

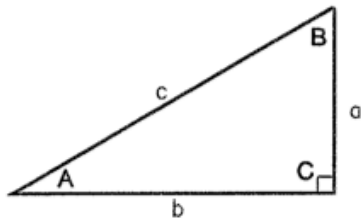
IM 3 Lesson 5.5: Trig Overview

BIG PICTURE of this UNIT:	<ul style="list-style-type: none"> Working with RTT Working with Sine and Cosine Law Sinusoidal Functions Unit Circle and Radians 		
CONTEXT of this LESSON:	Where we've been We have been working RTT, Sine, and Cosine Law.	Where we are We want to solidify our work with those laws by extending our learning into topics that are a bit more complex	Where we are heading After this we head to sinusoidal functions. .

Lesson Objectives:

Level	# of Problems	Points per problem
Level 1	6 Problems	6 Points
Level 2	4 Problems	10 Points
Level 3	3 Problems	15 Points
Level 4	1 Point	45 Points

RIGHT TRIANGLE FORMULAS

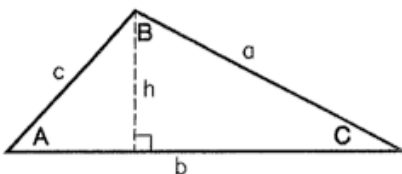


PYTHAGOREAN THEOREM: $a^2 + b^2 = c^2$

AREA: $\frac{1}{2}ab$

TRIGOMETRIC FUNCTIONS: $\sin A = \frac{a}{c}$ $\cos A = \frac{b}{c}$
 $\tan A = \frac{a}{b}$

OBLIQUE TRIANGLE FORMULAS



LAW OF SINES: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

LAW OF COSINES: $a^2 = b^2 + c^2 - 2bc \cos A$

AREA: $\frac{1}{2}bh$

Level 1 problems

Problem 1.

A new road requires building a bridge across a river. To determine the width of the river, a surveyor stakes out a base line of 300 m along the bank of a river. She places the line so that a tree on the opposite bank of the river lies between the ends of the line. From each end of the base line, she sights the position of the tree. The lines of sight to the tree make angles of 36° and 44° with the base line. Determine the width of the river.



Problem 2.

Example 1

Mark is a landscaper who is creating a triangular planting garden. The homeowner wants the garden to have two equal sides and contain an angle of 135° . Also, the longest side of the garden must be exactly 5 m.

- (a) How long is the plastic edging that Mark needs to surround the garden?
- (b) Determine the area of the garden.

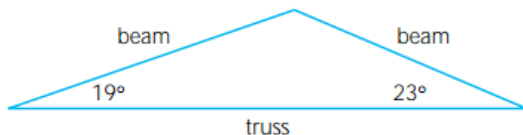
Problem 3.

10. The Leaning Tower of Pisa leans toward the south at an angle of about 5.5° . On one day, its shadow is 90 m long, and the angle of elevation from the tip of the shadow to the top of the tower is 32° .

- (a) What is the slant height of the tower?
- (b) How high is the tip of the tower above the ground?

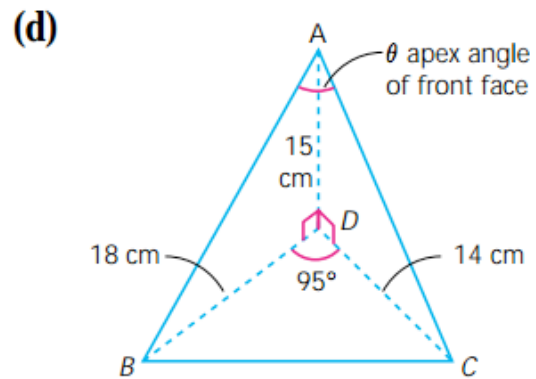
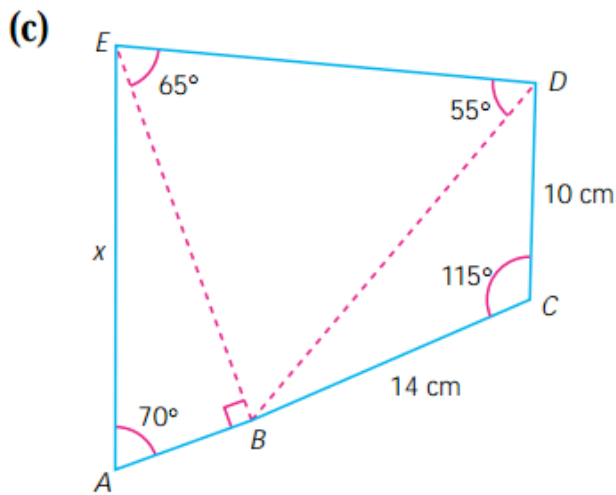
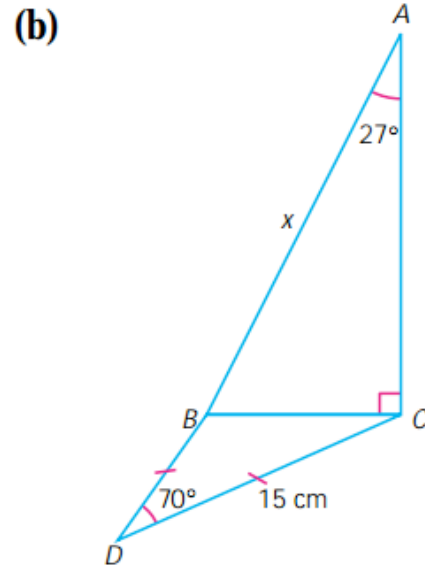
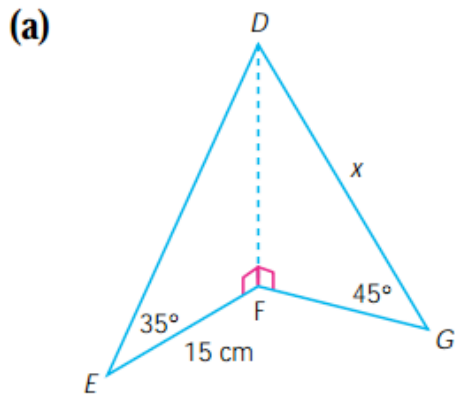
Problem 4.

