

A Tour of Your Textbook

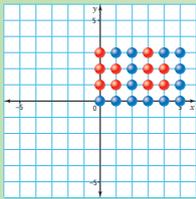
How is MathLinks 7 set up?

Each chapter starts off with a Chapter Problem called a **Math Link** that connects math and your world. You will be able to solve the problem using the math skills that you learn in the chapter.

You are asked to answer questions related to the problem throughout the chapter. These questions appear in **Math Link** boxes.

MATH LINK

- What type of transformation(s) do you see in this bead design?
- Reflect or rotate the entire design to make a different pattern.
 - If you use a reflection, one side of the image should touch one side of the original design.
 - If you use a rotation, one vertex of the image should touch one vertex of the original design.
- Describe the transformation you used.



MATH LINK

A number of cultures use designs in their artwork. Many Aboriginal peoples use beads to decorate their ceremonial clothing or to create jewellery. How would you create a bead design of your own on a Cartesian plane?



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The **Wrap It Up!** is at the end of the chapter, on the second Practice Test page.

WRAP IT UP!

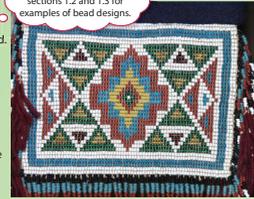
On a coordinate grid, create a bead design. Follow these guidelines:

- The design lies in one quadrant of a coordinate grid.
- The edges of the design lie along both axes.
- It includes at least one transformation.
- It has no more than 30 beads.

Then, follow these steps:

- Reflect the design over one of the axes.
- Now reflect the two designs over the other axis.
- Write a description of your design that explains the transformations you used.
- If possible, re-create your design using real beads.

See the Math Links in sections 1.2 and 1.3 for examples of bead designs.



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.

1.2 Create Designs

Focus on...
After this lesson, you will be able to...

- create a design and identify the coordinates used to make the design
- identify the coordinates of vertices of a 2-D shape

Multistep

- grid paper
- ruler
- coloured pencils

Literacy Link

Point of Axis
The word axis is used to describe more than one axis.



Many designs can be drawn on a coordinate grid. Look at the flag designs shown here. Also, think of the logo for your favourite sports team, the logo for a local bank, or the brand symbol on your shoes. Which of the designs may have been created on a coordinate grid?

Explore the Math

How do you draw a design on a coordinate grid?

- Draw a coordinate grid on grid paper. Label the axes by 5s from -10 to 10 .
- Plot the following points: $A(-10, -10)$, $B(10, -10)$, $C(10, 10)$, and $D(-10, 10)$. Connect them in alphabetical order from A to D. Connect D to A.
- On the same piece of grid paper, plot these points: $E(2, 5)$, $F(2, 2)$, $G(5, 2)$, $H(5, -2)$, $I(2, -2)$, $J(2, -5)$, $K(-2, -5)$, $L(-2, -2)$, $M(-5, -2)$, $N(-5, 2)$, $P(-2, 2)$, and $Q(-2, 5)$. Connect the points in alphabetical order from E to Q. Connect Q to E. Colour the inside of this design red.

Reflect on Your Findings

- What does the flag you created look like?
- Do you think you would have drawn the same design if you had connected the points in a different order? Explain.

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A three-part lesson follows.

The first part helps you find answers to the key question.

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

Explore the Math

Materials

- number charts
- coloured pencils
- counters or coins

FOLDABLES
Study Tool

What are the divisibility rules for 2, 3, 4, 5, 6, 8, 9, and 10?

- Make the following Foldable to organize what you learn in this Explore the Math.
 - Use five sheets of paper. Put them in a pile so they overlap by 1.5 cm. Keep the edges straight.



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

Example 1: Use Divisibility Rules to Sort Numbers

- Sort the numbers according to divisibility by 6 and 9.
30 79 162 3996 23517 31974
- If a number is divisible by both 6 and 9, what is the smallest number other than 1 that it is also divisible by? How do you know?

Solution

- Check for divisibility by 6. Is the number divisible by both 2 and 3? Check for divisibility by 9. Is the sum of the digits divisible by 9? Use an organizer such as a Carroll diagram or Venn diagram.

Key Ideas

Divisibility Rules	
A number is divisible by ...	If ...
2	the last digit is even (0, 2, 4, 6, or 8)
3	the sum of the digits is divisible by 3
4	the number formed by the last two digits is divisible by 2 at least twice
5	the last digit is 0 or 5
6	the number is divisible by both 2 and 3
8	the number is divisible by 2 at least three times
9	the sum of the digits is divisible by 9
10	the last digit is 0

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

Communicate the Ideas

- Why is a number that is divisible by 6 also divisible by 2 and 3?
 - A number is divisible by 10. What other numbers is the number divisible by? How do you know?
- Explain one method for determining the greatest common factor of 36 and 20.
 - Share your answer with a partner.
- Simone wrote $\frac{18}{30}$ in lowest terms as $\frac{6}{10}$.
 - Is she finished yet? Explain.
 - Show a method for writing $\frac{18}{30}$ in lowest terms.

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

- 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.

Practice

For help with #5 to #8, refer to Example 1 on page 202.

- Which of the following numbers are divisible by 3? Explain how you know.
1010 154 968 902 950 125
- Which of the following numbers are divisible by 4? Explain how you know.
124 330 3048 678 982 1432
- Use a diagram or table to sort the numbers according to divisibility by 4 and 8.
312 330 148 164 264 13824
 - If a number is divisible by 4 and 8, what is the smallest number other than 1 that it is also divisible by? How do you know?
- Using a diagram or table, sort the numbers based on divisibility by 6.
8832 35 010 243 9810 31 990
 - If a number is divisible by 6 and 10, what is the smallest number other than 1 that it is also divisible by? How do you know?

For help with #9 to #14, refer to Example 2 on page 202.

- Use the divisibility rules to list the factors of the following numbers.
 - 36
 - 15
 - 28
- What are the factors of these numbers?
 - 18
 - 14
 - 72

For help with #15 and #16, refer to Example 2 on pages 202–205.

- Write the following fractions in lowest terms.

$\frac{25}{20}$	$\frac{6}{15}$	$\frac{10}{16}$
$\frac{9}{12}$	$\frac{4}{10}$	$\frac{8}{15}$
- Write each fraction in lowest terms.

$\frac{12}{16}$	$\frac{6}{12}$	$\frac{8}{20}$
$\frac{14}{24}$	$\frac{5}{10}$	$\frac{12}{18}$

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How does MathLinks 7 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 highlighted the first time they are used in the chapter. The meaning is given close by in the margin.

Key Words

- radius
- diameter
- circumference
- pi
- circle graph
- sector
- central angle

radius

- distance from the centre of the circle to the outside edge
- usually represented by the variable r



Literacy Links provide tips to help you read and interpret items in math. These tips will help you in other subjects as well.

Literacy Link

Concentric circles have the same centre but different diameters. One circle lies inside another.



Literacy Link

Reading \approx
The symbol \approx means "is approximately equal to."

Understanding Concepts

The Explore the Math and Discuss 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.

3.4 Area of a Parallelogram

Focus on...
After this lesson, you will be able to...

- develop the formula for the area of a parallelogram
- calculate the area of a parallelogram

parallelogram

- a four-sided figure with opposite sides parallel and equal in length



Materials

- centimetre grid paper
- ruler
- scissors
- tape

Explore the Math

How do you determine the area of a parallelogram?

- On centimetre grid paper, draw a rectangle that is 6 cm long and 4 cm wide. Cut out the rectangle with scissors.



To find the area, I'll count the squares.

- Count the number of square centimetres the rectangle covers. What is the area of this rectangle?
- Use scissors to cut across the rectangle as shown. Tape the two pieces together.



What is this new shape? What is its area?

- What shape did you form? What do you know about this shape that helped you to identify it?
- Is the area of the parallelogram the same as that of the original rectangle? How do you know?

base

- a side of a two-dimensional closed figure
- common symbol is b

height

- the perpendicular distance from the base to the opposite side
- common symbol is h



- Predict the length of the **base** (b) of the parallelogram. Verify by measuring with a ruler.
 - Predict the **height** (h) of the parallelogram. Verify by measuring with a ruler.
 - Is h parallel or perpendicular to b of the parallelogram?
- What is the relationship between b and h , and the area of the parallelogram?

Reflect on Your Findings

- Suggest a formula for calculating the area of a parallelogram.
 - Compare your formula with those of your classmates. Discuss any differences and make sure that everyone agrees on the formula.

Example 1: Use Diameter to Find Circumference

Traffic circles, or roundabouts, are used in some neighbourhoods to slow down traffic. Vehicles enter the circle and drive around in a counterclockwise direction.



- Estimate the circumference of this traffic circle.
- What is the circumference of the traffic circle, to the nearest tenth of a metre?
- Is your estimate reasonable?

Solution

You are given the diameter of the traffic circle. You need to find the circumference.

$$C = \pi d, d = 5.2 \text{ m}$$

Use the formula $C = \pi \times d$. Use an approximate value for π to estimate and calculate the circumference. Substitute the diameter into the formula.

- When estimating, use 3 as an approximate value for π .
The diameter of the traffic circle is about 5 m.
 $C = \pi \times d$
 $C \approx 3 \times 5$
 $C \approx 15$
The circumference of the traffic circle is approximately 15 m. The actual value should be higher because you estimated using numbers smaller than the actual numbers.
- When calculating, use 3.14 as an approximate value for π .
 $C = \pi \times d$
 $C = 3.14 \times 5.2$
 $C \approx 16.3$
The circumference of the traffic circle is approximately 16.3 m.
- The answer of 16.3 m is close to but a bit higher than the estimate of 15 m. The estimate of 15 m is reasonable.



