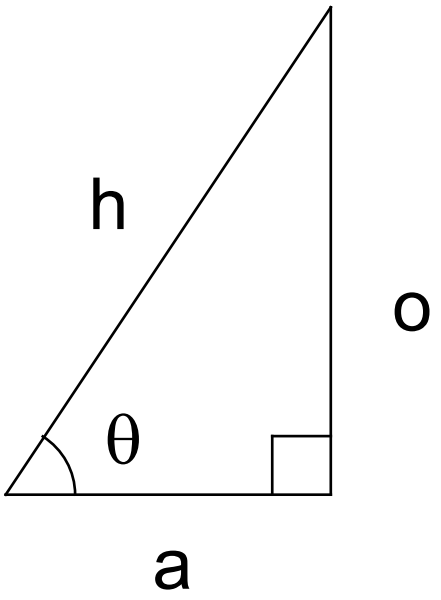
Lesson Plan 4 - Unit Circle & Trig Functions Part 1

1) Take attendance - record any new students
2) Hand back homework
3) Any questions on Homework?
4) Quiz on 8.1, 8.2, 6.1

View of Trig functions from the point of view of a Right Triangle



h-hypotenuse

o-opposite

a-adjacent

$$\sin(\theta)=\frac{o}{h}$$

$$\cos(\theta)=\frac{a}{h}$$

$$\tan(\theta)=\frac{o}{a}$$

SOH-CAH-TOA (Sounds indian)

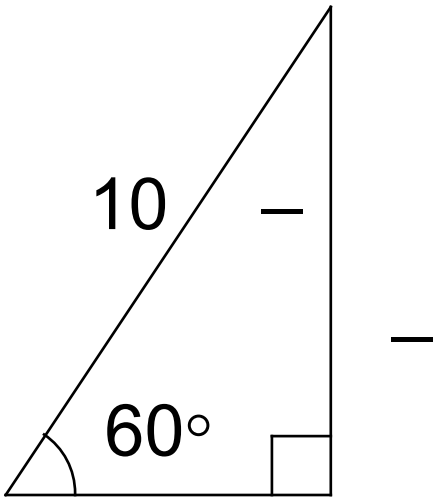
SOH (Sin = 0/H) CAH (Cos=A/H) TOA (Tan=O/A)

This is useful when you have a right triangle. Note that $0<\theta<\frac{\pi}{2}$.

What kind of problems can we solve with this?

Given any two of θ, h, a or o, we can find all missing angles and sides of the triangle.

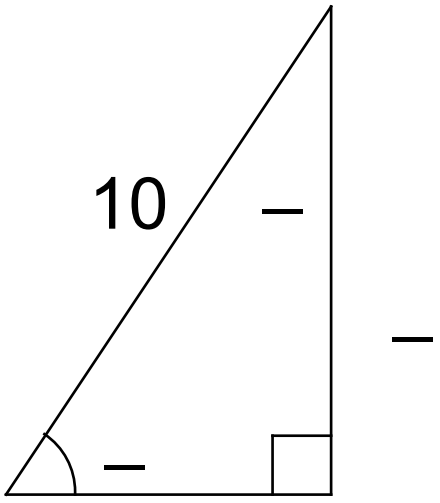
Example: Given a right triangle with hypotenuse length 10 and missing sides and θ = 60° what are the missing angles and sides?



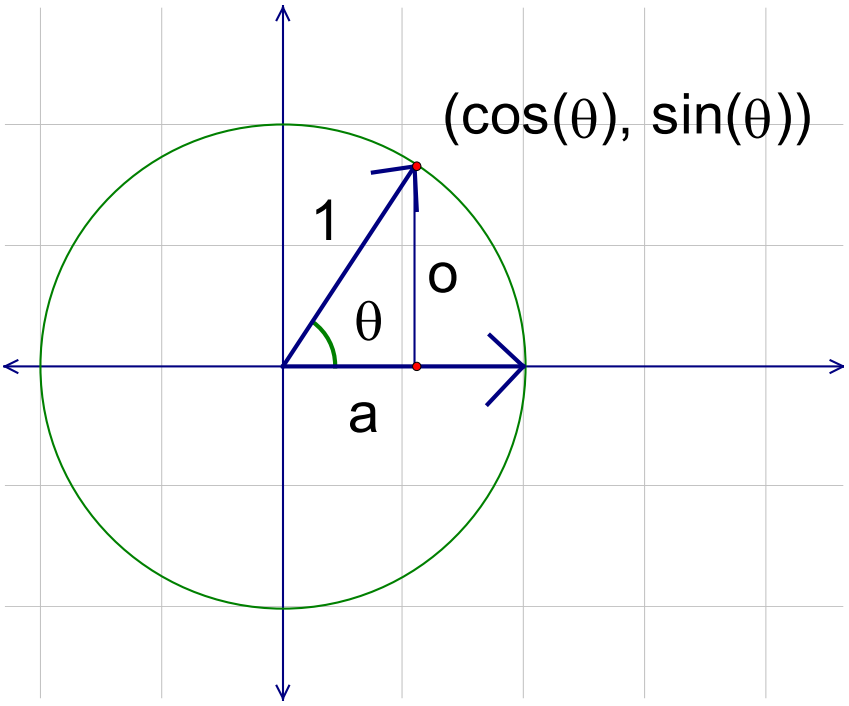
$$\sin(60^\circ) = \sqrt{3}/2$$

$$\cos(60^\circ) = 1/2$$

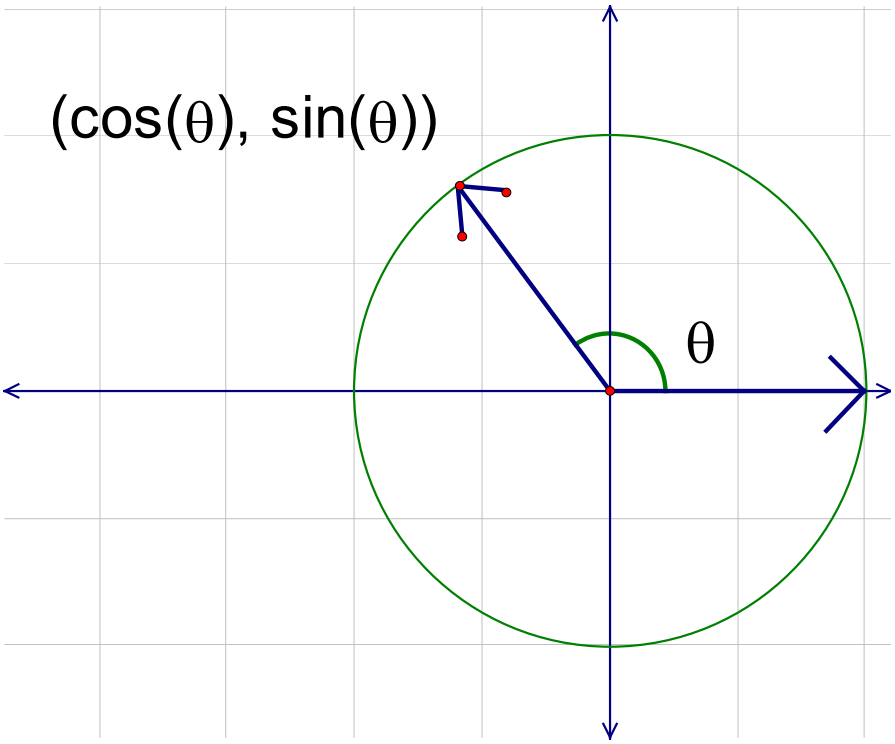
Example: Given a right triangle with hypotenuse length 10 and leg 4, what are the missing angles and sides?

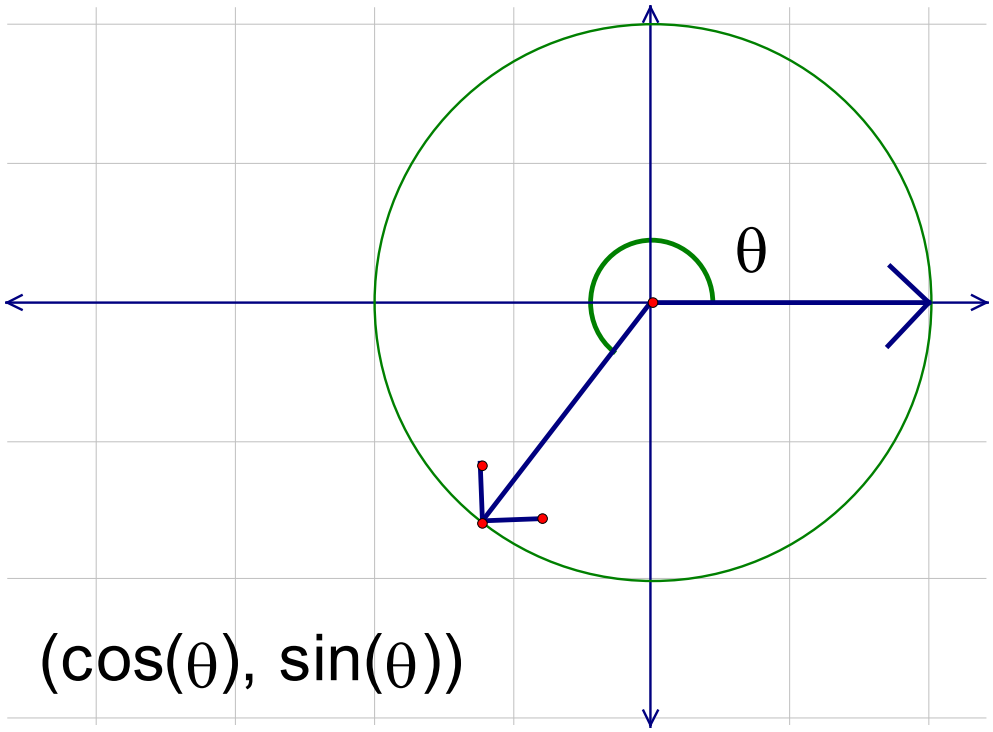


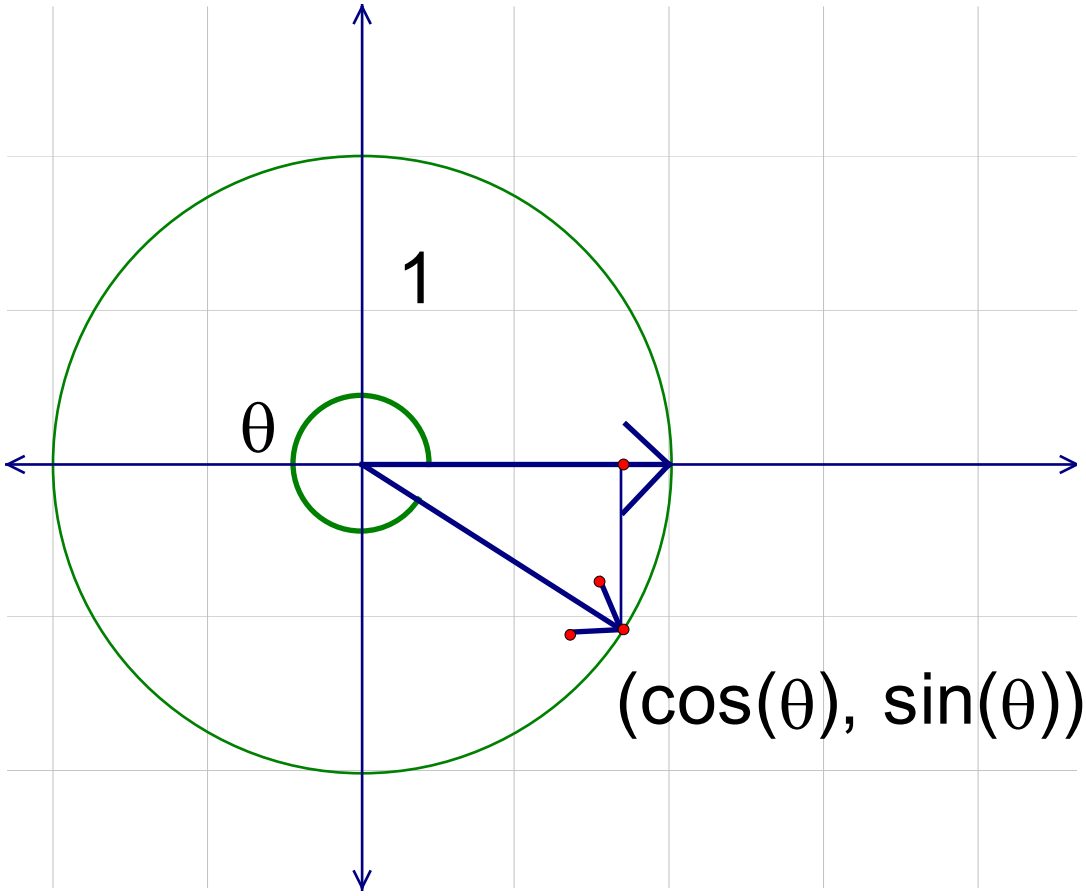
Unit Circle View of Trig functions



Note that this produces the same function values as the triangle, but is not limited to $0 < \theta < \frac{\pi}{2}$




θ
(cos(θ), sin(θ))


1
θ
(cos(θ), sin(θ))

Note that some interesting angles now have sines and cosines:

