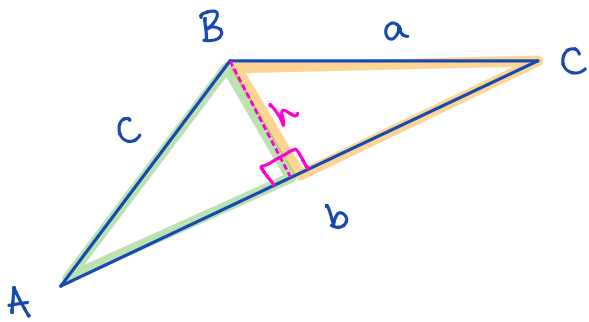Name: _____   Date: _____

Learning Goal 2.3	Use of sine and cosine laws to solve non-right triangles, including ambiguous cases.

What if it's not a right triangle?

$c \times \sin A = \dfrac{h}{c} \times c$

$a \times \sin C = \dfrac{h}{a} \times a$

$h = c \times \sin A$

$h = a \times \sin C$

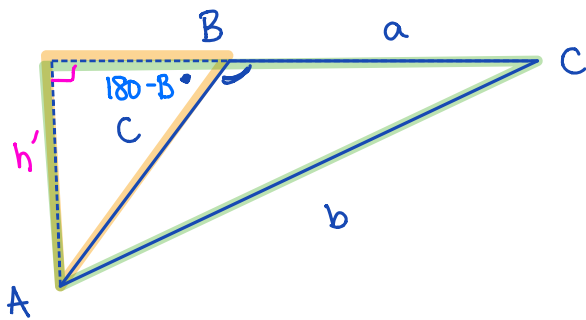$\dfrac{c \times \sin A}{a} = \dfrac{a \times \sin C}{a}$

$\dfrac{c \times \sin A}{a} \div c = \sin C \div c$

$\dfrac{\sin A}{a} = \dfrac{\sin C}{c}$

$\sin B = \dfrac{h'}{c}$ $\sin C = \dfrac{h'}{b}$
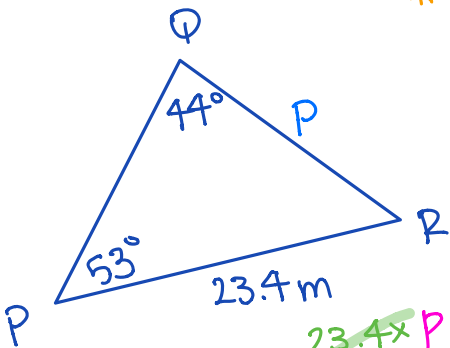
$\dfrac{\sin B}{b} = \dfrac{\sin C}{c}$

The Sine Law

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

Example In $\Delta PQR, \measuredangle P = 53°, \measuredangle Q = 44°$ and $q = 23.4$ m. Determine the measure of p to the nearest tenth of a metre.

✱ Because we know all 3 angles, that fixes the shape of the triangle and the one side fixes the size

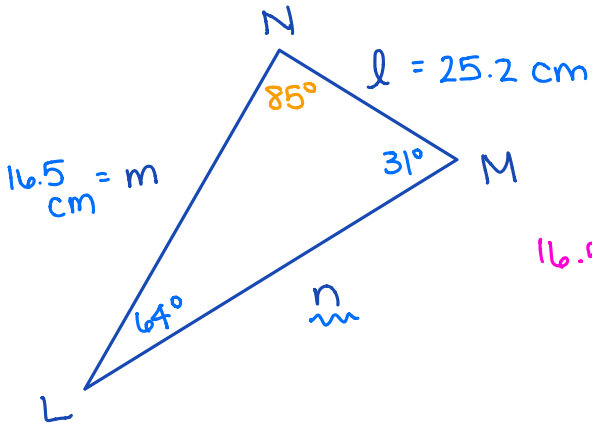$\dfrac{\sin Q}{q} = \dfrac{\sin P}{p}$ ⇒ unique triangle.

$23.4 \times p \times \dfrac{\sin 44}{23.4} = \dfrac{\sin 53}{p} \times p \times 23.4$

$p \times \sin 44 = 23.4 \times \sin 53$

$\dfrac{p \times \sin 44}{\sin 44} = \dfrac{23.4 \times \sin 53}{\sin 44}$

Assignment   p. 108 #1 – 5, 10, 13, 15, 24   Quiz Next Day!

$$p \doteq 26.9\,m$$

Example In $\triangle LMN$, $\angle L = 64°$, $\angle M = 31°$, $l = 25.2$ cm and $m = 16.5$ cm. Determine the measure of n to the nearest tenth of a **centimetre.**

unique (same as last example)

$$N = 180° - L - M = 180° - 64° - 31°$$
$$= 85°$$

$$\frac{\sin N}{n} = \frac{\sin M}{m}$$

$$16.5 \times n \times \frac{\sin 85}{n} = \frac{\sin 31}{16.5} \times n \times 16.5$$

$$\frac{16.5 \times \sin 85}{\sin 31} = \frac{n \times \sin 31}{\sin 31}$$

$$n \doteq 27.9\,cm.$$

Example Pudluck's family and his friend own cabins on the Kalit River in Nunavut. Pudluk and his friend wish to determine the distance from Pudluk's cabin to the store on the edge of town. They know that the distance between their cabins is 1.8 km. Using a transit, they estimate the measures of the angles between their cabins and the communications tower near the store. Determine the distance from Pudluk's cabin to the store to the nearest tenth of a kilometre.

friend's cabin

$c = 1.8$ km

A — 61° — Pudluk's cabin

b — communications tower

C
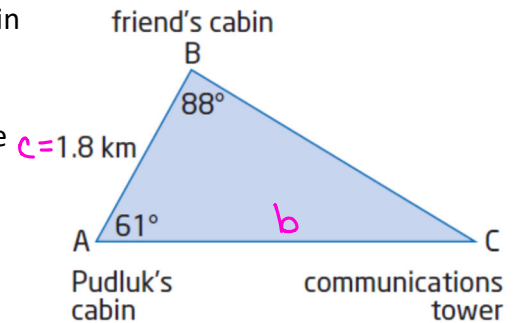
$$C = 180° - A - B$$
$$= 180° - 61° - 88°$$
$$= 31°$$

$$c \times b \times \frac{\sin C}{c} = \frac{\sin B}{b} \times b \times c$$

$$\frac{b \times \sin C}{\sin C} = \frac{c \times \sin B}{\sin C}$$

$$b = \frac{c \times \sin B}{\sin C}$$

$$= \frac{1.8 \times \sin 88}{\sin 31}$$

$$\doteq 3.5$$

Pudluk's cabin is approximately 3.5 km from the store.