# 4.2 Proving & Applying the Sine & Cosine Laws for Obtuse Triangles

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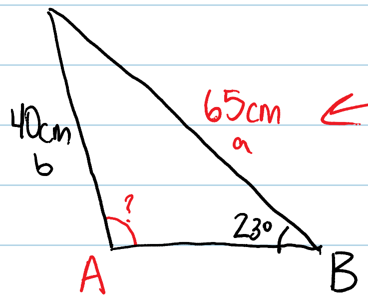
9:52 AM

$$\boxed{\begin{aligned} \sin\theta &= \sin(180^\circ-\theta) \\ \cos\theta &= -\cos(180^\circ-\theta) \\ \tan\theta &= -\tan(180^\circ-\theta) \end{aligned}}$$

} we can still use these laws for obtuse angles

# be cautious with angles over 90°

Ex. #1) In an obtuse triangle $\angle B = 23^\circ$ opposite $b = 40$. Side $\underline{a}$ is the longest side of the △ with a length of 65 cm. What is $\angle A$?




← since $\underline{a}$ is the longest side, $\angle A$ is the largest angle!!!
# use your logic!!

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

$$\frac{\sin A}{65} = \frac{\sin 23^\circ}{40}$$

$$\frac{\cancel{40}\cdot \sin A}{\cancel{40}} = \frac{65\cdot \sin 23^\circ}{40}$$

$\sin A = 0.63$
$A = \sin^{-1}(0.63)$
$= \underline{39.4}$

# we know it has to be an $\underline{\text{obtuse}}$ angle

greater than 90° → obtuse

→ Use this formula:

$\sin 39.4^\circ = \sin(180^\circ - \theta)$

0.63 ✓

$= \sin(180^\circ - 39.4)$
$= \sin(\boxed{140.6^\circ})$
$= 0.63$ ✓

# we do $\underline{\text{NOT}}$ use: $180^\circ - 23^\circ - 39.4^\circ$
$= 117.6^\circ$

we know $\angle A$ is the biggest therefore $\boxed{\angle A = 140.6^\circ}$

- Cosine ratios for an angle and its supplement are not equal (they are opposite). so the cosine laws are always correct.

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