Since grade 8, we've been solving right triangles involving 2 key concepts:

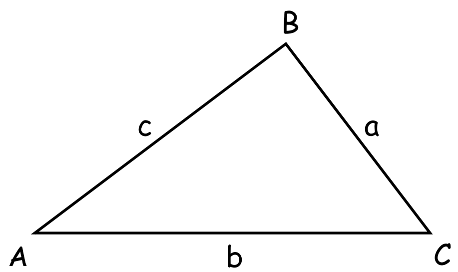
- **Pythagoras Theorem**: given 2 sides of a right triangle and find the 3rd side
- **Trigonometric Ratios**: given a side and an angle find a 2nd side, or given 2 sides determine the missing angle

Problem is, not every triangle will be a right triangle nor can one be easily made. In a situation like this we apply two new concepts that addresses this issue:

- We use the **Sine Law**, including the ambiguous case, and/or
- Use the **Cosine Law**

The Sine Law uses ratios, that's been derived using right triangles, basic trig, and algebra, to compare angles and sides.

Example 1: Given the triangle, determine the relationship of the sides and angles.



Draw an altitude from $\angle B$ to $\overline{AB}$ and label it "h"

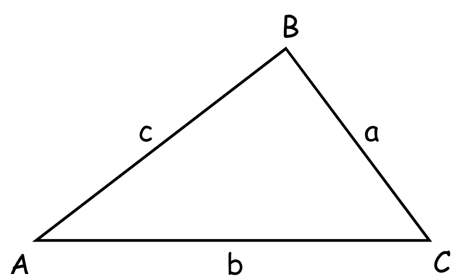
Determine $\sin A$ and $\sin C$, then solve for "h"

Since $h = h$, the equation is now

Multiply the equation by $\dfrac{1}{\sin A \sin C}$ we

Basically, for any triangle that is not right angled, use the sine law.

- It compares an angle and its opposite side, expressed as a ratio, and equates this to another ratio of a different angle and its opposite side



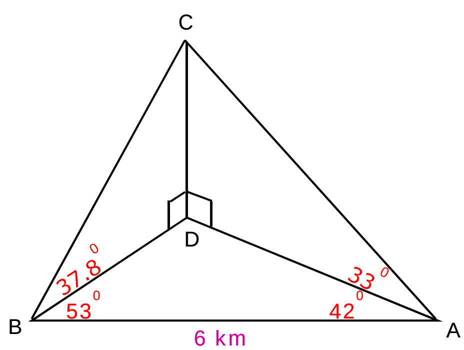
$$\boxed{\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}}$$

Example 2: Given ΔMNO, $\angle N = 115^0$, $MN = 4.5$, and $MO = 10.8$, determine the lengths and angles of the triangle to the nearest tenth.

Example 3: Given ΔABC, $\angle A = 37^0$, $AB = 15$, and $\angle C = 72^0$, calculate the lengths and angles of the triangle to the nearest tenth

Example 4: The Calgary Tower is located on 9th Ave. S. If you were standing west of the tower and measured the angle of elevation to the top of the tower, your clinometer would read 5.9^0. If you traveled 2.9 km so that you're now east of the tower, the angle of elevation measures 10.3^0. Determine the height of the tower.

Example 5: The diagram shows the measurements a student will need to use to calculate the height of Mauna Kea, in Hawaii. Determine the height of Mount Kea.



Example 6: The Harbor Center is 125.81 m tall. The angle of elevation from a person's eyes, 1.5 m above the ground, to the top is 43^0. When the person moves closer, the angle of elevation is 75^0. How much closer to the Harbor Center did the person move? How far is the top of the Harbor Center to the person's eyes?

Homework: