Date: _____

CHAPTER 2 Right Triangle Trigonometry

Get Set

Answer these questions to check your understanding of the Get Ready concepts on pages 44–45 of the *Foundations of Mathematics 10* textbook.

Solving Proportions

1. Solve each proportion.

a) $\frac{x}{15} = \frac{21}{45}$ **b)** $\frac{22}{y} = \frac{2}{3}$ **c)** $\frac{18}{23} = \frac{z}{46}$ **d)** $\frac{16}{24} = \frac{2}{x}$

2. Solve each proportion. Express each answer as a decimal. Round your answers to three decimal places.

a) $\frac{x}{11} = \frac{4}{14}$ **b)** $\frac{18}{y} = \frac{8}{30}$ **c)** $\frac{x}{3} = \frac{19}{8}$ **d)** $\frac{15}{t} = \frac{6}{13}$

Rounding

3. Round to the nearest degree.

a) 14.3° _____ **b)** 11.45° _____ **c)** 31.6° _____ **d)** 82.9° _____

4. Round to one decimal place.

a) 22.43 _____ **b)** 163.717 _____

c) 2.37 _____ **d)** 0.79 _____

5. Round to four decimal places.

a) 0.148 267 315 _____ **b)** 27.005 19 _____

c) 45.760 315 _____ **d)** 3.421 832 _____

e) 15.763 21 _____ **f)** 109.524 719 3 _____

Date: _____

2.1 The Pythagorean Theorem

Textbook pp. 46–53

Warm-Up

1. Square Roots

Calculate the positive square root of each number. Round your answers to one decimal place.

a) 124

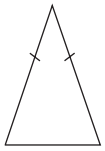
b) 68

c) 12

d) 300

2. Types of Triangles

Name this triangle according to its side lengths and angles.



3. Number Sense

Find the value of each variable that makes each statement true.

a) $x^2 = 9^2 + 12^2$

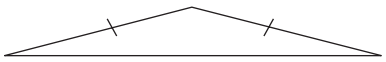
b) $p^2 = 12^2 + 5^2$

4. Math Literacy

Give three examples of places where triangles are used in everyday life.

5. Types of Triangles

Name this triangle according to its side lengths and angles.



6. Pythagorean Theorem

Choose the correct answers.

The Pythagorean theorem states, in a _____ (left, right, upside down) triangle, the square of the _____ (triangle, hypotenuse, legs) is equal to the sum of the square of the _____ (arms, hypotenuse, legs).

7. Number Sense

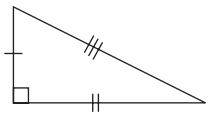
Solve for x.

a) $5^2 = x^2 + 4^2$

b) $10^2 = 8^2 + x^2$

8. Types of Triangles

Name this triangle according to its side lengths and angles.

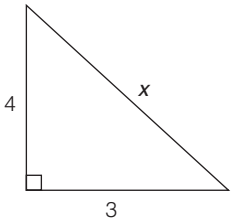


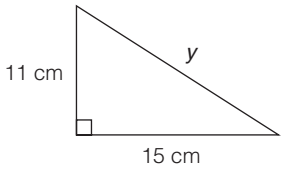
Date: _____

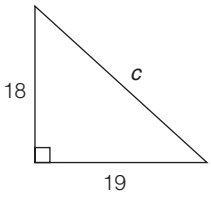
Practise: The Pythagorean Theorem

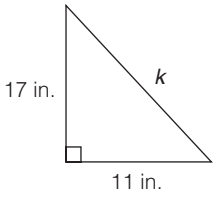
Section 2.1

1. Calculate the length of each hypotenuse. Round your answer to one decimal place, if necessary.



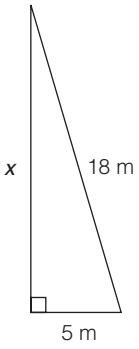


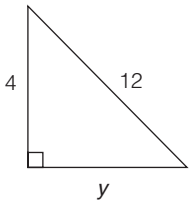


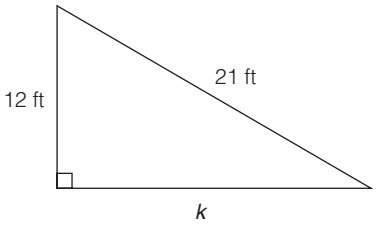


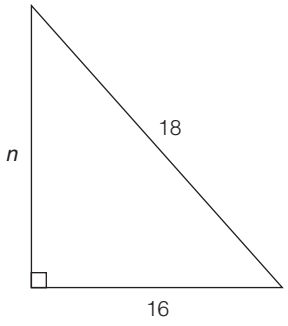
a) _____ **b)** _____ **c)** _____ **d)** _____

2. Find the length of the third leg in each triangle. Round your answers to one decimal place.



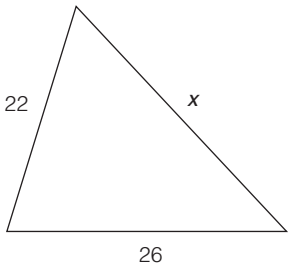






a) _____ **b)** _____ **c)** _____ **d)** _____

3. To find the length of the third side of the triangle shown on the right, Simone writes $22^2 + 26^2 = x^2$ and plans to solve for x. Is she correct? How do you know?



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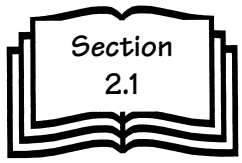
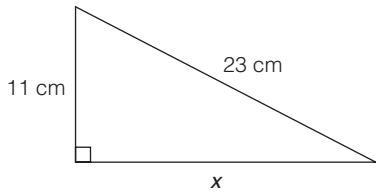
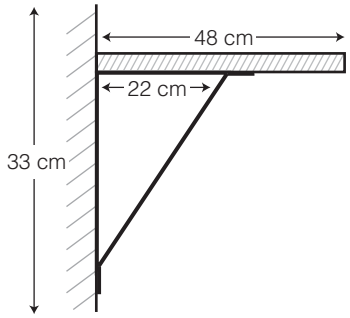
Date: _____



4. Explain to your friend John the steps he will need to follow to solve for x in the triangle shown on the right.



5. Ricardo is building a shelf in his garage. For support, he will attach three triangle-shaped brackets to the wall as shown in the diagram. Find the length of the third side. Round your answer to one decimal place.



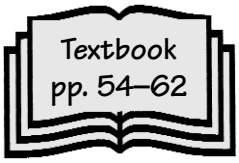
6. A 15-ft ladder is placed against a building. The bottom of the ladder is 4 ft out from the wall. You need to find how high up the side of the building the ladder touches the wall.

a) Make a sketch of the situation.

b) How far up the side of the building does the top of the ladder reach? Round your answer to one decimal place.

Date: _____

2.2 Explore Ratio and Proportion in Right Triangles



Warm-Up

1. Convert Fractions to Decimals

Write each fraction as a decimal.

a) $\frac{6}{15}$

b) $\frac{12}{5}$

c) $\frac{7}{8}$

d) $\frac{5}{4}$

2. Number Sense

Write each fraction in simplest form.

a) $\frac{8}{18}$

b) $\frac{2}{8}$

c) $\frac{3}{24}$

d) $\frac{16}{40}$

3. Math Literacy

What is a ratio? Use examples to explain.

4. Ratios

Write each ratio in simplest form.

a) 24:16

b) 21:28

c) 8:32

d) 15:35

5. Mental Math

Evaluate without using a calculator.

a) $\sqrt{121}$

b) $\sqrt{64}$

c) $\sqrt{100}$

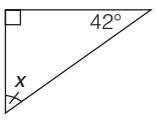
d) $\sqrt{400}$

6. Math Literacy

How are fractions and ratios similar? How are they different?

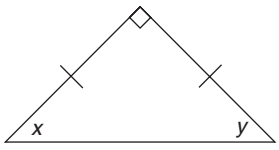
7. Angles in a Triangle

Find the value of x.



8. Angles in a Triangle

Find the missing angle measures.

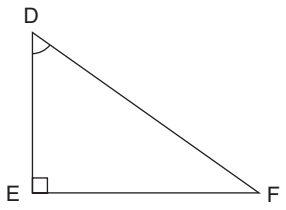


Date: _____

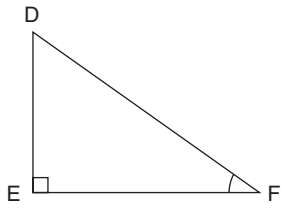
Practise: Explore Ratio and Proportion in Right Triangles

Section 2.2

1. **a)** In the following right triangle, label the adjacent side relative to ∠D. Draw an arrow from D to show where the opposite side is. Label the opposite side relative to ∠D.



b) What would change if you were asked to label the adjacent and opposite sides relative to ∠F?



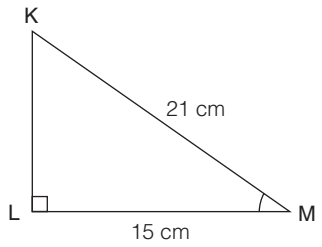
_____

_____

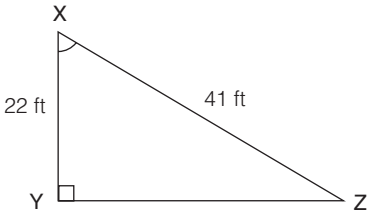
_____

2. Find each ratio for the indicated angle. Round your answers to two decimal places.

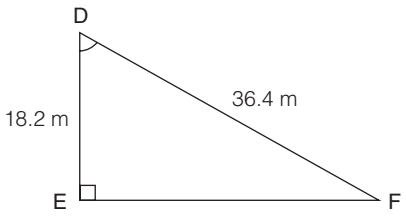
a) The ratio of the length of the adjacent side relative to ∠M to the length of the hypotenuse relative to ∠M is _____.



b) The ratio of the length of the adjacent side relative to ∠X to the length of the hypotenuse relative to ∠X is _____.



c) The ratio of the length of the adjacent side relative to ∠D to the length of the hypotenuse relative to ∠D is _____.



3. A wheelchair ramp reaches 1 m high at its highest point. The length of the ramp is 8.4 m.

a) Label the diagram on the right to represent this situation.

b) Find the length of the third side of the ramp. Round your answer to two decimal places.

_____

Date: _____

c) Find the ratio of the length of the opposite side to the length of the adjacent side relative to the angle the ramp makes with the ground. Round your answer to three decimal places.

Hint: Think of a term you would use to express how steep a roof, a road, or even a ski hill is.

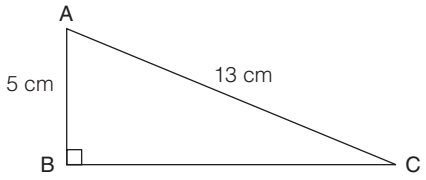
Section 2.2

_____

d) What other term can we use to describe the ratio in part **c)**?

_____

4. Use the diagram shown below to answer the following questions.



a) Use the Pythagorean theorem to find the length of the third side.

b) Find these ratios. Round your answers to two decimal places.

The ratio of the length of the opposite side relative to $\angle A$ to the length of the hypotenuse relative to $\angle A$ is _____.

The ratio of the length of the opposite side relative to $\angle C$ to the length of the hypotenuse relative to $\angle C$ is _____.

Date: _____

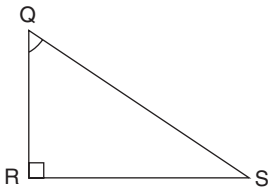
2.3 The Sine and Cosine Ratios

Textbook pp. 63–73

Warm-Up

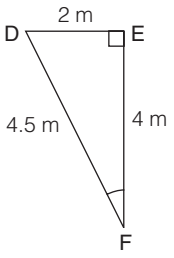
1. Label the Sides

Label the adjacent side relative to ∠Q and the hypotenuse of this right triangle relative to ∠Q.



2. Number Sense

Write a ratio comparing the length of the side opposite ∠F to the length of the hypotenuse. Then, express the ratio as a decimal, rounded to two decimal places.

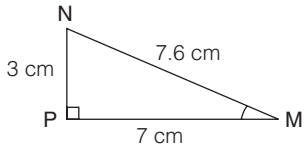


3. Math Literacy

Define an adjacent side.

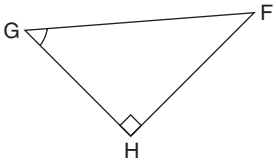
4. Ratios

Write a ratio comparing the length of the side adjacent to ∠M to the length of the hypotenuse. Then, express the ratio as a decimal, rounded to two decimal places.



5. Mental Math

Without looking at your textbook, name the adjacent side, opposite side and the hypotenuse relative to ∠G. Give one ratio comparing the length of one of two sides to the length of hypotenuse.

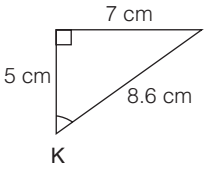


6. Math Literacy

Define an opposite side.

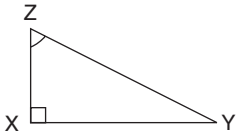
7. Comparing Sides

Write a ratio comparing the length of the side opposite ∠K to the length of the adjacent side relative to ∠K. Then, express the ratio as a decimal.



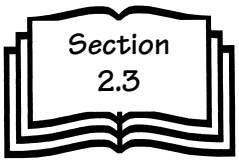
8. Label the Sides

Label the adjacent side and the hypotenuse relative to ∠Z.



Date: _____

Practise: The Sine and Cosine Ratios



1. Use a scientific calculator to find each value. Round to four decimal places.

a) cos 75° _____ **b)** sin 12° _____ **c)** sin 53° _____

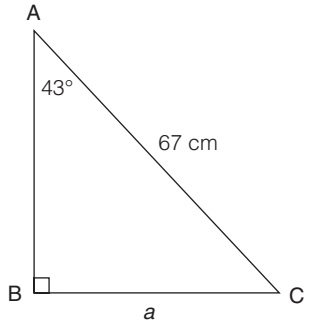
d) cos 8° _____ **e)** sin 66° _____ **f)** cos 81° _____

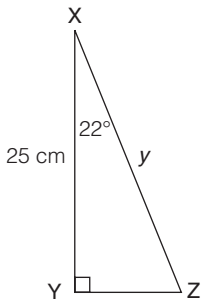
2. Use a scientific calculator to find the angle measure in each of the following. Round to the nearest degree.

a) sin X = 0.1636 _____ **b)** sin A = 0.9386 _____ **c)** cos Y = 0.2232 _____

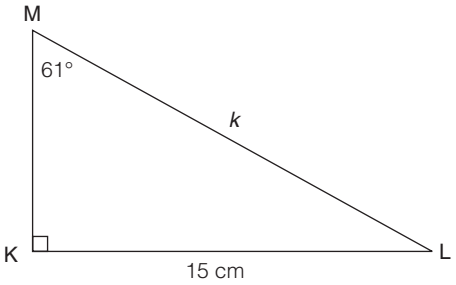
d) cos F = 0.5867 _____ **e)** sin B = 0.4587 _____ **f)** cos K = 0.6892 _____

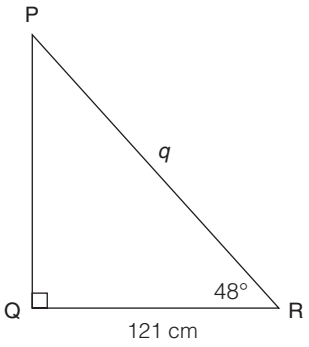
3. In the following right triangles, find the measure of the indicated side. Round to the nearest centimetre.





a) a = _____ **b)** y = _____



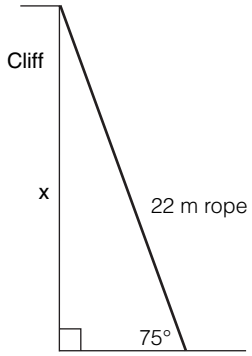


c) k = _____ **d)** q = _____

Date: _____

Section 2.3

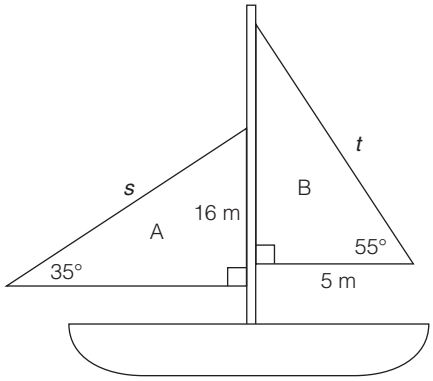
4. While mountain climbing, one end of a 22-m-long rope is at the top of a cliff. The angle the rope makes with the ground at the bottom of the cliff is approximately 75°. Approximately how high is the cliff? Round your answer to one decimal place.



Side View

5. Mark is looking at sailboats at a boat show. He admires a sailboat with two triangular sails.

a) The side opposite the 35° angle is 16 m. The length of the sail is the hypotenuse. Use the sine ratio to find *s*. Round your answer to one decimal place.



b) The side adjacent to the 55° angle is 5 m. The length of the sail is the hypotenuse. Use the cosine ratio to find *t*. Round your answer to one decimal place.

