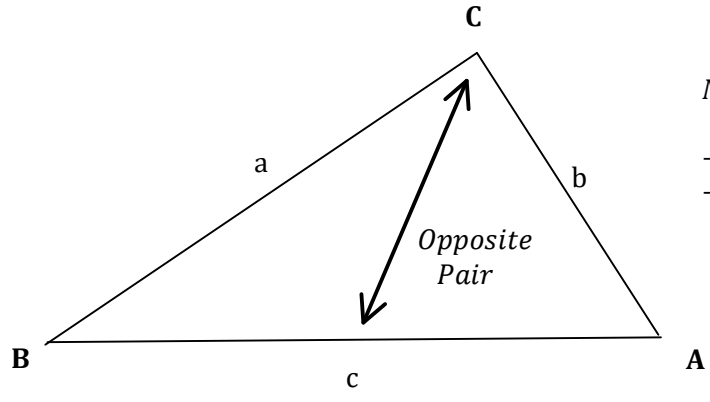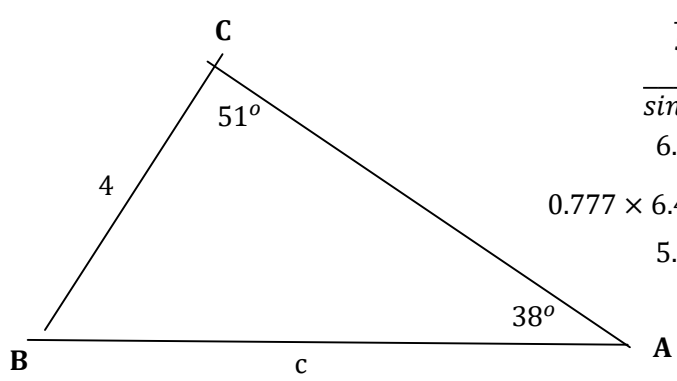# C11 - 2.9 - Sine Law Notes

Sine Law: $\dfrac{a}{sinA} = \dfrac{b}{sinB} = \dfrac{c}{sinC}$ **OR** $\dfrac{sinA}{a} = \dfrac{sinB}{b} = \dfrac{sinC}{c}$

$(to\ find\ a\ side)$ $(to\ find\ an\ angle)$

> *What you are looking for goes on top but algebra allows you to do either*

Notice: *Use the Sine Law if you have*:

$-An\ opposite\ pair$
$-And\ one\ other\ piece\ of\ information$

Remember: We only *sin* angles.
$180^o\ in\ a\ triangle$

Opposite
Pair

$\dfrac{a}{sinA} = \dfrac{c}{sinC}$

$\dfrac{4}{sin38^o} = \dfrac{c}{sin51^o}$

$6.497 = \dfrac{c}{0.777}$

$0.777 \times 6.497 = \dfrac{c}{0.777} \times 0.777$

$5.048 = c$

$\boxed{c = 5.048}$ (circled)

$\dfrac{a}{sinA} = \dfrac{c}{sinC}$
$\dfrac{asinC}{sinA} = c$

$\dfrac{sinA}{a} = \dfrac{sinB}{b}$

$\dfrac{sin(30)}{10} = \dfrac{sinB}{7}$

$0.05 = \dfrac{sinB}{7}$

$7 \times .05 = \dfrac{sinB}{7} \times 7$

$0.35 = sinB$

$sinB = 0.35$

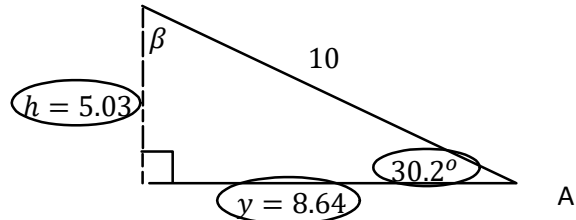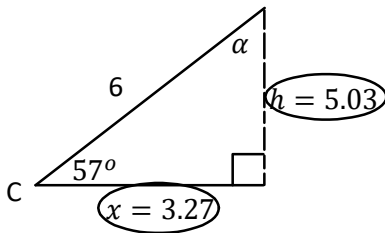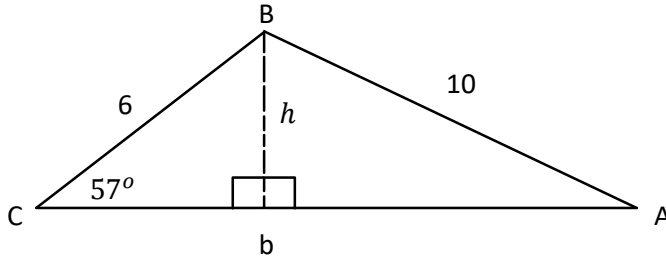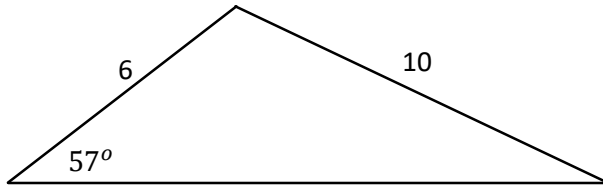$B = sin^{-1}(0.35)$