Check that you rounded your answer to the correct number of decimal places. Remember to use the proper units in your final answer.

Understand

Plan

Do It!

Tech Link

If your calculator has a π key, you can use the π key instead of the value 3.14.

Look Back

Show You Know

Estimate and calculate the circumference of each circle, to the nearest tenth of a unit.



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.
- Many 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 start the exercises.

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

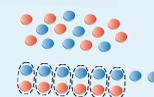
Key Ideas

- You can use integer chips to represent integer addition.
- A zero pair, which includes one $+1$ chip and one -1 chip, represents 0.
- The sum of any two opposite integers is zero.
 $(-7) + (+7) = 0$



Communicate the Ideas

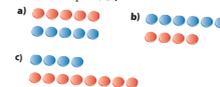
- Do the integer chips in the diagram represent a sum of $+3$ or -3 ? How do you know?
- What addition statement do the integer chips in the diagram represent? Explain your reasoning.
- Suppose that the sum of two integers is represented by equal numbers of red and blue chips. Can you state the sum without knowing how many chips there are? Explain.
- David asked his classmate Avril to show him why $(+1) + (-1) = 0$. She modelled the addition by climbing up one step and then climbing down it again. Explain how her model shows that $(+1) + (-1) = 0$.



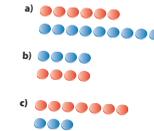
Practise

For help with #5 to #8, refer to Example 1 on page 311–312.

- What addition statement does each diagram represent?



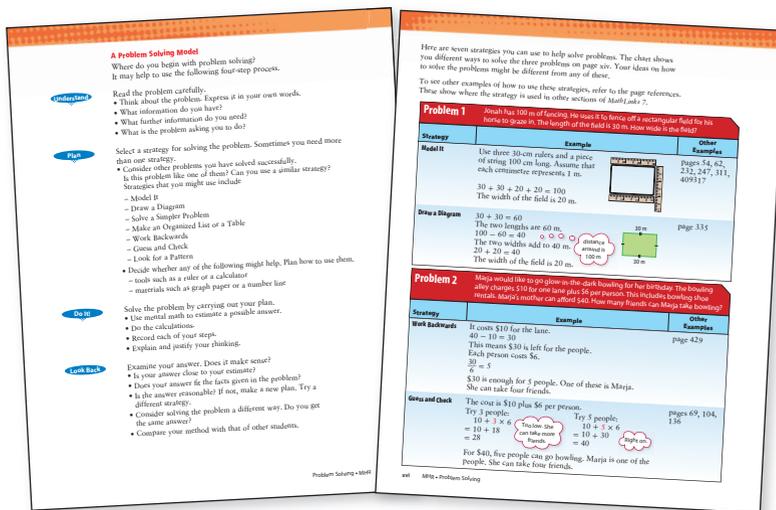
- What addition statement does each diagram represent?



What else will you find in *MathLinks 7*?

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 7 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.

$6 \div 2 = 3$ overestimate

- When using a calculator, estimate to make sure your answer is reasonable.

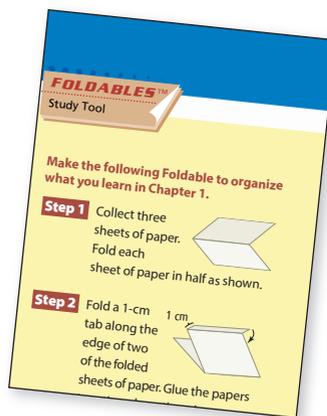
C $23.68 \div 3.2 = 7.4$

$21 \div 3 = 7$
 $24 \div 3 = 8$
 The estimates suggest an answer between 7 and 8. The answer 7.4 is reasonable.

Foldables™



Each chapter opener describes how to make a Foldable to help organize what you learn in the chapter. The last part of each Foldable encourages you to keep track of what you need to work on.



Other Features

Did You Know?

The colours of the Olympic rings were chosen because at least one of these colours is found in the flag of every nation. The five interlocking rings represent the union of the five major regions of the world—the Americas, Africa, Asia, Oceania, and Europe.

Did You Know?

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

Geography Link

The rainfall recorded for Terrace, BC is correct. You may wish to learn more about the geography of Terrace that makes it such a wet place.

Subject Links

This feature links the current topic to another subject area.

WWW Web Link

To learn more about pi, go to www.mathlinks7.ca and follow the links.

Web Links

You can find extra information related to some questions on the Internet. Log on to www.mathlinks7.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.

