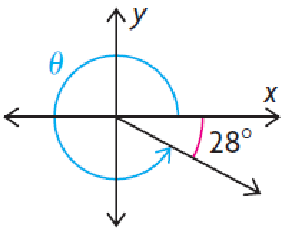
page 314... hmmmm... isn't that 100 times pi?

#1, 2, 3 and 4 use R-10 for review

#5 use R - 11 for review

#6 and 7 use R-12 for review

1. For angle θ, determine
   a) the size of the **related acute angle** $= 28°$
   b) the size of the **principal angle**

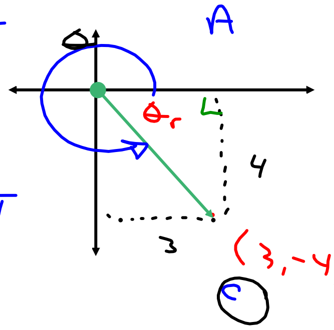


$= 360° - 28°$

$= 332°$

2. Point $P(3, -4)$ lies on the terminal arm of an angle in standard position.
   a) Sketch the angle, and determine the values of the primary and reciprocal ratios.
   b) Determine the measure of the principal angle, to the nearest degree.

a)



$r = \sqrt{4^2 + 3^2} = 5$

$\sin\theta = -\frac{4}{5}$ $\csc\theta = -\frac{5}{4}$

$\cos\theta = 3/5$ $\sec\theta = \frac{5}{3}$

$\tan\theta = -4/3$ $\cot\theta = -\frac{3}{4}$

b) $\cos\theta = 3/5$

$\theta = \cos^{-1}(3/5) \doteq 53°$

3. Draw each angle in standard position. Then, using the **special triangles** as required, determine the exact value of the trigonometric ratio.

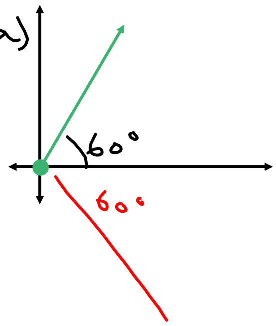
$\theta_r = 60°$

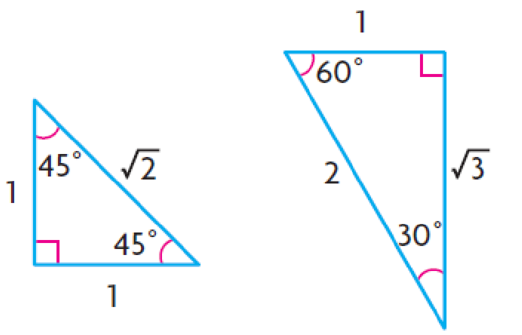
a) $\sin 60° = \frac{\sqrt{3}}{2}$ c) $\sin 120° = \frac{\sqrt{3}}{2}$ e) $\sec 135°$

b) $\tan 180° = 0$ d) $\cos 300°$ $\theta_r = 60$ f) $\csc 270°$

$= +\frac{1}{2}$

a)





e) $\sec 135° = \frac{1}{\cos 135°}$

$\theta_r = 45°$

$\cos 135° = \frac{-1}{\sqrt{2}}$

$\therefore \sec 135° = -\sqrt{2}$

f) $\csc 270° = \frac{1}{\sin 270°}$

$\sin 270° = -1$

$\therefore \csc 270° = -1$

4. Determine the value(s) of θ, if $0° \leq \theta \leq 360°$.

a) $\cos\theta = \frac{1}{2}$

b) $\tan\theta = \frac{1}{\sqrt{3}}$

c) $\tan\theta = 1$

$\theta = 45°, 225°$

d) $\cos\theta = -1$

$\theta = 180°$

e) $\cot\theta = -1$

$\tan\theta = -1$

$\theta = 135°, 315°$

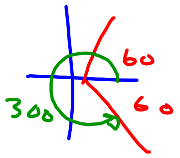
f) $\sin\theta = 1$

$\theta = 90°$

a) $\theta = \cos^{-1}\left(\frac{1}{2}\right)$

$\theta_r = 60°$

cos is ⊕ in I & IV



$\theta = 60°, 300°$

b) $\boxed{\theta = 30°}$

$\theta = 30° + 180°$

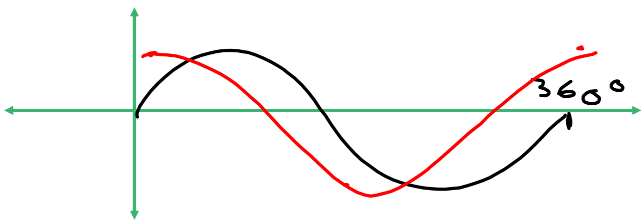
$\boxed{\theta = 210°}$

5. For each of the following, state the **period**, **amplitude**, **equation of the axis**, and range of the function. Then sketch its graph.

a) $y = \sin\theta$, where $-360° \leq \theta \leq 360°$.

b) $y = \cos\theta$, where $-360° \leq \theta \leq 360°$.

a)



$T = 360°$ Amp $= 1$ axis: $y = 0$

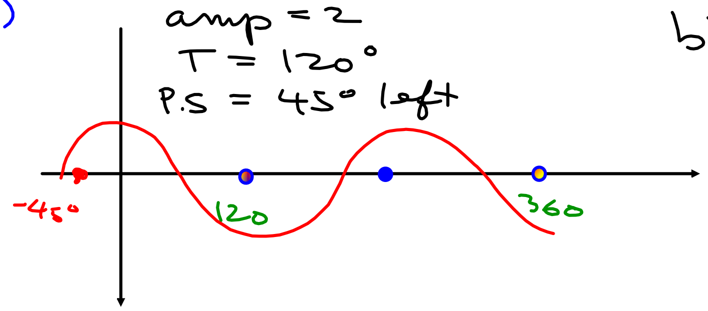
b) same

6. State the period, equation of the axis, horizontal shift, and amplitude of each function. Then sketch one cycle.

a) $y = 2\sin(3(x + 45°))$ **b)** $y = -\sin\left(\frac{1}{2}(x - 60°)\right) - 1$

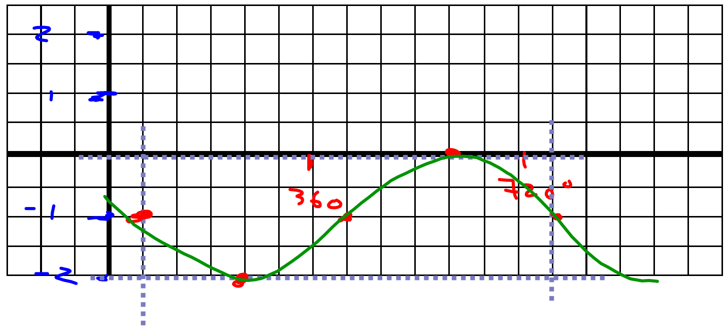
a)

amp = 2
T = 120°
P.S = 45° left



b) x-axis reflection
$T = \frac{360}{1/2}$
T = 720°
P.S. 60° →
V.D. ↓ 1

b)



7. Identify the transformation that is associated with each of the parameters (a, k, d, and c) in the graphs defined by $y = a\sin(k(x - d)) + c$ and $y = a\cos(k(x - d)) + c$. Discuss which graphical feature (period, amplitude, equation of the axis, or horizontal shift) is associated with each parameter.

a = vertical stretch aka amplitude

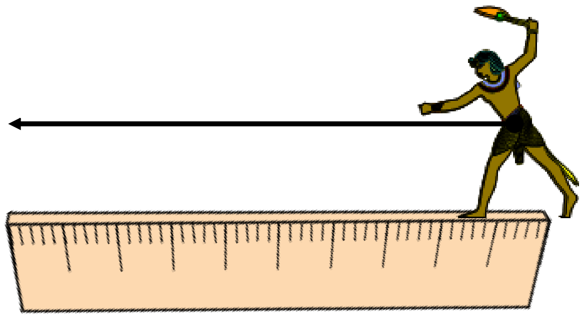
k = horizontal stretch (factor of $\frac{1}{k}$)
↳ related to the period (T)
$T = \frac{360°}{k}$

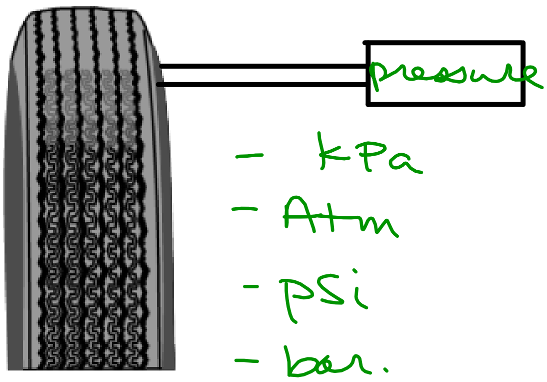
d = horizontal translation
aka phase shift

c = vert. translation
aka vert. displacement

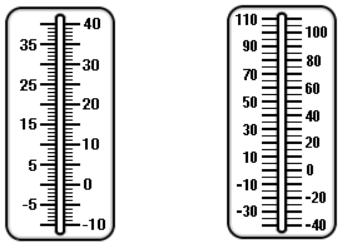
Think about it...

