

# Trigonometry

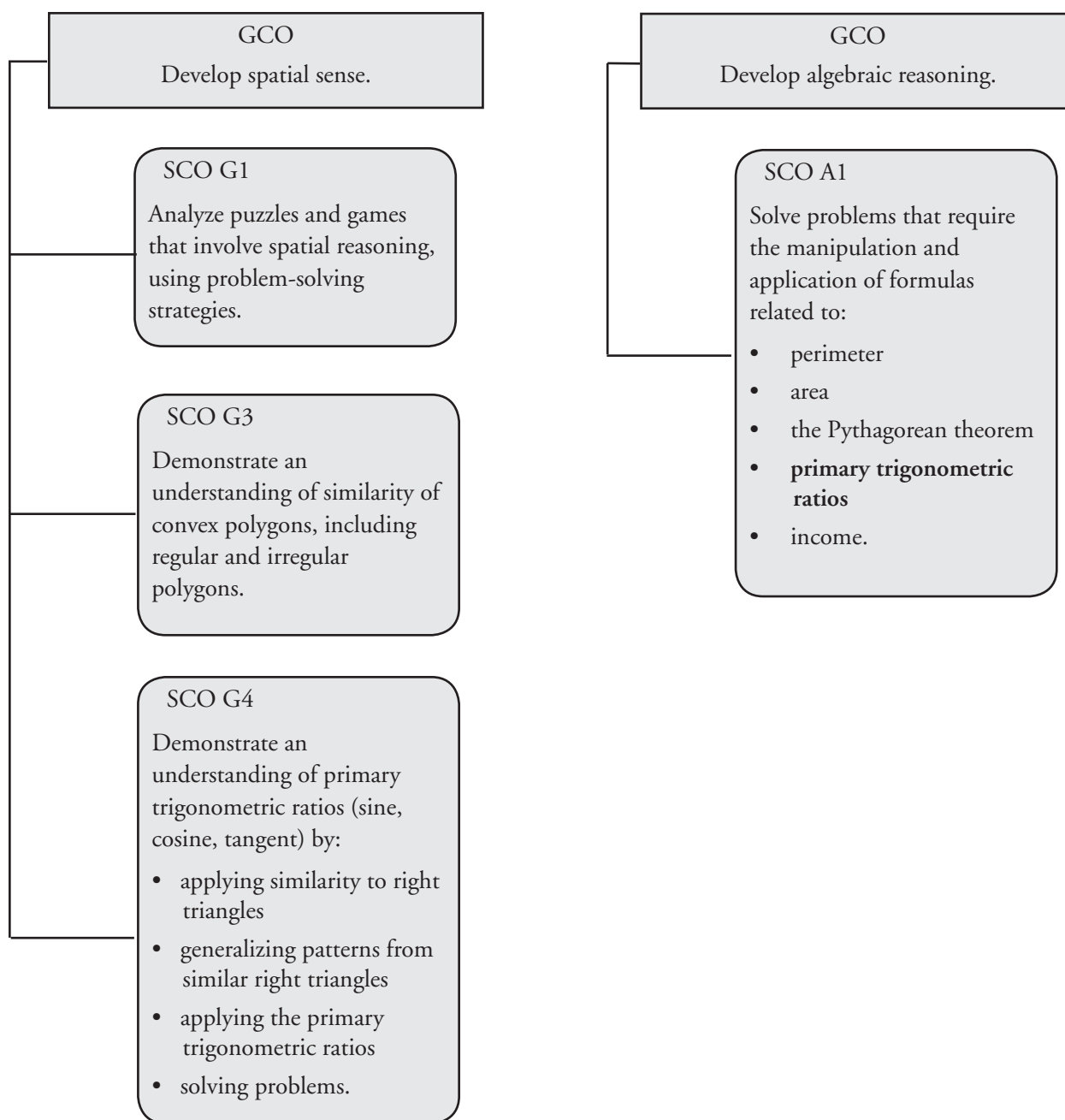
Suggested Time: 18 Hours

# Unit Overview

## Focus and Context

In this unit, students will explore the similarity of polygons and generalize patterns from similar right triangles to develop the primary trigonometric ratios. The sine, cosine and tangent ratios will be used to determine side lengths and acute angle measures in right triangles.

