

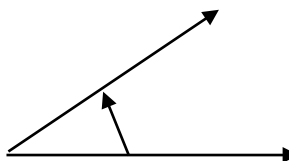
Section 7.1: Measurement of Angles

Essential Question:

Trigonometry

- Comes from two Greek words...TRIGONON and METRON meaning “*triangle measurement*”
- Ancient Egypt used trigonometry to survey land
- Today trigonometry is used for more modern applications such as radio waves

Measurements



- _____ :rotation from a point
- _____ :common unit used to measure very large angles
 - Example: car tire measures rev/min (rpm's)
- _____ :Common unit for small angles
 - 1 Revolution = 360°
- _____ :more precise unit of measure
 - 1 degree = _____ minutes ($60'$)
 - 1 minute = _____ seconds ($60''$)
 - 1 degree = _____ seconds

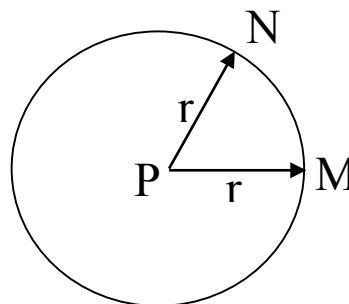
Examples

1) Given $24^\circ 18' 20''$ convert to decimal degrees

2) Given 19.7° convert to DMS (Degree Minute Second)

_____ is a **central angle**
(the center of the circle is the vertex of the angle)

_____ is the arc intercepted by _____



RADIAN MEASURE

Number of radius units in the length of an arc intercepted by a central angle

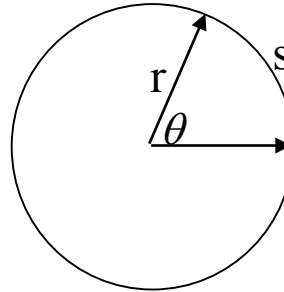
DEGREE MEASURE – _____

RADIAN MEASURE – _____

s =

r =

θ =



Arc Length

Angle Measure

Remember the circumference of a circle is $C = \underline{\hspace{2cm}}$ or $C = \underline{\hspace{2cm}}$

...but when we talk about radian and degree measures we are referring to a _____ which is a circle with a radius of 1 unit

1 revolution in radians = _____

1 revolution in degrees = _____

CONVERSIONS

2π radians = _____ or divide by 2 to get... π radians = _____

1 radian = _____ or 1 degree = _____

Examples

3) Convert 190° to radian measure

4) Convert 240° to radians (leave in terms of π)

5) Convert 2.6 radians to degrees

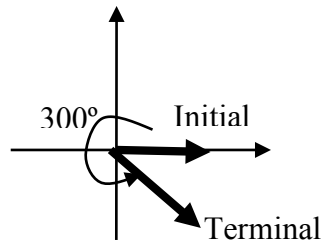
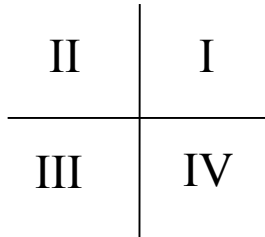
6) Convert 4.3 radians to DMS

Commonly Used Radian Measures

Multiples of... $90^\circ =$ $45^\circ =$ $60^\circ =$ $30^\circ =$

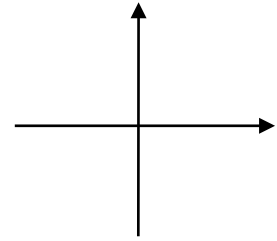
Standard Position

- Vertex is at the origin
- Initial ray on positive x-axis



Counterclockwise
IV Quadrant Angle

Ex:



$-\frac{2\pi}{3}$ Clockwise
___ Q Angle

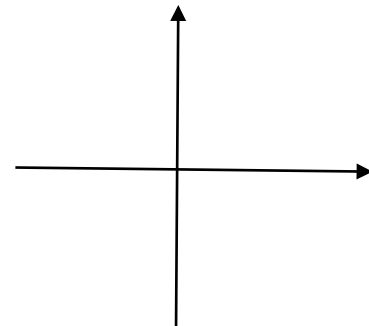
Quadrantal Angles

- Terminal side of angle in standard position lies on an axis
- Always a multiple of _____

