Date: _____

CHAPTER 2

Trigonometry

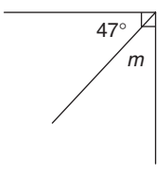
Get Set

Answer these questions to check your understanding of the Prerequisite Skills concepts on pages 72–73 of the *Foundations for College Mathematics 12* textbook.

Geometric Properties

1. Determine the measure of each indicated angle.

a)



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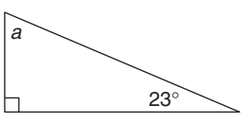
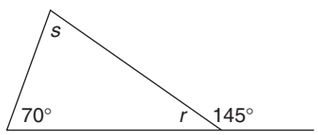


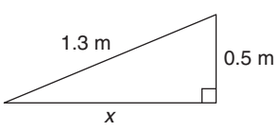
c)



The Pythagorean Theorem

2. Determine the length of the indicated side to one decimal place.

a)



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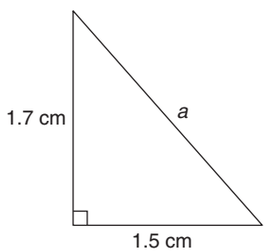


Primary Trigonometric Ratios

3. Evaluate to four decimal places. Use a calculator.

a) sin 54° **b)** cos 14° **c)** tan 61° **d)** sin 45°

4. Solve for $\angle\theta$, to the nearest degree. Use a calculator.

a) $\cos\theta = 0.2419$ **b)** $\tan\theta = 0.4245$ **c)** $\sin\theta = 0.7071$ **d)** $\cos\theta = 0.7986$

Solve Equations

5. Solve for x to one decimal place.

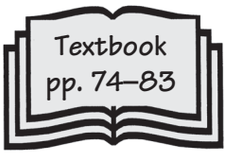
a) $\frac{x}{5} = \frac{10}{4}$ **b)** $\frac{12}{x} = \frac{20}{3}$ **c)** $\frac{6.7}{2.8} = \frac{x}{4.2}$ **d)** $\frac{3.5}{7} = \frac{4.3}{x}$

6. Solve for x to one decimal place.

a) $x^2 = 4^2 + 11^2$ **b)** $x^2 - 1.5^2 = 6^2$ **c)** $5x = 3.5^2 + 6.5^2$

Date: _____

2.1 Trigonometric Ratios With Acute Angles



Warm-Up

1. Number Skills

Which set of numbers could be the side lengths of a right triangle?

A 4, 6, 7

B 5, 18, 19

C 8, 15, 17

D 6, 8, 10

2. Algebra

Solve for each unknown.

a) $\frac{x}{20} = \frac{3}{5}$

b) $\frac{7}{y} = \frac{28}{18}$

c) $\frac{3.5}{6.3} = \frac{z}{1.8}$

3. Relations

Determine the value of x when $y = 5$ in the relation $\frac{x}{3} = \frac{y}{15} + 1$.

4. Geometry/Measurement

What is the complementary angle for each angle?

a) 17°

b) 65°

c) 48°

d) 9°

5. Data/Probability

The angles measured in an astronomy project are shown.

17.5°, 17.6°, 17.4°, 17.2°, 17.6°, 17.3°, 17.9°

a) What is the median angle?

b) What is the mode angle?

c) What is the mean angle?

6. Problem Solving

A flagpole is 6 m tall. It is supported by a wire that is bolted to the ground 2.5 m from the base of the pole. If the wire is attached to the top of the pole, how long is the wire?

7. Math Literacy

What is the name for a triangle with angles that are all less than 90°?

8. Previous Section

Evaluate to four decimal places. Use a calculator.

a) sin 82°

b) cos 3°

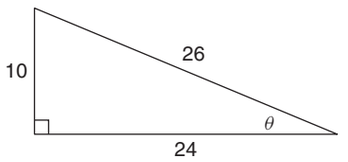
c) tan 44°

Date: _____

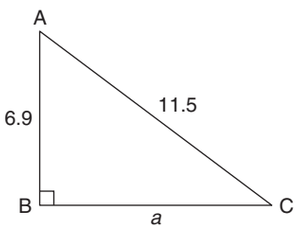
Section 2.1

Practise

1. Write the three primary trigonometric ratios relative to $\angle\theta$. Express each ratio as a fraction in lowest terms.

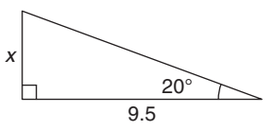


2. Determine the length of side a. Write the primary trigonometric ratios for $\angle$A to two decimal places.



3. Determine the length of x to one decimal place.

a)



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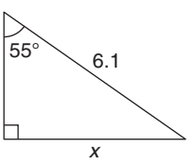
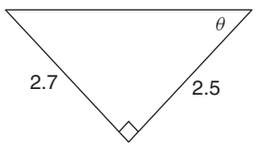


4. Solve for $\angle\theta$ to the nearest degree.

a)



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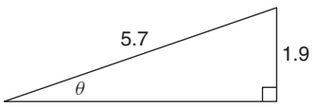

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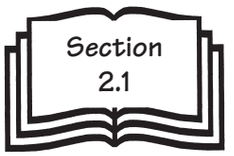
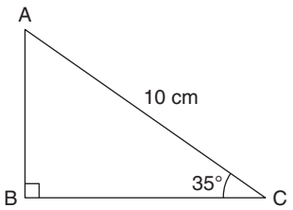
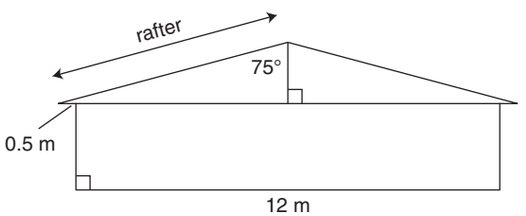


5. Solve the triangle. Express all lengths to one decimal place and all angles to the nearest degree.



6. From a distance of 10 m, the angle of elevation from the ground to the top of a tree is 38º. What is the height of the tree?

7. Determine the length of the rafter in the diagram.



8. A 6-m ladder is placed against a wall at an angle of 65º to the ground. How far up the wall will the ladder reach?

Date: _____

2.2 Trigonometric Ratios With Obtuse Angles

Textbook pp. 84–95

Warm-Up

1. Number Skills

Write each rational number as a decimal to two decimal places.

a) $\frac{-2.5}{10}$

b) $\frac{-8.2}{3}$

c) $\frac{1.2}{-4.4}$

d) $\frac{-20}{6.7}$

2. Algebra

Solve for each unknown.

a) $\frac{x}{9} = \frac{-4}{5}$

b) $\frac{-3}{y} = \frac{15}{8}$

c) $\frac{3.9}{-2.1} = \frac{z}{0.7}$

3. Relations

Determine the value of x when $y = 9$ in the relation $\frac{x}{5} = \frac{y}{15} - 2$.

4. Geometry/Measurement

If the hypotenuse of a right isosceles triangle is 2.0 cm long, how long are the other two sides? Round your answer to two decimal places.

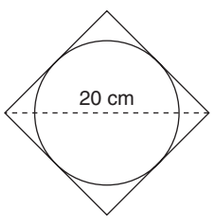
5. Data/Probability

A circle is divided into sectors that make these angles with the centre of the circle: 30º, 45º, 75º, 90º, 120º

Determine the probability of a spinner stopping in each section. Express your answer as a percent to one decimal place.

6. Problem Solving

What is the diameter of the circle?

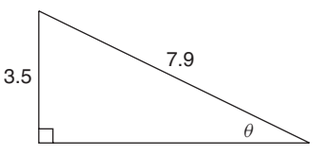


7. Math Literacy

What is the name for a triangle that has one angle greater than 90º?

8. Previous Section

Solve for $\angle\theta$ to the nearest degree.



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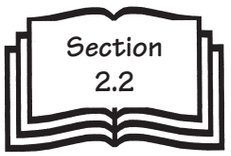
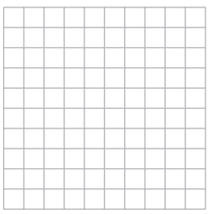


Practise

1. The terminal arm of an angle, θ, in standard position passes through A(2, 4).

a) Sketch a diagram for this angle in standard position.

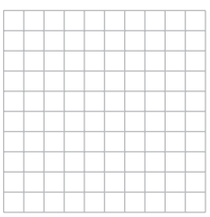


b) Determine the length of OA.

c) Determine the primary trigonometric ratios to three decimal places.

2. The terminal arm of an angle, θ, in standard position passes through B(−5, 6).

a) Sketch a diagram for this angle in standard position.



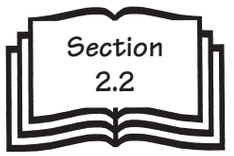
b) Determine the length of OB.

c) Determine the primary trigonometric ratios to three decimal places.

3. Complete the table. For each angle, indicate whether each trigonometric ratio is positive or negative. Round your answers to three decimal places.

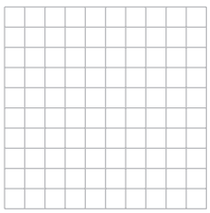
Angle	Sine	Cosine	Tangent
60°			
120°			
98°			
145°			
162°			

Date: _____



4. The sine of an obtuse angle, θ, in standard position is $\frac{3}{5}$.

a) Sketch a diagram of $\angle\theta$.



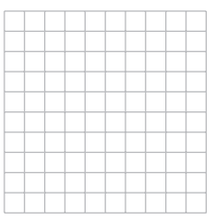
b) Identify the coordinates of a point that lies on the terminal arm of $\angle\theta$.

c) Determine $\cos\theta$ and $\tan\theta$.

d) Determine the measure of $\angle\theta$, using technology.

5. The tangent of an obtuse angle, θ, in standard position is -1.

a) Sketch a diagram of $\angle\theta$.



b) Identify the coordinates of a point that lies on the terminal arm of $\angle\theta$.

c) Determine $\sin\theta$ and $\cos\theta$. Round your answers to three decimal places.

d) Determine the measure of $\angle\theta$, using technology.

Date: _____

2.3 Sine Law

Textbook pp. 96–103

Warm-Up

1. Number Skills

Match each decimal number with its equivalent fraction.

a) 0.075 **A** $\frac{3}{0.4}$

b) 13.333… **B** $\frac{0.3}{4}$

c) 7.5 **C** $\frac{4}{0.3}$

2. Algebra

Solve for each unknown.

a) $\frac{9}{0.25} = \frac{b}{0.5}$

b) $\frac{a}{0.67} = \frac{3}{0.41}$

c) $\frac{0.95}{12} = \frac{0.56}{c}$

3. Relations

Determine the x-intercepts of each quadratic relation.

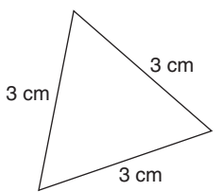
a) $y = 3x(x - 5)$

b) $y = -2(x - 5)^2 + 8$

c) $y = x^2 - 6x + 8$

4. Geometry/Measurement

Circle all the words that apply to this triangle.



right *isosceles* *obtuse*
acute *equilateral* *scalene*

5. Data/Probability

If you randomly choose the measure of an acute angle, what is the probability that your angle will have a tangent value greater than 1?

6. Problem Solving

A kite is flying at an angle of 50° to the ground. If 40 m of string has been let out, what is the vertical height of the kite from the ground?

7. Math Literacy

Which ratio represents the sine of an angle in a right triangle?

A adjacent : hypotenuse

B opposite : hypotenuse

C hypotenuse : opposite

D opposite : adjacent

8. Previous Section

What are the primary trigonometric ratios for each angle? Round your answers to three decimal places.

a) 91°

b) 160°

c) 125°

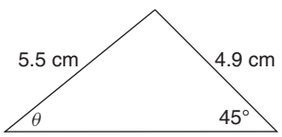
Date: _____

Practise

Section 2.3

1. Use the sine law to determine the measure of $\angle\theta$ to the nearest degree.

a)



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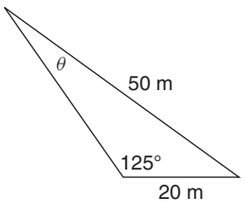


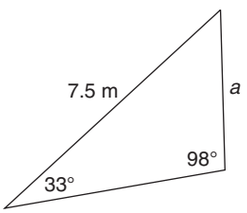
2. In $\triangle ABC$, $\angle A = 95°$, $a = 4.5$ cm, and $b = 3.5$ cm.

a) Draw and label a diagram.

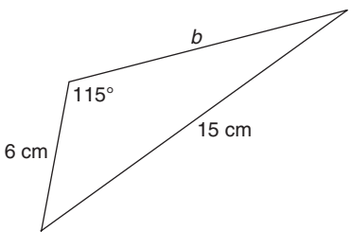
b) Determine the measure of $\angle B$ to the nearest degree.

3. Determine the length of each indicated side to one decimal place.

a)



b)

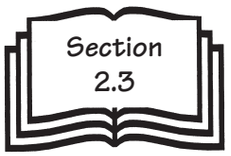


4. In $\triangle DEF$, $\angle D = 123°$, $\angle E = 37°$, and $d = 6.4$ km.

a) Draw and label a diagram.

b) Determine the length of side e to the nearest tenth of a kilometre.

Date: _____

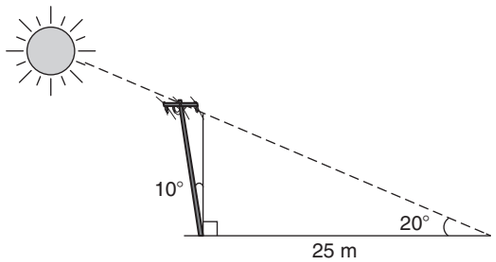


5. In $\triangle JKL$, $\angle J = 130°$, $j = 9.8$ cm, and $k = 5.0$ cm.

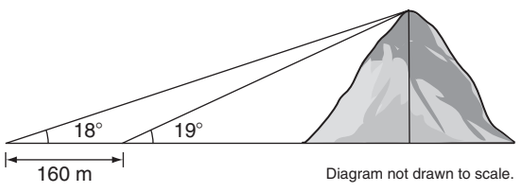
a) Draw and label a diagram.

b) Solve $\triangle JKL$ for all angles to the nearest degree and all side lengths to one decimal place.

6. A telephone pole is leaning at an angle of 10° and casting a shadow 25 m long. The angle of elevation of the sun from the end of the shadow is 20°. What is the length of the telephone pole?

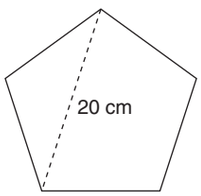


7. The angle of elevation to the top of a mountain is measured and found to be 18°. At a point 160 m closer to the mountain, the angle of elevation is 19°. What is the height of the mountain?



8. Find the perimeter of a regular pentagon with a diagonal length of 20 cm.

Hint: How many triangles make up a pentagon? How can you use this information to calculate the size of each angle in the pentagon?



