MathLinks 8

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CHAPTER 10

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CHAPTER 12

A Tour of Your Textbook

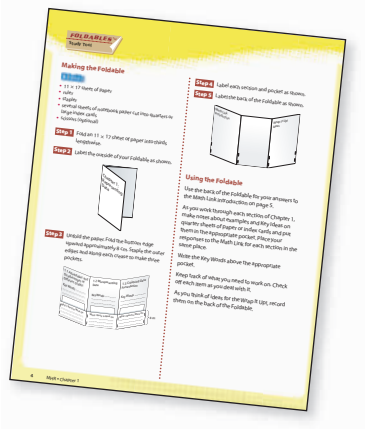
Chapter Opener

Each chapter begins with a two-page spread which introduces you to what you will learn in the chapter.

Foldables™

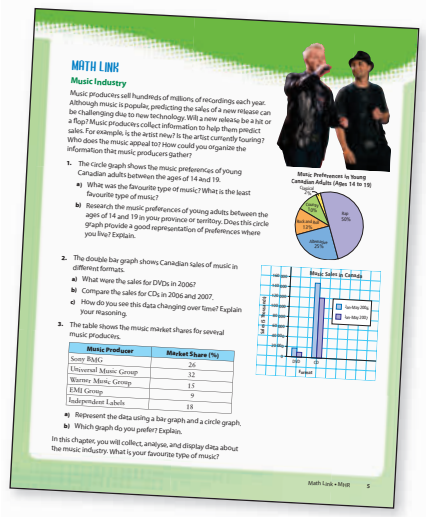
FOLDABLES™ Study Tool

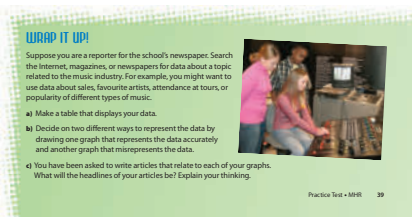
Each chapter includes a Foldable to help you organize what you are learning and keep track of what you need to work on. Instructions on where and how to record information on the Foldable will help you use it as a study tool.



Math Link

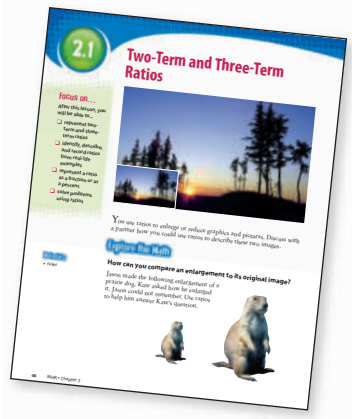
Each chapter introduces a Math Link that helps you connect math and your own personal experiences. You will often revisit the Math Link at the end of a lesson. This is an opportunity for you to build concepts and understanding. The Wrap It Up! at the end of each chapter gives you an opportunity to demonstrate your understanding of the chapter concepts.





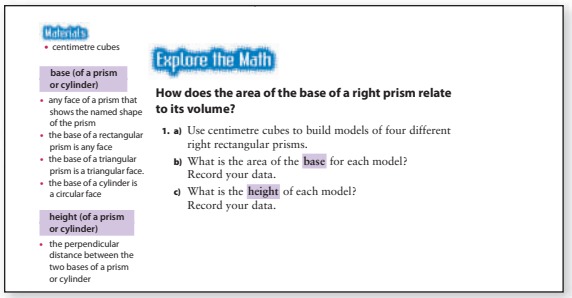
Numbered Sections

The numbered sections often start with a visual to connect the topic to a real setting. The purpose of this introduction is to help you make connections between the math in the section and the real world, or to make connections to what you already know.



A three-part lesson follows.

- An activity is designed to help you build your own understanding of the new concept and lead toward answers to the key question.


Materials
- centimetre cubes

base (of a prism or cylinder)
- any face of a prism that shows the named shape of the prism
- the base of a rectangular prism is any face
- the base of a triangular prism is a triangular face.
- the base of a cylinder is a circular face

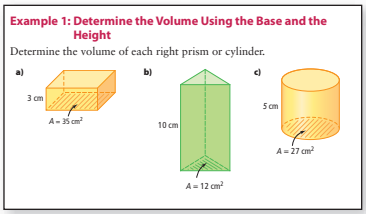
height (of a prism or cylinder)
- the perpendicular distance between the two bases of a prism or cylinder

Explore the Math

How does the area of the base of a right prism relate to its volume?

