Chapter 3+4: Trigonometry

3.4 Obtuse Angles

Bigger than 90 *degrees*

Fill in the chart below:

Angle	Tangent	Sine	Cosine
0	0	0	1
30	.577	0.5	.866
45	1	.707	.707
60	1.73	.866	.5
90	error	1	0
120	-1.73	.866	-.5
135	-1	.707	-.707
150	-.577	0.5	-.866
180	0	0	-1
210	.577	-0.5	-.866
225	1	-.707	-.707
240	1.73	-.866	-.5
270	error	-1	0
300	-1.73	-.866	.5
315	-1	-.707	.707
330	-.577	-.5	.866
360	0	0	1

Observations:

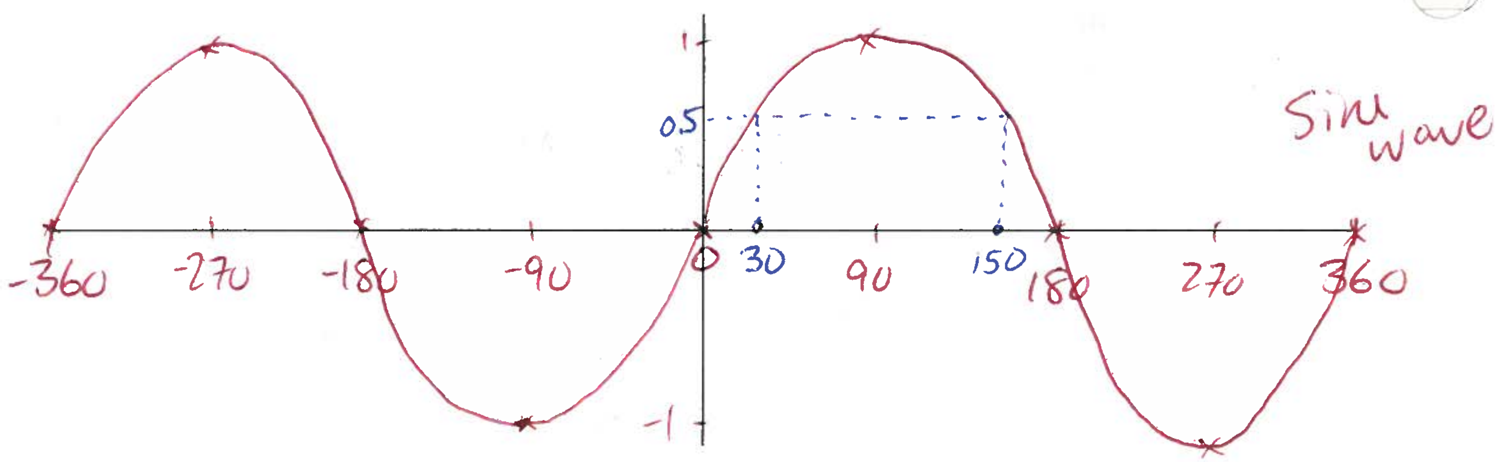
tangent repeats: 0→180 = 180→360

Sine = cosine (shifted 90)

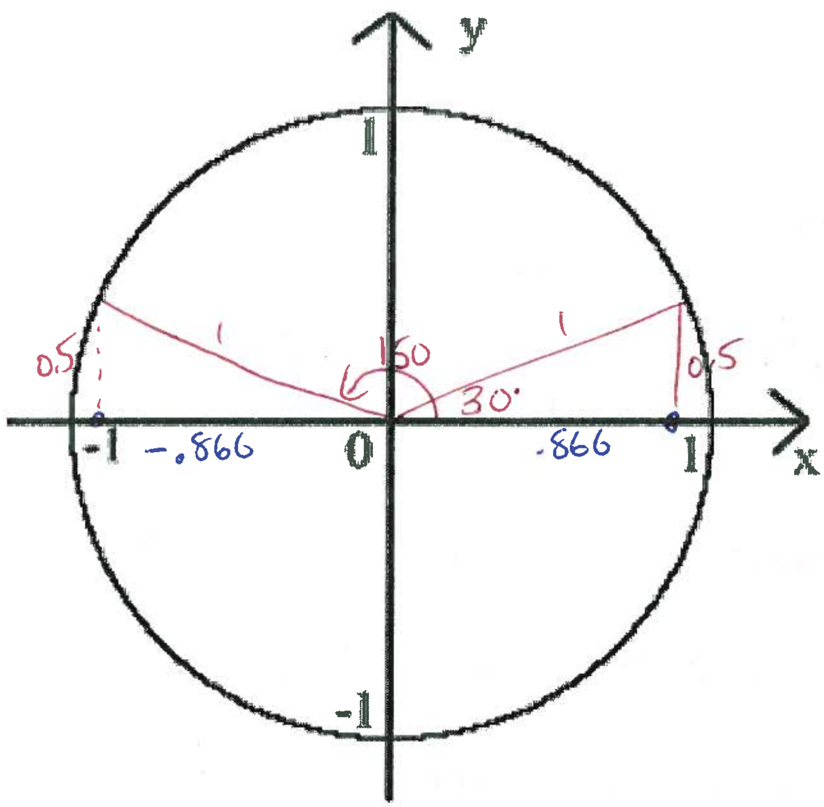
Sine & cosine between -1 & 1

Sine 30 = cosine 60, etc.

