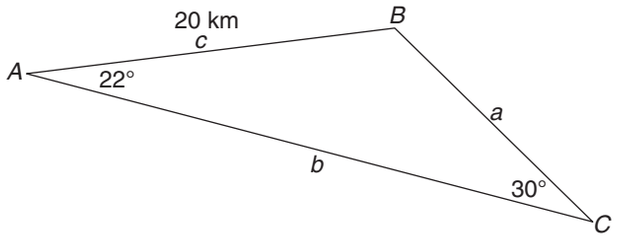
Practice Solutions – V

1. If c is 20 km, determine a, to the nearest tenth.



State what is known.

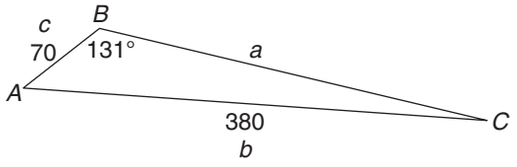
- $\angle A = 22°$
- $\angle B = ?$
- $\angle C = 30°$
- $a = ?$
- $b = ?$
- $c = 20$ km

$$\frac{a}{\sin A} = \frac{c}{\sin C}$$
$$\frac{a}{\sin 22°} = \frac{20}{\sin 30°}$$
$$a = \frac{20 \sin 22°}{\sin 30°}$$
$$a = 14.984...$$
$$a \doteq 15.0$$

The length of side a is approximately 15.0 km.

2. In $\triangle ABC$, $\angle B = 131°$, $AB = 70$, and $AC = 380$.

   a. Draw a diagram to represent the information.



b. Determine the measure of $\angle C$, to the nearest tenth of a degree.

Write down what is given.

- $\angle A = ?$
- $\angle B = 131°$
- $\angle C = ?$
- $a = ?$
- $b = 380$
- $c = 70$

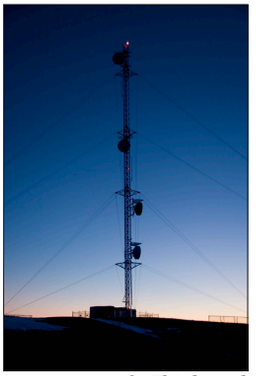
There is not enough information to solve this using the cosine law, but the sine law can be used.

$$\frac{\sin B}{b} = \frac{\sin C}{c}$$
$$\frac{\sin 131°}{380} = \frac{\sin C}{70}$$
$$\frac{70 \sin 131°}{380} = \sin C$$
$$0.139... = \sin C$$
$$\sin^{-1}(0.139...) = \angle C$$
$$7.991...° = \angle C$$
$$8.0° \doteq \angle C$$

The measure of $\angle C$ is approximately 8.0°.

3. A guy wire is a cable that is attached to a structure and to the ground to add stability to the structure. Guy wires are commonly used on towers and poles. The angle formed between the guy wire and the tower, and the location where the guy wire is attached to the tower both affect how much stability will be added by the guy wire.

   A telephone pole has been installed vertically on the side of a hill so the pole makes a 112° angle with the ground on the side of the pole where the guy wire is attached. The pole is 14 m tall, and the guy wire, which is attached to the top of the pole, is 25 m long.



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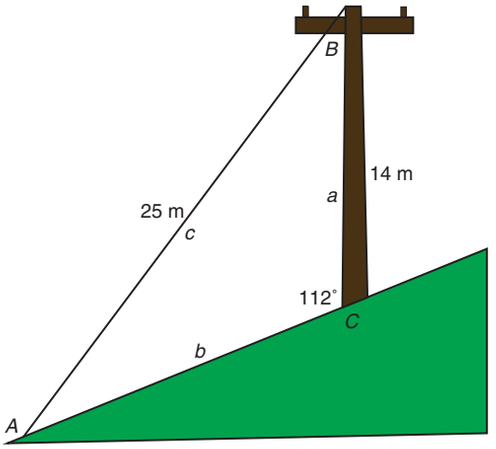
   a. Draw a diagram to represent this scenario.



   b. Determine the angle, to the nearest tenth of a degree, between the pole and the guy wire.

      Step 1: Write down what is given.

      $\angle A = ?$
      $\angle B = ?$
      $\angle C = 112°$
      $a = 14$ m
      $b = ?$
      $c = 25$ m

      There is not enough information to solve for $\angle B$ directly, but the sine law can be used to first determine $\angle A$, and then the sum of the angles in a triangle can be used to determine $\angle B$.

Step 2: Determine $\angle A$.

$$\frac{\sin A}{a} = \frac{\sin C}{c}$$
$$\frac{\sin A}{14} = \frac{\sin 112^\circ}{25}$$
$$\sin A = \frac{14 \sin 112^\circ}{25}$$
$$\sin A = 0.519...$$
$$\angle A = \sin^{-1}(0.519...)$$
$$\angle A = 31.280...^\circ$$

Step 3: Determine $\angle B$.

$$\angle B = 180^\circ - 112^\circ - 31.280...^\circ$$
$$= 36.719...^\circ$$
$$\angle B \doteq 36.7^\circ$$

The angle between the guy wire and the pole is approximately 36.7°.

Please return to *Unit 4: Trigonometry Lesson 4.3* to continue your exploration.

Practice Solutions – VI

1. For each triangle, determine whether there is no solution, one solution, or two solutions.

   a. $\triangle ABC$, $\angle A = 25^\circ$, $a = 40$ m, and $b = 90$ m

   Because $\angle A$ is acute, and $a < b$, calculate $b \sin A$.

   $$b \sin A = 90 \sin 25^\circ$$
   $$= 38.035...$$

   Because $38.035... < 40 < 90$, there are two solutions possible.

   b. $\triangle ABC$, $\angle A = 95^\circ$, $a = 5$ mm, and $b = 7$ mm

   Because $\angle A$ is obtuse, and $a < b$, there is no solution.