## Outcomes Framework



## Process Standards

[C] Communication  
 [CN] Connections  
 [ME] Mental Mathematics  
 and Estimation

[PS] Problem Solving  
 [R] Reasoning  
 [T] Technology  
 [V] Visualization

## SCO Continuum

Grade 9	Grade 10	Grade 11
Geometry		
SS3. Demonstrate an understanding of similarity of polygons. [C, CN, PS, R, V]	G1. Analyze puzzles and games that involve spatial reasoning, using problem-solving strategies. [C, CN, PS, R]  G3. Demonstrate an understanding of similarity of convex polygons, including regular and irregular polygons. [C, CN, PS, V]  G4. Demonstrate an understanding of primary trigonometric ratios (sine, cosine, tangent) by: <ul style="list-style-type: none"> <li>• applying similarity to right triangles</li> <li>• generalizing patterns from similar right triangles</li> <li>• applying the primary trigonometric ratios</li> <li>• solving problems.</li> </ul> [CN, PS, R, T, V]	N1. Analyze puzzles and games that involve numerical reasoning, using problem-solving strategies. [C, CN, PS, R]  G1. Solve problems that involve two and three right triangles. [CN, PS, T, V]  G2. Solve problems that involve scale. [PS, R, T, V]
Algebra		
not addressed	A1. Solve problems that require the manipulation and application of formulas related to: <ul style="list-style-type: none"> <li>• perimeter</li> <li>• area</li> <li>• the Pythagorean theorem</li> <li>• <b>primary trigonometric ratios</b></li> <li>• income.</li> </ul> [C, CN, ME, PS, R]	A1. Solve problems that require the manipulation and application of formulas related to: <ul style="list-style-type: none"> <li>• volume and capacity</li> <li>• surface area</li> <li>• slope and rate of change</li> <li>• simple interest</li> <li>• finance charges.</li> </ul> [CN, PS, R]

## Geometry

### Outcomes

*Students will be expected to*

**G3 Demonstrate an understanding of similarity of convex polygons, including regular and irregular polygons.**

[C, CN, PS, V]

### Achievement Indicators:

*G3.1 Determine if two or more regular or irregular polygons are similar.*

*G3.2 Explain why two or more right triangles with a shared acute angle are similar.*

### Elaborations—Strategies for Learning and Teaching

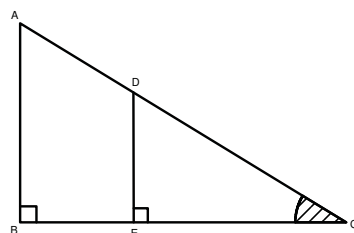
In this unit, students will explore similar polygons. They were previously introduced to the concept of similarity in Grade 9 (9SS3). Students sometimes confuse similarity with equality. Through investigation, students should recognize that similar polygons are polygons whose angles are congruent and whose corresponding side lengths are proportional.

Students will work with convex polygons, whose interior angles are less than  $180^\circ$ . They will explore similarity in both regular and irregular polygons.

To test for similarity, students should verify that the corresponding angles are of equal measure and the ratios of the corresponding sides are equal. Regular polygons with the same number of sides are always similar, regardless of size. Students could explore this using regular polygons such as squares or equilateral triangles. Since all the sides of a regular polygon are the same length, corresponding sides of the polygons must always be in the same proportions.

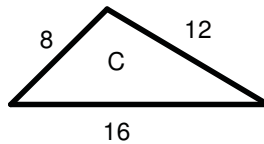
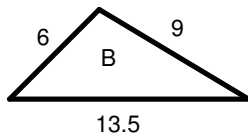
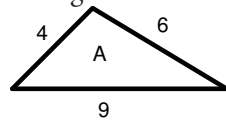
Students are also expected to determine if various irregular polygons are similar. When working with triangles, there are minimum conditions that prove the figures are similar. Proving two corresponding angles equal would be sufficient information to prove similarity, using angle-angle similarity.

In the diagram below, the figure can be separated into two triangles, namely  $\triangle ABC$  and  $\triangle DEC$ . Students should then notice there are two sets of corresponding equal angles ( $\angle B = \angle E$  and  $\angle C = \angle C$ ). Since the sum of the angles in a triangle is equal to  $180^\circ$ , the third set of corresponding angles ( $\angle A$  and  $\angle D$ ) must also be equal to each other. Therefore, the two triangles are similar using angle-angle similarity.