9. **Knowledge and Understanding:** A roof truss is 10.4 m wide and the angles formed by the roof beams are 19° and 23° . How long is each roof beam?



Problem 5.

7. Determine the measure of the indicated side or angle correct to the accuracy given in the question.



Level 2 Problems

Problem 1

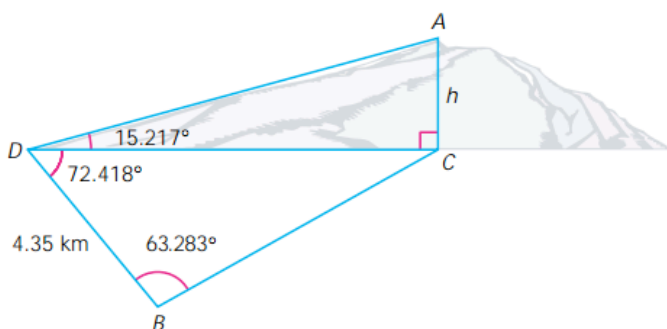
Example 2

The Great Pyramid at Giza in Egypt has a square base with sides of 232.6 m long. The distance from the top of the pyramid to each corner of the base was originally 221.2 m.

- (a) Determine the angle each face makes with the base.
- (b) Determine the size of the apex angle of a face of the pyramid.

Problem 2.

16. A surveyor uses a diagram to help determine the height, h , of a mountain.



- (a) Use $\triangle BDC$ to determine $\angle C$.
- (b) Use $\triangle BDC$ and the sine law to determine DC .
- (c) Use $\triangle ADC$ to calculate h .

Problem 3.

14. **Application:** Two forest fire towers, A and B , are 20.3 km apart. The bearing from A to B is $N70^\circ E$. The ranger in each tower observes a fire and radios the fire's bearing from the tower. The bearing from tower A is $N25^\circ E$. From tower B , the bearing is $N15^\circ W$. How far is the fire from each tower?

Problem 4.

12. A surveyor needs to estimate the length of a swampy area. She starts at one end of the swamp and walks in a straight line, 450 paces and turns 60° towards the swamp. She then walks in another straight line, 380 paces before arriving at the other end of the swamp. One pace is about 75 cm. Estimate the length of the swamp in metres.

Level 3 Problems

Problem 1.

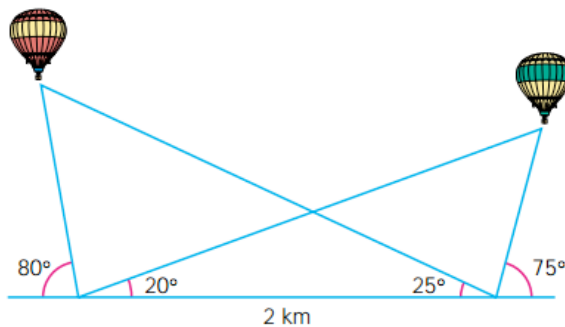
18. **Thinking, Inquiry, Problem Solving:** A given pyramid has a regular hexagonal base. Each side of the base is 12.5 cm and the vertical height of the pyramid is 20.0 cm. Determine
- the measure of the apex angle of each face
 - the surface area of the pyramid
 - the volume of the pyramid

Problem 2.

17. Two roads intersect at an angle of 12° . Two cars leave the intersection, each on a different road. One car travels at 90 km/h and the other car at 120 km/h. After 20 min, a police helicopter 1000 m directly above and between the cars, notes the angle of depression of the slower car is 14° . What is the horizontal distance from the helicopter to the faster car?

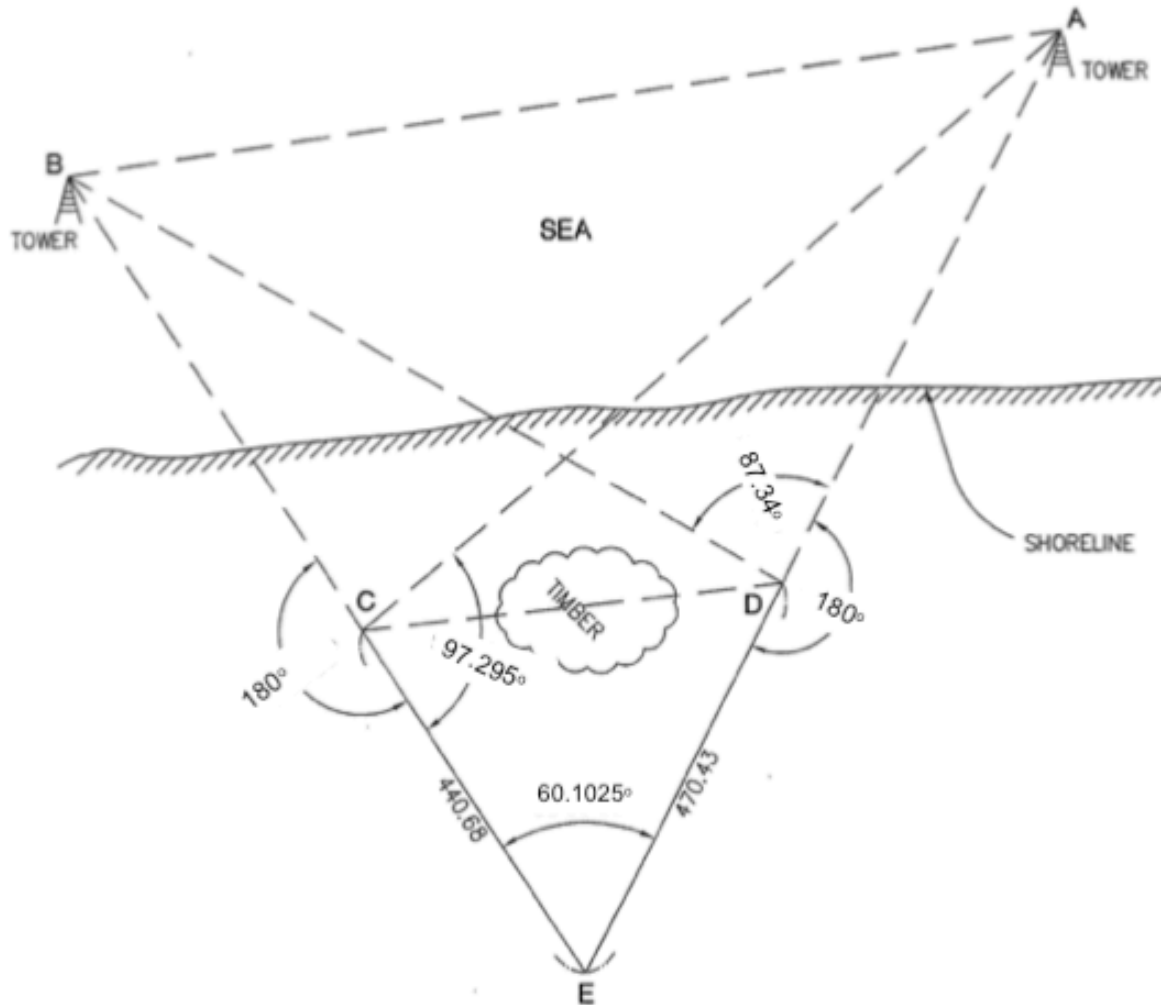
Problem 3.

20. Two hot air balloons are moored directly over a level road. The diagram shows the angle of elevation of the balloons from two observers 2 km apart.
- To the nearest tenth of a kilometre, how far apart are the balloons?
 - Which balloon is higher, and by how many metres?



Level 4 Problem

Problem 4: The government has constructed offshore communication towers to help monitor the coastal waters. A Fiber Optic Cable need to be connect from the points on land to the Towers for increased security. This cable will enable the towers to transmit information quicker, for surveillance and environmental purposes. We need you to find the following distances for our Engineers. Please write your answers to the nearest Thousandths Place



Find the following:

- Distance AC
- Distance AD
- Distance BD
- Distance BC
- Distance CD
- Distance AB