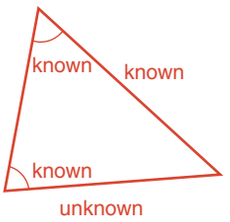
Unit 4: Geometry Lesson 4.4

Coach's Corner – VI

1. The sine law uses three known pieces of information in a triangle to determine a fourth piece.

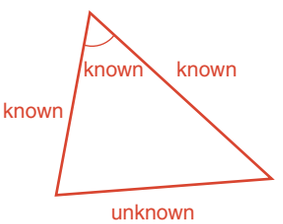
   a. Sketch a triangle with three labelled known values and one labelled unknown value where the sine law could be used to determine the unknown.

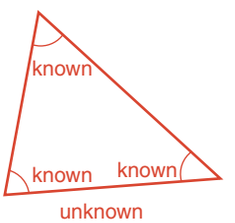
   Responses will vary. A sample is shown.



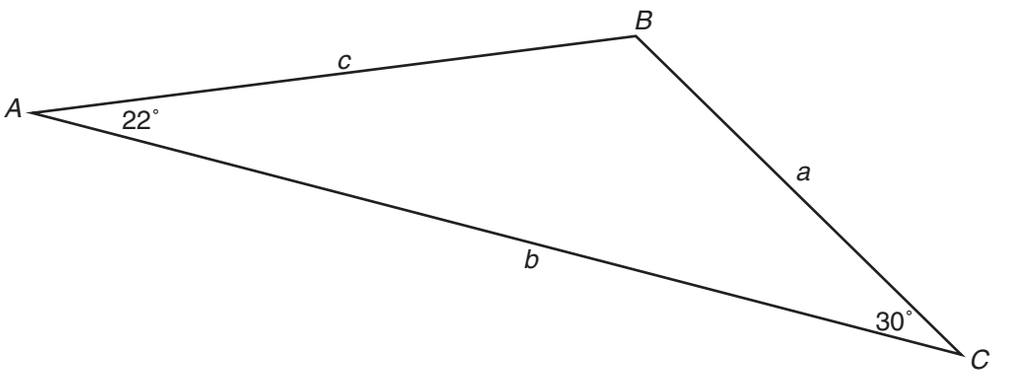
   b. Sketch a triangle with three labelled known values and one labelled unknown value where the sine law could **not** be used to determine the unknown.

   Responses will vary. If three of the four pieces of information are sides or three of the four pieces of information are angles, you will not be able to use the sine law. Samples are shown.





2. If c is 20 km, determine a.

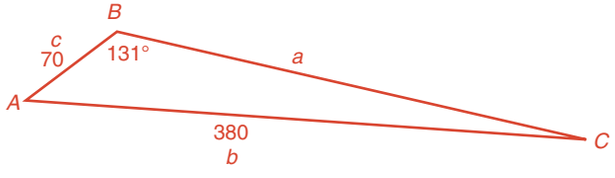


$$\frac{a}{\sin A} = \frac{c}{\sin C}$$
$$\frac{a}{\sin 22^\circ} = \frac{20}{\sin 30^\circ}$$
$$a = \frac{20 \sin 22^\circ}{\sin 30^\circ}$$
$$a = 14.98\ldots$$
$$a \doteq 15.0$$

The length of side a is approximately 15.0 km.

3. In ΔABC, $\angle B = 131^\circ$, $AB = 70$, and $AC = 380$.

   a. Draw a diagram to represent the given information.



   b. Determine the measure of $\angle C$.

$$\frac{\sin C}{c} = \frac{\sin B}{b}$$
$$\frac{\sin C}{70} = \frac{\sin 131^\circ}{380}$$
$$\sin C = \frac{70 \sin 131^\circ}{380}$$
$$C = \sin^{-1}\left(\frac{70 \sin 131^\circ}{380}\right)$$
$$C = 7.99\ldots^\circ$$
$$C \doteq 8.0^\circ$$

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

4. Enid was trying to determine the value of B in ΔABC and made the following table for the triangle.

A	
B	**?**
C	**114°**
a	
b	**17**
c	**10**

She has solved for B as shown below, but when she enters the final expression into her calculator, she receives an error.

$$\frac{\sin B}{b} = \frac{\sin C}{c}$$
$$\frac{\sin B}{17} = \frac{\sin 114^\circ}{10}$$
$$\sin B = \frac{17 \sin 114^\circ}{10}$$
$$B = \sin^{-1}\left(\frac{17 \sin 114^\circ}{10}\right)$$

a. Explain why Enid's calculator is displaying an error. (Hint: Between what two values are all sine ratios?)

The input value, $\frac{17 \sin 114^\circ}{10} \doteq 1.55$ is greater than 1. A sine ratio (in this case, sin B) cannot exceed 1. When a calculation reveals a sine ratio value greater than 1, you can be certain that an error has been made.

b. Draw Enid's triangle using the table. What is wrong with the diagram?

The largest side should be across the largest angle in a triangle. This is not the case for Enid's "triangle". It is not possible to draw a triangle using this information.

5. 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.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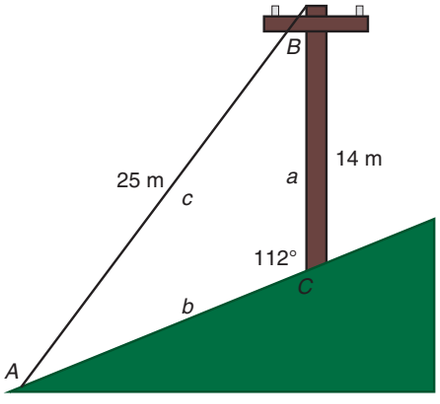
A telephone pole has been installed vertically on the side of a hill so the pole makes a 112° angle with the ground on the side of the pole where the guy wire is attached. The pole is 14 m tall, and the guy wire, which is attached to the top of the pole, is 25 m long.

a. Draw a diagram to represent this scenario.



b. Determine the angle between the pole and the guy wire.

Side b is not known, so $\angle B$ cannot be determined directly. However, there is enough information to determine $\angle A$, which can then be used to determine $\angle B$.

$$\frac{\sin A}{a} = \frac{\sin C}{c}$$
$$\frac{\sin A}{14} = \frac{\sin 112^\circ}{25}$$
$$\sin A = \frac{14 \sin 112^\circ}{25}$$
$$A = \sin^{-1}\left(\frac{14 \sin 112^\circ}{25}\right)$$
$$A = 31.28\ldots^\circ$$

The sum of the interior angles in a triangle can now be used to determine $\angle B$.

$$\angle A + \angle B + \angle C = 180^\circ$$
$$31.28\ldots^\circ + \angle B + 112^\circ = 180^\circ$$
$$\angle B = 36.71\ldots^\circ$$
$$\angle B \doteq 36.7^\circ$$

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

Please complete *Lesson 4.4 Game On!* located in *Workbook 4B* before proceeding to *Lesson 4.5*.