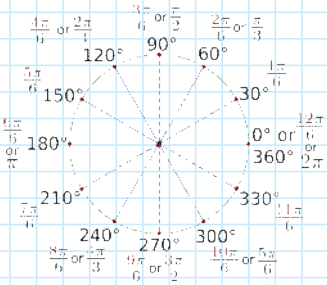
Tuesday, Mar. 12th

Plan For Today:

1. Any questions from Chapter 5?
   - Hand-in Chapter 5 Project - Part A (Desmos) & B
   - Do Unit 3 Exam ~1-1.5hr
2. Intro to Chapter 4: The Unit Circe & Trigonometry
   - **6.1: Trigonometric Functions**
   - **6.2: Trig Functions of Acute Angles**
   - **6.3: Trig Functions of General & Special Angles**
   - 6.4: Graphing Basic Trig Functions
   - 6.5: Applications of Periodic Functions
3. Do Practice Questions from Workbook

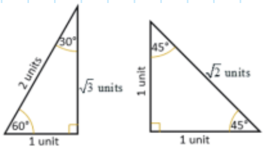


Degrees→ radians

$\times$ by $\frac{\pi}{180}$

Radians→ degrees

$\times$ by $\frac{180}{\pi}$



	30°	45°	60°
sin	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$
cos	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$
tan	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$

Plan Going Forward:

HAVE AN AWESOME AND PRODUCTIVE SPRING BREAK!

1. Finish going through 6.1-6.3 practice question in textbook.

   - **6.1-6.3 CHECK-IN QUIZ ON TUESDAY, APR. 2ND**

2. We will finish Chapter 6 (Trigonometry I) on the Thursday after Spring Break and start Chapter 7 (Trig II).

   - **CHAPTER 6 PROJECT (PART A HANDOUT & PART B IN DESMOS) DUE TUESDAY, APR. 9TH**
     - https://student.desmos.com/activitybuilder/student-greeting/65f089483694a5f29f2b2f77
   - **CHAPTER 6 QUIZ ON TUESDAY, APR. 9TH**

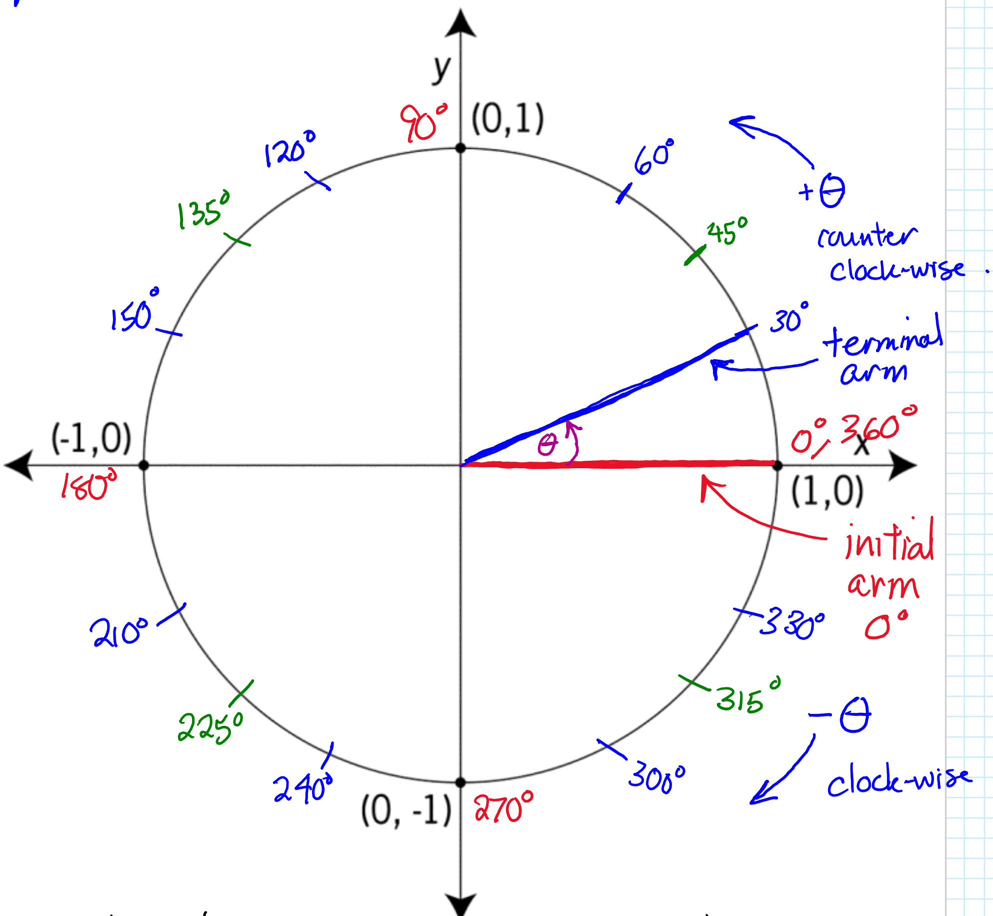
- **UNIT 3 EXAM REWRITE ON TUESDAY, APRIL 2ND**
  - Start 12:30pm
  - 12 Multiple Choice & 20 marks on the Written
  - ~1 hour
  - Closed-book - no notes

Please let me know if you have any questions or concerns about your progress in this course. The notes from today will be posted at anurita.weebly.com after class.
Anurita Dhiman = adhiman@sd35.bc.ca

This is a Unit circle because it has a radius of one unit. Notice the points on the x-axis and y-axis (intercepts are exactly 1 unit away from the origin.

