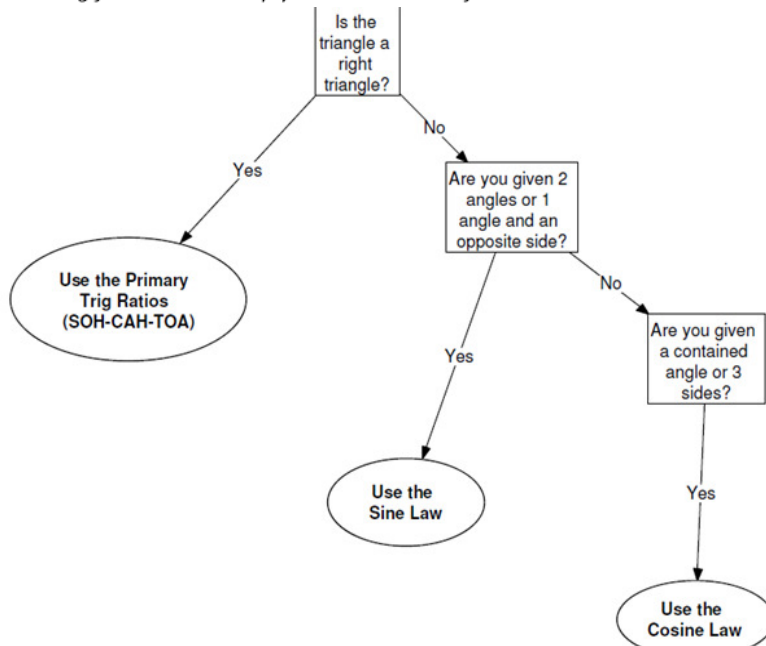# Solving Problems with Trigonometry

Steps to solving trigonometry problems:

1. state ___given info___ and draw a ___diagram___
2. choose the appropriate ___formula___
   - For right triangles,
     - use the ___primary trig ratios___ ___SOH___, ___CAH___, and ___TOA___ (also pythag)
   - For non-right triangles,
     - the ___Sine Law___ : $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$ can be used when
       → one pair of opposite side and angle must be given plus one more piece of information (the 3rd side can be found from subtracting two angles from 180°)
     - the ___Cosine Law___ : $c^2 = a^2 + b^2 - 2ab\cos C$ can be used when
       → two sides and a contained angle are given   S.A.S
   → three sides are given   S.S.S.

Use the following flowchart to help you decide which formula to use:

Is the triangle a right triangle?

Yes

Use the Primary Trig Ratios (SOH-CAH-TOA)

No

Are you given 2 angles or 1 angle and an opposite side?

Yes

Use the Sine Law

No

Are you given a contained angle or 3 sides?

Yes

Use the Cosine Law

3. ___Solve___ for the missing variable
4. make sure the answer ___makes sense___ in the context of the question
5. write a ___final statement___

Example 1

From the top of the Niagara Escarpment, Juan sees a car below at an angle of depression of 40°. He is approximately 100 m above the car. How far is the car from the base of the escarpment? Round your answer to the nearest metre.
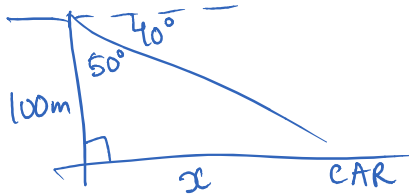

$$\tan 50° = \frac{x}{100}$$

$$119.2 = x$$

∴ car is 119m away from the base

Example 2

Micah is standing on the ground between two buildings on the opposite sides of a park. The top of the first building is 152 m from Micah, at an angle of elevation of 38°, while the top of the second building is 175 m from Micah, at an angle of elevation of 53°. How far apart are the tops of the two buildings? Round your answer to the nearest metre.
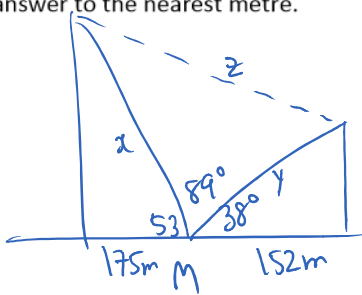
1.) find x

CAH
$$\cos 53° = \frac{175}{x}$$
$$x = 290.8$$

2.) find y

CAH
$$\cos 38° = \frac{152}{y}$$
$$y = 192.9$$

3.) find z

SAS cosine law

$$z^2 = 290.8^2 + 192.9^2 - 2(290.8)(192.9)\cos 89°$$
$$z^2 = 119817.05...$$
$$z = 346.1 m$$

∴ tops of buildings are 346m apart

Example 3

Sam is on a hiking trip. On the first section of the hike, he walks 5 km from the Loon Campsite to the Owl Campsite. Then, he turns 68° and hikes 7 km to the Eagle Campsite. He then returns to the Loon Campsite. What is the distance from the Eagle campsite to the Loon campsite, to the nearest kilometre?
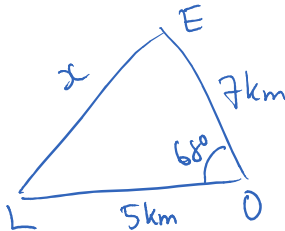
$$x^2 = 5^2 + 7^2 - 2(5)(7)\cos 68$$
$$x^2 = 47.77...$$
$$x = 6.9$$

∴ distance is about 7 km.