

IM2 Problem Set 2.6 - Applying All Trigonometric Ratios in Multiple Triangles

<p>BIG PICTURE of this UNIT:</p>	<ul style="list-style-type: none"> ● 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??
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Part 1 - Skills Review

1. Zein is on the beach at El Gouna, doing some kite-surfing. The rope to the kite is 25 meters long and Zein estimates that the angle of elevation of the kite is 50° and he also estimates that he is holding the rope 2m above the water. How high above the water is the kite?
2. The altitude of an equilateral triangle is 5 cm. What is the area of this triangle?
3. Find the altitude of an isosceles triangle whose base is 4.25 m and whose vertex angle is 85° .
4. At CAC, a student needs a 93% average to earn an A. Maya has four scores in IM2 of 94%, 93%, 96%, and 91%. What is the lowest score she could earn on the fifth test and still earn an A?
5. A survey was conducted to determine the average income of residents of a particular neighborhood. Twenty people were surveyed outside of a grocery store. The results of this survey are given in the table below.

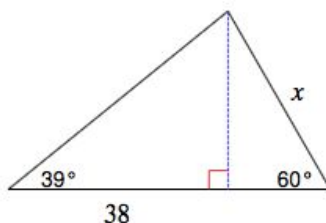
- a. Calculate the mean and median income based on this survey. Use a multiplicative process to determine the mean.
- b. Are there any outliers in this data set? If so, what data value? What effect does this outlier have on the mean value? Calculate the new median and mean if this data point were not used.

Income	Number of People
26,000	2
27,000	4
32,000	7
34,000	5
35,000	1
65,000	1

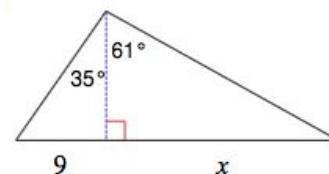
Part 2 - Working in Multiple Triangles

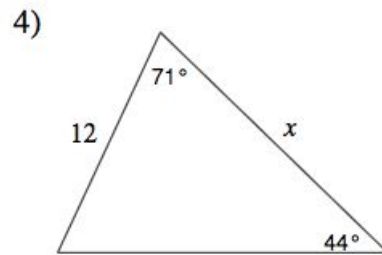
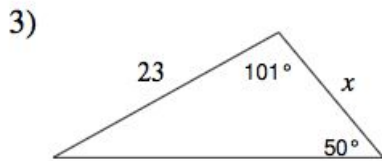
1. Find the length of the side labeled x . Round intermediate values to the nearest tenth. Use the rounded values to calculate the next value. Round your final answer to the nearest tenth. (NOTE: there is a HINT given in the diagrams of Q1 and Q2!!)

1)

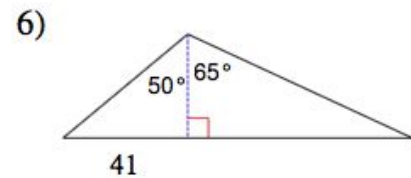
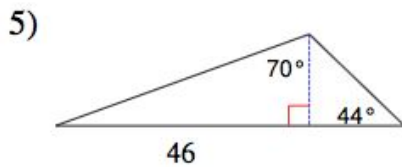


2)

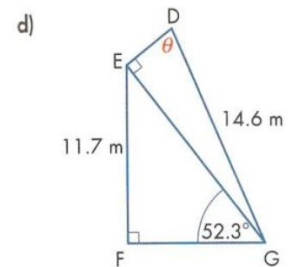
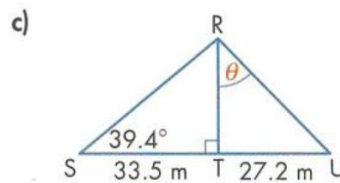
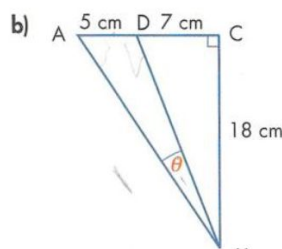
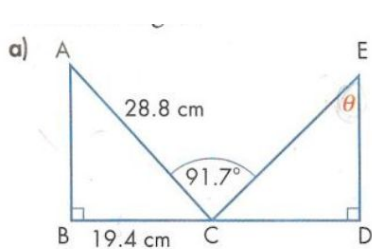




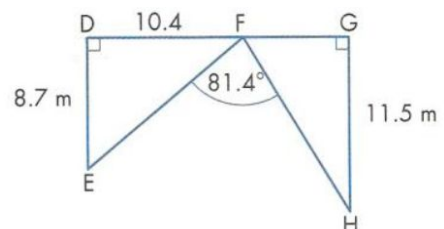
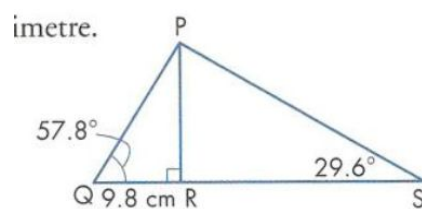
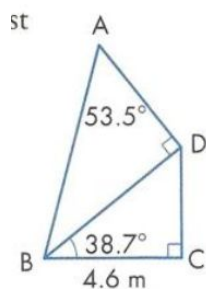
2. Find the area of each triangle. Round intermediate values to the nearest tenth. Use the rounded values to calculate the next value. Round your final answer to the nearest tenth.



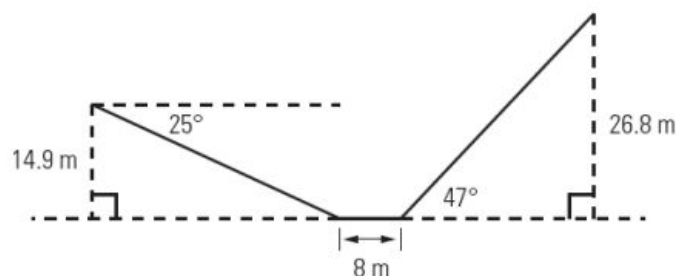
3. Find the measure of the angle in each of these triangles.



4. Solve for side AB in the first diagram and side RS in the second diagram and side FH in the third diagram.



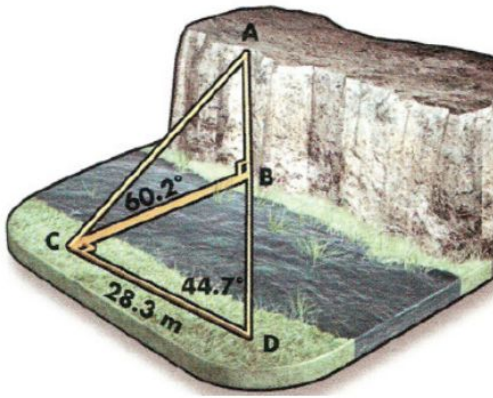
5. Here are word problems that do not have a diagram!!! So, step one is to make your own diagram and then of course, step two is to solve the problem!!
- To help reduce traffic problems in Cairo, a new bridge needs to be built across the Nile. The first step is to find out how wide the river is!! A surveyor is on one side of the river with a transit mounted on a tripod 1.2 m above the ground. An assistant stands on the other side of the river holding a 4 meter long pole upright. The angle of elevation from the transit to the top of the pole is 2.5° . How wide is the river?
 - Two watchtowers at an historic fort are located 375 meters apart. The first tower is 14 m tall and the second tower is 30 meters tall.
 - What is the angle of depression from the top of the second tower to the top of the first tower?
 - The guards in the towers simultaneously spot Amir. The angle of depression from the lower tower is 7.7° . For the guard in the higher tower, find the angle of depression that he needs to see Amir.
 - A forest ranger in a tower 128.0 m high sights two fires in the same line of sight with angles of depression of 42° and 61° . How far apart are the two fires?
 - From a window 26.0 m above the ground, the angle of elevation to the top of a nearby building is 39° , while the angle of depression to the bottom of the same building is 29° . How high is this nearby building?
 - A helicopter, directly above a building, sights a position, A, on the ground at an angle of depression of 38° . The helicopter then rises vertically a distance of d meters and the same position, A, now at an angle of depression of 52° . If Point A is 352 m from the building, how far has the helicopter risen?
 - A roller coaster has a track that drops at an angle of depression of 25° from a height of 14.9 m. When it reaches the ground, it travels horizontally for 8 m. It then rises at an angle of elevation of 47° to a height of 26.8 m.



- What is the total horizontal distance covered by this portion of track?
- What is the total distance travelled by a car on this portion of the roller coaster track?

6. Here are some 3D triangle trig word problems.

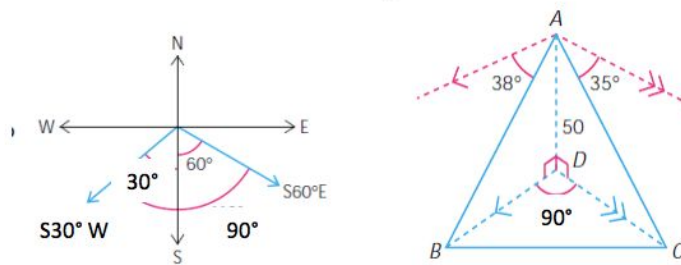
- a. A rock pillar lies in the middle of a river. Geologists set up a theodolite at point C and measured $\angle ACB$ to be 28.5° . A baseline CD was marked off, perpendicular to BC. The length of CD is 10 meters and $\angle CDB$ is 56.4° . If the height of the theodolite is 1.6 m, what is the height of the rock pillar, to the nearest tenth of a meter?



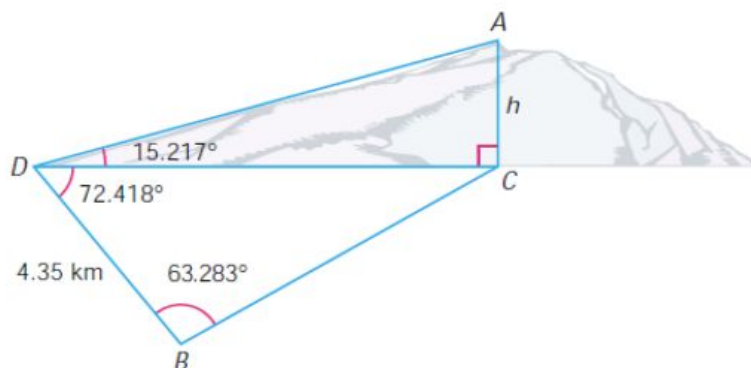
- b. A surveyor measured the height of a vertical rock face by determining the measurements shown. If the surveyor's theodolite had a height of 1.7 m, find the height of the rock face, AB, to the nearest tenth of a meter.

- c. From the top of a 50-m high bridge, two anchored boats are seen. One boat is $S30^\circ W$ and has an angle of depression of 38° . The other boat is $S60^\circ E$ and has a 35° angle of depression. How far apart are the boats?

Diagram: to visualize the problem and organize the given info

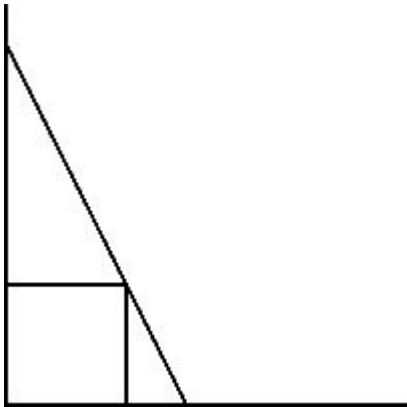


- d. From the top of a lighthouse, 30 m above the sea, the angle of depression to a tanker is 31° and the angle of depression to a sailboat is 20° . From the base of the lighthouse (sea level), the angle between the two lines of sight is 90° . How far apart are the tanker and the sailboat?
- e. A surveyor uses the following diagram to help determine the height of a mountain

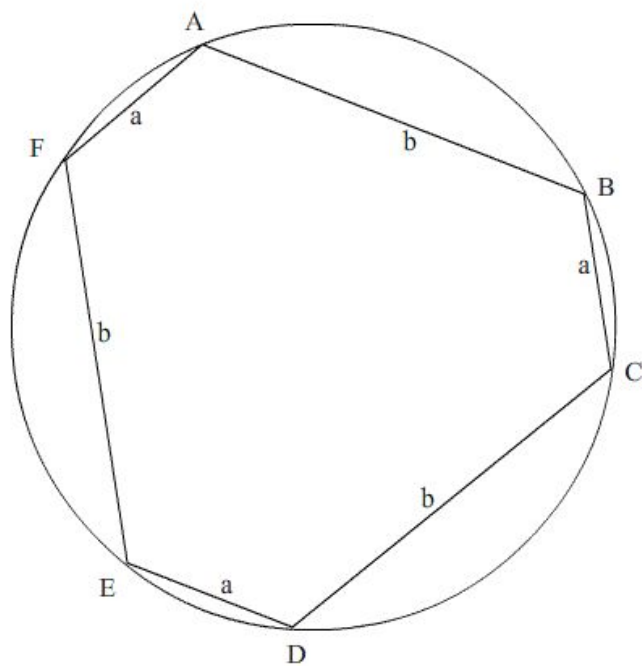


7. Here are some further challenge problems:

A 4 metre long ladder is leaning against the wall, just touching the cube.



How high is the top of the ladder above the ground?

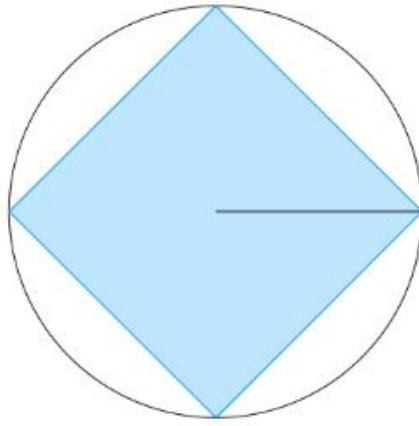


A hexagon is inscribed inside a circle.

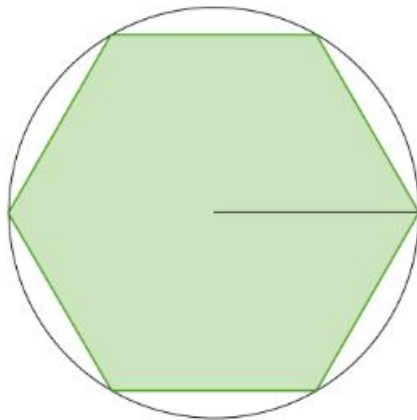
The sides of the hexagon are alternately a and b units in length.

What is the radius of the circle?

The area of a square inscribed in a circle with a unit radius is, satisfyingly, 2.



What is the area of a regular hexagon inscribed in a circle with a unit radius?



What is the area of an equilateral triangle inscribed in a circle with a unit radius?

