Sept 14

- HW 1 has been posted
  - Due Monday (21st).
- Labs this week.
- Office Hours: Friday 1-3 pm in LSK 300C.

Trigonometry.

Radians vs Degrees.

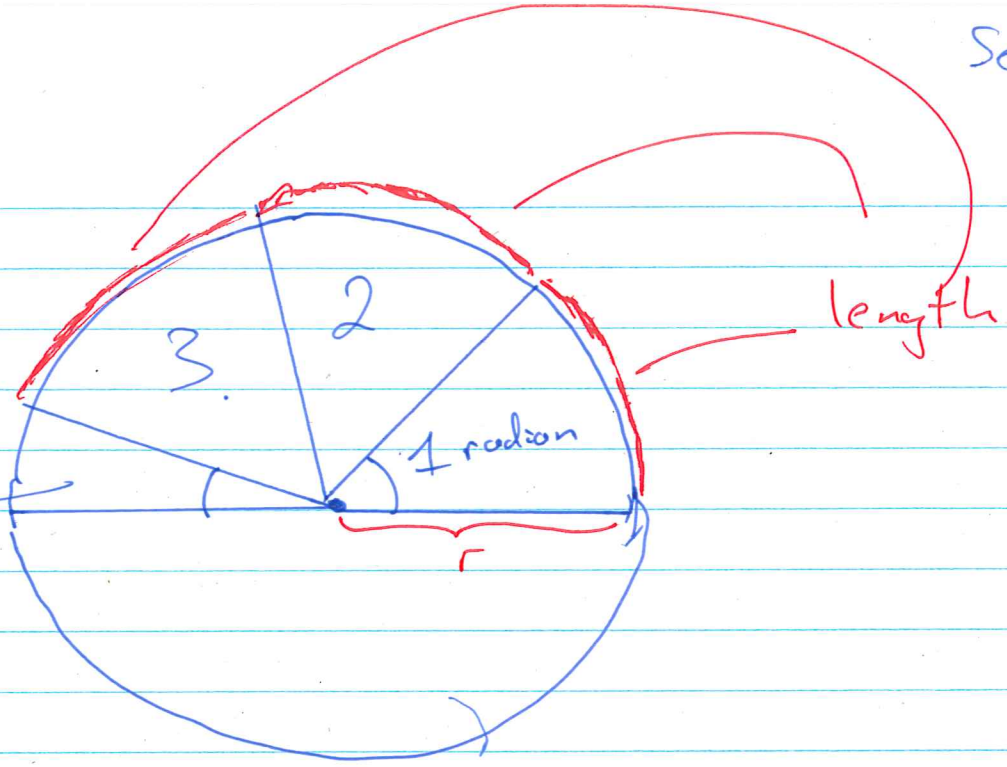
We need to decide how to measure angles.

Degrees cut the circle into 360 pieces. We do this because the Babylonians really liked multiples of 60.

For simple applications it doesn't matter which units we use. For us studying calculus, it makes a difference.

The natural units to use are Radians.

Sept. 14



$\pi = 3.1415\ldots$ radians.

There are 2π radians in a circle.

($C = 2\pi r$)

(circumference.

Clicker Q: $\pi/3$ rad. $\longleftrightarrow$? Degrees.

A) 30°
B) 45°
→ C) 60°
D) 90°.

In general: angle in degrees = angle in rad. $\cdot \frac{180^\circ}{\pi}$

$\frac{\pi}{180^\circ}$ angle in deg. = angle in rad.

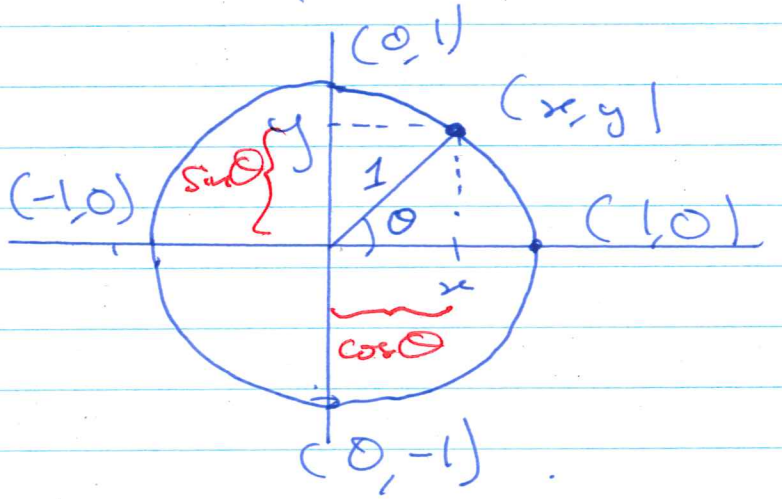
Sept. 14

$\pi/6$ rad. $\leftrightarrow$ 30°
$\pi/4$ rad. $\leftrightarrow$ 45°
$\pi/3$ rad. $\leftrightarrow$ 60°
$\pi/2$ rad. $\leftrightarrow$ 90°.

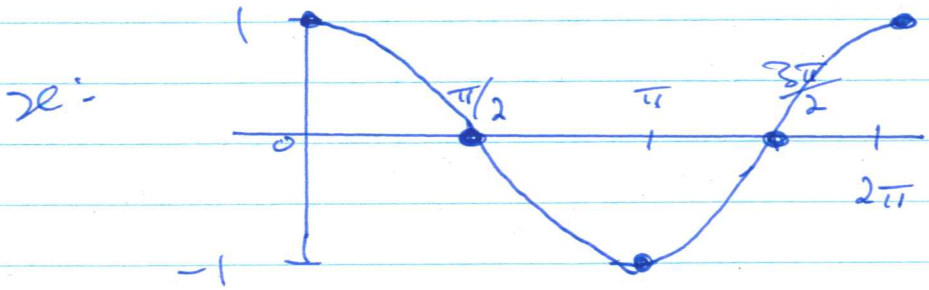
1 rad $\leftrightarrow$ $\frac{180^\circ}{\pi} \approx 57.29^\circ$.

Trigonometric Functions.

Consider a point on the unit circle:

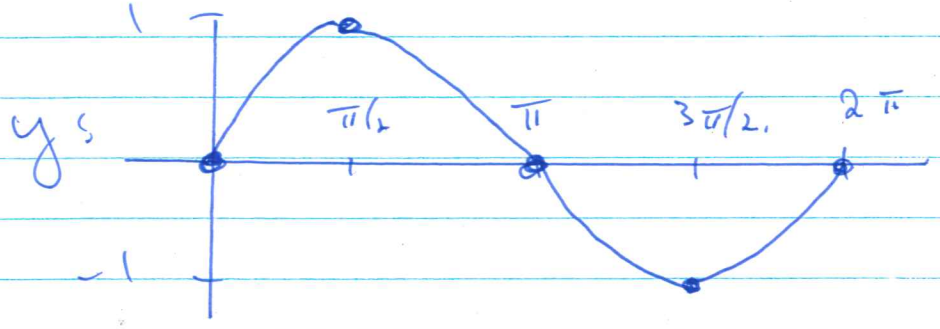


Let's plot the x and y values as a function of the angle θ.



$\leftarrow \cos\theta$.

Sept. 14

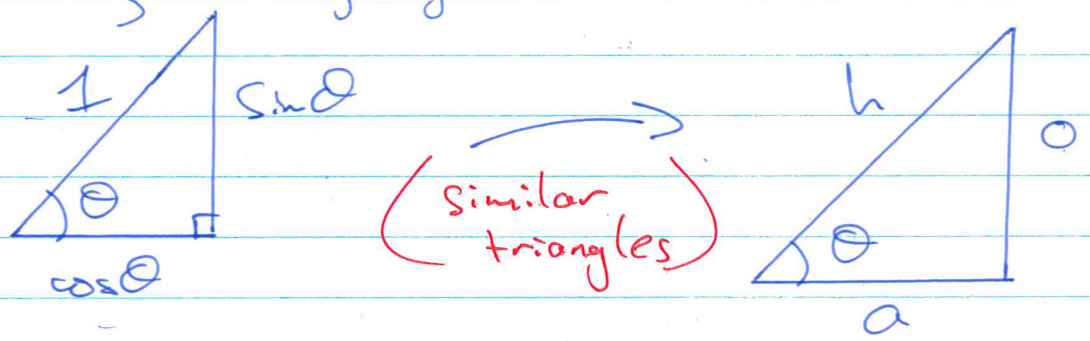


← $\sin\theta$.

We call the x value $\cos\theta$
and the y value $\sin\theta$.