$\sin(0^\circ) = 0$

$\cos(0^\circ) = 1$

$\sin(90^\circ) = 1$

$\cos(90^\circ) = 0$

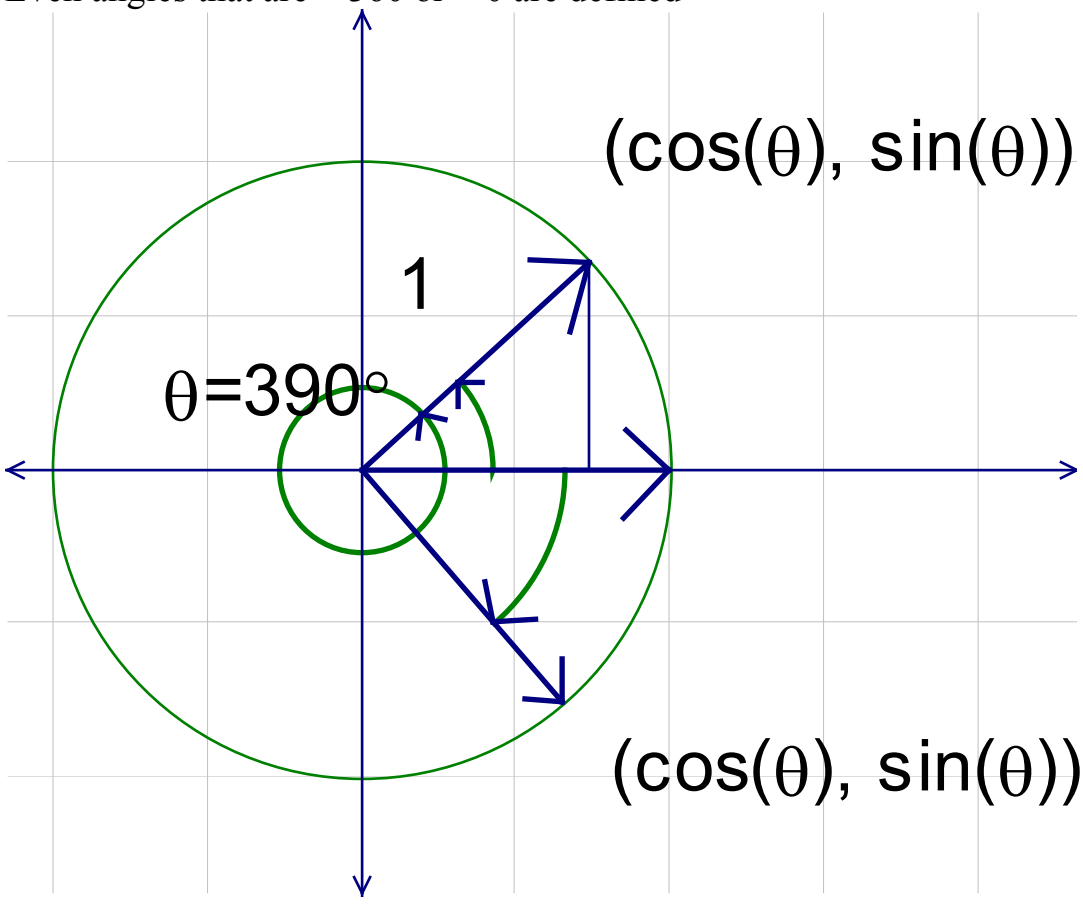
$\sin(180^\circ) = 0$

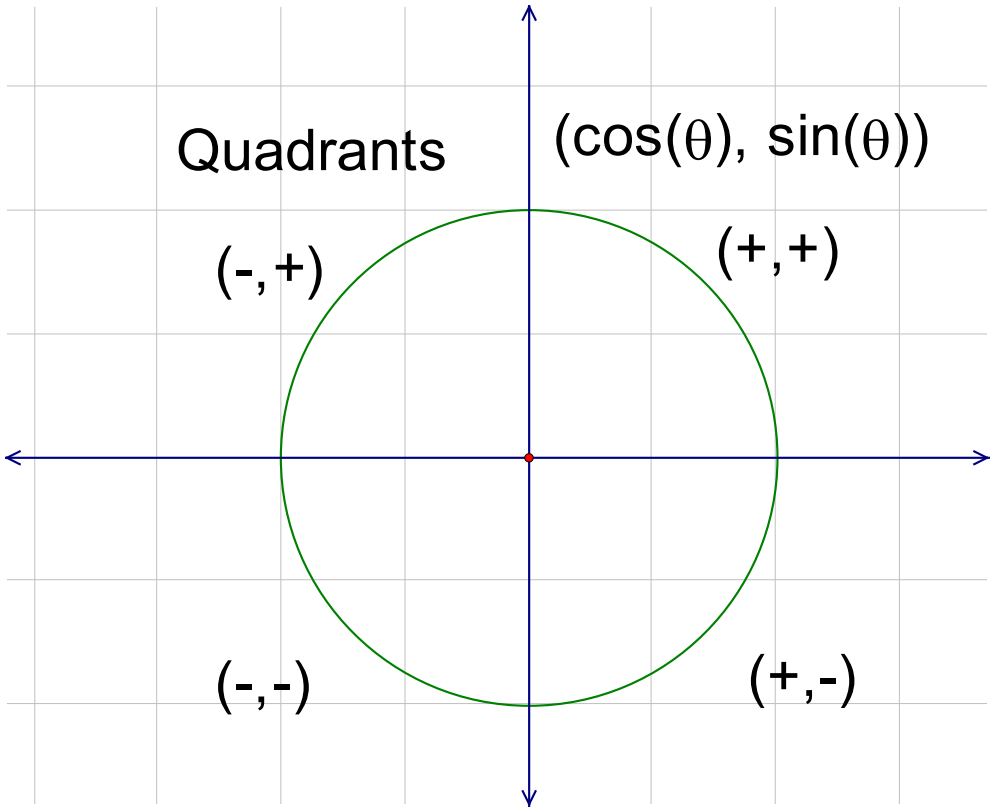
$\cos(180^\circ) = -1$

$\sin(270^\circ) = -1$

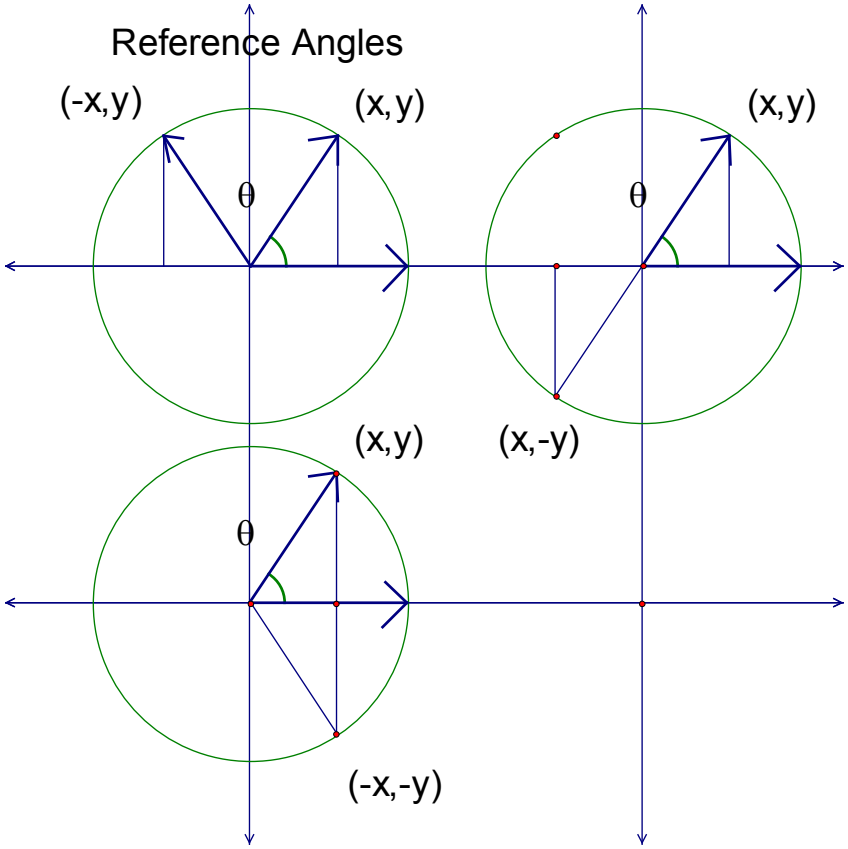
$\cos(270^\circ) = 0$

Even angles that are > 360 or < 0 are defined

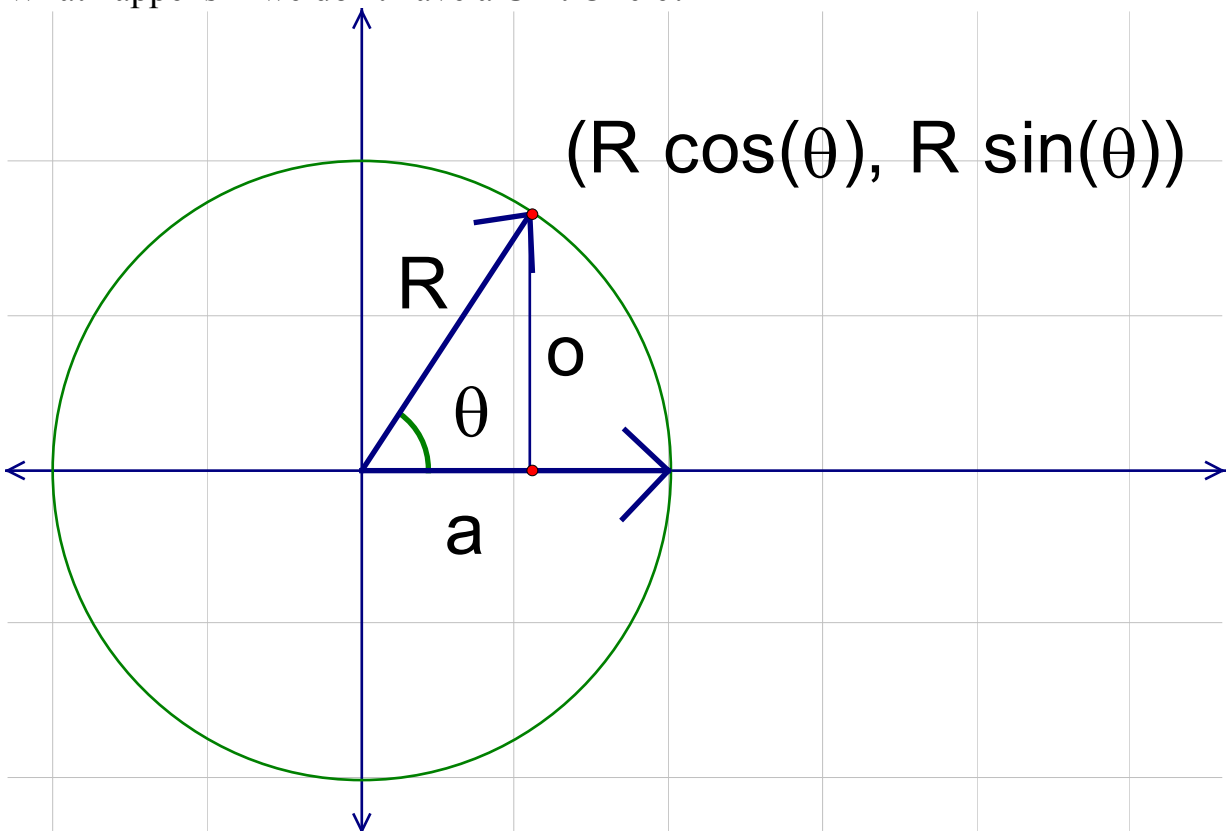