Coterminal Angles

- Two angles that have the same _____ side
- There are _____ many coterminal angles

Ex 8: Give a positive & negative coterminal angle of 45° (degrees and radians)



Section 7.1 Summary:

Section 7.2: Sector Of A Circle

Essential Question:

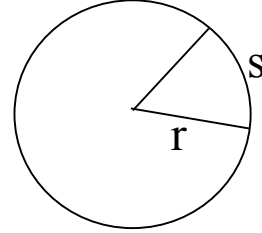
Sector of a Circle: Region bounded by a central angle and the intercepted arc

$$s = \underline{\hspace{2cm}}$$

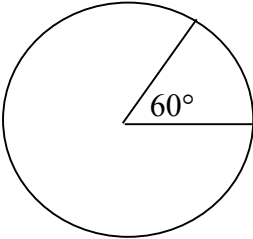
$$\text{Circumference (C)} = \underline{\hspace{2cm}}$$

$$r = \underline{\hspace{2cm}}$$

$$\text{Area} = \underline{\hspace{2cm}}$$



Given the following circle:



$\underline{\hspace{2cm}}$ of the circle

so the arc length =

and the area of the sector =

Arc Length

Area

If θ is in **DEGREES**:

If θ is in **RADIANS**:

Example 1

A sector has a radius of 5 cm and a central angle of .7 radians.
Find its arc length and area.

Example 2

The arc length of a sector is 6cm and the area is 75 cm².
What is the radius and central angle?

Example 3

The central angle is 25° and the arc length is 2.6 cm. What is the area?

Example 4

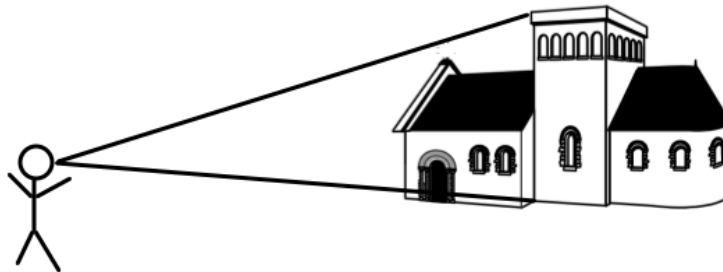
A sector has a perimeter of 16 cm and area of 15cm^2 .
What is the radius and arc length?

APPARENT SIZE: the measure of an angle

Formula to use: _____

Example 5

The apparent size of a building 2km away is .05 radians.
What is its approximate height?



Section 7.2 Summary:

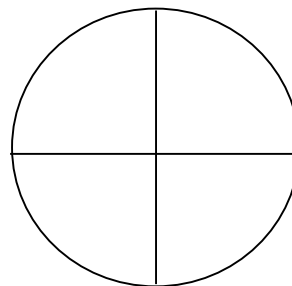
Section 7.3: The Sine and Cosine Functions

Essential Question:

The Sine and Cosine Functions

- Used to describe repetitive patterns (i.e. sound waves)
- Sine (_____)
- Cosine (_____)

If $P(x, y)$ is on a circle and θ is an angle in standard position, then



Remember an equation of circle is...

$$x^2 + y^2 = r^2$$

Example 1

If the terminal ray of θ in standard position passes through $(-5, 4)$ find $\sin\theta$ and $\cos\theta$.

Example 2

If θ is in quadrant III and $\cos\theta = \frac{-3}{5}$ find the $\sin\theta$.

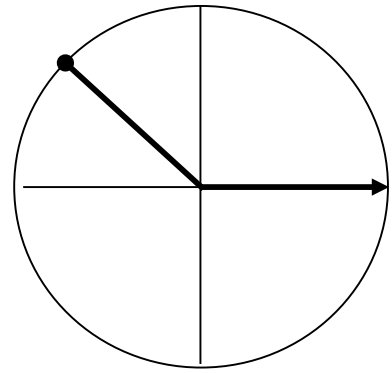
Example 3

If θ is a 4th quadrant angle and $\sin\theta = -\frac{5}{13}$ find $\cos\theta$.

