

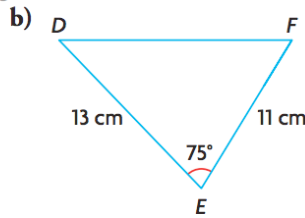
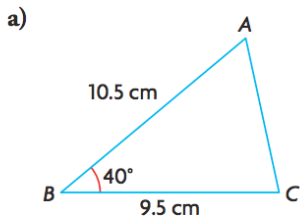
BIG PICTURE of this Unit

- How can we extend our geometry skills with triangles to go beyond right triangles to (i) obtuse triangles and (ii) circles and Cartesian Planes?
- What do triangles have to do with sinusoidal functions in the first place?
- How can we connect previously learned function concepts and skills to sinusoidal functions?
- How can use the equation of a sinusoidal function be used to analyze for key features of a graph of a sinusoidal curve?
- When and how can triangles and sinusoidal functions be used to model real world scenarios?

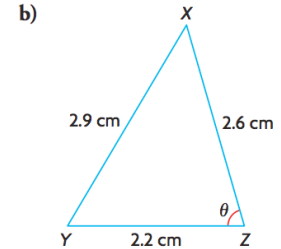
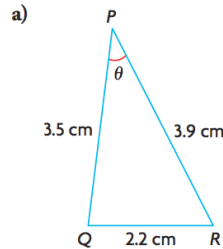
1. (CA) In the following right triangle trig problems, you must first create a diagram to visualize the problem. Then, use the diagram to help you solve the problem. {2,4}
 - a. A plane is flying at an elevation of 35,000 feet within sight of the Giza Pyramids. The pilot would like to estimate her distance from the pyramids. She finds that the angle of depression to a point on the ground beside the pyramid is 22° .
 - i. What is the direct distance between the plane and the pyramid?
 - ii. What is the distance between a point on the ground directly below the plane and the pyramid? (along the ground)
 - b. From the top of a 200 foot lighthouse, the angle of depression to a ship on the ocean is 23° . How far is the ship from the base of the lighthouse?
 - c. A 96 foot tree casts a shadow that is 120 feet long. What is the angle of elevation of the sun?
 - d. A man who is 6 feet tall is on the beach, flying a kite. He holds the end of the kite string and estimates the angle of elevation of the kite to be 50° . If the string is 45 feet long, how high is the kite above the ground?
 - e. The altitude of an equilateral triangle is 5 cm. What is the length of a side of the triangle?
 - f. Find the altitude of an isosceles triangle with base 4.24 feet. The vertex angle of the triangle measures 85° .
2. (CA) To investigate the relationship between linear functions and angles: {2,4}
 - a. Graph the line $f(x) = 2x$
 - b. Label the following points on the line you graphed: A(0,0); B(3,0); C(3,6)
 - c. Draw right triangle ABC
 - d. To determine the measure of angle BAC, which trigonometric ratio could you use?
 - e. Hence, determine the measure of angle BAC
 - f. OBSERVATION: Determine the slope of the line, $f(x) = 2x$.
 - g. OBSERVATION: State the value of the tangent ratio of angle BAC.
 - h. CONCLUSION: What do you notice about your answers from Q(f) & Q(g)?

3. (CA) Solve the following triangles using the Sine Law (you will find the measure of ALL 3 sides and ALL 3 angles) OR explain why it may not be possible to solve these triangles using the Sine Law. For those that are NOT possible, solve them using right triangle trigonometry based strategies. {8,9,10}
- In $\triangle ABC$, $\angle B = 79^\circ$ and $\angle C = 66^\circ$ and $a = 36$ cm
 - In $\triangle ABC$, $\angle A = 56^\circ$ and $a = 6.7$ cm and $b = 7.2$ cm
 - In $\triangle DEF$, $\angle F = 63^\circ$ and $e = 9.0$ cm and $d = 9.5$ cm
4. (CA) Go to this GEOGEBRA animation to investigate the cosine law → <https://www.geogebra.org/m/CPeCKmBu>. Hence:
- Explain WHEN the cosine law needs to be used {9}
 - Solve for the required unknowns in the following diagrams {9}

3. Determine each unknown side length.



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



5. (CA) The point P (-3, 4) is on the terminal arm of an angle, θ , in standard position. {11,12}
- Sketch the principal angle, θ and show the related acute/reference angle.
 - Determine the values of the sine, cosine and tangent ratios of θ .
 - Determine the value of the related acute angle to the nearest degree.
 - What is the measure of θ to the nearest degree?
6. (CA) Omar rides on a Ferris wheel. The vertical distance, in meters, of a rider with respect to the horizontal diameter is modelled by $h(t) = 5 \cos (18t)^\circ$, where t is the number of seconds.
- To one decimal place, what is the riders verical distance with respect to the horizontal diameter of the wheel when $t = 8$ s? $t = 16$ s? $t = 30$ s?
 - When is the rider first at $h(t) = 4.5$ m?
 - When is the third time the rider is at -2.5 m?



Higher Level Questions for More Complex Concepts OR an EXTENSION of basic concepts involved with triangle trigonometry and sinusoidal functions.

1. (CA) You are given a triangle enclosed by the following lines: Line #1: $y = x + 10$ and Line #2: $y = -2x + 6$ and then Line #3: $x + 2y = 10$.
 - a. Draw the lines, outline the triangle and then determine the measure of all three interior angles.
 - b. Determine the area of the triangle using Heron's formula

2. (CA) Word problems

Problem 1.

- 18. Thinking, Inquiry, Problem Solving:** A given pyramid has a regular hexagonal base. Each side of the base is 12.5 cm and the vertical height of the pyramid is 20.0 cm. Determine
- (a) the measure of the apex angle of each face
 - (b) the surface area of the pyramid
 - (c) the volume of the pyramid

Problem 2.

- 7.** Suppose Romeo is serenading Juliet while she is on her balcony. Romeo is facing north and sees the balcony at an angle of elevation of 20° . Paris, Juliet's other suitor, is observing the situation and is facing west. Paris sees the balcony at an angle of elevation of 18° . Romeo and Paris are 100 m apart as shown. Determine the height of Juliet's balcony above the ground, to the nearest metre.