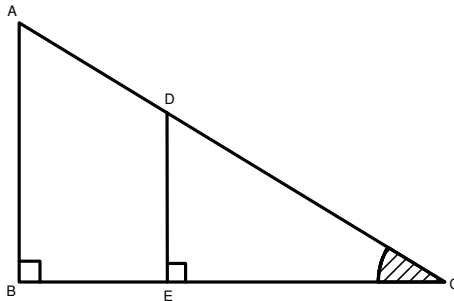
**General Outcome: Develop spatial sense.****Suggested Assessment Strategies***Paper and Pencil*

- Ask students to answer the following:
  - Determine if either triangle B or C is similar to triangle A.



(G3.1, G3.4)

- Answer the questions that follow based on the diagram given.



- Which triangles are similar?
- Measure the sides and determine the ratios of:

$$\frac{AB}{DE}, \frac{AC}{DC}$$

$$\frac{AB}{BC}, \frac{DE}{EC}$$

$$\frac{BC}{EC}, \frac{AC}{DC}$$

What do you notice about the values?

- If  $AB = 9$  cm,  $DE = 6$  cm, and  $EC = 8$ , what is the length of  $BC$ ?

(G3.1, G3.2, G3.3)

**Resources/Notes****Authorized Resource***Math at Work 10*

7 Get Ready

Student Book (SB): pp. 322-323

Teacher Resource (TR): pp. 335-336

BLM 7-3

7.1 Similarity

SB: pp. 324-335

TR: pp. 337-346

BLM 7-4, 7-5

## Geometry

### Outcomes

Students will be expected to

G3 Continued ...

#### Achievement Indicators:

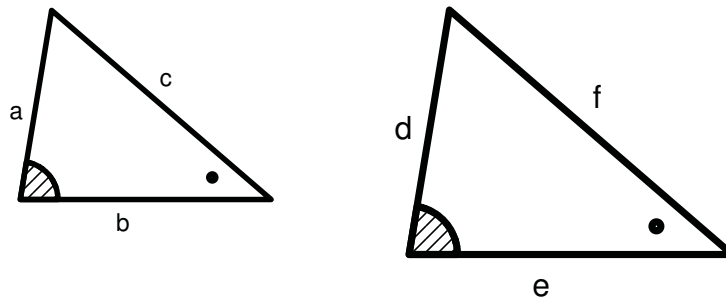
G3.3 Explain the relationships between the corresponding sides of two polygons that have corresponding angles of equal measure.

G3.4 Explain why two given polygons are not similar.

G3.5 Solve a contextual problem that involves similarity of polygons.

### Elaborations—Strategies for Learning and Teaching

If two polygons have corresponding angles of equal measure, they are similar. Students could consider similar triangles such as those shown here:



If polygons are similar, corresponding side lengths are all enlarged or reduced by the same factor. In Grade 9, students would have expressed this as “the ratios of their corresponding sides are equal”.

Therefore, in the triangles above,  $\frac{a}{d} = \frac{b}{e} = \frac{c}{f}$ .

An alternative test for similarity involves comparing side lengths within each shape. That is, if the ratio between two side lengths on one shape is the same as the ratio between the two corresponding side lengths on the other shape, the figures are similar.

Therefore,  $\frac{a}{b} = \frac{d}{e}$ ,  $\frac{c}{b} = \frac{f}{e}$ ,  $\frac{a}{c} = \frac{d}{f}$ .

Indirect measurement is one example of the applications of similar triangles. The concept of similarity is very useful in measuring the heights of inaccessible objects such as buildings, trees and mountains.

The shadowing technique works very well outdoors on sunny days. This “hands-on” project gives students an opportunity to go outside the classroom and take measurements. Students use an object perpendicular to the ground, a metre stick and their shadows to determine the height of the object. Using the fact that the sun’s rays are parallel, students can set up a proportion with similar triangles.

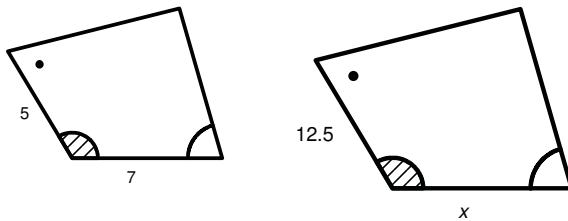
**General Outcome: Develop spatial sense.****Suggested Assessment Strategies***Journal*

- Ask students to respond to the following:  
Two triangles are similar. The side lengths of the smaller triangle are 3 cm, 4 cm, and 5 cm respectively. Describe how you can determine possible side lengths of the larger triangle.