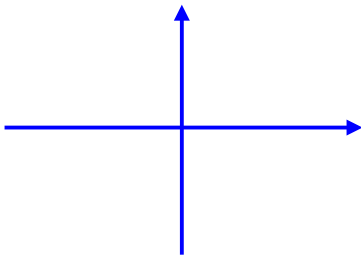
☞ The values of $\sin\theta$ and $\cos\theta$ depend only on θ NOT on the radius of the circle

UNIT CIRCLE

- Radius =
- Equation
- $\sin\theta =$ $\cos\theta =$
- Trig functions are called circular functions



Value of $\sin\theta = y$ and $\cos\theta = x$



Example 4

Find the value of

a) $\cos 90^\circ$

b) $\sin 90^\circ$

Example 5

Find the value of

a) $\cos 360^\circ$

b) $\sin(2\pi)$

c) $\cos(-\pi)$

Example 6

Solve $\sin\theta = 1$ for θ in degrees and radians.

☞ Because the values of $\sin\theta$ and $\cos\theta$ repeat, trig functions are _____.

Section 7.3 Summary:

Section 7.4: Evaluating and Graphing Sine and Cosine

Essential Question:

CHECK YOUR MODE!!

If using TI – 83 or higher...

CHECK your **MODE**: θ is measured in either radians or degrees

- Press the **MODE** key
- Arrow down to degree or radian (depending on problem)
- Highlight** the correct mode and then press **enter**
- Exit to the main screen by pressing **Clear** or **Quit**

If using TI-30...

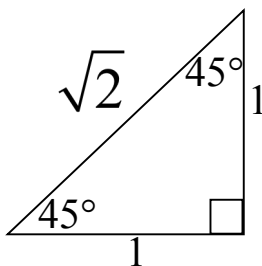
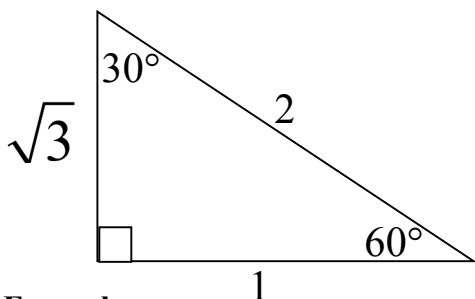
- Press the **DRG** key
- Arrow left/right to degree (DEG) or radian (RAD)
- Once your choice is underlined select by pressing **ENTER** (the equal key)
- At the bottom-right of screen your selection will be visible

SINE AND COSINE

Use a calculator to find the following values.

- | | |
|---------------------|------------------------|
| 1) $\sin 42^\circ$ | 2) $\sin 37.3^\circ$ |
| 3) $\cos 160^\circ$ | 4) $\cos 17^\circ 20'$ |
| 5) $\sin 2.3$ | 6) $\cos 1.2$ |

SPECIAL ANGLES using 30-60-90 Δ 's and 45-45-90 Δ 's



$$\sin \theta = \frac{\textit{opposite}}{\textit{hyp.}}$$

$$\cos \theta = \frac{\textit{adjacent}}{\textit{hyp.}}$$

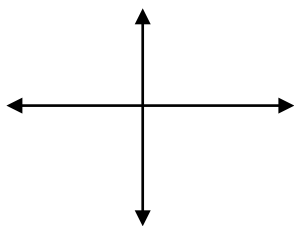
Examples

- | | |
|--------------------|---------------------|
| 7) $\cos 60^\circ$ | 8) $\sin 30^\circ$ |
| 9) $\sin 45^\circ$ | 10) $\cos 30^\circ$ |

