controlled burn in order to keep the fire under control.

Burn bosses use maps to help decide exactly what area to burn.

It is not an easy job to be in charge of a prescribed fire. Burn bosses undergo extensive training. A burn boss must understand fire safety. To do the job well, a burn boss must use maps and computer programs. Setting the fire properly takes training, too.

Burn bosses must know the exact location of the spot to burn. The boss considers factors such as temperature, wind direction, and moisture in the air, among many other things. The fire must be hot enough to burn debris, but it cannot be so hot that it destroys big trees or certain animal habitats. A prescribed fire requires trained crew members as well as many different tools.

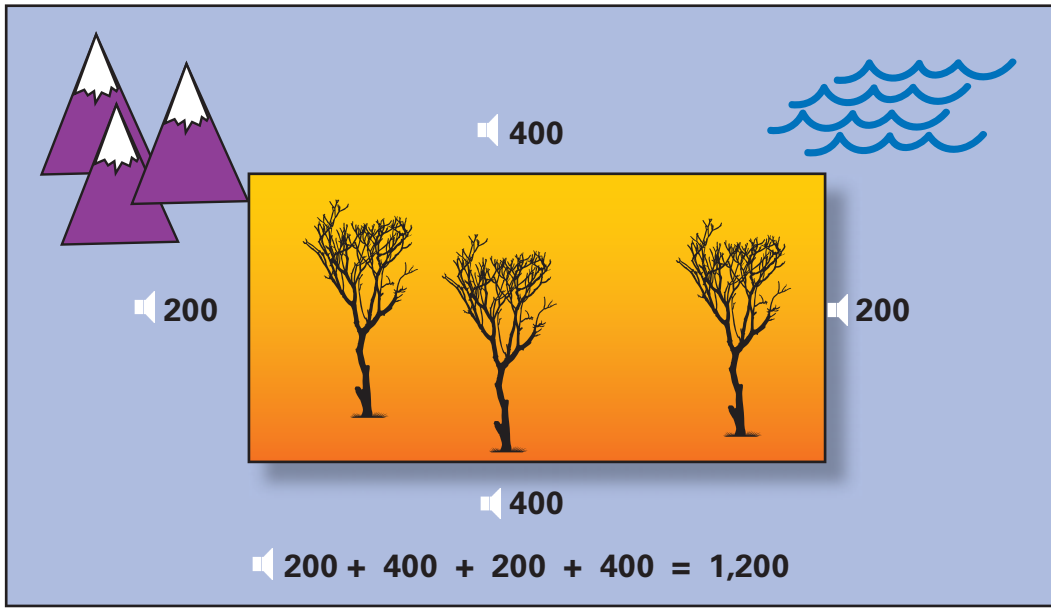
Chapter 2:

Mapping the Fire

People use maps to plan a prescribed fire. Maps show exact locations and let people "see" what is in the burn region. It is important for crew members of a burn to know the features of the land to be burned.

A burn boss often calls in wildlife experts to help plan a burn. They look at the map of a burn location. They decide whether or not the fire will hurt any animal habitats.

Maps also help determine where to hammer repeaters into the ground. Repeaters are radio towers that share information around the burn. Finally, maps can show the perimeter of a burn. Perimeter is calculated by adding the lengths of the sides of the section to be burned.



The perimeter of this rectangular burn area is 1,200 feet.

Remember, perimeter can have two meanings when talking about a prescribed fire. Suppose a controlled burn is set in a rectangular figure. The perimeter refers to the border of the rectangle itself, as well as to the distance around the rectangle.

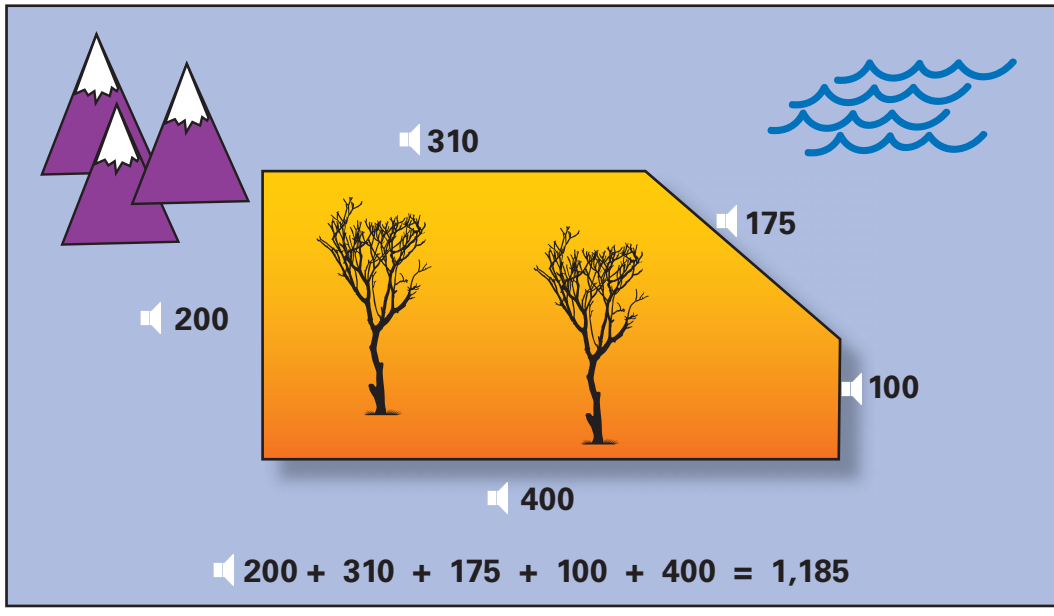
You can find the perimeter of the rectangular figure by using this formula.

$P = (2 \times l) + (2 \times w)$

$P = (2 \times 400) + (2 \times 200)$

$P = 1{,}200$

The perimeter of this burn is 1,200 feet. A map shows the location of where the burn will take place. This includes all of the things around the perimeter, such as mountains or rivers.



The sides of this burn area are not the same length. The perimeter is 1,185 feet.

Often the perimeter of a burn is not a shape with sides that are the same length. The burn boss may walk the perimeter with a wildlife expert. Together they will find spots that should not be burned. The spots may be home to an endangered animal. The boss will not include the spots in the burn perimeter.

Now the burn boss recalculates the perimeter. The sides measure 200 feet, 310 feet, 175 feet, 100 feet, and 400 feet.

$P = a + b + c + d + e$

$P = 400 + 310 + 200 + 175 + 100$

$P = 1{,}185$

The fire perimeter is 1,185 feet.

Firefighters walk along a trench called a fire line.

Maps give information to firefighters, such as the location where a planned burn will take place. They may discover that the burn section is about 190 feet on one side, 240 feet on another side, and 85 feet on a third side.

$P = a + b + c$

$P = 190 + 240 + 85$

$P = 515$

The firefighters need to contain a perimeter of about 515 feet. Knowing the perimeter helps the burn boss determine the number of firefighters needed to control the burn. As the perimeter increases, so does the number of firefighters needed. Maps help firefighters know exactly where to be during a prescribed fire.

Chapter 3:
From Brown to Green

Organizing a controlled burn takes careful planning. The burn itself is hard work, too. The burn boss and firefighters must be prepared. Every detail is important.

Taking care of all the details helps ensure that the crew stays safe and the fire remains under control.

One of the first things the burn crew does is dig a trench. This trench is called a *fire line* and it is formed by digging into the soil where there is no fuel to burn.

The trench keeps the fire from spreading and often forms part, if not all, of the perimeter. A body of water or a road may also form part of the perimeter.

Lighters get equipment ready before laying down fire lines.

Once a fire line is established, trained professionals called *lighters* lay down lines of fire. They keep the fire lines close together. They create a burn line by keeping the fire burning within a small portion of the ground. With fire lines and a burn line formed, crews allow the fire to grow larger. Fuel, such as dead leaves and branches, burns as the section of the fire gets larger.

The lighters wear protective gear. This includes masks to prevent them from inhaling too much smoke. It is very important that everyone who participates in a controlled burn respect the power of fire. By taking proper safety precautions, crew members lower their risk of injury.

Crew members communicate information about the fire to each other.

The prescribed fire crew keeps in constant communication with one another. This keeps everyone safe and it also keeps the fire from getting out of control.

A burn boss might position firefighters along the perimeter of a burn using a Global Positioning System (GPS). Suppose a burn boss knows that one side of his burn is about 100 feet long. The second side is about 75 feet long and the third side is about 165 feet long.

$P = a + b + c$

$P = 100 + 75 + 165$

$P = 340$

By adding all the lengths of the sides, the burn boss knows how and where to position firefighters around a perimeter of about 340 feet.

A firefighter uses water to put out embers after the flames die down.

The controlled burn crew watches the fire very carefully. They work around the perimeter, or the border, of the location being burned and keep a very close eye on burning embers. They want to make sure the fire does not cross the fire line. Using maps, they know exactly where the fire should burn and where it should not.

The firefighting crew is prepared with many tools, such as backpacks and water pumps. With these pumps, crew members quickly extinguish flames that cross over the perimeter into any part of the forest that is not in the controlled burn plan. This is just one more way crew members keep the forest safe while protecting themselves at the same time.

Crew members mop up and make sure there are no smoldering hot spots.

The burn is complete. Now the crew begins the clean up stage, often referred to as *mopping up*. Mopping up means that crew members move through the burn zone to extinguish any remaining smoldering material.

Sometimes a fire cannot be seen, but that does not mean it isn't there. Fire may burn in a tree stump under the soil and, if left alone, a hot spot such as this could reignite.

By finding hot spots, firefighters ensure that no unwanted fire develops. They also ensure that once the controlled burn is over, it is truly over. An unplanned wildfire can burn out of control, causing acres of destruction to plants and wildlife.

Everything within the perimeter of a prescribed fire will grow lush and new again.

Within weeks, the burned region will sprout new growth. The nutrients put back into the soil by the fire will help grass grow where there had only been dry debris.

The careful planning on the part of the burn boss and crew helps prevent the spread of dangerous wildfires. Everything within the perimeter grows lush and new.

The spread of Rocky Mountain Lodgepole Pine seeds is only one of many examples of the benefits of fire. From creating new habitats to encouraging new plant growth, fire can be a positive force. Like water and sunlight, fire is necessary for life. Controlled burns, when well planned and carefully executed, help continue the life cycle.

Glossary

- **debris** the pieces of something that has been broken up
- **endangered** to be threatened by extinction
- **executed** carried out according to a plan
- **extinguish** to put out
- **habitat** the place where an animal or plant lives or grows
- **perimeter** the distance around a figure or a boundary
- **precaution** an action that happens in advance to protect against danger
- **smoldering** to burn without flame, usually slowly and with a lot of smoke
- **trench** a long ditch cut in the ground

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Think and Respond

1. Suppose you are a burn boss. You want to calculate the perimeter of a prescribed fire. The shape of the burn section you are planning is a rectangle. The lengths of the sides of the rectangle are 300 feet, 300 feet, 250 feet, and 250 feet. What is the perimeter of the fire?

2. You are in charge of creating a small burn to test some new equipment. The burn section is the approximate shape of a triangle. The lengths of the sides of the triangle are 50 feet, 59 feet, and 48 feet. What is the perimeter of the fire?

3. A small, controlled burn has an irregular shape. The lengths of the sides are 100 feet, 120 feet, 128 feet, 135 feet, and 140 feet. Calculate the perimeter.

WRITE Math

4. Draw a picture of a burn area that has a rectangular shape. The lengths of the sides of the burn area are 425 feet, 425 feet, 790 feet, and 790 feet. Label the drawing with the lengths of the sides of the perimeter. Then calculate the perimeter. Explain how you calculated the perimeter.