Date: _____

2.4 The Tangent Ratio

Textbook pp. 74–82

Warm-Up

1. Sine Ratio

Complete the sine ratio.

$$\sin x = \frac{\text{length of side } \_\_\_\_\_ \ x}{\text{length of } \_\_\_\_\_}$$

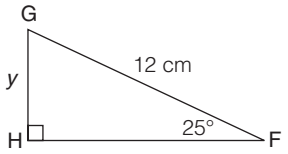
2. Number Sense

Find the length of side GH, to the nearest tenth of a centimetre.

$\sin \_\_\_\_\_° = \frac{y}{\_\_\_\_}$

$\_\_\_\_ \sin \_\_\_\_\_° = y$

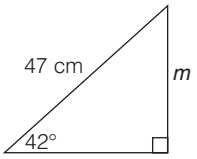
$y = \_\_\_\_\_$



3. Sine Ratio

Write the sine ratio for the 42° angle in this triangle.

$\sin \_\_\_\_\_° = \frac{m}{\_\_\_\_}$



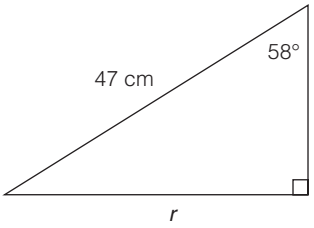
4. Cosine Ratio

Complete the cosine ratio.

$$\cos x = \frac{\text{length of side} \_\_\_\_\_ \ x}{\text{length of } \_\_\_\_\_}$$

5. Mental Math

Would you use the sine or cosine ratio to find the length of side r of this triangle?



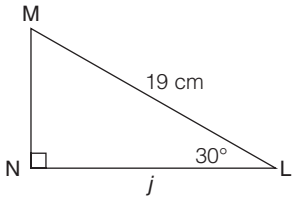
6. Cosine Ratio

Find the length of side LM to the nearest tenth of a centimetre.

$\cos \_\_\_\_\_° = \frac{j}{\_\_\_\_}$

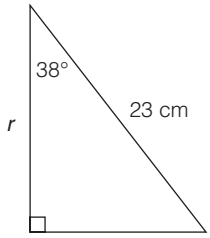
$\_\_\_\_ \cos \_\_\_\_\_° = j$

$j = \_\_\_\_\_$



7. Sine or Cosine

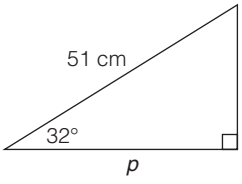
Use the sine or cosine ratio to find the length of side r for this triangle. Round your answer to one decimal place.



8. Cosine Ratio

Write the cosine ratio for the 32° angle in this triangle.

$\cos \_\_\_\_\_° = \frac{p}{\_\_\_\_}$



Date: _____

Practise: The Tangent Ratio

Section 2.4

1. Find each value. Round to four decimal places.

a) tan 22.4° _____ **b)** tan 75° _____

c) tan 12° _____ **d)** tan 45° _____

2. Find each angle measure. Round to the nearest degree.

a) tan A = 0.6375 _____ **b)** tan B = 2.6758 _____

c) tan C = 1.1111 _____ **d)** tan D = 0.3353 _____

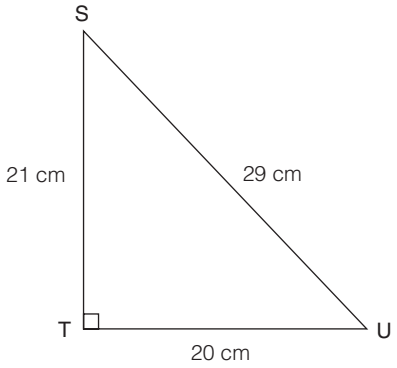
3. Calculate the measure of ∠S to the nearest degree, using a scientific calculator.

The opposite side relative to ∠S is _____ cm.

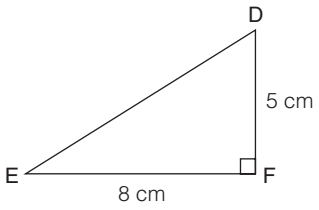
The adjacent side relative to ∠S is _____ cm.