REFERENCE ANGLE: an _____ angle formed with the x-axis and terminal side

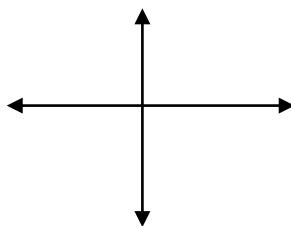
EXAMPLES

11) 125°



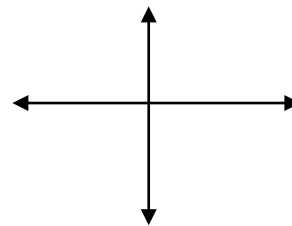
Ref $\angle =$ _____

12) 42°



Ref $\angle =$ _____

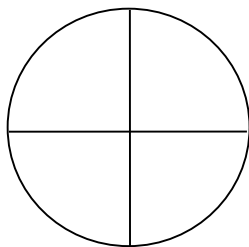
13) -220°



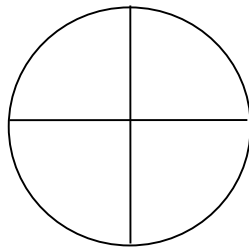
Ref $\angle =$ _____

Express the following in terms of a reference angle.

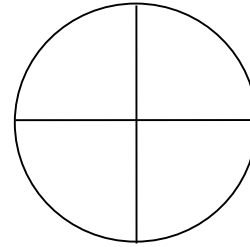
14) $\sin 130^\circ$



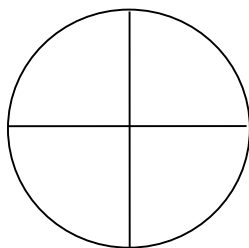
15) $\sin(-100^\circ)$



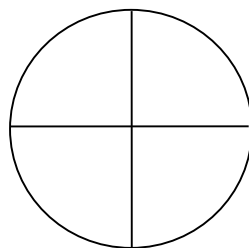
16) $\sin(-42^\circ)$



17) $\cos 130^\circ$

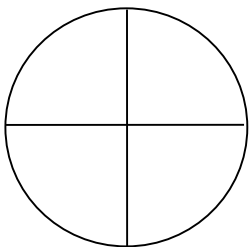


18) $\cos 1200^\circ$

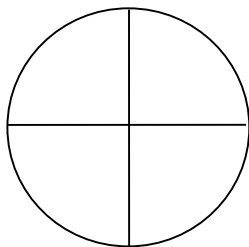


Examples: Find the exact value of each. **NO DECIMALS!**

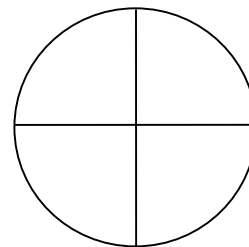
19) $\sin 45^\circ$



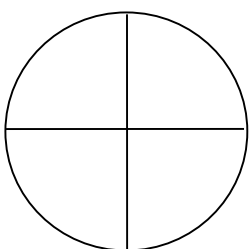
20) $\cos 135^\circ$



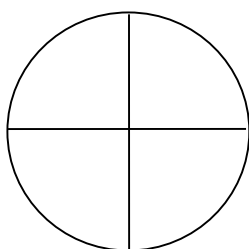
21) $\sin 150^\circ$



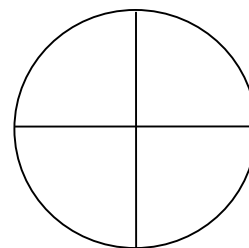
22) $\sin 2\pi$



23) $\cos\left(\frac{\pi}{2}\right)$



24) $\sin(-300^\circ)$



MATH IS _____!

