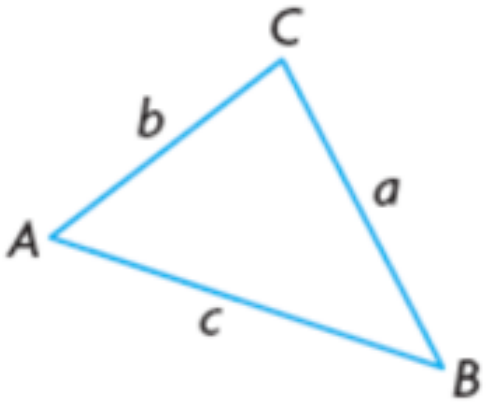
Unit 4: Oblique Triangle Trigonometry

Reminder – SIN LAW

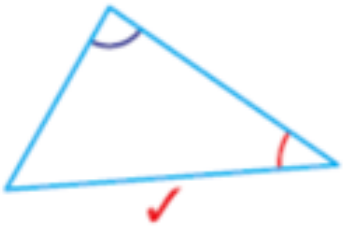
In any acute triangle,

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

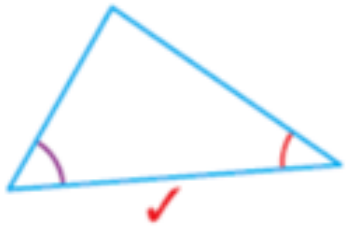


- two sides and the angle opposite a known side.

- two angles and any side.



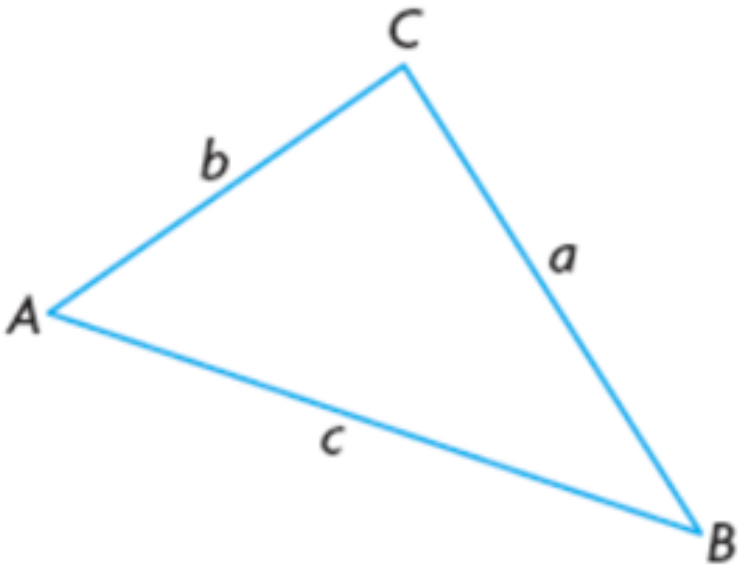
or



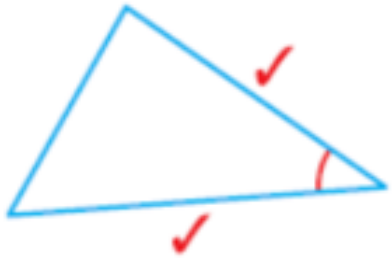
Reminder – COSINE LAW

In any acute triangle,

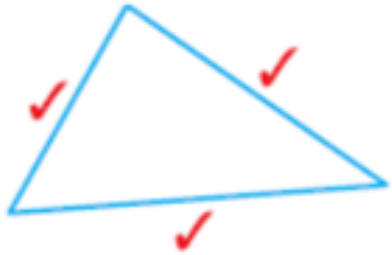
$a^2 = b^2 + c^2 - 2bc \cos A$
$b^2 = a^2 + c^2 - 2ac \cos B$
$c^2 = a^2 + b^2 - 2ab \cos C$



two sides and the contained angle.



– all three sides.



Go further

*We only dealt with **acute triangles***

What is an acute triangle?

*Now lets expand to **oblique triangles***

Oblique triangle – a triangle that does not contain a 90° angle

What does that mean?

*Could have an **obtuse angle!***

4.1 Exploring the Primary Trigonometric Ratios of Obtuse Angles

Let's try to find the relationships between the primary trigonometric ratios of acute and obtuse angles

Obtuse angle – an angle greater than 90°

Sine

Angle x	Sin x	$(180° - x)$	Sin $(180° - x)$
100°	.9848	80°	.9848
110°	.9397	70°	.9397
120°	.8660	60°	.8660
130°	.7660	50°	⋮
140°	.6428	40°	⋮
150°	.5	30°	⋮
160°	.3420	20°	.3420
170°	.1736	10°	⋮
180°	0	0	

What do you notice for Sin?

$$\sin\theta = \sin(180° - \theta)$$

Cosine

Angle x	Cos x	(180° - x)	Cos (180° - x)
100°	−.1736	80°	.1736
110°	−.3420	70°	.3420
120°	−.5	60°	.5
130°	−.6428	50°	.6428
140°	−.7660	40°	⋮
150°	−.8660	30°	.8660
160°	−.9397	20°	⋮
170°	−.9848	10°	⋮
180°	−1	0	

What do you notice for Cos?

$$\cos\theta = -\cos(180° - \theta)$$

Tangent

Angle *x*	Tan *x*	(180° - *x*)	Tan (180° - *x*)
100°		80°	
110°		70°	
120°		60°	
130°		50°	
140°		40°	
150°		30°	
160°		20°	
170°		10°	
180°		0	

What do you notice for Tan?

$$\tan\theta = -\tan(180° - \theta)$$

Key Idea

What did you notice?

Are there relationships between trig functions of an acute angle and the trig function of its ***supplement****?*

$\sin\theta = \sin(180-\theta)$

$\cos\theta = -\cos(180-\theta)$

What does supplementary mean?

There are relationships between the value of primary trig ratio for an acute angle and the value of the same primary trig ratio for the supplement of the acute angle

Need to Know

- For any angle θ,
- $\sin\theta = \sin(180° - \theta)$
- $\cos\theta = -\cos(180° - \theta)$
- $\tan\theta = -\tan(180° - \theta)$

Example

Find another trig ratio equal to the following:

Sin 45 = $\sin(180-45) = \sin 135^\circ$

-cos 62 = $\cos(180-62) = \cos 118^\circ$

Sin 34 = $\sin(180-34) = \sin 146^\circ$

Tan 71 = $-\tan(180-71) = -\tan 109^\circ$

Homework

P. 163
1, 2, 3, 4

Find 2 angles between 0° & 180° such that the sine ratio = 0.7436

$\sin\theta = .7436$

$\theta = \sin^{-1}(.7436)$

$\theta = 48^\circ$ $\theta = 132^\circ$