$\boxed{B = 20.5^o}$ (circled)
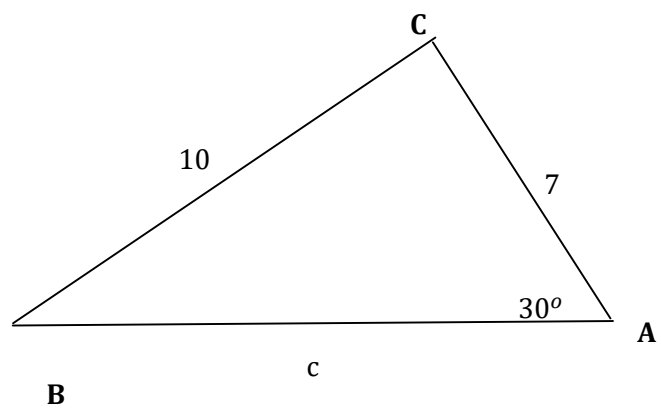
Remember: If you have 2 angles without either opposite side, use 180° in a triangle.

C11 - 2.9 - Solve ASS Triangle Without Sine Law Notes

Solve the triangle with side lengths of 6 m and 10 m, and an angle of 57°.

Triangle with sides 6 and 10, angle 57°.

Triangle with vertices B (top), C (bottom left, 57°), A (bottom right). Side from C to B = 6, side from B to A = 10. Height h from B, base b, right angle at base.

Left sub-triangle: vertex C with 57°, side 6, angle α at top, $h = 5.03$, $x = 3.27$, right angle.

Right sub-triangle: angle β at top, side 10, $h = 5.03$, $y = 8.64$, angle 30.2^o, vertex A, right angle.

$$sin\theta = \frac{O}{H}$$
$$sin57^o = \frac{h}{6}$$
$$6 \times sin57^o = \frac{h}{6} \times 6$$
$$6sin57^o = h$$
$$5.03 = h$$
$$\boxed{h = 5.03}$$

$$cos\theta = \frac{A}{H}$$
$$cos57^o = \frac{x}{6}$$
$$6 \times cos57^o = \frac{x}{6} \times 6$$
$$6cos57^o = x$$
$$3.27 = x$$
$$\boxed{x = 3.27}$$

$$sin\theta = \frac{O}{H}$$
$$sin\theta = \frac{5.03}{10}$$
$$sin\theta = 0.503$$
$$\theta = sin^{-1} 0.503$$
$$\boxed{\theta = 30.2^o}$$

$$cos\theta = \frac{A}{H}$$
$$cos\,30.2^o = \frac{y}{10}$$
$$0.864 = \frac{y}{10}$$
$$10 \times 0.864 = \frac{y}{10} \times 10$$
$$8.64 = y$$
$$\boxed{y = 8.64}$$

$$\alpha = 180^o - (57^o + 90^o)$$
$$\alpha = 180^o - 147^o$$
$$\alpha = 33^o$$

$$\beta = 180^o - (30.2^o + 90^o)$$
$$\beta = 180^o - 120.2^o$$
$$\beta = 59.8^o$$

$$B = \alpha + \beta$$
$$= 33^o + 59.8^o$$
$$= \boxed{92.8^o}$$

$$b = x + y$$
$$b = 3.27 + 8.64$$
$$\boxed{b = 11.91}$$

Triangle with B (top, 92.8^o), side 6 to left vertex (57°), side 10 to right vertex (30.2^o), base 11.91.