# Math 10

Lesson 7–5 Applying trig ratios – part 2

Now that we have learned how to handle a variety of trig problems, we are ready for a few more complicated problems.

Example 1   Solving problems involving two right triangles

From a height of 50 m in his fire tower near Francois Lake, BC, a ranger observes the beginnings of two fires. One fire is due west at an angle of depression of 9°. The other fire is due east at an angle of depression of 7°. What is the distance between the two fires, to the nearest metre?
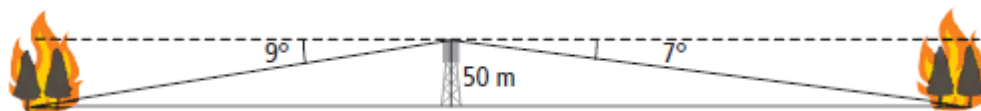
Solution
Model the problem using right triangles.
Let *x* and *y* represent the lengths of the bases of the triangles.

$$\tan 9 = \frac{50}{x}$$

$$x = \frac{50}{\tan 9}$$

$$x = 315.687\ldots$$

$$\tan 7 = \frac{50}{x}$$

$$x = \frac{50}{\tan 7}$$
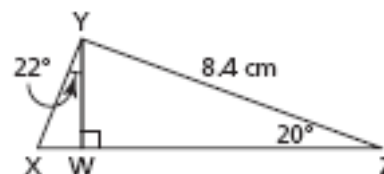
$$x = 407.217\ldots$$

Add to determine the distance between the fires.
315.687… + 407.217… = 722.904…
The distance between the fires, to the nearest metre, is 723 m.

Question 1
Calculate the length of XY to the nearest tenth of a centimetre.

Question 2

A surveyor stands at a window on the 9th floor of an office tower. He uses a clinometer to measure the angles of elevation and depression of the top and the base of a taller building. The surveyor sketches this plan of his measurements. Determine the height of the taller building to the nearest tenth of a metre.
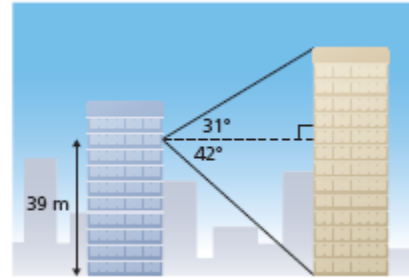

Question 3

From the top of a 90-ft. observation tower, a fire ranger observes one fire due west of the tower at an angle of depression of 5°, and another fire due south of the tower at an angle of depression of 2°. How far apart are the fires to the nearest foot? The diagram is *not* drawn to scale.
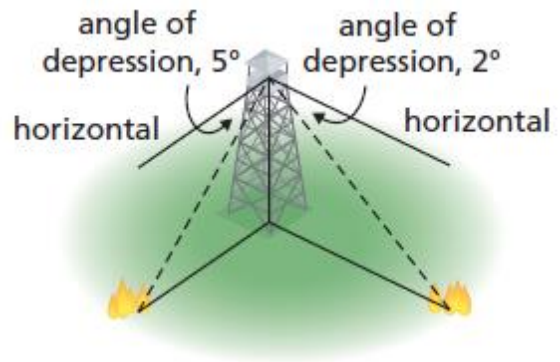
Question 4

A communications tower is 35 m tall. From a point due north of the tower, Tannis measures the angle of elevation of the top of the tower as 70°. Her brother Leif, who is due east of the tower, measures the angle of elevation of the top of the tower as 50°. How far apart are the students to the nearest metre? The diagram is *not* drawn to scale.
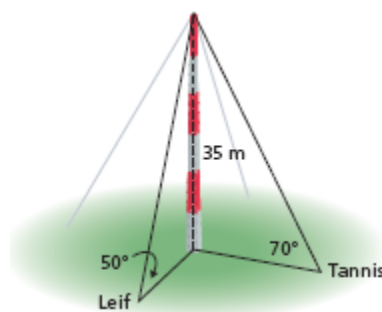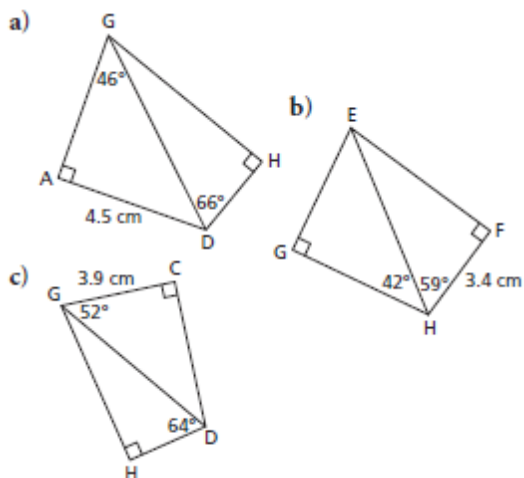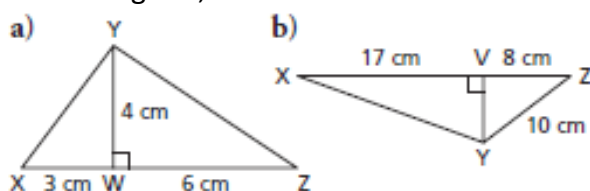

I.   Assignment

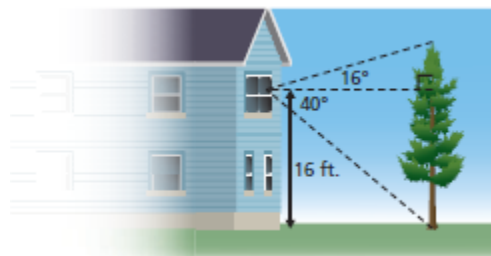1.   In each triangle, determine the length of JK to the nearest tenth of a centimetre.

a)

b)
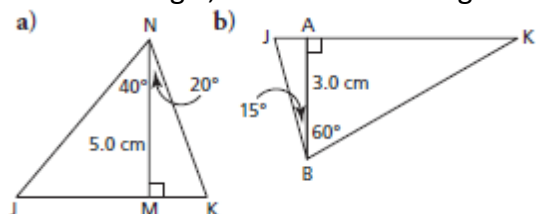
2.   In each quadrilateral, calculate the length of GH to the nearest tenth of a centimetre.

a)

b)

c)

3. In each diagram, calculate the measure of each ∠XYZ to the nearest tenth of a degree.

a)

b)

4. From a window on the second floor of her house, a student measured the angles of elevation and depression of the top and base of a nearby tree. The student knows that she made the measurements 16 ft. above the ground.
a) What is the horizontal distance between the student and the tree?
b) How tall is the tree?
Give the measures to the nearest foot.

5. A student wanted to know the distance between two particular carvings on a spirit pole. She measured the angle of elevation of each carving 15.0 m from the base of the pole. The student drew the sketch below. What is the distance between the carvings to the nearest tenth of a metre?
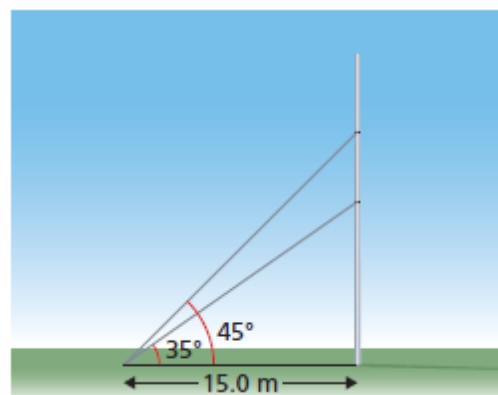
6. The Legislative Building in Wascana Park, Regina, has a domed tower at its centre. Janelle stood due south of the tower, 40 m from a point directly beneath the dome, and measured the angle of elevation of the top of the dome as 53°. Troy stood due east of the tower and measured the angle of elevation of the top of the dome as 61°.
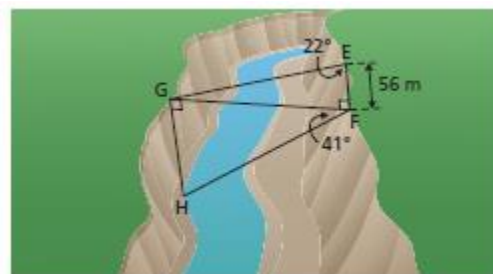a) How high is the top of the dome?
b) How far is Troy from a point directly beneath the dome?
c) How far apart are Janelle and Troy?
Give the measures to the nearest metre.

7. A surveyor drew the sketch below to show the measurements he took to determine the width and depth of a gorge.
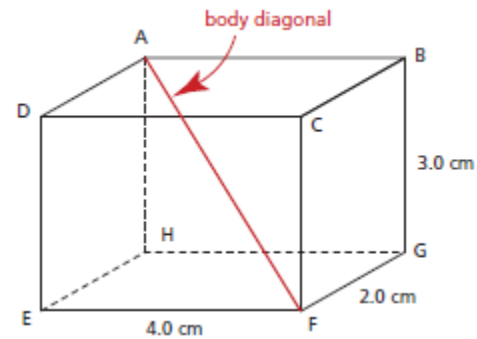a) Determine the width, GF, of the gorge.
b) Determine the depth, GH, of the gorge.
Give the measures to the nearest metre.

8. a) What is the length of the body diagonal in this rectangular prism?

   b) What is the measure of ∠AFH, the angle between the body diagonal and a diagonal of the base of the prism?

   Give the measures to the nearest tenth.

body diagonal

3.0 cm

2.0 cm

4.0 cm

9. A communications tower is supported by guy wires. One guy wire is anchored at a point that is 8.9 m from the base of the tower and has an angle of inclination of 36°. From this point, the angle of elevation of the top of the tower is 59°. How far from the top of the tower is the guy wire attached to the tower?

10. A geodesic dome is constructed by bolting together many pentagonal pyramids. Each triangular face of a pyramid is formed with two struts, each 54 in. long, and one strut that is 60 in. long. Determine the height of one of these pyramids.