### (A) Lesson Context

BIG PICTURE of this UNIT:	• How do I determine the measure of angles in geometric shapes, without direct measurement? • How do I solve for sides or angles in right triangles? • How can I solve problems that require geometric models using right triangles??

(B) Lesson Objectives:

a. Work with the relationships that exist between the ratio of the sides of a right triangle and the measurement of the non-right angles

b. Solve problems modeled using multiple right triangles

(C) Skill Review: Pythagorean Theorem

**Example 1:** Find the values of h and s in the two triangles below:
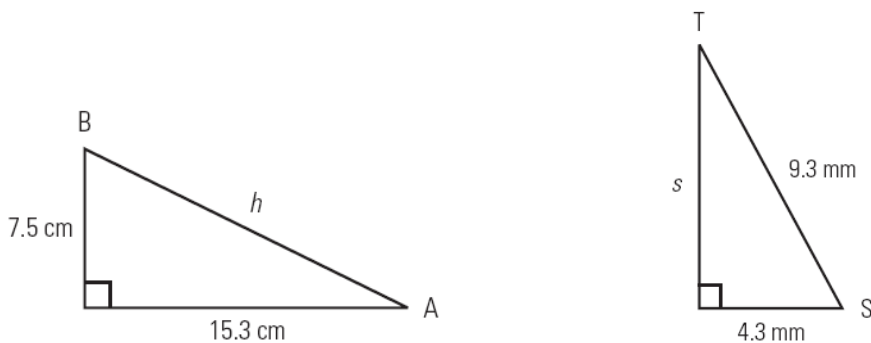
REVIEW ➔ SOH CAH TOA

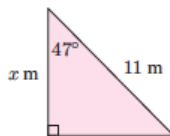| Sine	Cosine	Tangent
Sine of angle $A = \dfrac{\text{Opp}}{\text{Hyp}}$	Cosine of angle $A = \dfrac{\text{Adj}}{\text{Hyp}}$	Tangent of angle $A = \dfrac{\text{Opp}}{\text{Adj}}$

Please solve for the indicated variable. Round to 3 decimal places.

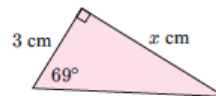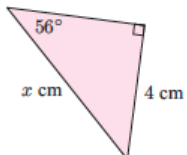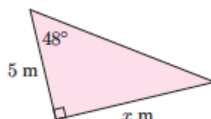Find, to 3 significant figures, the unknown length in the following triangles:
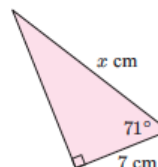
a

x cm

8 cm 61°

b

47° x m 11 m

c

3 cm 69° x cm

d

56° x cm 4 cm

e

48° 5 m x m

f

x cm 71° 7 cm
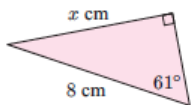
Complex Situations

For those of you NOT ready or confident of working with the trig ratios YET, follow this link and work through more practice questions from this worksheet

(http://cdn.kutasoftware.com/Worksheets/Geo/9-Solving%20Right%20Triangles.pdf)
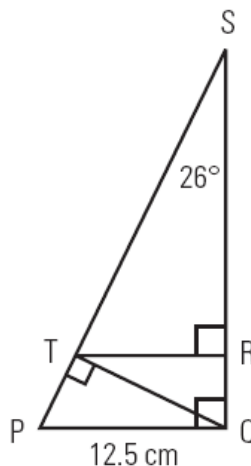
Trigonometric ratios can be used to solve real-life situations; these calculations may require multiple steps.

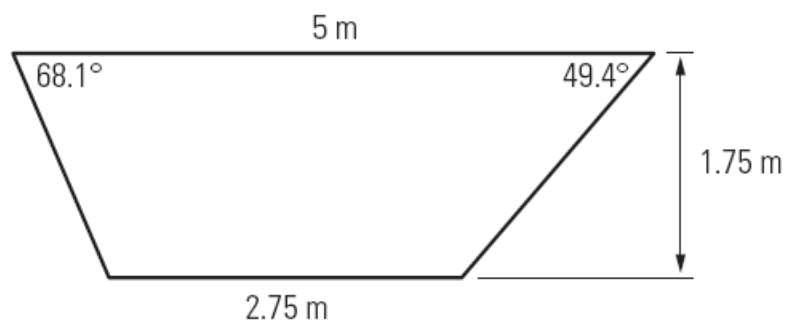*Note: the sum of the angles in a triangle is 180º.*
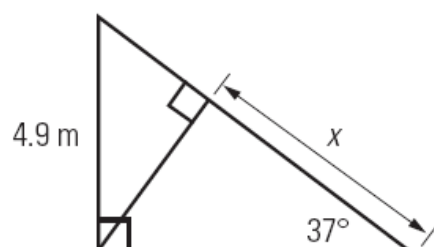
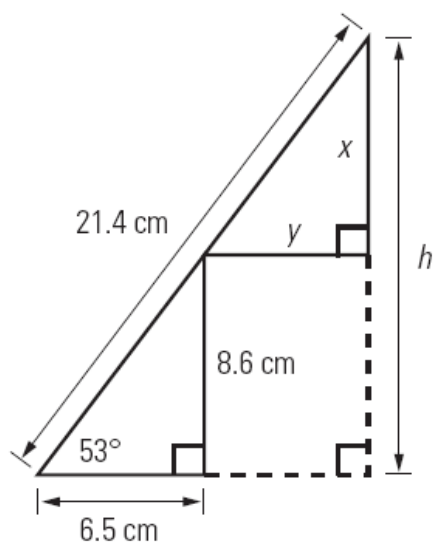What is the length of x?