Section 7.4 Summary:

Section 7.5: The Other 4 Trigonometric Functions

Essential Question:

Other Trig Functions

tangent (tan) secant (sec)
cotangent (cot) cosecant (csc)

$$\sin \theta = \frac{y}{r}$$

$$\cos \theta = \frac{x}{r}$$

$$\tan \theta = \frac{y}{x}$$

$$\csc \theta = \frac{r}{y}$$

$$\sec \theta = \frac{r}{x}$$

$$\cot \theta = \frac{x}{y}$$

RECIPROCAL

$\sec \theta$ and $\cos \theta$ are reciprocals:

$$\sec \theta =$$

$$\cos \theta =$$

$\csc \theta$ and $\sin \theta$ are reciprocals:

$$\csc \theta =$$

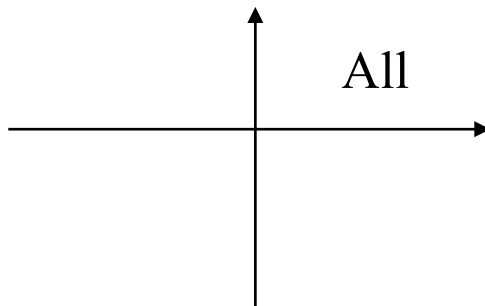
$$\sin \theta =$$

Since $\sin \theta = y$ and $\cos \theta = x \dots$

$$\tan \theta =$$

$$\cot \theta =$$

POSITIVE TRIG VALUES



Example 1

Use a calculator to find the following.

a) $\sin 27^\circ$

b) $\tan 175^\circ$

c) $\sec 42^\circ$

d) $\cot 7$

e) $\csc(-1)$

Example 2

If θ is in the 3rd quadrant and $\tan \theta = 5/12$ find the other five trig functions.

Example 3

Express each of the following in term of a reference angle.

a) $\sin 190^\circ$

b) $\sec(-100^\circ)$

c) $\tan 300^\circ$

d) $\csc 125^\circ$

e) $\cos(-72^\circ)$

Example 4

Give the value of x (in radians) for which $\sec(x)$ is:

a) 1

b) 0

c) undefined

Example 5

Give the value of x (in radians) for which $\tan(x)$ is:

a) 0

b) 1

c) undefined

Example 6

Given $\tan\theta = -\frac{3}{4}$ and $0 < \theta < \pi$, find the other trig values.

Example 7

Find the exact values.

a) $\sec 150^\circ$

b) $\tan (-225^\circ)$

c) $\sec 180^\circ$

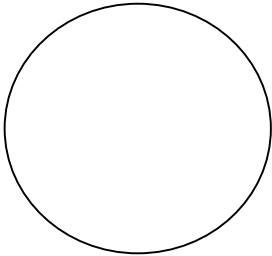
d) $\tan 90^\circ$

Section 7.5 Summary:

Section 7.6: The Inverse Trigonometric Functions

Essential Question:

$$\cos^{-1}x$$



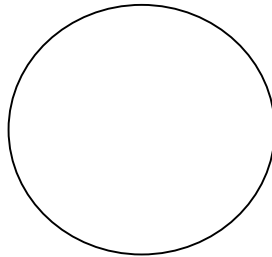
Domain: _____

or _____

Example 1

Using a calculator, find the $\cos^{-1}(-1)$

$$\sin^{-1}x$$

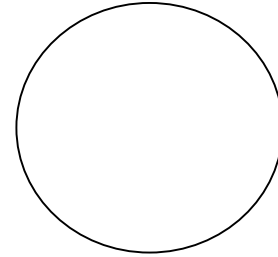


Domain: _____

or _____

In degree mode

$$\tan^{-1}x$$



Domain: _____

or _____

In radian mode

Taking the inverse of a value is finding the angle measure which would produce that value.

Ask yourself, if $\cos \theta = -1$, what does θ have to be to get (-1)?

Example 2

Using a calculator, find the $\tan^{-1}4$

In degree mode

In radian mode

Example 3

Without a calculator, find the exact answer of $\tan^{-1}(-1)$

Example 4

Without a calculator, find the exact answer of $\cos^{-1}(-0.5)$

Example 5

Find the $\cos\left(\tan^{-1}\left(\frac{-2}{3}\right)\right)$

a) with a calculator

b) without a calculator

Example 6

Find the $\cos\left[\sin^{-1}\left(\frac{4}{5}\right)\right]$ without a calculator.

Section 7.6 Summary: