

Section 8.1: Simple Trigonometric Equations

Essential Question: How do you solve for θ given a trig value?
What is inclination?

Example 1

Solve

$\sin(x) = .5$

$\sin^{-1}(\sin x) = \sin^{-1}(.5)$

$x = \sin^{-1}(.5)$

only get w/ calculator
 $\rightarrow x = 30^\circ$ or $.524$

Degree

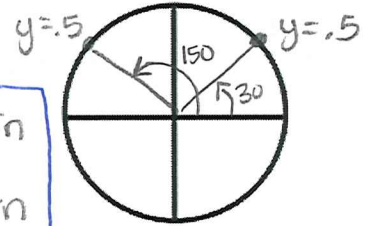
$\theta = 30^\circ \pm 360n$

$\theta = 150^\circ \pm 360n$

Radian

$\theta = \frac{\pi}{6} \pm 2\pi n$

$\theta = \frac{5\pi}{6} \pm 2\pi n$



Example 2

Solve

$\sin(x) = .8$ for $0 < x < 2\pi$ ← radian mode

$\sin^{-1}(\sin x) = \sin^{-1}(.8)$

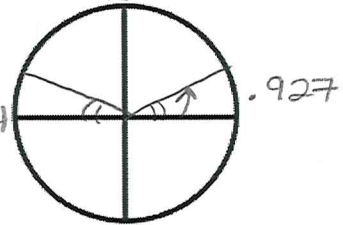
$x = \sin^{-1}(.8)$

$x = .927$

$\pi - .927$

$= 2.214$

0 to 2π
only 2 answers



Example 3

Solve

$\tan(x) = -1.2$ for $0^\circ < x < 360^\circ$ ← degree mode

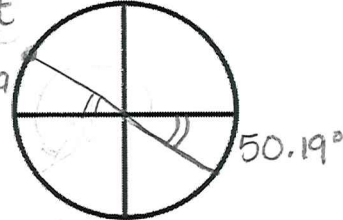
$x = \tan^{-1}(-1.2)$

$x = -50.19^\circ$

$\frac{180}{-50.19} = 129.81^\circ$

$\frac{360}{-50.19} = 309.81^\circ$

* tangent negative
Q2 and Q4



Example 4

Solve

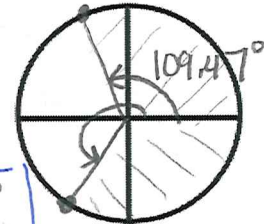
$3\cos\theta + 6 = 5$ for $0^\circ < x < 360^\circ$

$3\cos\theta = -1$
 $\cos\theta = -1/3$

$\theta = \cos^{-1}(-1/3)$

$\theta = 109.47^\circ$

$\frac{360}{-109.47} = 250.53^\circ$



Inclination and Slope

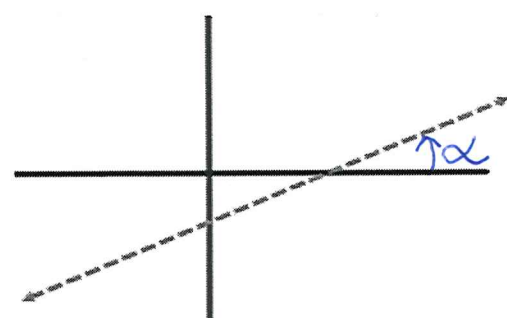
The inclination of a line is angle α where $0^\circ \leq \alpha \leq 180^\circ$
and measured from the positive x-axis to the line.

For any nonvertical line with slope m and inclination α

$m = \tan\alpha$ and $\alpha \neq 90^\circ$

If $\alpha = 90^\circ$ then the line is vertical and has No Slope

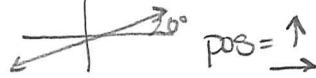
Remember: $\frac{\text{rise}}{\text{run}} = \frac{\#}{0} = \text{undefined}$



Example 5

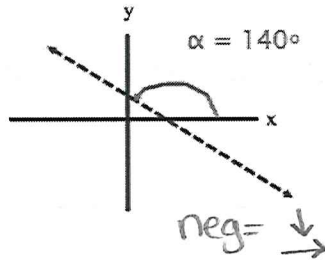
Given the inclination of a line is 20° find the slope.

$$m = \tan \alpha$$
$$m = \tan 20^\circ = .364$$



Example 6

Find the slope of the given line.



$$m = \tan \alpha$$
$$m = \tan 140^\circ$$
$$m = -.839$$

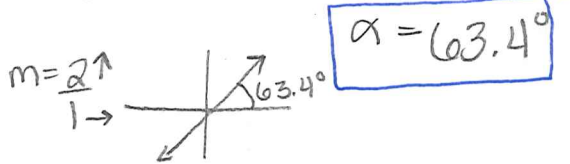
Example 7

To the nearest tenth of a degree find the inclination of the line with the following slope.

a) $m = 2$

$$m = \tan \alpha$$

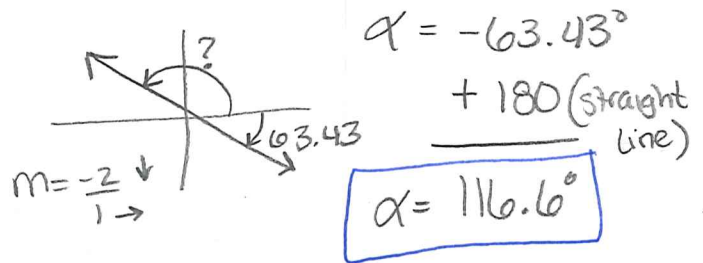
$$2 = \tan \alpha \rightarrow \alpha = \tan^{-1}(2)$$



b) $m = -2$

$$m = \tan \alpha$$

$$-2 = \tan \alpha \rightarrow \alpha = \tan^{-1}(-2)$$



Example 8

Find the inclination of the line.

a) $3x + 4y = 8$

$$4y = -3x + 8$$

$$y = \frac{-3}{4}x + 2$$

$$m = \frac{-3}{4}$$

$$m = \tan \alpha$$

$$\alpha = \tan^{-1}(-3/4)$$

$$\alpha = -36.87 + 180$$

$$\alpha = 143.1^\circ$$

b) $5y = 6 + 4x$

$$y = \frac{6}{5} + \frac{4}{5}x$$

$$m = \frac{4}{5}$$

$$\alpha = \tan^{-1}(m)$$

$$= \tan^{-1}(4/5)$$

$$\alpha = 38.7^\circ$$

Example 9

Find the equation of a line with inclination of 52° and passes through $(3, 7)$.

*your answer will contain decimals

$$m = \tan \alpha$$

$$m = \tan(52)$$

$$m = 1.28$$

Point Slope form

$$y - y_1 = m(x - x_1)$$

$$y - 7 = 1.28(x - 3)$$

$$y - 7 = 1.28x - 3.84$$

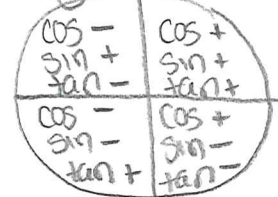
$$+7$$

$$+7$$

$$y = 1.28x + 3.16$$

Section 8.1 Summary:

Given $\sin \theta = \#$, $\cos \theta = \#$, $\tan \theta = \#$ and so forth to solve you take the inverse.



Inclination is the angle α from the positive x-axis and is 0° to 180° .
 $m = \tan \alpha$ and $\alpha = \tan^{-1}(m)$