Solve for QS, ST, and RT.

X 35° 33 cm 19 cm

S 26° T R P Q 12.5 cm
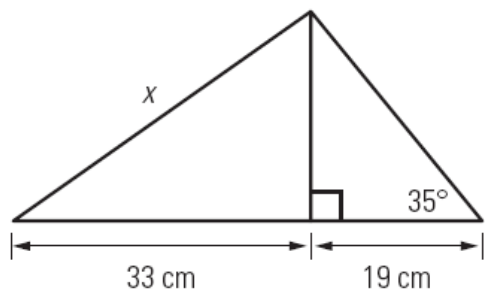
Pauline is building a fence around her vegetable garden, shown below. What length of fence will she need to build?

5 m

68.1°   49.4°

1.75 m

2.75 m

Calculate x in the following diagram.

4.9 m

x

37°

Calculate x, y, and h for the following diagram.

x

21.4 cm

y

h

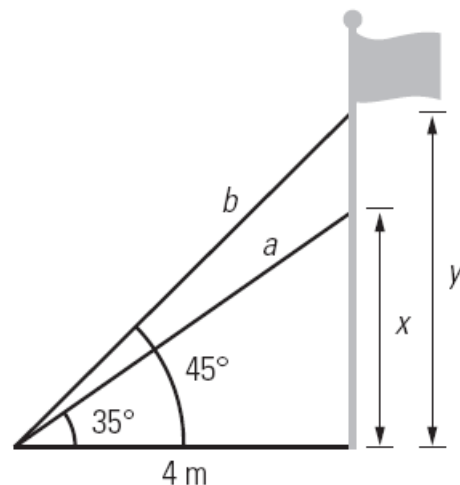8.6 cm

53°

6.5 cm

Solve for x and y in the following diagram.

40°   6.4 m

x

68°

y
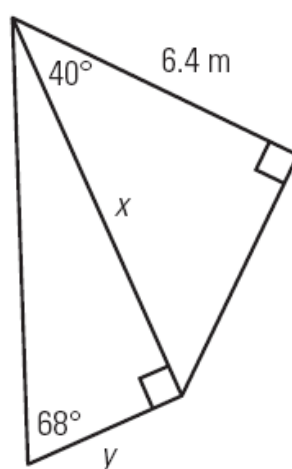
A flagpole is supported by two guy wires, each attached to a peg in the ground 4 m from the base of the pole. The guy wires have angles of elevations of 35° and 45°.
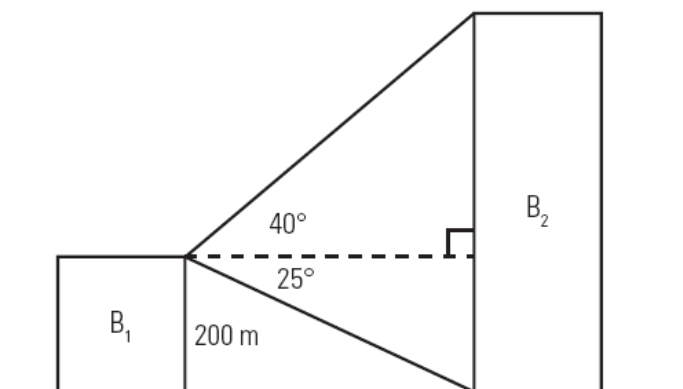
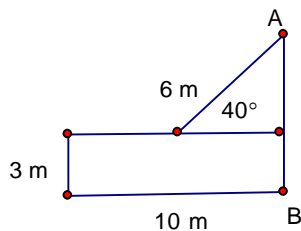a) How much higher up the flagpole is the top guy wire attached?

b) How long is each guy wire?