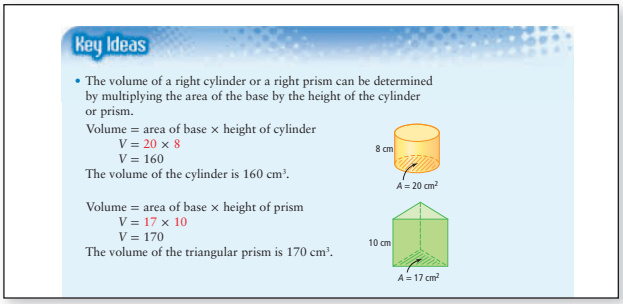
1. a) Use centimetre cubes to build models of four different right rectangular prisms.
   b) What is the area of the base for each model? Record your data.
   c) What is the height of each model? Record your data.

- **Examples** and **Solutions** demonstrate how to use the concept.


Example 1: Determine the Volume Using the Base and the Height

Determine the volume of each right prism or cylinder.

a) 3 cm, A = 35 cm²
b) 10 cm, A = 12 cm²
c) 5 cm, A = 27 cm²


Key Ideas

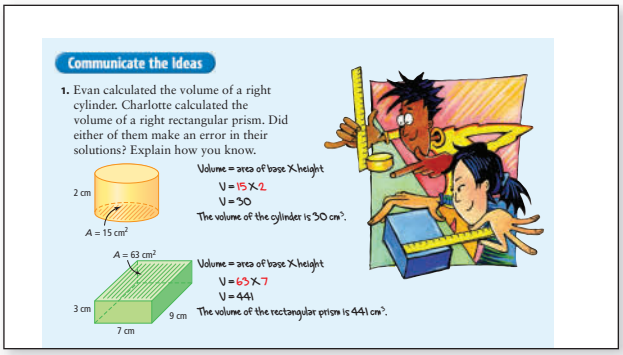
- The volume of a right cylinder or a right prism can be determined by multiplying the area of the base by the height of the cylinder or prism.

Volume = area of base × height of cylinder
$V = 20 \times 8$
$V = 160$
The volume of the cylinder is 160 cm³.

Volume = area of base × height of prism
$V = 17 \times 10$
$V = 170$
The volume of the triangular prism is 170 cm³.

8 cm, A = 20 cm²
10 cm, A = 17 cm²

- A summary of the main new concepts is given in the **Key Ideas** box.


Communicate the Ideas

1. Evan calculated the volume of a right cylinder. Charlotte calculated the volume of a right rectangular prism. Did either of them make an error in their solutions? Explain how you know.

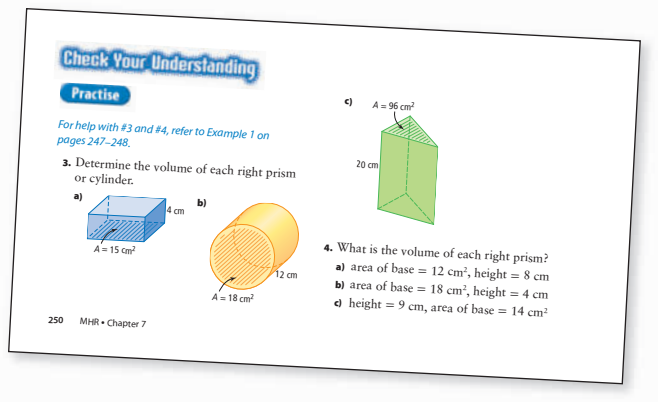
2 cm, A = 15 cm²
Volume = area of base × height
V = 15 × 2
V = 30
The volume of the cylinder is 30 cm³.

A = 63 cm², 3 cm, 9 cm, 7 cm
Volume = area of base × height
V = 63 × 7
V = 441
The volume of the rectangular prism is 441 cm³.

- Questions in the **Communicate the Ideas** section let you talk or write about the concepts and assess whether you understand the ideas.