Note the signs of the sine and cosine function in the 4 quadrants.



What happens if we don't have a Unit Circle?



Exact Values of the Sine and Cosine Functions: We can find an exact expression for any multiple of 30° or 45°

Angle	(cos,sin)	Angle	(cos,sin)	Angle	(cos,sin)	Angle	(cos,sin)
0°	(+1,0)	90°	(0,+1)	180°	(-1,0)	270°	(0,-1)
30°	$\left(+\frac{\sqrt{3}}{2},+\frac{1}{2}\right)$	120°	$\left(-\frac{1}{2},+\frac{\sqrt{3}}{2}\right)$	210°	$\left(-\frac{\sqrt{3}}{2},-\frac{1}{2}\right)$	300°	$\left(+\frac{1}{2},-\frac{\sqrt{3}}{2}\right)$
45°	$\left(+\frac{1}{\sqrt{2}},+\frac{1}{\sqrt{2}}\right)$	135°	$\left(-\frac{1}{\sqrt{2}},+\frac{1}{\sqrt{2}}\right)$	225°	$\left(-\frac{1}{\sqrt{2}},-\frac{1}{\sqrt{2}}\right)$	315°	$\left(+\frac{1}{\sqrt{2}},-\frac{1}{\sqrt{2}}\right)$
60°	$\left(+\frac{1}{2},+\frac{\sqrt{3}}{2}\right)$	150°	$\left(-\frac{\sqrt{3}}{2},+\frac{1}{2}\right)$	240°	$\left(-\frac{1}{2},-\frac{\sqrt{3}}{2}\right)$	330°	$\left(+\frac{\sqrt{3}}{2},-\frac{1}{2}\right)$

Demonstration Using Calculator!

Homework

Read Section 8.3
Problems for 1/22 on page 542 #15-18, 37, 45, 50, 51, 54