Date: _____

2.4 Cosine Law

Textbook pp. 104–111

Warm-Up

1. Number Skills

Evaluate to one decimal place.

a) $4.5^2 + 3.4^2 - 2 \times 4.5 \times 3.4 \times 0.5$

b) $6.1^2 + 1.9^2 - 2 \times 6.1 \times 1.9 \times 0.32$

c) $8.5^2 + 5.3^2 - 2 \times 8.1 \times 5.3 \times 0.902$

2. Algebra

Solve $a^2 = b^2 + c^2 - 2bc \times 0.375$ for a if $b = 6$ and $c = 8$. Round your answer to one decimal place.

3. Relations

Expand and simplify.

a) $a(3a + 1)$

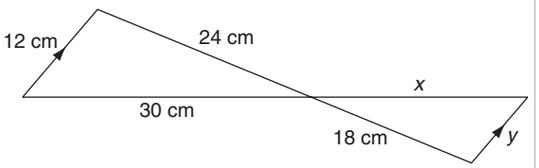
b) $(b + 7)(2b + 5)$

c) $(3c - 2)(5c + 1)$

d) $(d - 10)(d + 10)$

4. Geometry/Measurement

Determine the lengths of x and y in the two similar triangles.



5. Data/Probability

A bag contains one 5¢ coin, one 10¢ coin, one 25¢ coin, and one loonie. Jan draws a coin and then puts it back. Then she draws another coin. Determine the probability that

a) the total is 20¢

b) the total is not 20¢

c) the total is less than 50¢

6. Problem Solving

Sketch and label the sides and angles of a right triangle that has a perimeter of 24 cm and an area of 24 cm^2.

7. Math Literacy

Which ratio represents the cosine of an angle in a right triangle?

A adjacent : hypotenuse

B opposite : hypotenuse

C hypotenuse : opposite

D opposite : adjacent

8. Previous Section

In $\triangle ABC$, $\angle A = 110°$, $a = 5$ cm, and $b = 3$ cm. Determine the measure of $\angle B$ to the nearest degree.

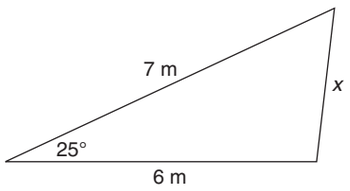
Date: _____

Section 2.4

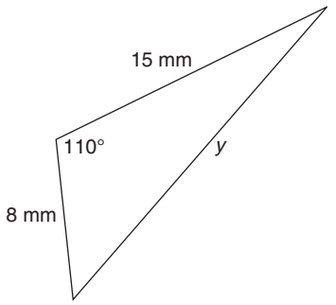
Practise

1. Determine the length of each indicated side to the nearest unit.

a)



b)



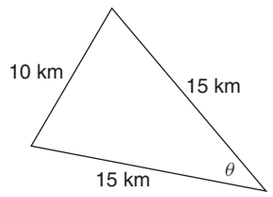
2. In $\triangle XYZ$, $x = 40$ ft, $y = 45$ ft, and $\angle Z = 100°$.

a) Draw and label a diagram.

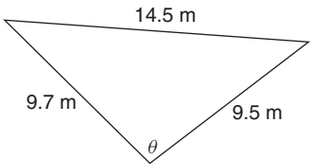
b) Determine the length of side z to the nearest foot.

3. Determine the measure of each indicated angle to the nearest degree.

a)



b)

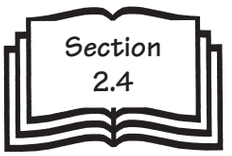


4. In $\triangle ABC$, $a = 6.2$ cm, $b = 7.9$ cm, and $c = 12.5$ cm.

a) Draw and label a diagram.

b) Determine the measure of $\angle C$ to the nearest degree.

Date: _____

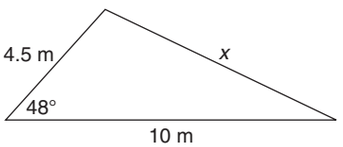


5. In $\triangle RST$, $\angle R = 112°$, $s = 5.2$ cm, and $t = 4.6$ cm.

a) Draw and label a diagram.

b) Solve $\triangle RST$ for all angles to the nearest degree and all side lengths to one decimal place.