Sine and Cosine ratios are cyclical. Observe the graph of y=sinX



Sine and Cosine ratios are based on the "unit circle":



$\text{Sine}30 = \frac{0.5}{1}$

$\sin 150 = \frac{0.5}{1}$

$\cos 30 = \frac{.866}{1}$

$\cos 150 = \frac{-.866}{1}$

The Problem:

$\sin X = 0.5$ find X

$\sin^{-1}(0.5) = 30°$

PROBLEM: CALCULATOR LIES
only gives smallest angle

$180 - 30 = \boxed{150°}$

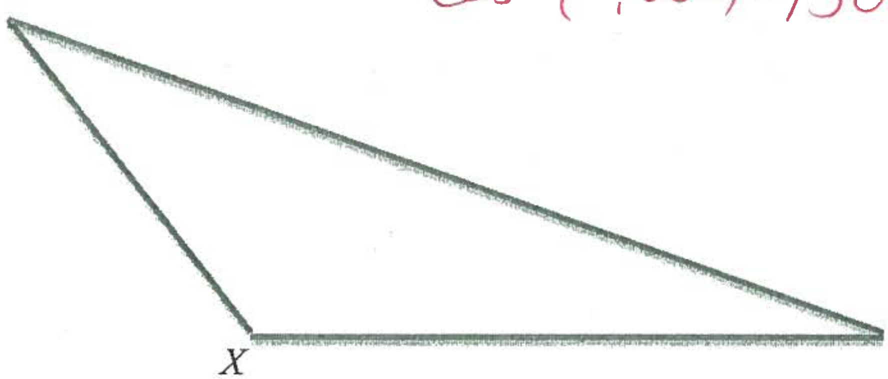
Also has Sin of 0.5

looks more like 150°

The Good News:

$\cos X = -0.866$ find X

$\cos^{-1}(-.866) = 150°$



Simple Rule:

Between 0° and 180° sine has __2__ solutions and cosine has __1__ solutions.

This means to find a second answer for ***sine*** you always *subtract your first solution from 180°*.

Examples: Solve the following for angle A, where $0 \le A \le 180º$.

1) $\sin A = 0.374$

$\sin^{-1}(0.374) = 22°$

OR $180 - 22 = 158°$

2) $\sin A = 0.815$

$\sin^{-1}(0.815) = 54.6°$

OR $180 - 54.6 = 125.4°$

3) $\cos A = 0.195$

$\cos^{-1}(.195) = 78.8$

~~OR 180 - 78.8 = 101.2~~

COSINE ONLY HAS ONE ANSWER!

4) $\cos A = -0.943$

$\cos^{-1}(-.943) = 161°$

5) $\sin A = 0.513$

$\sin^{-1}(.513) = 30.9$

OR

$180 - 30.9 = 149.1$

Assignment:

1. Each angles is inside a triangle (must be between 0 and 180). Which equations result in two difference answers?

a) $\sin A = 0.7071$
b) $\cos A = -0.5$
c) $\sin A = 0.9269$
d) $\cos A = -0.7071$
e) $\sin A = 0.8660$
f) $\cos A = -1$
g) $\sin A = \frac{3}{4}$
h) $\cos A = \frac{3}{4}$
i) $\cos A = -\frac{3}{4}$

2. Given that $0^0 \leq \angle C \leq 180^0$, determine the value(s) of $\angle C$.

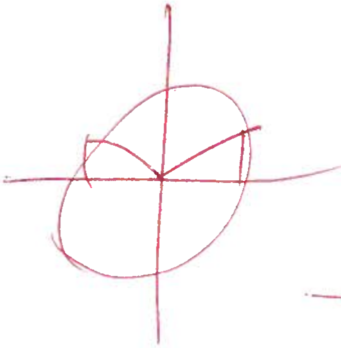
a) $\sin C = 0.9063$
b) $\cos C = 0.5736$
c) $\cos C = -0.7321$
d) $\sin C = 0.4283$
e) $\sin C = 0.5726$
f) $\cos C -0.3747$
g) $\sin C = \frac{1}{2}$
h) $\cos C = \frac{1}{2}$
i) $\cos C = -\frac{1}{2}$
j) $\sin C = \frac{2}{3}$
k) $\sin C = \frac{1}{4}$
l) $\cos C = -\frac{5}{6}$

Answers

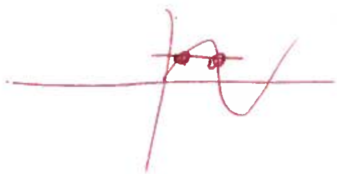
1. a,c,e,g
2. a) $65^0, 115^0$ b) 55^0 c) 137^0 d) $25^0, 155^0$ e) $35^0, 145^0$
f) 112^0 g) $30^0, 60^0$ h) 60^0 i) 120^0 j) $42^0, 138^0$
k) $14^0, 166^0$ l) 146^0

Practice Quiz

1) Explain why sinX = 0.5 has two possible answers between 0 and 180 degrees.



Two triangles in the unit circle have positive "y-values" of 0.5.



Sine function is cyclical.

2) Given that $0^0 \leq \angle C \leq 180^0$, determine the value(s) of $\angle C$ (to the nearest whole number)

a) sinC = 0.866

b) cosC = 0.5

c) cosC = -0.866

Practice Quiz Answer Key

1) see notes 2) a) 60,120 b) 60 c) 150