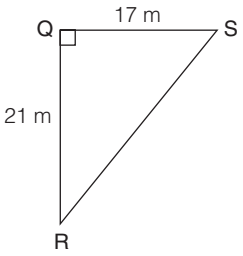
tan S = ——

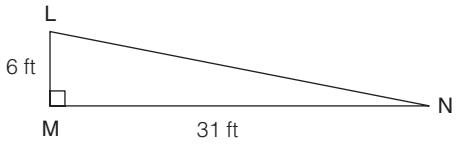
∠S = _____



4. Write the tangent ratio for the indicated angle in each triangle shown below. Write your answers as fractions in lowest terms.







a) tan D = _____ **b)** tan R = _____ **c)** tan N = _____

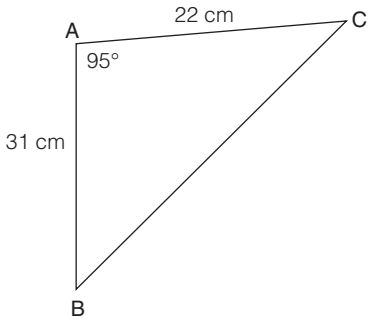
5. Jeremy uses the Pythagorean theorem and the tangent ratio to solve for ∠B in triangle ABC shown on the right. Explain the error Jeremy made.

_____

_____

_____

_____

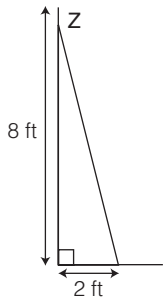


Date: _____

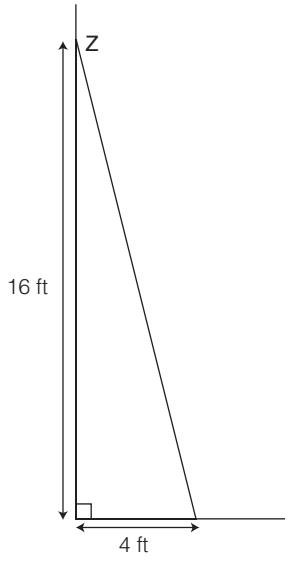
Section 2.4

6. To ensure safety, ladders must be placed with a 4:1 ratio. That means, if Keri places his ladder 8 ft up the wall, the base of the ladder must be 2 ft away from the wall.

a) Calculate the measure of $\angle Z$ to the nearest degree, using a scientific calculator.



b) Keri extends the ladder and places it 16 ft up the wall. He moves the base to 4 ft away from the wall. Calculate the measure of $\angle Z$ to the nearest degree, using a scientific calculator.



c) What do you notice about the measure of $\angle Z$ in parts **a)** and **b)**? Explain.

_____

_____

_____

_____

Date: _____

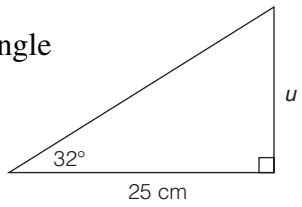
2.5 Solve Problems Using Right Triangles

Textbook pp. 83–87

Warm-Up

1. Tangent Ratio

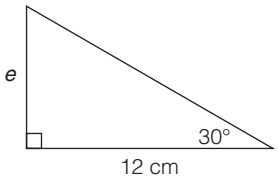
Write the tangent ratio for the 32° angle of this triangle.



tan _____° = $\frac{u}{\quad}$

2. Number Sense

Find the length of side e, to the nearest tenth of a centimetre.



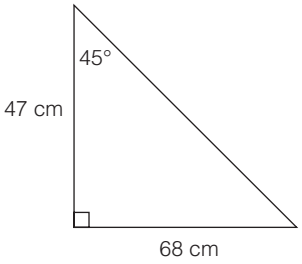
tan _____° = $\frac{e}{\quad}$

___ tan _____° = ____

e = _____

3. Adjacent Sides

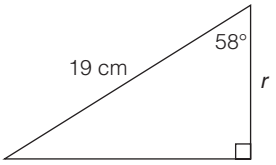
What is the length of the side adjacent to the 45° angle labelled in the diagram?



_____ cm

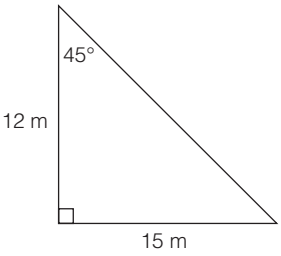
4. Mental Math

Could you use the tangent formula to calculate the length of r? Explain.