Check Your Understanding

- **Practise:** These are questions to check your knowledge and understanding of what you have learned.
- **Apply:** In these questions, you need to apply what you have learned to solve problems.
- **Extend:** These questions may be more challenging and may make connections to other lessons.


Check Your Understanding

Practise

For help with #3 and #4, refer to Example 1 on pages 247–248.

3. Determine the volume of each right prism or cylinder.

a) 4 cm, A = 15 cm²
b) 12 cm, A = 18 cm²
c) A = 96 cm², 20 cm

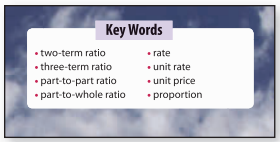
4. What is the volume of each right prism?
   a) area of base = 12 cm², height = 8 cm
   b) area of base = 18 cm², height = 4 cm
   c) height = 9 cm, area of base = 14 cm²

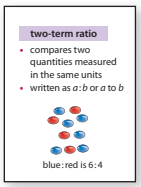
250 MHR • Chapter 7

How does *MathLinks 8* help you learn?

Understanding Vocabulary

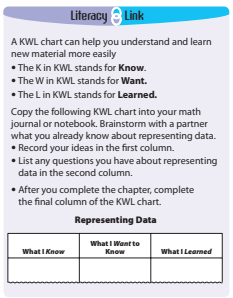
Key Words are listed on the Chapter Opener. Perhaps you already know the meaning of some of them. Great! If not, watch for these terms the first time they are used in the chapter. The meaning is given close by in the margin.

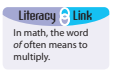




A **Literacy Link** at the beginning of each chapter provides tips to help you read and interpret the chapter content.

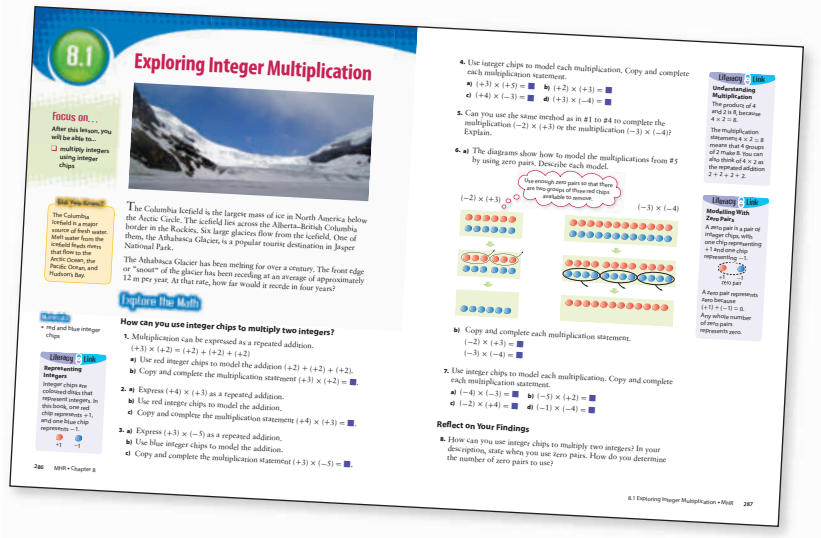
Other **Literacy Links** throughout the chapter assist you in reading and interpreting items in math. These tips will help you in other subjects as well.





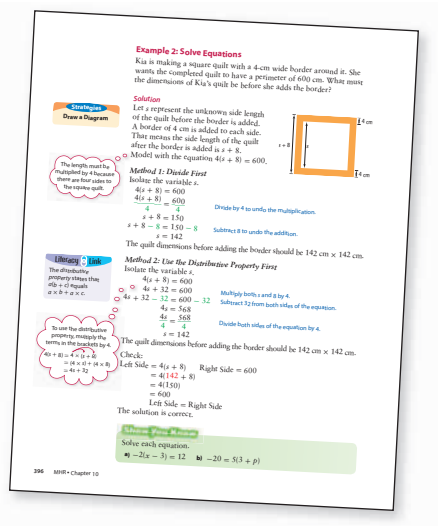
Understanding Concepts

The **Explore the Math** activities are designed to help you construct your own understanding of new concepts. The key question tells you what the activity is about. Short steps, with illustrations, lead you to make some conclusions in the **Reflect on Your Findings** question.