(G3.3, G3.5)

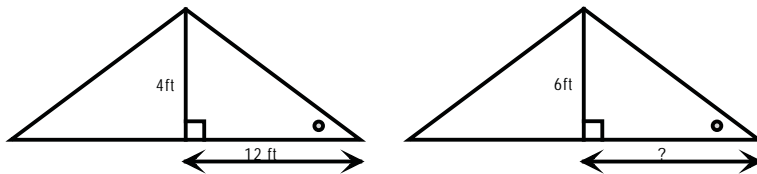
*Paper and Pencil*

- Ask students to answer the following:  
(i) The following quadrilaterals are similar. Determine the value of  $x$ .



(G3.3)

- (ii) John wants to build a roof truss that is “4 on 12” (see diagram below). If the roof truss height changes to 6 feet, how wide will the new roof truss be?



(G3.5)

*Performance*

- Each student is given a triangle. Cooperative learning strategies, such as appointment cards, can be used to have students meet in pairs to compare their triangles. Ask them to determine and justify why the triangles are or are not similar. This could also be extended to include other polygons.

(G3.1, G3.4)

**Resources/Notes****Authorized Resource***Math at Work 10*

7.1 Similarity

SB: pp. 324-335

TR: pp. 337-346

BLM 7-4, 7-5

## Geometry

### Outcomes

*Students will be expected to*

G3 Continued ...

### Achievement Indicators:

G3.5 Continued

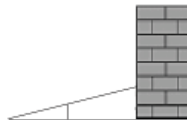
### Elaborations—Strategies for Learning and Teaching

As an alternative, the mirror technique can be used since this method works both indoors and outdoors. When you look into a mirror, you see light that has bounced off at the same angle that it hit the mirror, so your line of sight creates similar triangles. The goal is to create student interaction and promote mathematical understanding. A suggested classroom activity is to have students guess each other's height using this technique. This investigation can then lead to another group activity where students go to the gymnasium, for example, and measure the height of the basketball net. Students will make a sketch, show the similar triangles formed, take measurements, and find the required height of the object.



Engage students in a discussion about using similar triangles to find indirect measures for a variety of real-world applications. Students will then use similar triangles to solve for missing lengths in real world applications. You could consider situations such as the following:

Many public buildings in the past were built before wheelchair-access ramps became widespread. When it became time to design the ramps, unfortunately the doors of the buildings were already in place. Discussion should be centered around designing a ramp supported by a vertical beam.



Reiterate for students that, when creating a similar figure, there are two important features to remember. The measures of their corresponding angles are equal and the measures of their corresponding sides are proportional because they have increased or decreased by the same scale factor. Rulers and protractors can be used to construct similar polygons. Students can use dynamic geometry software to construct a shape and then reduce or enlarge it. As well, students can draw a shape on one square grid and then redraw it on a grid with a different scale (smaller or larger squares).

G3.6 Draw a polygon that is similar to a given polygon.

## General Outcome: Develop spatial sense.

### Suggested Assessment Strategies

#### *Paper and Pencil*

- Students have been asked to create a poster to advertise a field trip to see the lighthouse in Codroy Valley. They want to enlarge a photo of the lighthouse that is 3.5 inches wide and 5 inches long. Ask students to determine how long it will be if the enlargement is to be 16 inches wide. They should draw a sketch of the lighthouse image using the new dimensions.

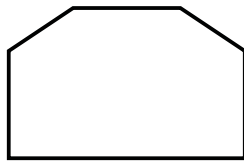
(G3.5)

#### *Performance*

- The diagram represents the top view of a patio. Students could choose one of the following parallel tasks.

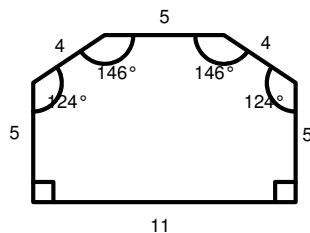
Either:

- (i) Measure the angles and sides and reproduce the drawing using a scale factor of 2.



Or:

- (ii) Given the same diagram with the angle measures, reproduce the drawing using a scale factor of 2.



(G3.5, G3.6)

- In small groups, students can create sets of similar triangles (one per student). Combine all class triangles and ask students to sort by similarity.