CDN
1.5 $ = €

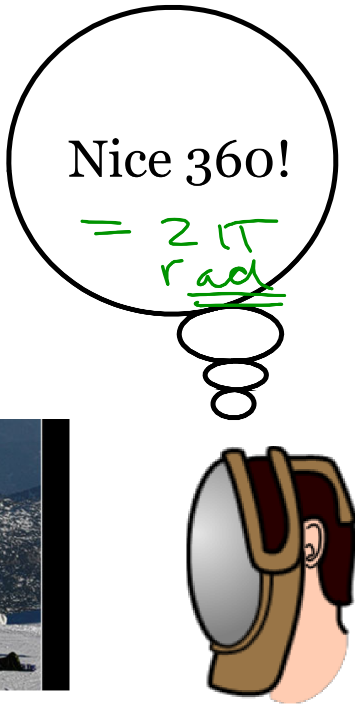




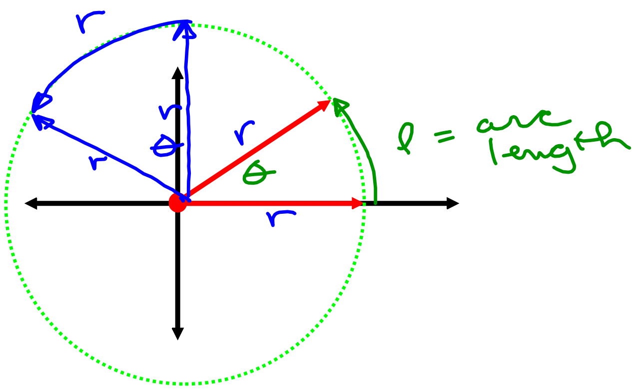
- kPa
- Atm
- psi
- bar.



$\frac{5}{9}$ °C = °F



6.1 Radian Measure



The origin: relation b/w radius & arc length

The arc length can be calculated by: ℓ = circumference × fraction of circumference

$= 2\pi r \times \frac{\theta}{360^\circ}$

$= \frac{\cancel{2}\pi r\theta}{\cancel{360}^\circ}$

$\boxed{\ell = \frac{\pi r\theta}{180^\circ}}$

What happens when $\ell = r$?

arc length = radius

$\cancel{\ell}\,1 = \frac{\pi \cancel{\ell} \theta}{180^\circ}$

$1 = \frac{\pi\theta}{180^\circ}$ solve for θ

$\frac{180^\circ}{\pi} = \theta$

this angle is known as 1 radian

$\boxed{\theta \doteq 57.3^\circ}$

$\ell = \frac{\pi r\theta}{180^\circ}$ degrees

$\ell = r\theta$ radians

or $a = r\theta$

arc length

Relationship between radians and degrees...

$1 \text{ rad} \doteq 57.3^\circ = \boxed{\frac{180^\circ}{\pi} = 1 \text{ rad}}$

To convert from radians to degrees... $\times \dfrac{180^\circ}{\pi}$

To convert from degrees to radians... $\times \dfrac{\pi}{180^\circ}$

Examples:

Convert to radians: a) $\cancel{75}^{5\,\circ} \times \dfrac{\pi}{{}_{12}\cancel{180^\circ}} = \dfrac{5\pi}{12}$

b) $220^\circ \times \dfrac{\pi}{180} = \dfrac{11\pi}{9}$

Convert to degrees:

a) $\dfrac{\cancel{\pi}}{5} \cdot \dfrac{180^\circ}{\cancel{\pi}} = 36^\circ$

but wait... $\pi = 180^\circ$ so replace π with 180°

A little trick...

b) $\dfrac{3\pi}{4} = \dfrac{3(180)}{4} = 135^\circ$

Arc Length, Angular Speed and Linear Speed

arc length - how long is the length (the pie crust)
- this is a curved distance

angular speed - how fast something is turning

linear speed - how fast something is moving

$$\ell = r\theta$$

angular speed $\quad \omega = \dfrac{\theta}{t}$

θ ← amount of rotation

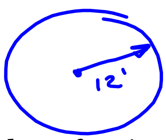
t ← time

Example: A merry go round makes 8 revolutions per minute.

but 1 rev = 2π rad

(a) what is the angular speed? $\quad \omega = \dfrac{8 \text{ rev}}{\text{min}} = \dfrac{8(2\pi)}{\text{min}} = 16\pi \ \dfrac{\text{rad}}{\text{min}}$

(b) how fast is a horse 12 feet from the center?



$v = r\omega$
$= (12')(16\pi\ /\text{min})$
$= 192\pi$ ft/min
≈ 10 ft/s

(c) how fast is a horse 4 feet from the center?

$v = r\omega$
$= (4')(16\pi\ /\text{min})$
$= 64\pi$ ft/min
≈ 3.35 ft/s

NB radians are unitless

Homefun:

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