6. The roof of a house is 10 m wide. A 4.5-m solar panel inclined at an angle of 48° covers the southern part of the roof. How long is the northern rafter of the roof, indicated by x?



7. Two roads intersect at an angle of 95°. The land at the corner has 200 m of frontage along one road and 100 m along the other. How long is the third side of the triangular lot?

8. Two aircraft leave Thunder Bay at the same time. One flies at 550 km/h and the other flies at 450 km/h. The angle between their flight paths is 160°. How far apart will they be in 2 h?

Date: _____

2.5 Applications of Trigonometry

Textbook pp. 120–129

Warm-Up

1. Number Skills

Calculate mentally.

a) $2 \times 4.5 \times 6 \times 0.5$

b) $2 \times 0.4 \times 5 \times 0.75$

c) $2 \times 15 \times 11 \times 0.3$

d) $2 \times 16 \times 12.5 \times 0.25$

2. Algebra

Given $a^2 = b^2 + c^2 - 2bc \cos A$, calculate $\cos A$ to four decimal places if $a = 3.5$, $b = 6.2$, and $c = 5.1$.

3. Relations

Factor fully.

a) $x^2 - 12x + 36$

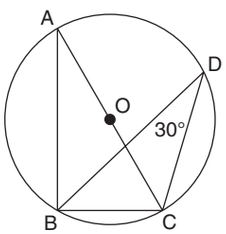
b) $a^2 + 2x - 8$

c) $3b^2 + 16b + 5$

d) $8c^2 - 50$

4. Geometry/Measurement

Find the measure of all the angles in $\triangle ABC$.



5. Data/Probability

How many different four-digit numbers can you make using all of these digits: 1, 1, 2, and 3?

6. Modelling

The sides of $\triangle ABC$ are represented by a, 3, and 4. Write an expression for $\cos A$.

7. Math Literacy

Which ratio represents the tangent of an angle in a right triangle?

A adjacent : hypotenuse

B opposite : hypotenuse

C hypotenuse : opposite

D opposite : adjacent

8. Previous Section

What are the angles in $\triangle DEF$, if DE = 2.5 cm, EF = 2.8 cm, and DF = 2.3 cm? Round your answers to the nearest tenth of a degree.

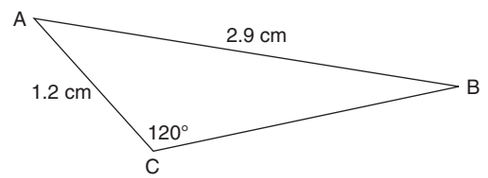
Date: _____

Section 2.5

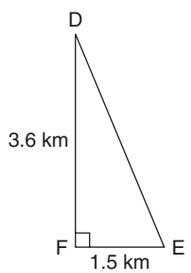
Practise

1. Decide which formula to use to solve each triangle. Then, solve the triangle.

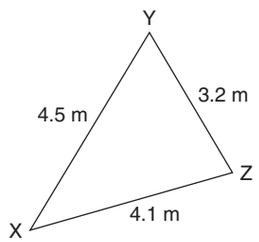
a)



b)



c)

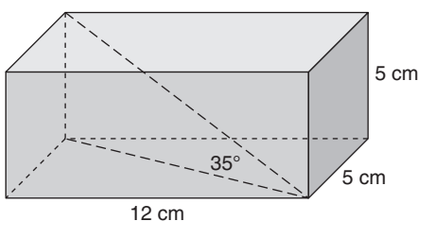


2. The area of $\triangle ABC$ is 24 cm^2. BC measures 8 cm and $\angle C$ is 60º.

a) Determine the lengths of AC and AB.

b) Determine the measures of $\angle A$ and $\angle B$ to the nearest degree.

3. A box in the shape of a square-based prism has measurements as shown. The diagonal makes a 35º angle with the base. What is the length of the diagonal? Hint: Mark all the right angles in the diagram.