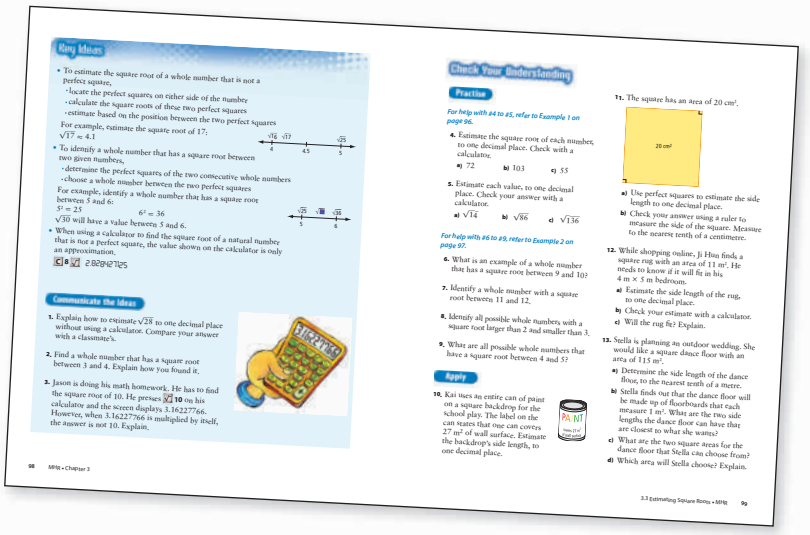
The **Examples** and their worked **Solutions** include several tools to help you understand the work.

- Notes in a thought bubble help you think through the steps.
- Sometimes different methods of solving the same problem are shown. One way may make more sense to you than the other.
- **Problem Solving Strategies** are pointed out.
- Calculator key press sequences are shown where appropriate.
- Most Examples are followed by a **Show You Know**. These questions help you check that you understand the skill covered in the Example.



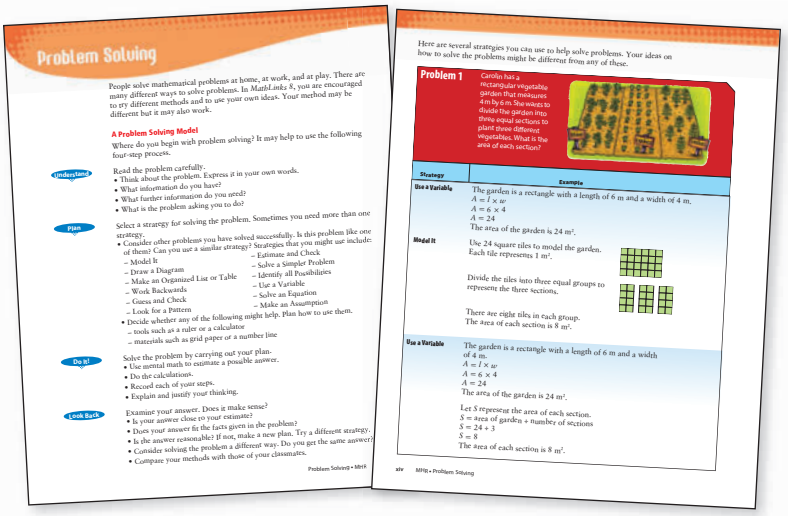
The exercises begin with **Communicate the Ideas**. These questions focus your thinking on the **Key Ideas** you learned in the section. By discussing these questions in a group, or doing the action called for, you can see whether you understand the main points and are ready to begin the **Check Your Understanding**.

The first few questions in the **Check Your Understanding** can often be done by following one of the worked Examples.



Problem Solving

At the beginning of the student resource there is an overview of the four steps you can use to approach **Problem Solving**. Samples of problem solving strategies are shown. You can refer back to this section if you need help choosing a strategy to solve a problem. You are also encouraged to use your own strategies.



Mental Math and Estimation

This **Mental Math and Estimation** logo does one of two things:

1. It signals where you can use mental math and estimation.
2. It provides useful tips for using mental math and estimation.

You could also determine 1.5% of $20 000 as:
30% of 20 000 is 6000.
3% of 20 000 is 600.
1.5% of 20 000 is 300.

Other Features

Did You Know?
The Columbia Icefield is a major source of fresh water. Melt water from the icefield feeds rivers that flow to the Arctic Ocean, the Pacific Ocean, and Hudson's Bay.

Did You Know?

These are interesting facts related to math topics you are learning.

History Link
In Roman times, the term *centurion* was used to describe an officer in the Roman Legion who was in charge of 100 soldiers. There was one centurion *per cent*, meaning there was one centurion per 100 soldiers. What other English words do you know that include *cent*?

Subject Links

This feature links the current topic to another subject area.

WWW Web Link
To generate tessellations on the computer, go to www.mathlinks8.ca and follow the links.

Web Links

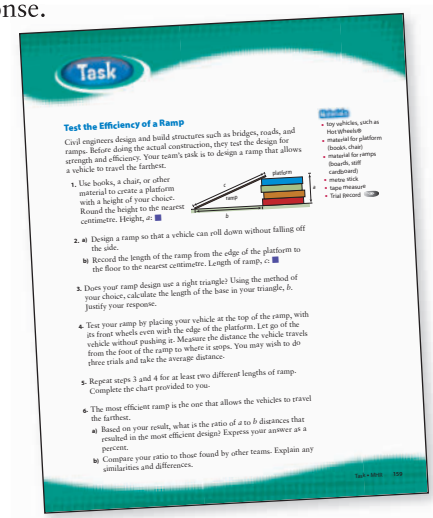
You can find extra information related to some questions on the Internet. Log on to **www.mathlinks8.ca** and you will be able to link to recommended Web sites.

Chapter Review and *Practice Test*

There is a **Chapter Review** and a **Practice Test** at the end of each chapter. The chapter review is organized by section number so you can look back if you need help with a question. The test includes the different types of questions that you will find on provincial tests: multiple choice, numerical response, short answer, and extended response.

Cumulative Review

To help you reinforce what you have learned, there is a review of the previous four chapters at the end of Chapters 4, 8, and 12. Each of these special reviews is followed by a Task.

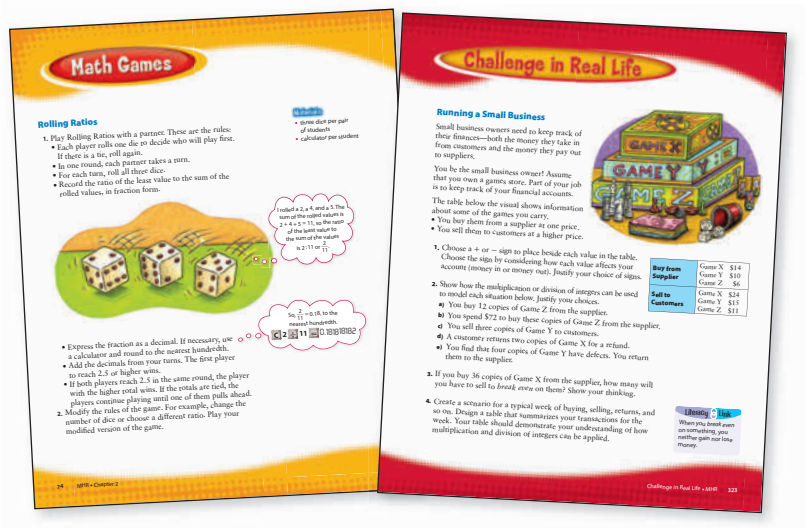


Task

These tasks require you to use skills from more than one chapter. You will also need to use your creativity.

Math Games and *Challenge in Real Life*

The last two pages of each chapter provide **Math Games** and a **Challenge in Real Life**. **Math Games** provide an interesting way to practise the skills you learned during the chapter. Most games can be played with a partner. Some can be played with a larger group. Enjoy them with your friends and family. The **Challenge in Real Life** provides an interesting problem that shows how the math you learned in the chapter relates to jobs, careers, or daily life.



Answers

Answers are provided for all Practise, Apply, Extend, and Review questions. Sample answers are given for questions that have a variety of possible answers or that involve communication. If you need help, read the sample and then try to give an alternative response. Answers are omitted for the Math Link questions and for Practice Tests because teachers may use these questions to assess your progress.

Glossary

Refer to the illustrated **Glossary** at the back of the student resource if you need to check the exact meaning of mathematical terms.

Problem Solving

People solve mathematical problems at home, at work, and at play. There are many different ways to solve problems. In *MathLinks 8*, you are encouraged to try different methods and to use your own ideas. Your method may be different but it may also work.

A Problem Solving Model

Where do you begin with problem solving? It may help to use the following four-step process.

Understand

Read the problem carefully.

- Think about the problem. Express it in your own words.
- What information do you have?
- What further information do you need?
- What is the problem asking you to do?

Plan

Select a strategy for solving the problem. Sometimes you need more than one strategy.

- Consider other problems you have solved successfully. Is this problem like one of them? Can you use a similar strategy? Strategies that you might use include:
  - Model It
  - Draw a Diagram
  - Make an Organized List or Table
  - Work Backwards
  - Guess and Check
  - Look for a Pattern
  - Estimate and Check
  - Solve a Simpler Problem
  - Identify all Possibilities
  - Use a Variable
  - Solve an Equation
  - Make an Assumption
- Decide whether any of the following might help. Plan how to use them.
  - tools such as a ruler or a calculator
  - materials such as grid paper or a number line

Do It!

Solve the problem by carrying out your plan.

- Use mental math to estimate a possible answer.
- Do the calculations.
- Record each of your steps.
- Explain and justify your thinking.

Look Back

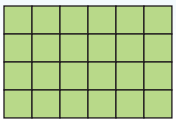
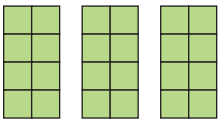
Examine your answer. Does it make sense?

- Is your answer close to your estimate?
- Does your answer fit the facts given in the problem?
- Is the answer reasonable? If not, make a new plan. Try a different strategy.
- Consider solving the problem a different way. Do you get the same answer?
- Compare your methods with those of your classmates.

Here are several strategies you can use to help solve problems. Your ideas on how to solve the problems might be different from any of these.

Problem 1

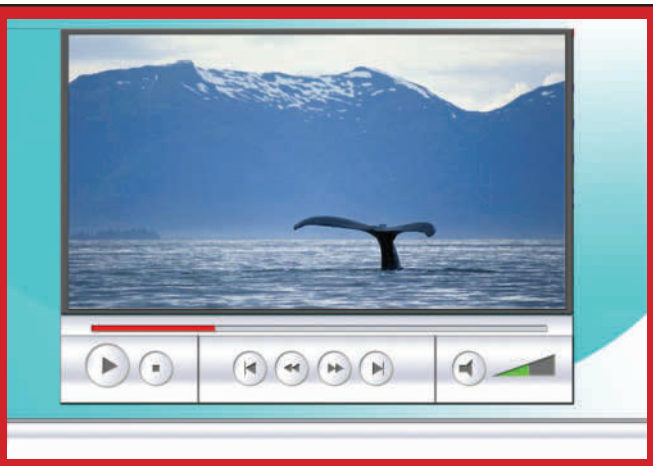
Carolin has a rectangular vegetable garden that measures 4 m by 6 m. She wants to divide the garden into three equal sections to plant three different vegetables. What is the area of each section?

Strategy	Example
Use a Variable	The garden is a rectangle with a length of 6 m and a width of 4 m. $A = l \times w$ $A = 6 \times 4$ $A = 24$ The area of the garden is 24 m^2.
Model It	Use 24 square tiles to model the garden. Each tile represents 1 m^2.  Divide the tiles into three equal groups to represent the three sections.  There are eight tiles in each group. The area of each section is 8 m^2.
Use a Variable	The garden is a rectangle with a length of 6 m and a width of 4 m. $A = l \times w$ $A = 6 \times 4$ $A = 24$ The area of the garden is 24 m^2. Let S represent the area of each section. S = area of garden ÷ number of sections $S = 24 \div 3$ $S = 8$ The area of each section is 8 m^2.

Problem 2

Amil is downloading some software. It has taken 56 s to complete $\frac{1}{4}$ of the download.

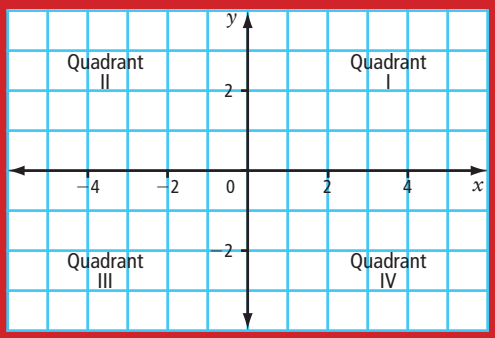
What is the total time that the download will likely take?

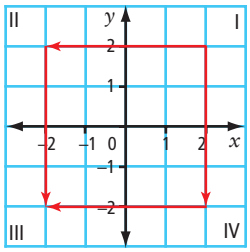
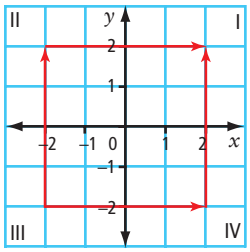
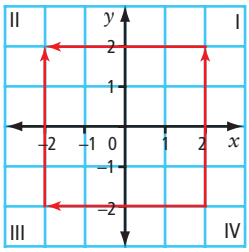
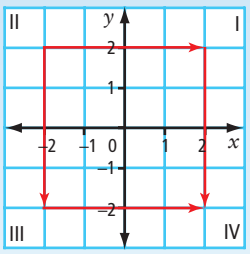


Strategy	Example
Solve an Equation	Let t represent the total time required to complete the download. $\frac{1}{4}$ of the total time is 56 s. The equation that models this situation is $\frac{t}{4} = 56$. $\frac{t}{4} = 56$ $\frac{t}{4} \times 4 = 56 \times 4$ Multiply both sides of the equation by 4. $t = 224$ There are 60 s in 1 min. The download will take about 224 s, or 3 min and 44 s.
Estimate and Check	Estimate that 56 s is close to 60 s, which is 1 min. $\frac{1}{4}$ of the download takes about 1 min. Multiply by 4 to estimate the total download time. $1 \times 4 = 4$ The total download will likely take about 4 min. Check: $56 \times 4 = 224$ The download will take about 224 s, or 3 min and 44 s. The estimate and the calculated values are close.

Problem 3

A teacher is playing a guessing game with her class. Her clue is "After a reflection in each axis of a Cartesian plane, a point is in quadrant II. What quadrant did the point start in?" What is the solution?



Strategy	Example
Identify all Possibilities	The point can be reflected in x-axis and then in the y-axis or it can be reflected in the y-axis and then the x-axis. After the two reflections, the point lies in quadrant II. So, the possible starting quadrants are quadrants I, III, or IV. List all the possibilities, using quadrants I, III, and IV as the starting quadrants. **Starting in Quadrant I**  Both possibilities result in quadrant III as a final position. **Starting in Quadrant III**  Both possibilities result in quadrant I as a final position. **Starting in Quadrant IV**  Both possibilities result in quadrant II as a final position. The point started in quadrant IV.
Work Backwards	Use the final position of quadrant II as the starting quadrant and work backwards. Both possibilities result in quadrant IV. The point started in quadrant IV. 

Problem 4

Sharon's family owns and operates a small restaurant. They have many small square tables and stacking chairs. What is the greatest number of people that can be seated when 10 tables are put together?

Strategy	Example

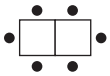
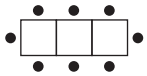
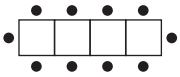
Make an Assumption

Draw a Diagram

Make an Organized List or Table

Look for a Pattern

Assume that only one person can sit along each side of a table.

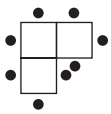
Diagram	Number of Tables	Number of People
	1	4
	2	6
	3	8
	4	10

When 10 tables are put together in a line, $4 + 2 \times 9$ people can be seated.
This is 22 people.

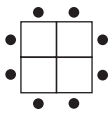
The table shows a pattern. One table seats four people. With each extra table, two more people can be seated.

Identify all Possibilities

Consider other possible arrangements.



When 3 tables are put together in an L-shape, 8 people can be seated. This is the same as when the tables are in a line.



When 4 tables are put together to form a square, 8 people can be seated. This is less than when the tables are in a line.

Other arrangements of tables cannot seat more people than when the tables are arranged in a line. So, the greatest number of people that can be seated when 10 tables are put together is 22 people.