Divide this circle up into degrees in multiples of 30°, 45° and 60° degrees. (recall a circle has 360°)

6.1 p.251-252



coterminal angles → other angles that have the same terminal arm location

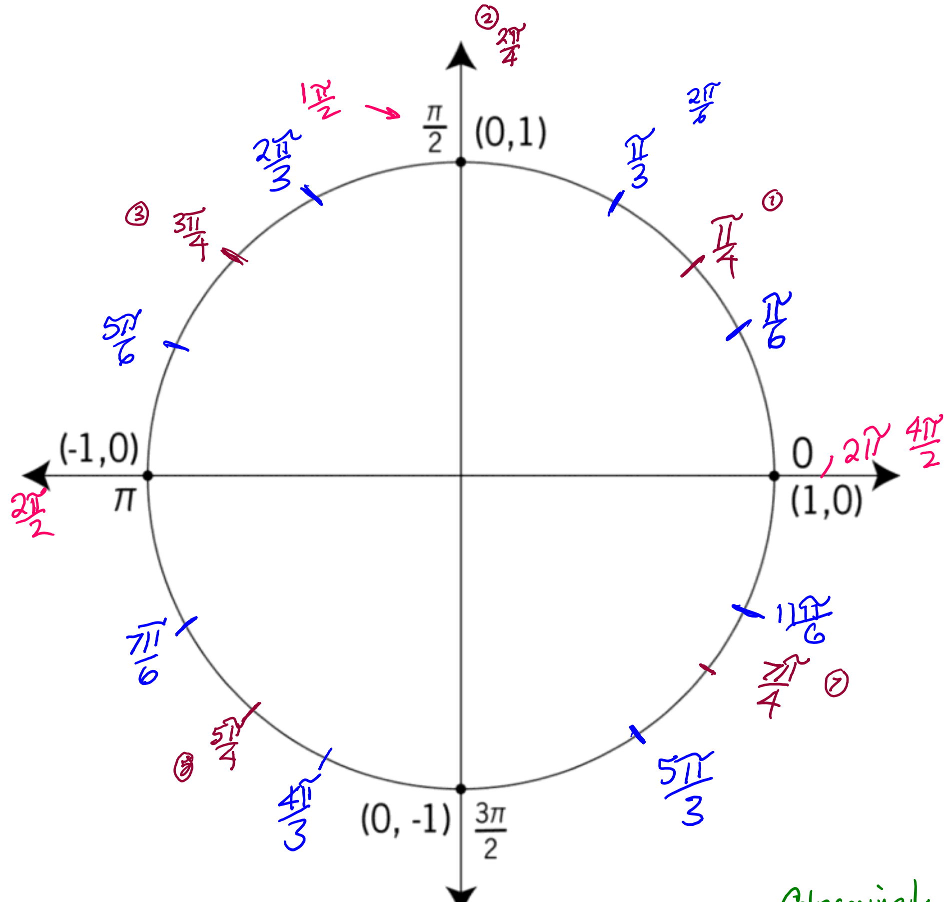
→ $\theta \pm 360°$ to determine coterminal angles.

→ general : $\theta \pm 360°n$, $n \in I$

$180° = \pi$

A circle can also be divided into radians which are multiples and fractions of pi (π). If 180° = π radians and 360°= 2π radians, try to divide up the circle into radians.

$30° = \frac{\pi}{6}$, $45° = \frac{\pi}{4}$, $60° = \frac{\pi}{3}$



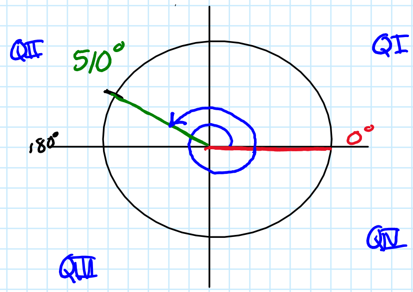
Convert : Degrees $\rightarrow$ Radians . $\times \frac{\pi}{180°}$

Radians $\rightarrow$ Degrees $\times \frac{180°}{\pi}$

Coterminal:
$\theta \pm 2\pi n$, $n \in \mathbb{Z}$.
#of turns.

6.1 ex: $\theta = 510°$

① Draw angle position (standard position)



$510 - 360 = 150°$

② coterminal angle.

$\theta_1 = 510° - 360° \rightarrow 150°$

(2) coterminal angles

$$\theta_1 = 510^\circ - 360^\circ \rightarrow 150^\circ$$

$$\theta_2 = 510^\circ + 360^\circ \rightarrow 870^\circ$$

$$\theta_3 = 510^\circ - 360^\circ(2) \rightarrow -210^\circ$$

$n=2$

(3) $510^\circ \rightarrow$ radians.

$$510^\circ \times \frac{\pi}{180^\circ} = \frac{51\cancel{0}\pi}{18\cancel{0}}$$

$$= \boxed{\frac{17\pi}{6}} \text{ (radians)}$$

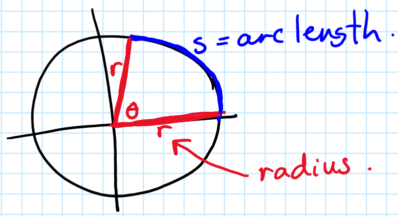
Arc Length p. 254.

$$s = r\theta$$

s = arc length or "a"

r = radius of circle

θ = angle in <u>radians</u>

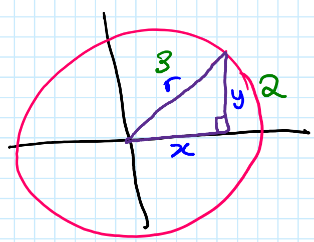


$$\sin\theta = \frac{opp}{hyp} \qquad \cos\theta = \frac{adj}{hyp} \qquad \tan\theta = \frac{opp}{adj}$$

reciprocals.

$$\csc\theta = \frac{hyp}{opp} \qquad \sec\theta = \frac{hyp}{adj} \qquad \cot\theta = \frac{adj}{opp}.$$

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

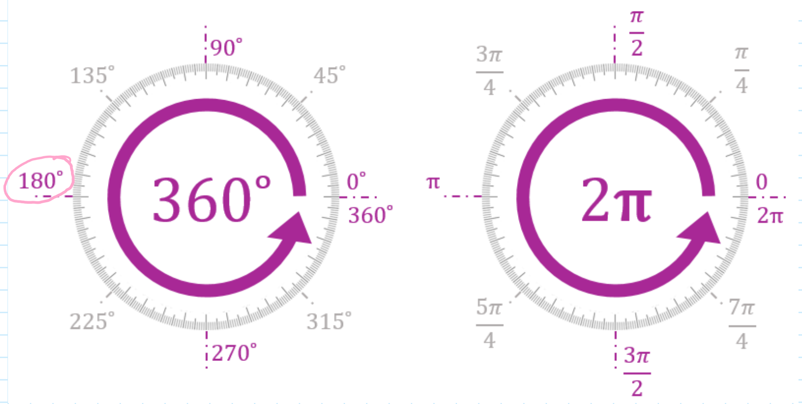


Ex: $\csc\theta = \frac{3}{2}$ ← hyp, ← opp

or

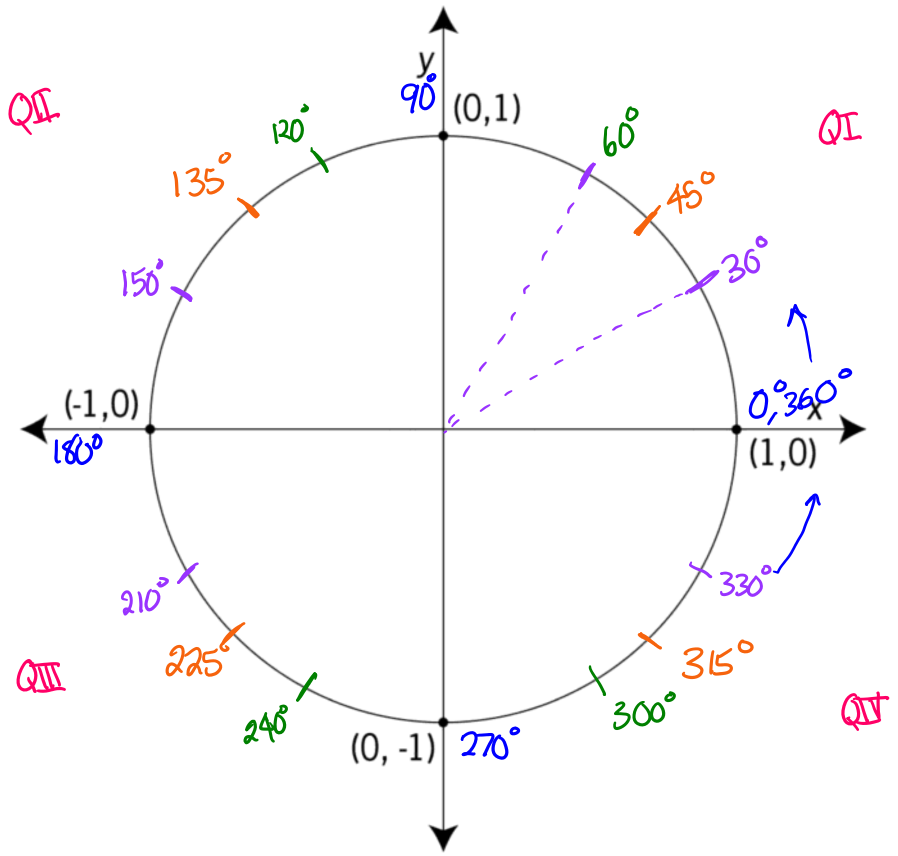
$\sin\theta = \frac{2}{3}$ ← opp, ← hyp.

What is a Unit Circle and how do you divide it into degrees and radians?

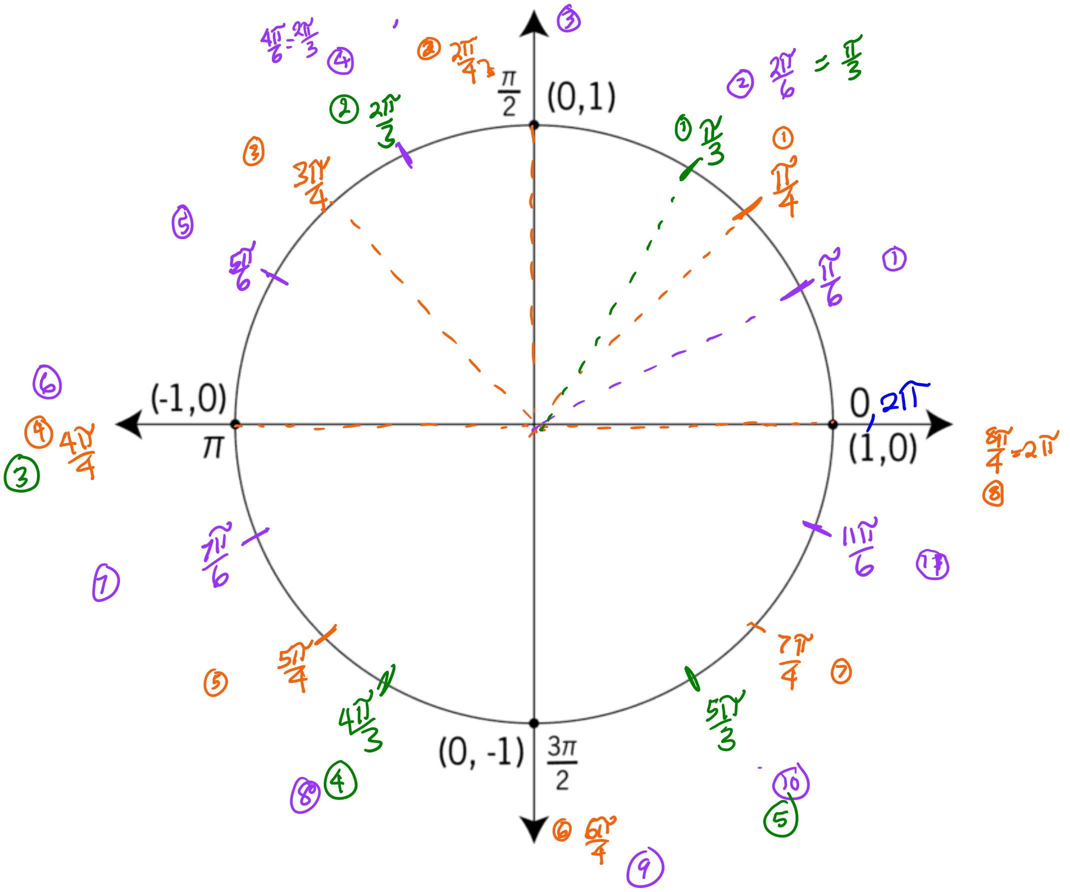


This is a Unit circle because it has a radius of one unit. Notice the points on the x-axis and y-axis (intercepts are exactly 1 unit away from the origin.

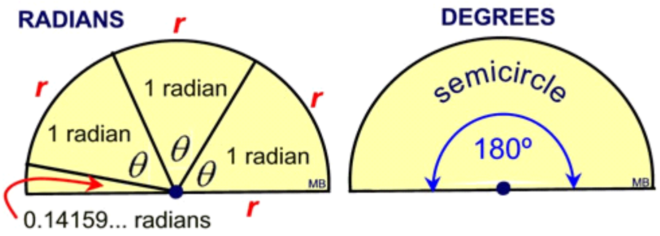
Divide this circle up into degrees in multiples of 30°, 45° and 60° degrees. (recall a circle has 360°)



A circle can also be divided into radians which are multiples and fractions of pi (π). If 180° = π radians and 360°= 2π radians, try to divide up the circle in to radians.

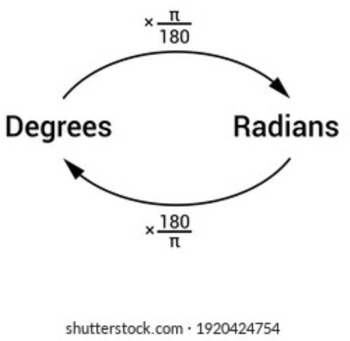


Converting between Degrees and Radians:



$$\underbrace{3.14159...}_{\pi} \text{ radians} = 180^\circ$$

$$\pi \text{ radians} = 180^\circ$$



Your Turn

Draw each angle in standard position. Change each degree measure to radians and each radian measure to degrees. Give answers as both exact and approximate measures (if necessary) to the nearest hundredth of a unit.

a) $-270°$ **b)** $150°$

c) $\frac{7\pi}{6}$ **d)** -1.2

a) $-\cancel{270}^{\circ\,3} \times \frac{\pi}{\cancel{180}^{\circ}_{2}} = \boxed{-\frac{3\pi}{2}}$

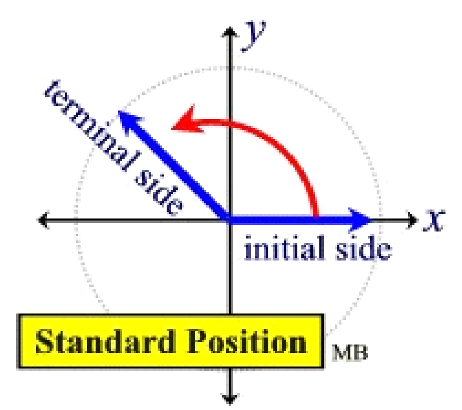
b) $\cancel{150}^{\circ\,5} \times \frac{\pi}{\cancel{180}_{6}} = \boxed{\frac{5\pi}{6}}$

c) $\frac{7\cancel{\pi}}{\cancel{6}_{1}} \times \frac{\cancel{180}^{\circ\,30}}{\cancel{\pi}} = \boxed{210^\circ}$

d) $-1.2 \times \frac{180^\circ}{\pi} = \frac{-1.2 \times 180}{\pi}$

$= \boxed{-68.8^\circ}$

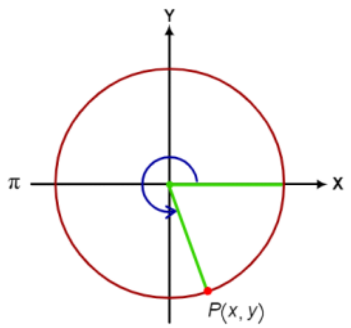
Graphing Angles in Standard Position:



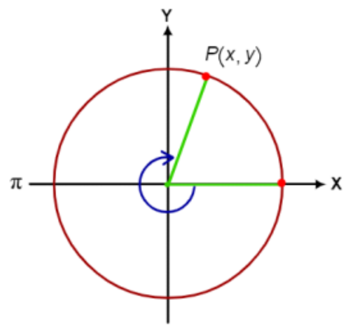
1.12 Angles in Standard Position

If $\theta > 0$ (or positive), the rotation is counter clockwise.

If $\theta < 0$ (or negative), the rotation is clockwise.



Counter Clockwise



Clockwise

Kuta Software - Infinite Algebra 2 Name___________________________

Angles and Angle Measure Date_______________ Period____

Convert each degree measure into radians and each radian measure into degrees.

1) $325°$

2) $60°$

3) $-\frac{4\pi}{3}$

4) $\frac{23\pi}{12}$

5) $570°$

6) $-315°$

Convert each decimal degree measure into degrees-minutes-seconds and each degrees-minutes-seconds into decimal degrees.

7) $128.77°$

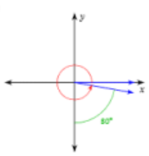
8) $232° 7' 57"$

9) $-154° 47' 42"$

10) $-0.9225°$

Find the measure of each angle.

11)



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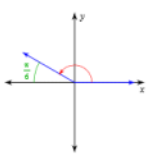

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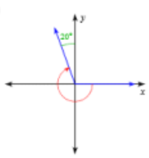

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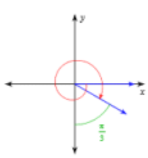

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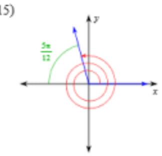
15)



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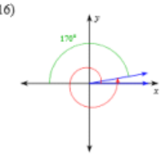
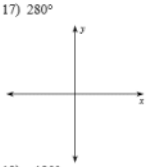
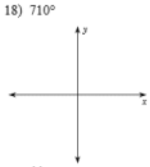


Draw an angle with the given measure in standard position.

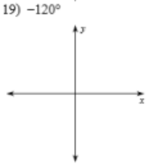
17) $280°$



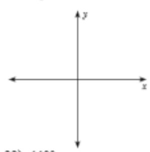
18) $710°$



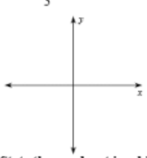
19) $-120°$



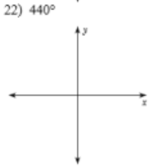
20) $\frac{11\pi}{6}$



21) $-\frac{10\pi}{3}$



22) $440°$



State the quadrant in which the terminal side of each angle lies.

23) $-509°$

24) $-\frac{5\pi}{6}$

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Kuta Software - Infinite Algebra 2 Name________________________________

Angles and Angle Measure

Date________________ Period____

Convert each degree measure into radians and each radian measure into degrees.

1) $325°$ $\frac{65\pi}{36}$

2) $60°$ $\frac{\pi}{3}$

3) $-\frac{4\pi}{3}$ $-240°$

4) $\frac{23\pi}{12}$ $345°$

5) $570°$ $\frac{19\pi}{6}$

6) $-315°$ $-\frac{7\pi}{4}$

Convert each decimal degree measure into degrees-minutes-seconds and each degrees-minutes-seconds into decimal degrees.

7) $128.77°$

$128° \, 46' \, 12''$

8) $232° \, 7' \, 57''$

$232.1325°$

9) $-154° \, 47' \, 42''$

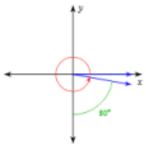
$-154.795°$

10) $-0.9225°$

$-0° \, 55' \, 21''$

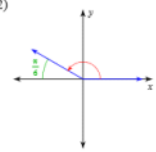
Find the measure of each angle.

11)



$350°$

12) $\frac{5\pi}{6}$



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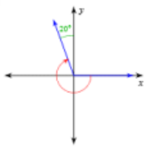
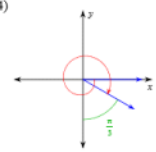


$-250°$

14) $-\frac{13\pi}{6}$



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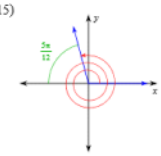
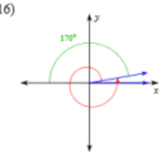
15) $\frac{55\pi}{12}$

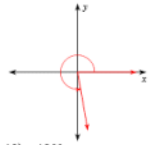


16) $370°$

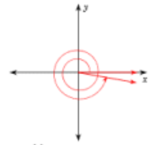


Draw an angle with the given measure in standard position.

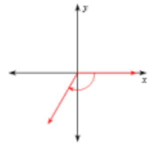
17) $280°$



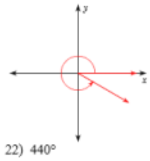
18) $710°$



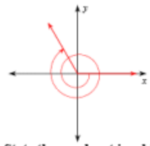
19) $-120°$



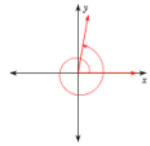
20) $\frac{11\pi}{6}$



21) $-\frac{10\pi}{3}$



22) $440°$



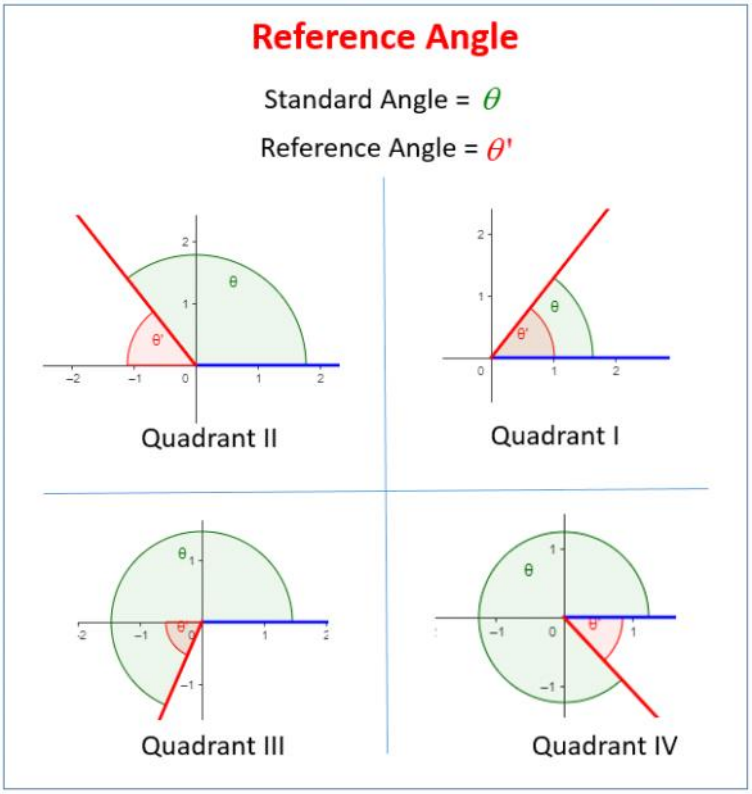
State the quadrant in which the terminal side of each angle lies.

23) $-509°$ III

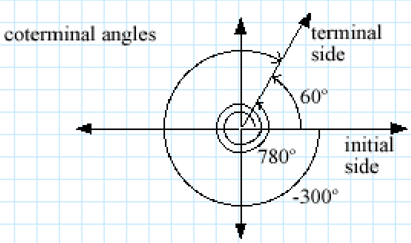
24) $-\frac{5\pi}{6}$ III

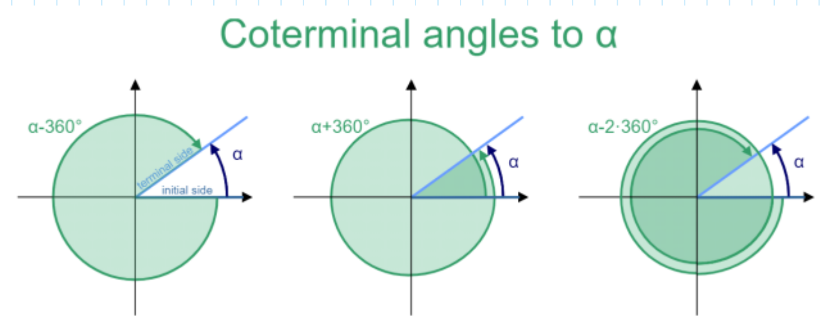
-2-

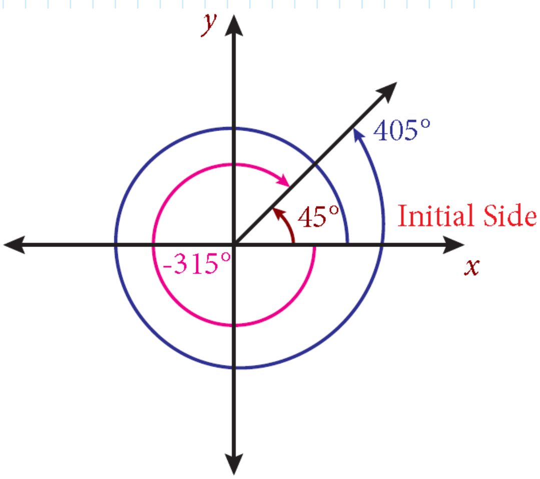
Reference Angle = acute angle to the x-axis (never written as a negative number since it is a measure of distance and does not include direction)