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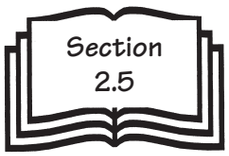
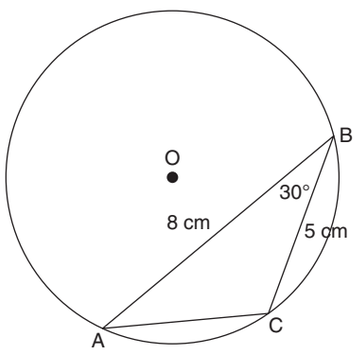


4. A golf hole is 380 yd from the tee. Sasha drove her ball 235 yd. Her drive was at an angle of 9º to the straight line to the hole. How far is her ball from the hole?

5. Two guy-wires are anchored at the same point. The first guy-wire is 12 m in length and is attached to the top of a tower. The second guy-wire is 9 m in length and is attached to a point 5 m below the top of the tower. How far are the wires anchored from the base of the tower?

6. Two chords of a circle form an angle of 30º as shown. One chord is 8 cm long and the other is 5 cm long. What is the radius of the circle?
Hint: Draw a diameter AD from point A and join DC. What do you know about △ADC? How can you use this information to find the diameter (and the radius) of the circle?



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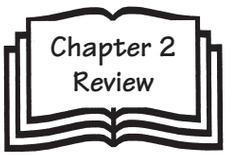
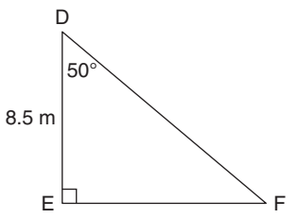
Chapter 2 Review



2.1 Trigonometric Ratios With Acute Angles, textbook pages 74–83

1. Solve $\triangle DEF$. Express all measures to one decimal place.

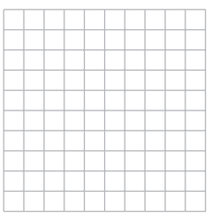


2. In $\triangle ABC$, $\angle C = 90°$, $\angle A = 20°$, and $b = 21$ cm. Solve the triangle. Express all measures to one decimal place.

2.2 Trigonometric Ratios With Obtuse Angles, textbook pages 84–95

3. The terminal arm of an angle, θ, in standard position passes through B(–3, 7).

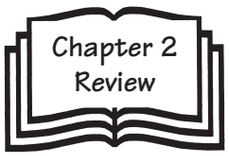
a) Sketch a diagram for this angle in standard position.



b) Determine the length of OB.

c) Determine the primary trigonometric ratios to three decimal places.

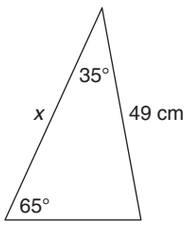
Date: _____



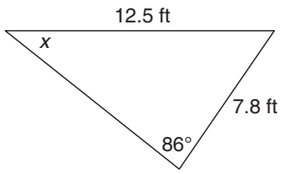
2.3 Sine Law, textbook pages 96–103

4. Solve for x to the nearest whole unit.

a)



b)



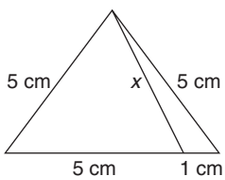
2.4 Cosine Law, textbook pages 104–111

5. Two sides of a triangle are 100 mm and 85 mm in length. The angle between them is 100º. How long is the third side?

2.5 Applications of Trigonometry, textbook pages 120–129

6. Two observers are 20 km apart when they spot a forest fire. The fire is 48º south-east of one observer and 37º south-west of the other observer. How far is the fire from each observer?

7. Determine x to one decimal place.



8. Find the length of the diagonal of a regular pentagon with 10 cm sides.
Hint: Refer to section 2.3, question 8, in this workbook for help.