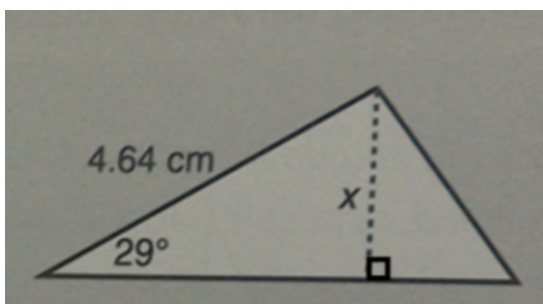# That's Non-right!

Learning Goal
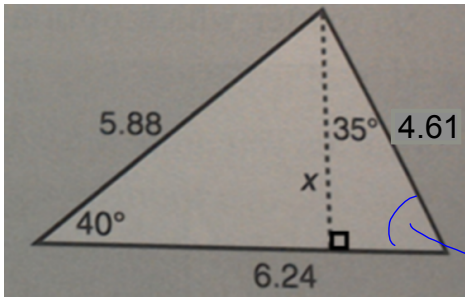
Minds on Math

How would you solve for the height, *x*? Describe.

Minds on Math

Solve for the height, *x*, in *at least* two ways.

$\rightarrow$ A method ...

1. $\sin 40 = \dfrac{x}{5.88}$

$5.88 \sin 40 = x$

$5.88(0.6427) = x$

$x = 3.78$ ✓

A second

method ...

$\cos 35°$

2. $\cos 35 = \dfrac{x}{4.61}$

$4.61 \cos 35 = x$

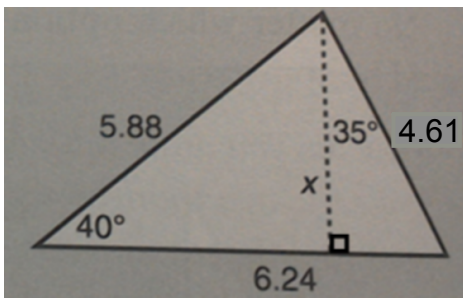$4.61(0.8191) = x$

$x = 3.78$

3. $\sin 55 = \dfrac{x}{4.61}$

$4.61 \sin 55 = x$

$4.61(0.8191) = x$

$x = 3.78$ ✓

A third
method

Problem

Solve for the height, *x*, in *at least* two ways.

$\rightarrow x = \boxed{4.61 \sin 55°} ①$

$\rightarrow x = \boxed{5.88 \sin 40°} ②$

By the transitive

property, ① = ②

$4.61 \sin 55° = 5.88 \sin 40°$

Write two, different expressions that represent the height, *h*, of triangle ABC.

A diagram of triangle ABC with vertex C at top, altitude *h* dropped to point D on base AB. Side *b* on left (A to C), side *a* on right (C to B).
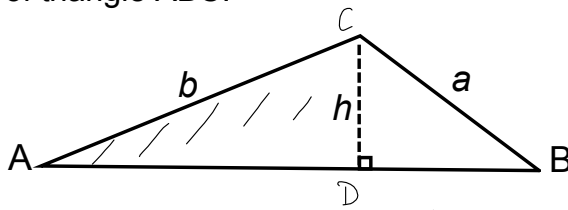
For $\triangle ACD$:
$$b \cdot \sin A = \frac{h}{b} \cdot b$$
$$h = b \sin A$$

For $\triangle BCD$:
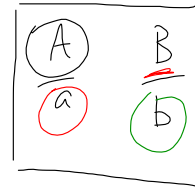$$a \cdot \sin B = \frac{h}{a} \cdot a$$
$$a \sin B = h \qquad \text{(solving for } h\text{)}$$

By the transitive property,
$$\frac{b \sin A}{ba} = \frac{a \sin B}{ab}$$
$$\boxed{\frac{\sin A}{a} = \frac{\sin B}{b}}$$

$$\frac{A}{a} \qquad \frac{B}{b}$$

The Sine Law

In any non-right triangle, ...

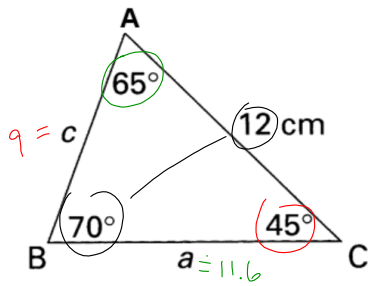A diagram of triangle ABC with vertex C at top, altitude *c* dropped to base AB. Side *b* on left, side *a* on right.
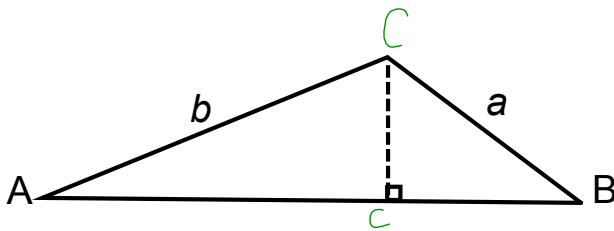
The Sine Law $\Rightarrow$
$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

Example 1: Using the Sine Law

Determine the missing lengths to the nearest cm.

A
65°
$g = c$
12 cm
70°   45°
B $a \doteq 11.6$ C

a = ⑦ 11.6	A = 65°
b = 12	B = 70°
c = 9.0?	C = 45°

$$\frac{A}{\textcircled{a}} \quad \frac{B}{b}$$

$$\frac{\sin A}{a} = \frac{\sin B}{b}$$

$$\frac{\sin 65°}{a} \bcancel{=} \frac{\sin 70°}{12}$$

$$\frac{12 \sin 65°}{\sin 70°} = \frac{a \sin 70°}{\sin 70°}$$

$$11.6 \doteq a$$

$$\frac{\sin B}{b} = \frac{\sin C}{c}$$
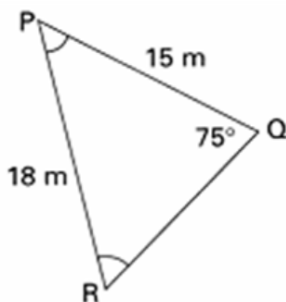
$$\frac{\sin 70°}{12} = \frac{\sin 45°}{c}$$

$$\frac{c \cdot \sin 70°}{\sin 70°} = \frac{12 \sin 45°}{\sin 70°}$$

$$c \doteq 9.0$$

Example 2: Using the Sine Law

Determine the missing angles to the nearest degree.

P
15 m
75° Q
18 m
R

p =	P =
q =	Q =
r =	R =