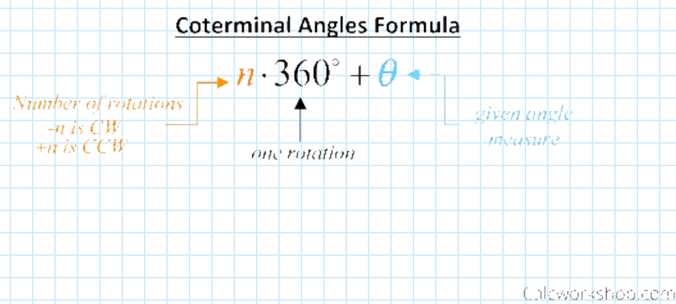


Coterminal Angles = angles of different measurements which end at the same terminal arm (determined by adding and subtracting rotations around the circle)



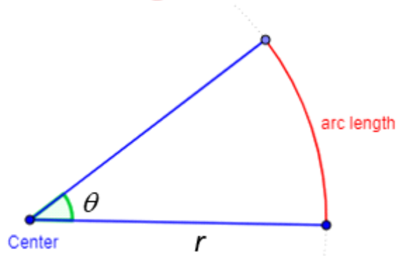






Finding Arc Length:

Arc Length of a Circle



If θ is measured in degrees then

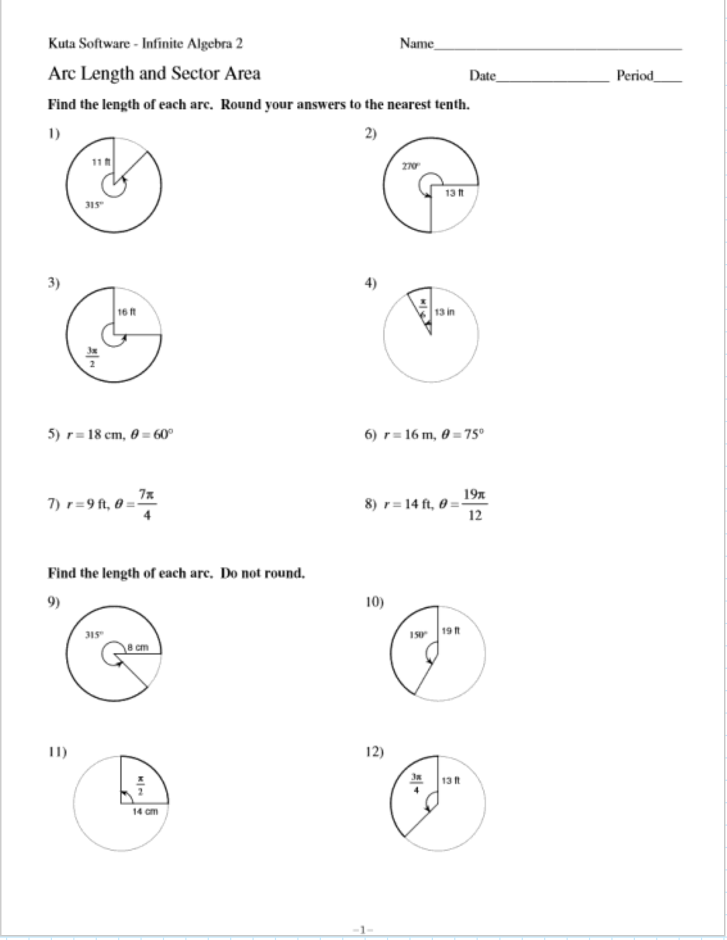
$$\text{arc length} = \frac{\theta}{360°} \times 2\pi r$$

If θ is measured in radians then

$$\text{arc length} = \theta r$$

when angle in degrees.

$$a = \left(\theta \times \frac{\pi}{180°}\right) r$$



Kuta Software - Infinite Algebra 2 Name____________________

Arc Length and Sector Area Date______________ Period____

Find the length of each arc. Round your answers to the nearest tenth.

1) 11 ft, 315°

2) 270°, 13 ft

3) 16 ft, $\frac{3\pi}{2}$

4) $\frac{\pi}{6}$, 13 in

5) $r = 18$ cm, $\theta = 60°$

6) $r = 16$ m, $\theta = 75°$

7) $r = 9$ ft, $\theta = \frac{7\pi}{4}$

8) $r = 14$ ft, $\theta = \frac{19\pi}{12}$

Find the length of each arc. Do not round.

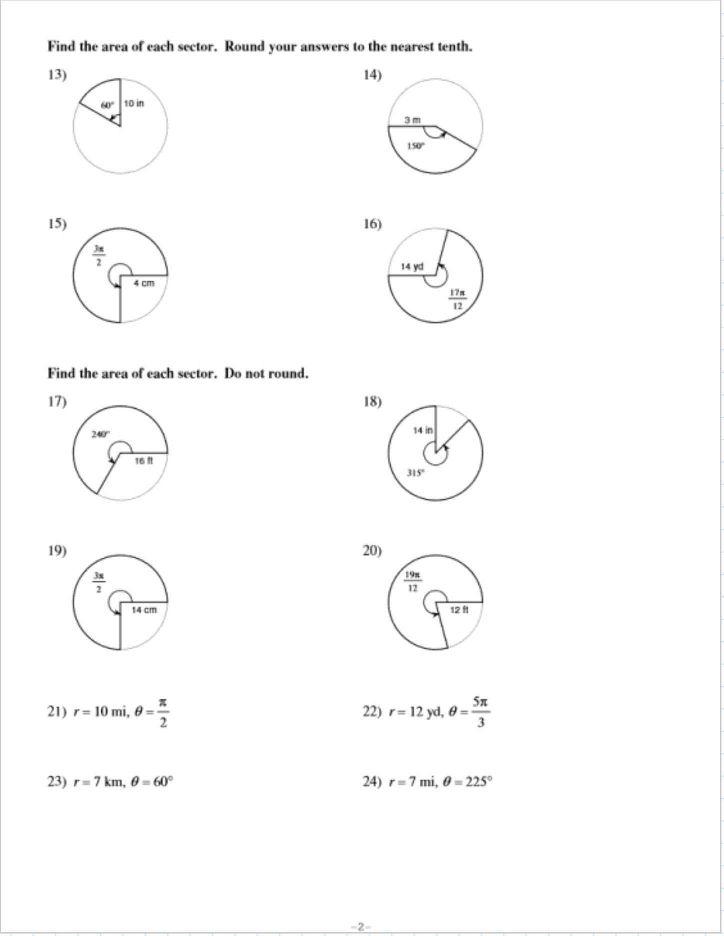
9) 315°, 8 cm

10) 150°, 19 ft

11) $\frac{\pi}{2}$, 14 cm

12) $\frac{3\pi}{4}$, 13 ft

-1-



Find the area of each sector. Round your answers to the nearest tenth.

13) 60°, 10 in

14) 3 m, 150°

15) $\frac{3\pi}{2}$, 4 cm

16) 14 yd, $\frac{17\pi}{12}$

Find the area of each sector. Do not round.

17) 240°, 16 ft

18) 14 in, 315°

19) $\frac{3\pi}{2}$, 14 cm

20) $\frac{19\pi}{12}$, 12 ft

21) $r = 10$ mi, $\theta = \frac{\pi}{2}$

22) $r = 12$ yd, $\theta = \frac{5\pi}{3}$

23) $r = 7$ km, $\theta = 60°$

24) $r = 7$ mi, $\theta = 225°$

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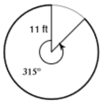
Kuta Software - Infinite Algebra 2 Name________________________________

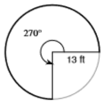
Arc Length and Sector Area

Date________________ Period____

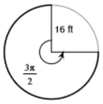
Find the length of each arc. Round your answers to the nearest tenth.

1)


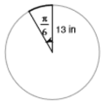
60.5 ft

2)


61.3 ft

3)


75.4 ft

4)


6.8 in

5) $r = 18$ cm, $\theta = 60°$

18.8 cm

6) $r = 16$ m, $\theta = 75°$

20.9 m

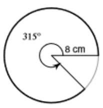
7) $r = 9$ ft, $\theta = \frac{7\pi}{4}$

49.5 ft

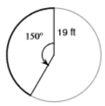
8) $r = 14$ ft, $\theta = \frac{19\pi}{12}$

69.6 ft

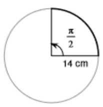
Find the length of each arc. Do not round.

9)


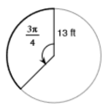
14π cm

10)


$\frac{95\pi}{6}$ ft

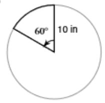
11)


7π cm

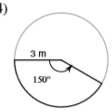
12)


$\frac{39\pi}{4}$ ft

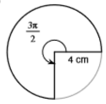
Find the area of each sector. Round your answers to the nearest tenth.

13)


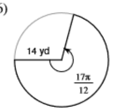
52.4 in²

14)


11.8 m²

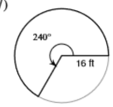
15)


37.7 cm²

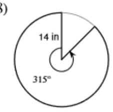
16)


436.2 yd²

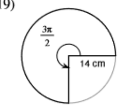
Find the area of each sector. Do not round.

17)


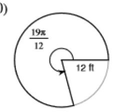
$\frac{512\pi}{3}$ ft²

18)


$\frac{343\pi}{2}$ in²

19)


147π cm²

20)


114π ft²

21) $r = 10$ mi, $\theta = \frac{\pi}{2}$

25π mi²

22) $r = 12$ yd, $\theta = \frac{5\pi}{3}$

120π yd²

23) $r = 7$ km, $\theta = 60°$

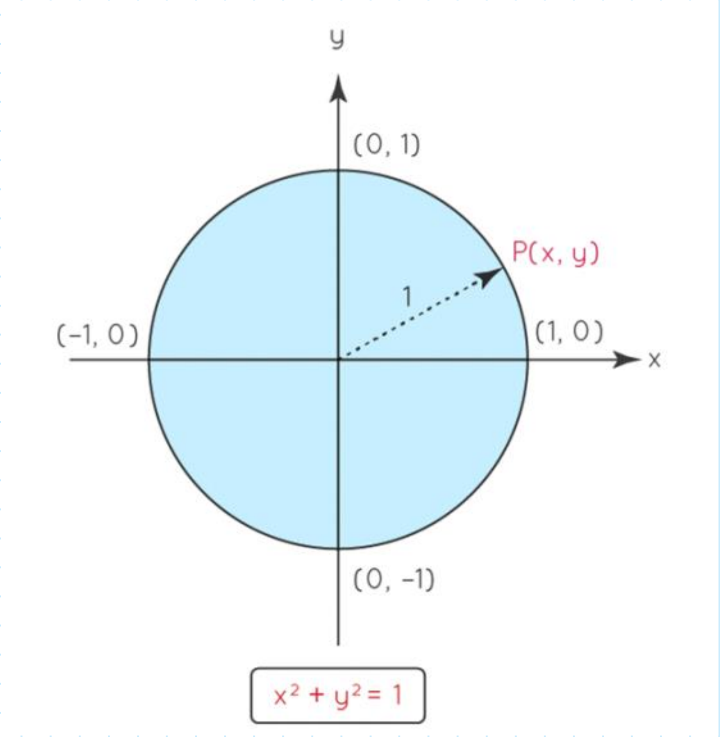
$\frac{49\pi}{6}$ km²

24) $r = 7$ mi, $\theta = 225°$

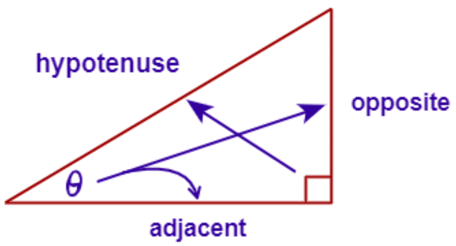
$\frac{245\pi}{8}$ mi²

6.2 Trig Functions of Acute Angles (SOH CAH TOA)

Equation of a Unit Circle & Coordinates in a Unit Circle



Review of Trig Ratios:



These definitions are only useful for acute angles.

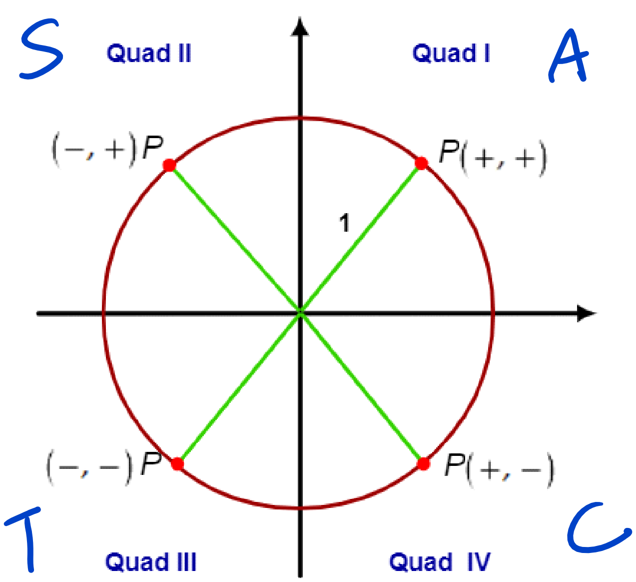
$$\sin\theta = \frac{\text{length of side opposite } \theta}{\text{length of hypotenuse}}$$

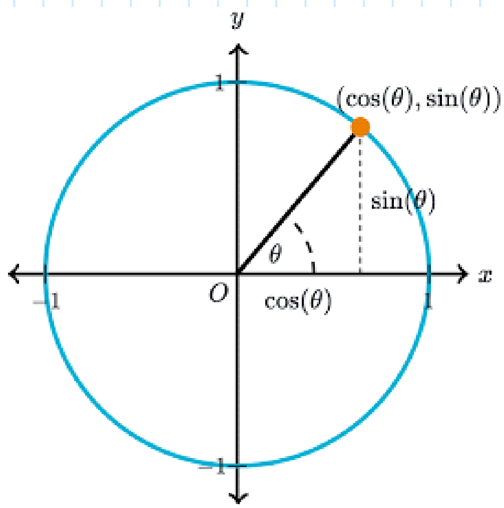
$$\cos\theta = \frac{\text{length of side adjacent } \theta}{\text{length of hypotenuse}}$$

$$\tan\theta = \frac{\text{length of side opposite } \theta}{\text{length of side adjacent } \theta}$$

Signs of trig ratios in each quadrant:

All Students Take Calculus



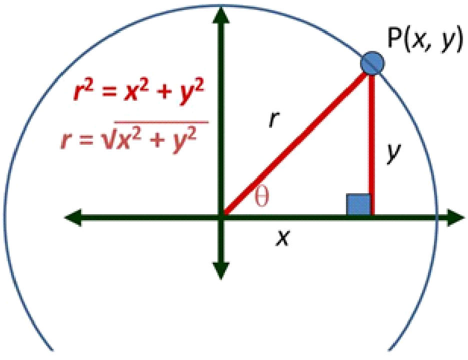


$$\tan\theta = \frac{y}{x}$$

$$\cos\theta = x$$

$$\sin\theta = y$$

Point P(x, y) is the point on the terminal arm of angle θ ,an angle in standard position, that intersects a circle.



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

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

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

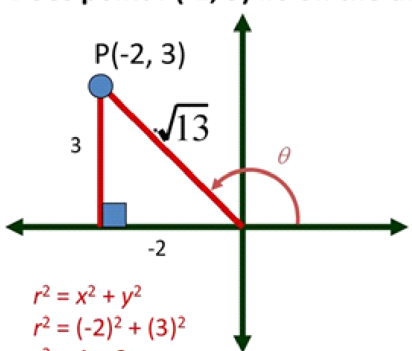
The three reciprocal ratios are defined as follows:

$$\text{cosecant} = \frac{1}{\text{sine}} \qquad \text{secant} = \frac{1}{\text{cosine}} \qquad \text{cotangent} = \frac{1}{\text{tangent}}$$

Finding the Trig Ratios of an Angle in Standard Position

The point P(-2, 3) is on the terminal arm of θ in standard position.

Does point P(-2, 3) lie on the unit circle? No, the radius of a unit circle is 1.



$r^2 = x^2 + y^2$
$r^2 = (-2)^2 + (3)^2$
$r^2 = 4 + 9$
$r^2 = 13$
$r = \sqrt{13}$

Determine the exact value of the six trigonometric ratios for angle θ.

$$\sin\theta = \frac{3}{\sqrt{13}} \qquad \csc\theta = \frac{\sqrt{13}}{3}$$

$$\cos\theta = -\frac{2}{\sqrt{13}} \qquad \sec\theta = -\frac{\sqrt{13}}{2}$$

$$\tan\theta = -\frac{3}{2} \qquad \cot\theta = -\frac{2}{3}$$

Cofunction Identities

Using Degree Measure

$\sin(90° - \theta) = \cos\theta$
$\csc(90° - \theta) = \sec\theta$

$\cos(90° - \theta) = \sin\theta$
$\sec(90° - \theta) = \csc\theta$

$\tan(90° - \theta) = \cot\theta$
$\cot(90° - \theta) = \tan\theta$

Using Radian Measure

$$\sin\left(\frac{\pi}{2} - \theta\right) = \cos\theta$$
$$\csc\left(\frac{\pi}{2} - \theta\right) = \sec\theta$$

$$\cos\left(\frac{\pi}{2} - \theta\right) = \sin\theta$$
$$\sec\left(\frac{\pi}{2} - \theta\right) = \csc\theta$$

$$\tan\left(\frac{\pi}{2} - \theta\right) = \cot\theta$$
$$\cot\left(\frac{\pi}{2} - \theta\right) = \tan\theta$$