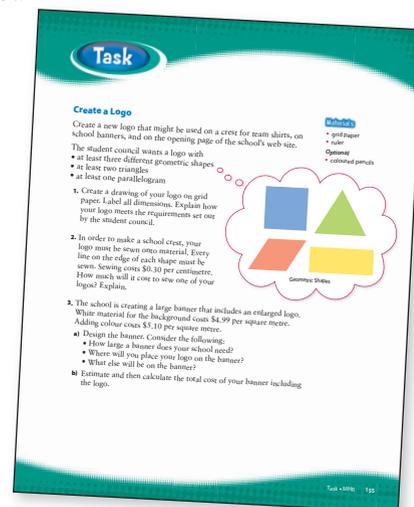
Answers

Answers are provided for all Practise, Apply, and Extend questions, as well as Reviews. 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.



Task

Create a Logo

Create a new logo that might be used on a crew for team shirts, on school banners, and on the opening page of the school's web site.

The student council wants a logo with:

- at least three different geometric shapes
- at least two triangles
- at least one parallelogram

1. Create a drawing of your logo on grid paper. Label all dimensions. Explain how your logo meets the requirements set out by the student council.

2. In order to make a school crest, your logo must be sewn onto material. Every line on the edge of each shape must be sewn. Sewing costs \$0.30 per centimetre. How much will it cost to sew one of your logos? Explain.

3. The school is creating a large banner that includes an enlarged logo. White material for the background costs \$4.99 per square metre.

Adding colour costs \$5.10 per square metre.

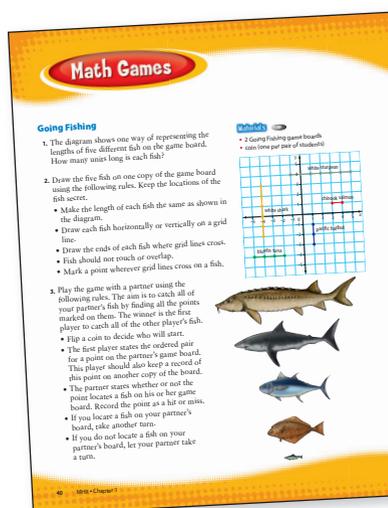
- Design the banner. Consider the following:
 - How large a banner does your school need?
 - Where will you place your logo on the banner?
 - What else will be on the banner?
- Estimate and then calculate the total cost of your banner including the logo.

Checklist

- grid paper
- scissors
- coloured pencils

Geometric Shapes

Task - MHR 123



Math Games

Going Fishing

1. The diagram shows one way of representing the lengths of five different fish on the game board. How many units long is each fish?

2. Draw the five fish on one copy of the game board using the following rules. Keep the locations of the fish secret.

- Make the length of each fish the same as shown in the diagram.
- Draw each fish horizontally or vertically on a grid line.
- Draw the ends of each fish where grid lines cross.
- Fish should not touch or overlap.
- Mark a point where one grid line crosses on a fish.

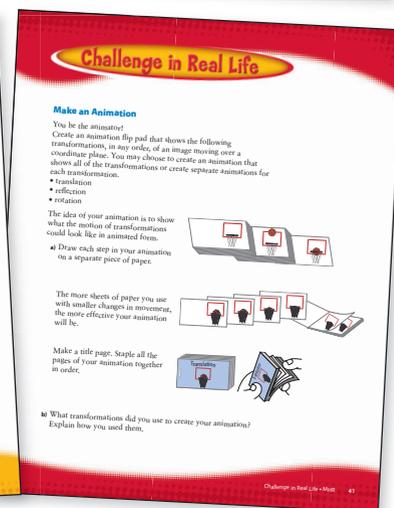
3. Play the game with a partner using the following rules. The aim is to catch all of your partner's fish by finding all the points marked on them. The winner is the first player to catch all of the other player's fish.

- The first player states the ordered pair for a point on the partner's game board. This player should also keep a record of this point on another copy of the board.
- The partner states whether or not the point locates a fish on his or her game board. Record the point as a hit or miss.
- If you locate a fish on your partner's board, take another turn.
- If you do not locate a fish on your partner's board, let your partner take a turn.

Materials

- 2 Going Fishing game boards
- coins (one per pair of students)

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Challenge in Real Life

Make an Animation

You're the animator!

Create an animation flip pad that shows the following transformations, in any order, of an image moving over a coordinate plane. You may choose to create an animation that shows all of the transformations or create separate animations for each transformation.

- translation
- reflection
- rotation

The idea of your animation is to show what the motion of transformations could look like in an animated form.

Draw each step in your animation on a separate piece of paper.

The more sheets of paper you use with smaller changes in movement, the more effective your animation will be.

Make a table page. Staple all the pages of your animation together in order.

What transformations did you use to create your animation? Explain how you used them.

Challenge in Real Life - MHR 41