5. Opposite Sides

What is the length of the side opposite the 45° angle labelled in the diagram?



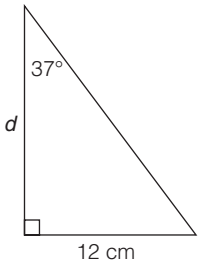
_____ m

6. Estimation

Pick an object up high in your home and estimate the angle of elevation from where you sit or stand. Write down your estimate. Use your clinometer to check how close you were.

7. Tangent Ratio

Find the length of side e, to the nearest tenth of a centimetre.



tan _____° = $\frac{\quad}{d}$

___ tan _____° = ____

d = _____

d = _____

8. Math Literacy

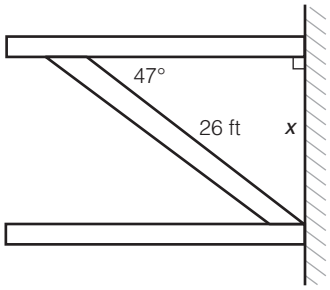
Matthew stands on the balcony of his apartment. He wants to find out the height of the apartment building 50 m away. Would Matthew be measuring the angle of elevation, or the angle of depression, or both?

Date: _____

Practise: Solve Problems Using Right Triangles

Section 2.5

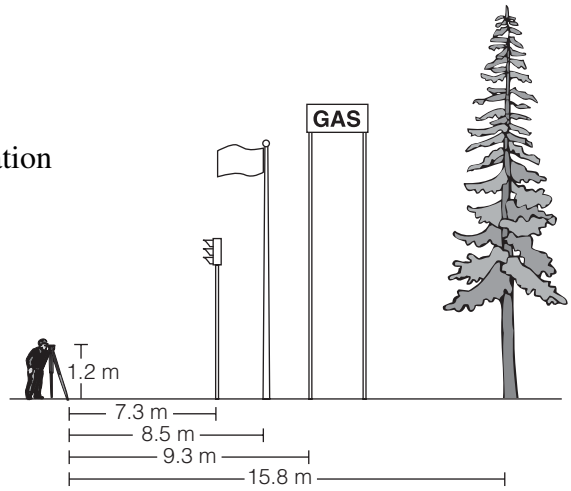
1. A large support beam in the frame of a building runs diagonally between two beams, as shown in the diagram.



a) Use the tangent ratio to calculate the length of the side opposite the 47° angle. Round your answer to one decimal place.

b) Does the support beam form an angle of elevation or an angle of depression with the wall?

2. Raul uses a transit that is 1.2 m above the ground to sight a number of objects. Find the height of each object above the ground. Round your answers to the nearest tenth of a metre.



Distance From Object (m)	Angle of Elevation (°)	Height From Transit to Top of Object (m)	Height of Object (m)
8.5	48.2		
9.3	44.2		
15.8	51.3		
7.3	49.6		

3. From the top of a cliff 88 m above the canyon floor, Stefani notes the angle of depression to the edge of the river in the canyon to be 37°.

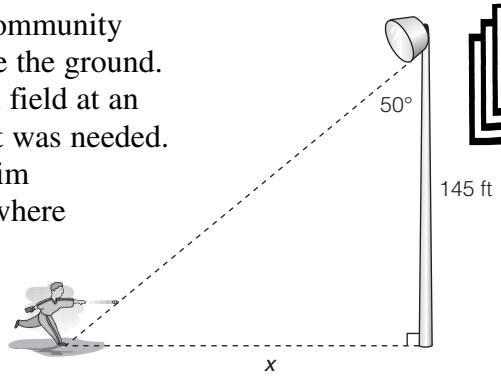
a) Sketch and label a model of the situation.

b) Calculate the horizontal distance from the base of the cliff to the river's edge. Round your answer to the nearest metre.

Date: _____

Section 2.5

4. The town bought a new light for the community baseball field. The light is 145 ft above the ground. Justin set the new light on the baseball field at an angle of 50° so it would shine where it was needed.



a) Justin's friend Sam came to meet him after work. He waited on the field where the new light was shining. How far is Sam from the light standard? Round your answer to one decimal place.

b) What is the angle of elevation from Sam to the light fixture?

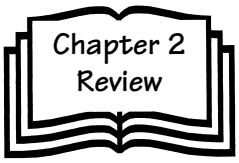
5. Jeff measures the angle of elevation to the top of a 250 ft high telecommunications tower to be 33° and the angle of depression to the base of the tower to be 16°.

a) Sketch and label a diagram of the situation.

b) How far is Jeff from the tower? Round your answer to the nearest foot.

Date: _____

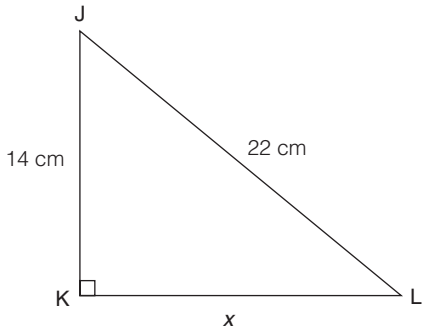
Chapter 2 Review



For all questions, answer to the nearest degree or to one decimal place wherever appropriate.

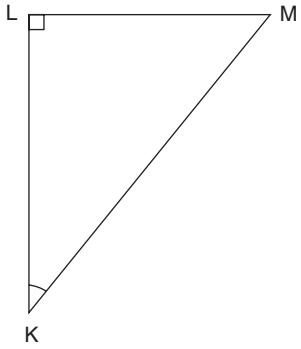
2.1 The Pythagorean Theorem, textbook pages 46–53

1. Find the measure of the third side in the following triangle. Round your answer to one decimal place.



2.2 Explore Ratio and Proportion in Right Triangles, textbook pages 54–62

2. Label the hypotenuse and the opposite and adjacent sides relative to ∠K in triangle KLM below.



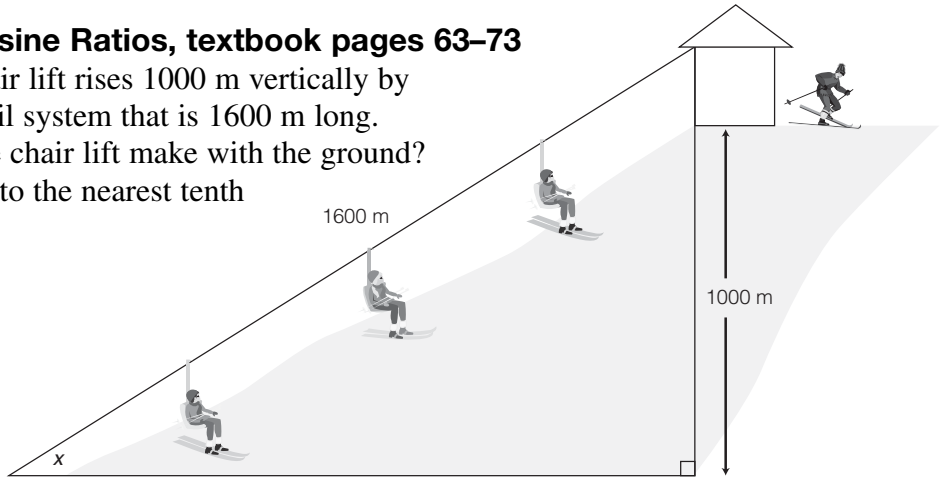
a) The ratio comparing the length of the opposite side to the length of the adjacent side is _____.

b) The ratio comparing the length of the adjacent side to the length of the hypotenuse is _____.

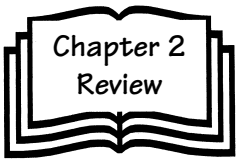
c) The ratio comparing the length of the opposite side to the length of the hypotenuse is _____.

2.3 The Sine and Cosine Ratios, textbook pages 63–73

3. At a ski hill, the chair lift rises 1000 m vertically by travelling along a rail system that is 1600 m long. What angle does the chair lift make with the ground? Round your answer to the nearest tenth of a degree.



Date: _____



2.4 The Tangent Ratio, textbook pages 74–82

4. A ramp built inside a stadium for people to move from the main level to the second floor forms an angle of 20° with the main floor. The second floor is 18 ft above the main floor.

a) Sketch and label a model of the situation.

b) What is the length of the ramp? Round your answer to the nearest tenth of a foot.

2.5 Solve Problems Using Right Triangles, textbook pages 83–87

5. From the top of a tall building, the base of a second building 50 m away is at an angle of depression of 77°, and the top of the second building is at an angle of elevation of 25°.

a) Sketch and label a model of the situation.

b) What is the height of the second building? Round your answer to the nearest tenth of a metre.