From the top of a 200 m-tall office building, the angle of elevation to the top of another building is 40°. The angle of depression to the bottom of the second building is 25°.
***How tall is the second building?***
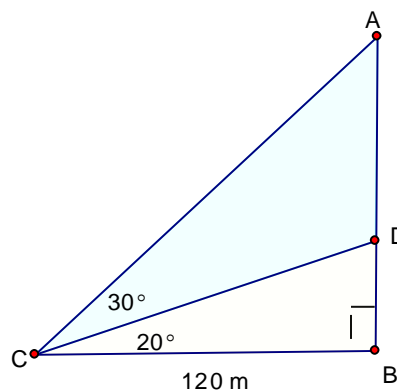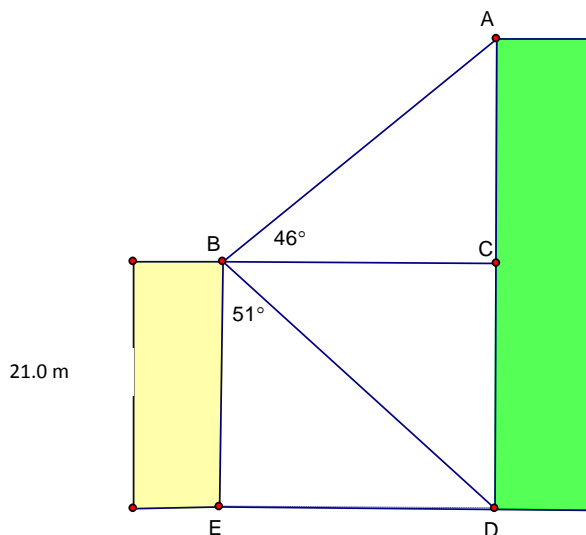
Find the length of AB.

Example 1

Two students want to determine the heights of two buildings. They stand on the roof of the shorter building. The students use a clinometer to measure the angle of elevation of the top of the taller building. The angle is 44°. From the same position, the students measure the angle of depression of the base of the taller building. The angle is 53°. The students then measure the horizontal distance between the two buildings. The distance is 18.0 m. The students drew this diagram. How tall is each building?
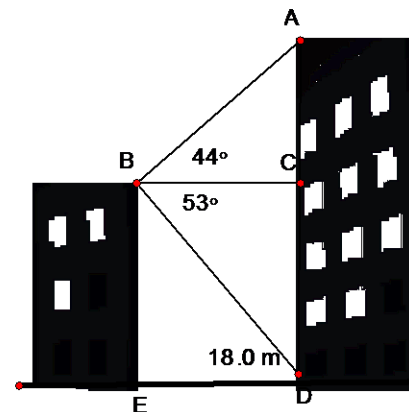
Example 2

How would you calculate the length of AB using the information

provided? Show all your steps.

Assignment

From the top of a building 21.0 m tall, the angle of

elevation of the top of a taller building is 46°. The angle

of depression of the base of the taller building is 51°.

What is the height of the taller building?

3. Find the length of AD. Show the steps of your solution.

A

55° D

46°

B   55.0 m   C
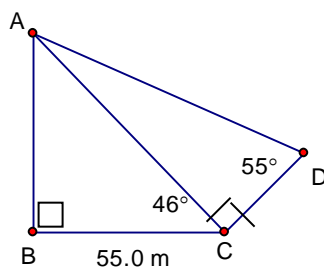
4. Sean wishes to find the length of a pole, CD, that is on the roof of a building. The angles of elevation of C and D are 40° and 28°, respectively. The distance AB is 40.0 m. Find the length of the pole. Show the steps of your solution.

C

D

building

A   B

40.0 m
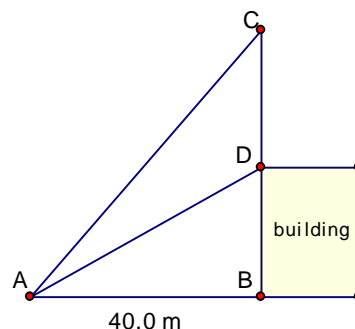
5. A person observes that from point A, the angle of elevation to the top of a cliff at D is 30°. Another person at point B, notes that the angle of elevation to the top of the cliff is 45°. If the height of the cliff is 80.0 m, find the distance between A and B. Show the steps of your solution.

D

30°   45°

A   B   C
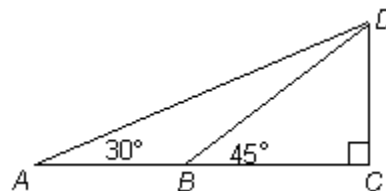
Challenge Problem!

Mr. Smith and Mr. Santowski are trying to figure out the height of a new building recently constructed in Cairo. They call it the Super Building. Mr. Smith started from the base of the building and walked for a while… then took an angle measurement from the ground to the top of the building… the device read 80.8858°. Then Mr. Smith realized he didn't count how far he was away from the base of the building. Mr. Santowski, not wanting to walk back, said… I have an idea. Mr. Santowski walked 13 more meters away from their current location and took another angle measurment from the ground. The measuring device read 73.3289°.

It was now that Mr. Santowski could figure out how tall the building is…

1. Draw a picture of this problem.
2. How tall is the building? Show your work.
3. How far was Mr. Smith from the base of the building when he took his first measurement?