(G3.1, G3.6)

### Resources/Notes

#### Authorized Resource

*Math at Work 10*

7.1 Similarity

SB: pp. 324-335

TR: pp. 337-346

BLM 7-4, 7-5

#### Web Links

- [learner.org/courses/learningmath/geometry/session8/part\\_b/measuring.html](http://learner.org/courses/learningmath/geometry/session8/part_b/measuring.html)

This is a link to videos that:

- demonstrate the mirror trick and how similarity of triangles can be used to estimate height
- show how similar triangles are used to calculate the position of radiation treatment for cancer patients

- [http://nlvm.usu.edu/en/nav/category\\_g\\_4\\_t\\_3.html](http://nlvm.usu.edu/en/nav/category_g_4_t_3.html)

This dynamic geometry software can be used to perform dilatations.

## Geometry

### Outcomes

*Students will be expected to*

**G4 Demonstrate an understanding of primary trigonometric ratios (sine, cosine, tangent) by:**

- applying similarity to right triangles
- generalizing patterns from similar right triangles
- applying the primary trigonometric ratios
- solving problems.

[CN, PS, R, T, V]

**A1 Solve problems that require the manipulation and application of formulas related to:**

- perimeter
- area
- the Pythagorean theorem
- primary trigonometric ratios
- income.

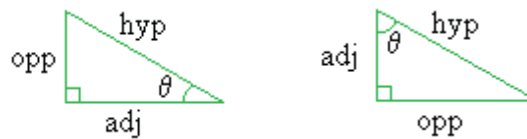
[C, CN, ME, PS, R]

### Elaborations—Strategies for Learning and Teaching

Students will be introduced to the three primary trigonometric ratios by applying similarity and generalizing patterns from similar right triangles. Since this is the first exposure to trigonometry, students may be interested in some brief history of this particular branch of mathematics.

The term trigonometry comes from two Greek words, trigon and metron, meaning “triangle measurement”. A trigonometric ratio is a ratio of the lengths of two sides of a right triangle.

One of the difficulties students sometimes have when working with trigonometric ratios is correctly identifying the opposite and adjacent sides in relation to the reference angle. They should be exposed to right triangles with the reference angle in various locations, so that they recognize that the opposite and adjacent sides are relevant to the reference angle. Angles are often labeled using greek letters, such as theta ( $\theta$ ).



Students should realize that there are three possible pairs of sides with respect to the reference angle,  $\theta$ : opposite and hypotenuse, opposite and adjacent, and adjacent and hypotenuse.

It is intended that this outcome be integrated throughout the course. Students have already been exposed to problems related to perimeter (M3), area (M4), the Pythagorean theorem (A2) and income (N2). In this unit, the problems will require the manipulation and application of formulas related to the primary trigonometric ratios.

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**General Outcome: Develop spatial sense.**


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**Suggested Assessment Strategies**
*Paper and Pencil*

- Given a right triangle with the right angle and reference angle labelled, ask students to label the sides as opposite, adjacent and hypotenuse.

(G4)

*Performance*

- Ask students to draw a right triangle, mark the right angle and place a bingo chip on one of the acute angles. Students should then challenge their partner to place sticky notes which read opposite, adjacent and hypotenuse in the proper place.

(G4)

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**Resources/Notes**
**Authorized Resource***Math at Work 10*

7.2 The Tangent Ratio

7.3 The Sine and Cosine Ratios

SB: pp. 336-347, 348-363

TR: pp. 347-355, 356-367

BLM 7-6, 7-7, 7-8, 7-9, 7-10,  
7-11

## Geometry

### Outcomes

Students will be expected to

G4 Continued ...

#### Achievement Indicators:

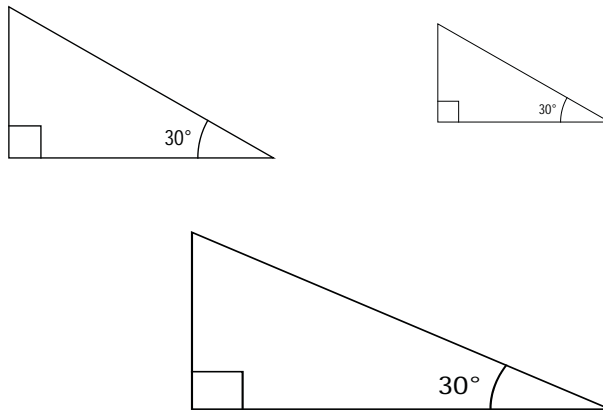
G4.1 Show, for a specified acute angle in a set of right triangles, that the ratios of length of the side opposite to the length of the side adjacent are equal, and generalize a formula for the tangent ratio.

G4.2 Show, for a specified acute angle in a set of right triangles, that the ratios of length of the side opposite to the length of the hypotenuse are equal, and generalize a formula for the sine ratio.

G4.3 Show, for a specified acute angle in a set of right triangles, that the ratios of length of the side adjacent to the length of the hypotenuse are equal, and generalize a formula for the cosine ratio.

### Elaborations—Strategies for Learning and Teaching

Students should investigate the three ratios between the lengths of pairs of sides in right-angled triangles. They could begin this process by constructing several similar right triangles, each with an angle of  $30^\circ$ .



Using  $30^\circ$  as the reference angle, students could then measure the opposite and adjacent sides and the hypotenuse for each triangle, and determine the appropriate ratios (opposite to adjacent, opposite to hypotenuse, and adjacent to hypotenuse) for each. Students should notice that the value of any given ratio stays constant, regardless of the size of the triangle. They should then repeat this process for right triangles containing angles of other sizes. As the reference angle changes, the values of the three ratios change. Students should conclude that in any right triangle, the ratios of the different pairs of sides remain constant for a given acute angle, regardless of the size of that angle or the size of the triangle.

Once students have a clear understanding of the concept of these ratios being fixed for any given angle, the formal mathematical names can be introduced.

$$\sin \theta = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\cos \theta = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\tan \theta = \frac{\text{opposite}}{\text{adjacent}}$$

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**General Outcome: Develop spatial sense.**


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**Suggested Assessment Strategies**
*Portfolio*

- Ask students to draw and label a right triangle and state the three primary trigonometric ratios.

(A1.1, G4.1, G4.2, G4.3)

*Paper and Pencil*

- Ask students to create their own problem and distribute to other students to complete a solution to the problem.

(A1.2)

*Performance*

- Students can play the game found at [slidermath.com/rpoly/Trigapps.shtml](http://slidermath.com/rpoly/Trigapps.shtml) to practice word problems that require the use of sine, cosine and tangent.

(G4.1, G4.2, G4.3)

- Ask students to create their own mnemonic for the primary trigonometric ratios. Students can share their mnemonics and the class can vote for the preferred one.

(G4.1, G4.2, G4.3)

**Resources/Notes**
**Authorized Resource**

*Math at Work 10*

7.2 The Tangent Ratio

7.3 The Sine and Cosine Ratios

SB: pp. 336-347, 348-363

TR: pp. 347-355, 356-367

BLM 7-6, 7-7, 7-8, 7-9, 7-10, 7-11

## Geometry

### Outcomes

*Students will be expected to*

G4, A1 Continued ...

#### Achievement Indicators:

G4.4 *Identify situations where the trigonometric ratios are used for indirect measurement of angles and lengths.*

G4.5 *Solve a contextual problem that involves right triangles, using the primary trigonometric ratios.*

A1.1 *Solve a contextual problem that involves the application of a formula that does not require manipulation.*

A1.2 *Solve a contextual problem that involves the application of a formula that requires manipulation.*

A1.3 *Explain and verify why different forms of the same formula are equivalent.*

### Elaborations—Strategies for Learning and Teaching

Once students have a clear picture of the connection between the trigonometric ratios and the reference angle, they can use them to determine missing side lengths and angle measures. Students have used the Pythagorean theorem to find the length of the third side in a right triangle when given the lengths of the other two sides. They can now use the appropriate trigonometric ratio to determine a side length when given an angle measure and another side length. In Grade 9, students solved equations of the form  $a = \frac{b}{c}$  (9PR3). A review of this may be necessary prior to solving equations such as  $\tan 30^\circ = \frac{x}{10}$  or  $\tan 30^\circ = \frac{5}{x}$ .

Students will also use the sine, cosine or tangent ratios to determine the measure of a missing acute angle in a right triangle. This will require the use of the inverse of the ratio.

It is expected that students will use a calculator to find trigonometric ratios and angle measurements for given trigonometric ratios. Practice using the calculator is essential and students should be aware of the need to work in degree mode.