Their ratio $\dfrac{\sin\theta}{\cos\theta} = \tan\theta$.

Also $\sin^2\theta + \cos^2\theta = 1$.
Using Pythagorean Theorem: $x^2+y^2=1$.



$$\frac{\sin\theta}{1} = \frac{o}{h}$$

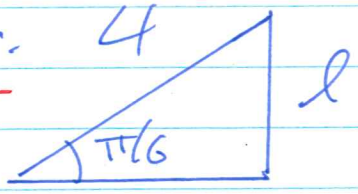
$$\frac{\cos\theta}{1} = \frac{a}{h}$$

$$\frac{\sin\theta}{\cos\theta} = \tan\theta = \frac{o}{a}.$$

Recovers our familiar "SOHCAHTOA".

Sept. 14.

Examples:



Find l:

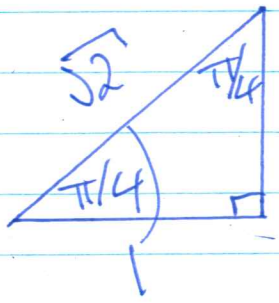
$$\sin\left(\frac{\pi}{6}\right) = \frac{l}{4}$$

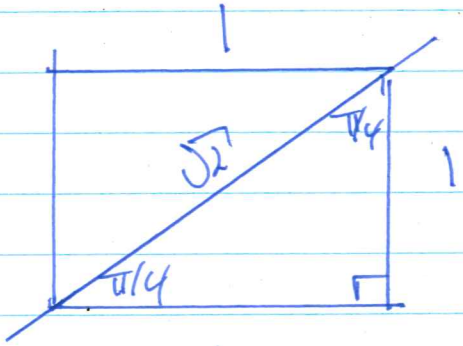
$$l = 4\sin(\pi/6) = \ldots = 4 \cdot \frac{1}{2} = 2.$$

how do we find $\sin(\pi/6)$?

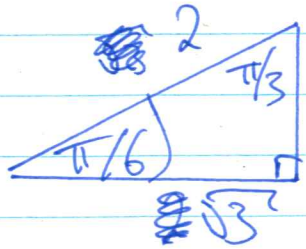
We need the special triangles and/or unit circle.

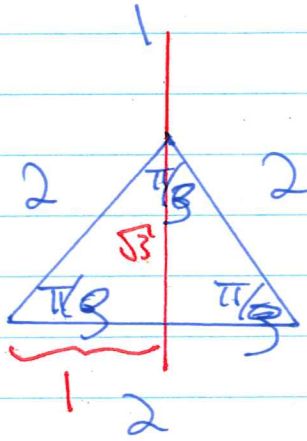
Special Triangles

- 

(aside: 

)

- 

(aside: 

)

Sept. 14.

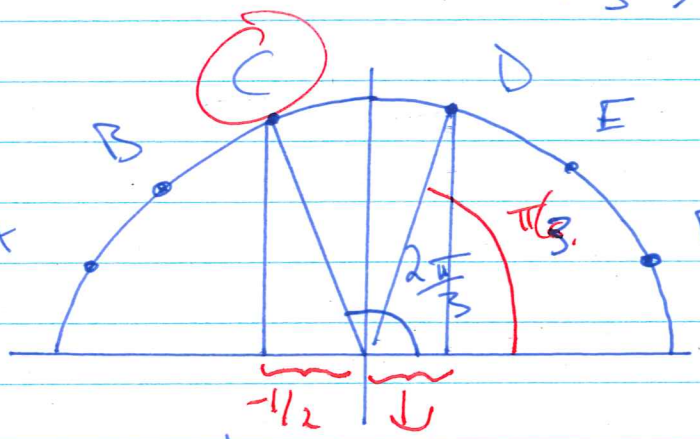
So, $\sin(\pi/6) = 1/2$, $\cos(\pi/6) = \sqrt{3}/2$

$\sin(\pi/4) = 1/\sqrt{2}$, $\cos(\pi/4) = 1/\sqrt{2}$

$\sin(\pi/3) = \sqrt{3}/2$, $\cos(\pi/3) = 1/2$.

Examples: Find $\cos\left(\frac{2\pi}{3}\right)$?

Clicker: S



A

T $\cos(\pi/3) = 1/2$.

C.

$\cos\left(\frac{2\pi}{3}\right) = -\cos(\pi/3) = -1/2$.