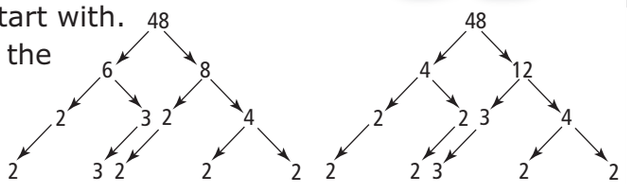
Get Ready

Name: _____ **Date:** _____

Factors

Factors are numbers that are multiplied to produce a specific product.
For example, 2 and 5 are factors of 10, since $2 \times 5 = 10$.
You can use a factor tree to write a **composite number** as the product of its prime factors. Different factor trees are possible for many composite numbers.
It depends on which factor pair you start with.
Here are two possible factor trees for the number 48.
Therefore, 48 can be expressed as a product of its **prime factors**.
48 is $2 \times 2 \times 2 \times 2 \times 3$.
The factor pairs of 48 are
1 and 48 2 and 24 3 and 16
4 and 12 6 and 8

A composite number has factors other than 1 and itself.



A prime number has only two different factors, 1 and itself.

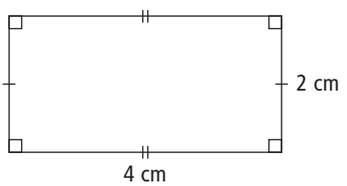
1. a) Use a factor tree to write 60 as a product of prime factors.

b) List the factor pairs of 60.

2. List the factor pairs of 12. Show your thinking.

Perimeter and Area

The **perimeter** of a polygon is a measure of the distance around the geometric shape.
The **area** of an object is a measure of how much space a two-dimensional surface covers.
Find the perimeter and area of the rectangle shown.

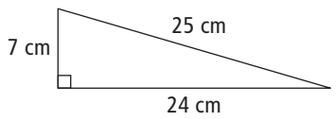


$P = 2l + 2w$
$P = 2 \times 4 + 2 \times 2$
$P = 8 + 4$
$P = 12$
The perimeter is 12 cm.

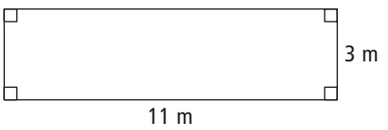
$A = lw$
$A = 4 \times 2$
$A = 8$
The area is 8 cm^2.

Name: _____ Date: _____

3. a) Find the perimeter of the polygon.



b) What is the area of the polygon?



Numbers Between

The whole numbers between 9 and 16 are 10, 11, 12, 13, 14, 15.
The difference between 9 and 16 is 7. $16 - 9 = 7$
Half of this difference is 3.5. $7 \div 2 = 3.5$
The number 12.5 is halfway between 9 and 16. $9 + 3.5 = 12.5$

4. List the whole numbers between

a) 4 and 9 **b)** 25 and 36

5. What number is halfway between each of the numbers in #5?

Solving Equations

An **equation** contains a variable, or unknown value. $x + 5 = 8$
Simple algebraic equations can be solved using mental math. This method of solving is known as inspection. $x = 3$

To solve an equation, isolate the variable on one side of the equal sign. When undoing the operations performed on the variable, follow the reverse order of operations.
- subtract and add
- multiply and divide

$5x + 7 = 22$
$5x + 7 - 7 = 22 - 7$ Reverse the addition of 7 by subtracting 7.
$5x = 15$
$\frac{5x}{5} = \frac{15}{5}$ Reverse the multiplication of the variable with 5 by dividing by 5.
$x = 3$

6. Solve by inspection.

a) $x + 4 = 11$

b) $2x = 32$

7. Solve for x.

a) $3x = 18$

b) $4x + 1 = 13$

Name: _____ **Date:** _____

3.1 Squares and Square Roots

***MathLinks 8*, pages 80–87**

Key Ideas Review

Write the term from column B that matches the correct statement in column A.

A	B
1. A whole number that has only two factors, 1 and itself. _____	**a)** Prime factorization **b)** Square number **c)** Perfect square **d)** Prime number **e)** Square root
2. The product of the same two numbers. _____	
3. The number that equals a given value when you multiply the number by itself. _____	
4. The product of the same two factors. _____	
5. A number written as the product of its prime factors. _____	

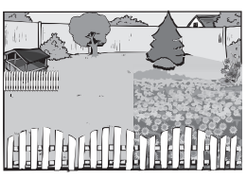
Practise and Apply

6. a) Determine the prime factorization of 36. Show your work.

b) Is 36 a perfect square? Explain your thinking.

c) Draw a quadrilateral that shows whether or not 36 is a perfect square. Label its side lengths.

7. Janie's backyard has an area of 100 m^2.



a) Determine the prime factorization of 100. Show your work.

Name: _____ **Date:** _____

b) Is 100 a perfect square? Explain your thinking.

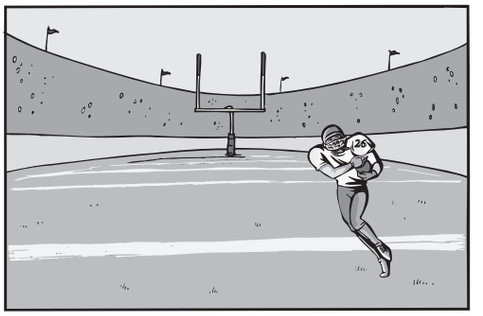
c) Draw a quadrilateral that shows whether or not 100 is a perfect square. Label its side lengths.

8. Write the prime factorization of each number. Circle the perfect squares.

a) 164 **b)** 196

c) 225 **d)** 325

9. Alasie's local football field has an area of 1296 m^2. Is 1296 a perfect square? Show your thinking.



10. Ingrid says that she knows that 9 and 16 are perfect squares, and that 10 is not. Is she correct? Explain your thinking.

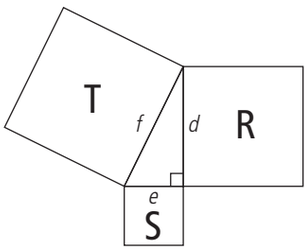
Name: _____ **Date:** _____

3.2 Exploring the Pythagorean Relationship

***MathLinks 8*, pages 88–94**

Key Ideas Review

Use the diagram below to complete #1.

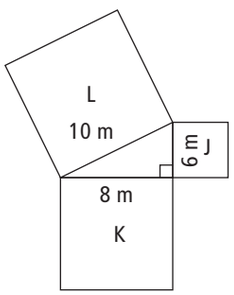


1. a) Write an addition statement to show the relationship of the squares.

b) Use words to describe the relationship of the squares.

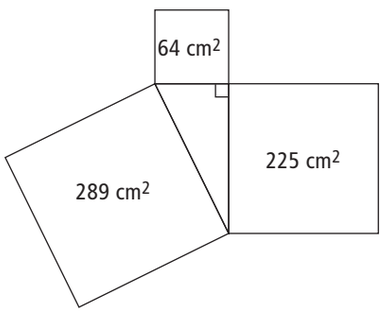
Practise and Apply

2. a) What are the areas of the squares in the diagram? Show your work.



b) Write two addition statements to show the relationship between the squares.

3. a) Complete the table using information provided in the diagram below.



Area of Square	Side Length of Square

Name: _____ **Date:** _____

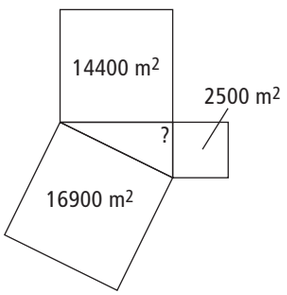
b) Show the relationship of the squares.

4. The sides of a right triangle measure 15 cm, 20 cm, and 25 cm.

a) What is the area of each square? Show your work.

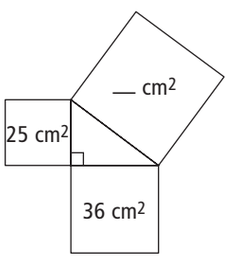
b) Show the relationship of the squares.

5. Is the triangle below a right triangle? Explain your reasoning.

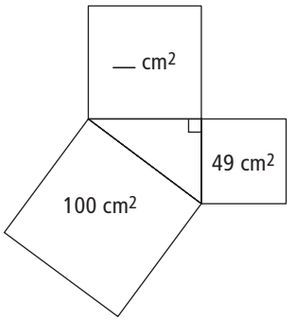


6. Use the Pythagorean relationship to find the unknown area of the squares in the following diagrams. Show your work.

a)

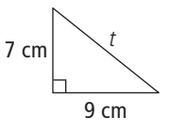


b)

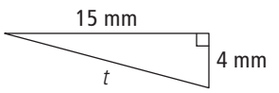


7. What is the area of the square on side *t* of each triangle? Show your work.

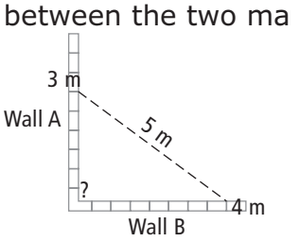
a)



b)



8. Jeremy wants to make sure that the walls he is building are at right angles to each other. He measures and marks 3 m along Wall A, and 4 m along Wall B. The distance between the two marks is 5 m.



Are the walls at right angles to each other? Explain how you know.

Name: _____ **Date:** _____

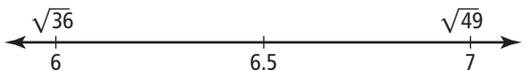
3.3 Estimating Square Roots

***MathLinks 8*, pages 95–100**

Key Ideas Review

Use your estimating skills to complete #1.

1. a) Estimate the square root of 40 using the number line below.



b) Estimate the whole number that has a square root two thirds of the way along the number line between 3 and 4.

2. Complete the following.

a) When I use a calculator to calculate the square root of a natural number that is a perfect square, I get a _____ number as my answer. This is a(n) _____ answer.

b) When I use a calculator to get the square root of a natural number that is *not* a perfect square, the answer the calculator gives me has a _____ in it. This is not an exact answer. It is a(n) _____.

Practise and Apply

3. List the perfect squares immediately before and after the whole number.

Perfect Square Before	Whole Number	Perfect Square After
a)	5	
b)	18	
c)	78	
d)	95	

4. Identify all of the whole numbers with a square root larger than 5 and smaller than 6.

5. Estimate the square root to one decimal place. Show your work. Check your answer with a calculator.

a) $\sqrt{17}$

b) $\sqrt{85}$

Name: _____ **Date:** _____

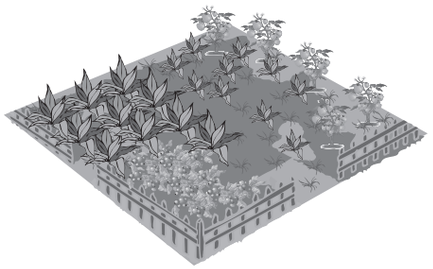
6. Write the perfect square immediately before and after the whole number, and then estimate the square root of the whole number to one decimal place. Check your estimates with a calculator.

Perfect Square Before	Whole Number	Perfect Square After	Approx-imate Square Root
a)	27		
b)	55		
c)	105		
d)	140		

7. Martina's painting is on a square canvas with an area of 45 cm^2. She needs to buy a frame for the painting. Estimate the square's side length to one decimal place. Show your work.

8. Braden's new game board has 225 small squares. All of the small squares form one large square. How many small squares are along one side? Show your work.

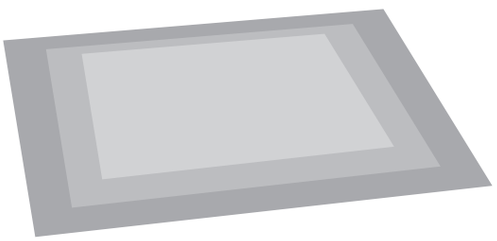
9. Chelsea's square garden has an area of 60 m^2.



a) Estimate to one decimal place the side length of the garden.

b) She has 32 m of fencing to go around the garden. Does she have enough fencing? Explain your thinking.

10. Aaron's parents want to buy an area rug for their 4 m $\times$ 4 m living room. They want space around the rug. The rug itself cannot take up more than 90% of the living room. What is the maximum size of rug they can buy? Show your work.



Name: _____ **Date:** _____

3.4 Using the Pythagorean Relationship

***MathLinks 8*, pages 101–105**

Key Ideas Review

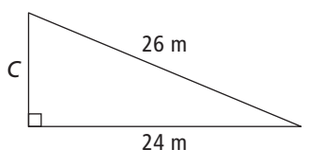
Choose from the following terms to complete #1.

hypotenuse	legs	length	Pythagorean

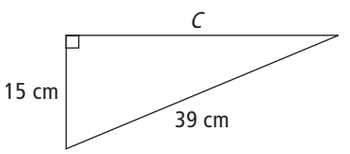
1. The _____ relationship can be used to determine the _____ of the _____ of a right triangle when the lengths of the two _____ are known.

2. Use the relationship to determine the length of *C* in each triangle, to the nearest whole number. Show your work.

a)



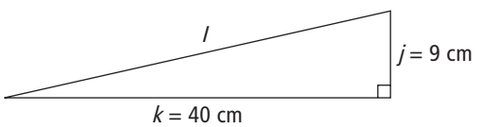
b)



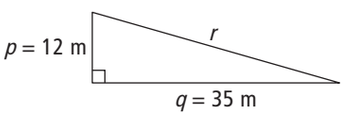
Practise and Apply

3. Determine the length of each hypotenuse. Show your work.

a)

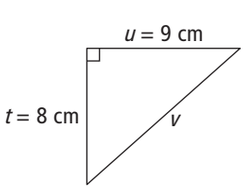


b)

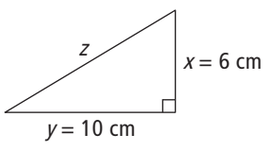


4. What is the length of each hypotenuse, to the nearest centimetre? Show your work.

a)



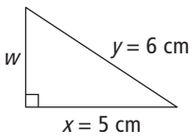
b)



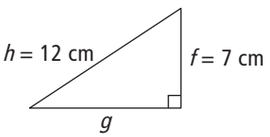
Name: _____ **Date:** _____

5. Calculate the missing side length for each right triangle, to the nearest tenth of a centimetre. Show your work.

a)

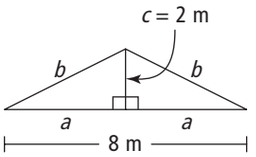


b)



6. Find the height of a triangle with a base of 4 cm and a hypotenuse of 11 cm. Round to the nearest tenth of a centimetre. Show your work.

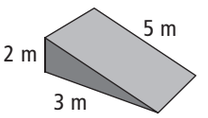
7. A triangle is made up of two smaller congruent right triangles.



a) Find the length of the hypotenuse for the right triangles, to the nearest tenth of a metre. Show your work.

b) Calculate the perimeter of the large triangle, to the nearest tenth of a metre. Show your work.

8. Ellie and Lucas are going to the skateboard park to try out the new ramp.



Is the new ramp a right triangle? Explain your thinking.

Name: _____ **Date:** _____

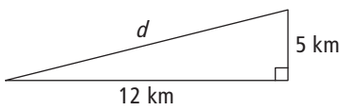
3.5 Applying the Pythagorean Relationship

***MathLinks 8,* pages 106–111**

Key Ideas Review

Use the diagrams provided to complete the equations for #1.

1. a)



$d^2 = 12^2 +$ _____

$d^2 =$ _____ + _____

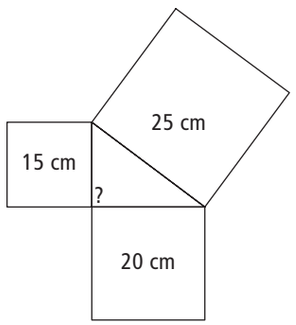
$d^2 =$ _____

$d = \sqrt{\text{_____}}$

$d =$ _____

The hypotenuse is _____ km long.

b)



_____ + _____ = _____

Left side: _____ + _____

= _____ + _____

= _____

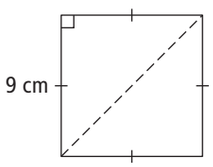
Right side: _____ = _____

Are both sides equal?
YES _____ NO _____

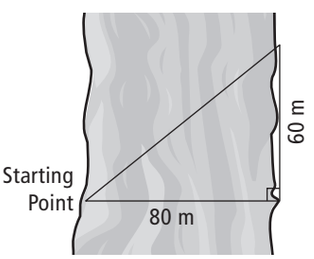
Is this a right triangle?
YES _____ NO _____

Practise and Apply

2. What is the length of the diagonal of a square whose sides measure 9 cm? Give the answer to the nearest tenth of a centimetre. Show your work.

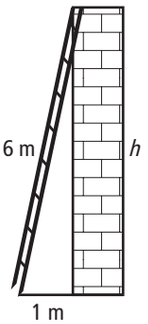


3. Aden decides to swim across a river that is 80 m wide. As he begins to swim the current carries him 60 m downstream. How far did he actually swim?

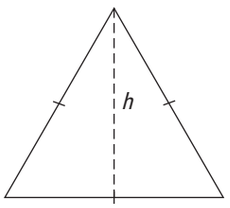


Name: _____ **Date:** _____

4. The foot of a ladder is 1 m from a wall. If the ladder is 6 m long, how far up the wall does the ladder reach? Give the answer to the nearest tenth of a metre. Show your work.

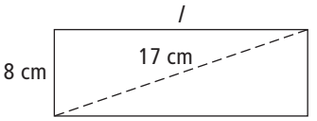


5. The perimeter of an equilateral triangle is 24 cm.



Calculate the height of the triangle to the nearest tenth of a centimetre. Show your work.

6. The width of a rectangle is 8 cm, and its diagonal is 17 cm.

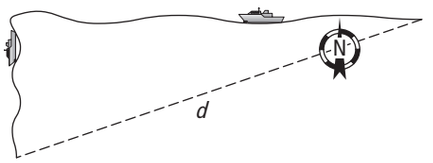


a) Calculate the length of the rectangle. Show your work.

b) Calculate the area of the rectangle. Show your work.

7. A quadrilateral has a width of 17 cm and a length of 26 cm. A diagonal is 31 cm. Is the quadrilateral a rectangle? Justify your answer.

8. A ship leaves port heading due west. After travelling at a speed of 20 km/h for 10 h, the ship makes a 90° turn and heads south, travelling at the same speed. After travelling south for $7\frac{1}{2}$ h, how far is the ship from the port? Show your work.



Name: _____ **Date:** _____

Link It Together

1. Complete the table

Perfect Square	Factors	Square Root
a) 16	1, 2, _____, 8, 16	$\sqrt{16}$ = _____
b) 81	1, 3, _____, _____, 81	$\sqrt{81}$ = _____
c) 144	1, _____, _____, 4, _____, _____, _____, 18, 24, _____, _____, 72, 144	$\sqrt{144}$ = _____
d) 225	1, _____, 15, 45, _____	$\sqrt{225}$ = _____
e) 625	_____, 5, _____, _____, 625	$\sqrt{625}$ = _____

2. Two search and rescue boats responded to an SOS off the coast of Tofino. Boat A, which was travelling north at 15 km/h, reached the stranded vessel in 36 minutes. Boat B started from a location directly east of Boat A. It travelled northwest at a speed of 20 km/h and took 45 minutes to reach the stranded vessel.

a) Draw a diagram that represents the stranded vessel and the search and rescue boats.

b) Calculate the distance that each search and rescue boat travelled. Show your work.

c) How far apart were the starting points of Boat A and Boat B? Show your work.

Name: _____ **Date:** _____

Vocabulary Link

Use the clues to identify the key words from Chapter 3. Then, write them in the crossword puzzle blank.

Across

2. The number 289 is a _____ _____ because $17 \times 17 = 289$.

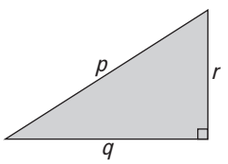
4. Here is one way of showing the _____ _____: $p^2 = q^2 + r^2$

Down

1. The number 13 is the _____ _____ of 169.

2. This example shows _____ _____: $125 = 5 \times 5 \times 5$

3. Side p is referred to as the _____ of this right triangle.



5. Sides q and r are referred to as the _____ of this right triangle.