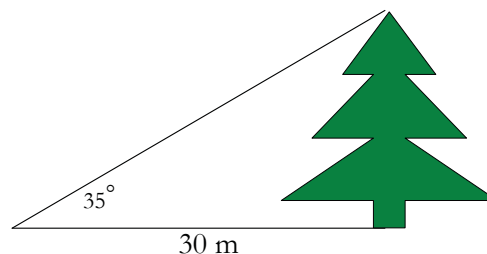
Using the trigonometric ratios to solve problems will help clarify their value. Examples such as the following could be presented:

- The escalator in a shopping mall rises 76 feet at an angle of  $30^\circ$ .



To find the distance a person travels on the escalator stairs, the sine ratio would be used.

- Use a trigonometric ratio to determine the height of the tree.



Students should also apply the appropriate trigonometric ratios to solve triangles.

## General Outcome: Develop spatial sense.

### Suggested Assessment Strategies

#### Journal

- Ask students to describe how they would determine the height of a flagpole which they cannot climb in each of the following cases:
  - on a very sunny day, you and your friend have a tape measure
  - it is a very cloudy, overcast day and you and your friend have a metre stick and a clinometer (a device to measure angle of elevation)

(G4.4, G4.5)

#### Performance

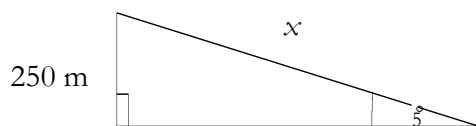
- Students could make a graffiti wall. Each student draws a right triangle on a sticky note, labels the right angle, and marks one acute angle with a star. They also write a length value for any two sides. Remind students that the hypotenuse must be the longest. Have them post their notes on the wall. Students then choose a sticky other than their own and determine which ratio can be identified. They then place it in the appropriate section of the board under sine, cosine or tangent.

(G4.5, A1.1)

#### Paper and Pencil

- Ask students to answer the following:
  - A guy wire 6 m long is holding up a telephone pole. The guy wire makes an angle of  $70^\circ$  with the ground. At what height on the telephone pole is the guy wire attached?
 

(A1.2, A1.5, G4.5)
  - An airplane is approaching the St. John's airport as represented by the diagram. Find the line of sight distance from the airplane to the terminal.



(A1.2, A1.4, A1.5, G4.5)

- A ramp 4 m long is being built to reach a loading dock that is 1.5 m in height. What is the measure of the angle between the ramp and the ground?

(A1.2, A1.4, A1.5, G4.5)

### Resources/Notes

#### Authorized Resource

*Math at Work 10*

7.2 The Tangent Ratio

7.3 The Sine and Cosine Ratios

7.4 Finding Unknown Angles

SB: pp. 336-347, 348-363, 364-375

TR: pp. 347-355, 356-367

BLM 7-6, 7-7, 7-8, 7-9, 7-10, 7-11, 7-12, 7-13

#### Web Link

[www.k12pl.nl.ca](http://www.k12pl.nl.ca)

The professional learning site provides a classroom clip of the graffiti wall performance strategy being used. It also offers a clip of students using a clinometer to determine angle measures.

## Geometry

### Outcomes

Students will be expected to  
G4, A1 Continued ...

#### Achievement Indicators:

A1.6 Describe, using examples, how a given formula is used in a trade or an occupation.

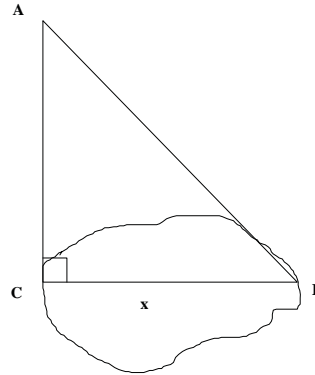
A1.4 Create and solve a contextual problem that involves a formula.

A1.5 Identify and correct errors in a solution to a problem that involves a formula.

G4.6 Determine if a solution to a problem that involves primary trigonometric ratios is reasonable.

### Elaborations—Strategies for Learning and Teaching

Trigonometric ratios are used in many different trades and occupations. Carpenters, pipefitters and tailors use them on a regular basis. Trigonometry is used, for example, in surveying to determine height and distances, in navigation to determine location, and in construction to determine the roof pitch. For example, a surveyor could use the sine ratio to determine the length of a pond if AB is 15 km of a section of highway and  $\angle A$  is  $50^\circ$ .



Often, there are terms that are specific to an occupation, but knowledge of mathematics can be used to help solve problems. A pipefitter, for example, would use the terms *offset*, *run* and *travel*, but these are actually the opposite and adjacent sides and the hypotenuse of a right triangle.

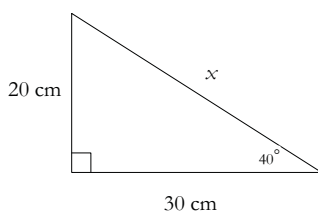
Engaging students in error analysis heightens awareness of common errors. Along with providing the correct solutions, they should be able to identify incorrect solutions, including why errors might have occurred and how they can be corrected. This reinforces the importance of recording solution steps rather than only giving a final answer.

To determine if a solution is reasonable, students should ask themselves questions such as:

- Is the hypotenuse the longest side in the triangle?
- Is the smallest angle opposite the shortest side?
- Is the angle measure too big for the triangle whose angles have a sum of  $180^\circ$ ?

**General Outcome: Develop spatial sense.****Suggested Assessment Strategies***Paper and Pencil*

- Ask students to identify and correct any errors in the following solution:



$$\begin{aligned}\sin 40^\circ &= \frac{30}{x} \\ x \sin 40^\circ &= 30 \\ x &= \frac{30}{\sin 40^\circ} \\ x &\doteq 46.7\end{aligned}$$

(A1.5, G4.6)

*Project*

- Students could research how trigonometric ratios can be used in a trade or an occupation such as:
  - surveying
  - plumbing/pipefitting
  - construction
  - warehouse job
  - lighting technician
  - any other occupation of interest

(A1.6)

*Interview*

- Ask students to design a question that involves the application of the trigonometric ratios as it applies to a trade or occupation.  
Teachers could invite tradespeople to visit the class. Students could ask their questions to begin discussion of how trigonometry is used in the various trades.

(A1.6, G4.4, G4.5)

**Resources/Notes****Authorized Resource***Math at Work 10*

7.2 The Tangent Ratio

7.3 The Sine and Cosine Ratios

7.4 Finding Unknown Angles

SB: pp. 336-347, 348-363, 364-375

TR: pp. 347-355, 356-367, 368-376

BLM 7-6, 7-7, 7-8, 7-9, 7-10, 7-11, 7-12, 7-13

## Geometry

### Outcomes

*Students will be expected to*

**G1 Analyze puzzles and games that involve spatial reasoning, using problem-solving strategies.**

[C, CN, PS, R]

### Achievement Indicators:

G1.1 *Determine, explain and verify a strategy to solve a puzzle or to win a game; e.g.,*

- *guess and check*
- *look for a pattern*
- *make a systematic list*
- *draw or model*
- *eliminate possibilities*
- *simplify the original problem*
- *work backward*
- *develop alternative approaches.*

G1.2 *Identify and correct errors in a solution to a puzzle or in a strategy for winning a game.*

G1.3 *Create a variation on a puzzle or a game, and describe a strategy for solving the puzzle or winning the game.*

### Elaborations—Strategies for Learning and Teaching

This outcome is intended to be integrated throughout the course by using puzzles and games focused on sliding, rotation, construction and deconstruction. These are intended to help students enhance spatial reasoning and problem-solving strategies.

Students internalize what they have learned when they apply their learning to other situations. Considering two puzzles or games they have worked on, discuss what is different and what is the same. Ask them how well strategies for one game would apply to the other. Is it possible to invent a new game that blends rules from both games?

Extend the discussion to other situations. Discuss ways that solving puzzles is similar to solving problems in mathematics. Consider common events, such as planning a trip. Point out to students that when you plan a trip you often work backwards to ensure everything gets done before you leave. Ask them to consider how other strategies used to solve puzzles or play games can be applied to everyday planning.

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**General Outcome: Develop spatial sense.**

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**Suggested Assessment Strategies***Paper and Pencil*

- Puzzles can be classified using a Venn diagram. Ask students to list 10 puzzles and decide on 3 or 4 attributes for classifying the puzzles. They can sort the puzzles into categories. For categories with no members, they could find existing types of puzzles or invent new ones.

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**Resources/Notes****Authorized Resource***Math at Work 10*

Games and Puzzles

Trig Solitaire SB: p. 381

Trig's a Snap SB: p. 381

TR: p. 382

BLM 7-16

