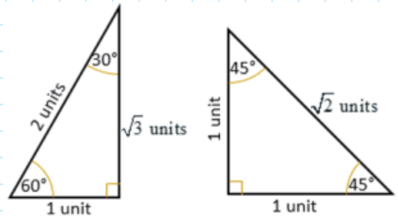
Tuesday, Apr. 2nd

Plan For Today:



	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	$\sqrt{3}$

1. Any questions about anything?
   - *Review 6.1 & part of 6.2 with Check-in quiz*
2. Continue Chapter 6: 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
4. **Do Unit 3 Exponents and Logs Rewrite at 12:30pm**

Plan Going Forward:

1. Finish going through 6.1-6.4 practice questions in textbook.

   - **6.1-6.4 CHECK-IN QUIZ ON THURSDAY, APRIL 4TH**

2. We will finish Chapter 6 (Trigonometry I) on the Thursday 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**

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

Apr. 2, 2024 **Name:** KEY **TOTAL = _____ / 9 marks**

Check-in Quiz Section 6.1-6.2:
Radian, Degrees, Angles, Arc Length, & Trig Ratios

Complete the following questions SHOWING ALL WORK and steps where applicable.

$180^\circ = \pi$

1. Convert the following angles to degrees or radians. 0.5 marks each = 2 marks

a. $\theta = \cancel{150}^{5} \times \frac{\pi}{\cancel{180}_{6}} = \boxed{\frac{5\pi}{6}}$

b. $\theta = \frac{2\cancel{\pi}}{\cancel{3}_{1}} \times \frac{\cancel{180}^{60}}{\cancel{\pi}} = \boxed{120^\circ}$

c. $\theta = -\cancel{460}^{23} \times \frac{\pi}{\cancel{180}_{9}} = \boxed{-\frac{23\pi}{9}}$

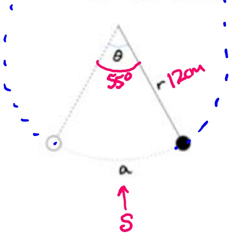
$-\frac{23}{9}\pi$ ✓

d. $\theta = -\frac{7\cancel{\pi}}{\cancel{4}_{1}} \times \frac{\cancel{180}^{45}}{\cancel{\pi}} = \boxed{-315^\circ}$

2. A pendulum swings in a frictionless environment forever. If the angle it makes through its swing is 55° and the length of the chain holding the pendulum is 12cm, what is the length of the arc that is produced by the swing of the pendulum?

1 mark

$a = r\theta$ or $s = r\theta$



θ = in radians only.

$\cancel{55}^{11} \times \frac{\pi}{\cancel{180}_{36}} = \frac{11\pi}{36}$

$S = \cancel{12}^{1} \cdot \frac{11\pi}{\cancel{36}_{3}} = \boxed{\frac{11\pi}{3}\text{ cm}}$ exact.

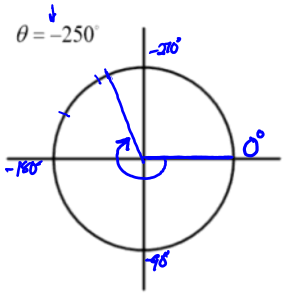
$= \boxed{11.52\text{ cm}}$. approximate.

Page **1** of **2**

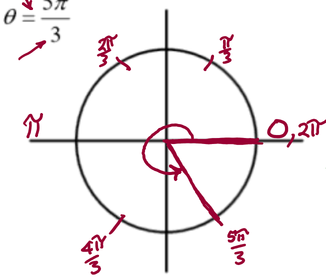
3. Draw the following angles in standard position and determine two coterminal angles.

0.5 marks each = 3 marks

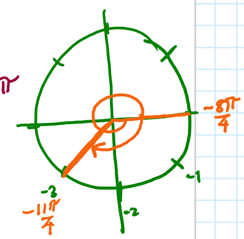
a. $\theta = -250^{\circ}$ clockwise.



b. $\theta = \frac{5\pi}{3}$ counter-clockwise



$\theta = -\frac{11\pi}{4}$



coterminal angles

$\theta = -250^{\circ} + 360^{\circ} = \boxed{110^{\circ}}$

$= -250^{\circ} + 360^{\circ}(2) = \boxed{470^{\circ}}$

OR $-250^{\circ} - 360^{\circ} = \boxed{-610^{\circ}}$

in general = any coterminal $\rightarrow \boxed{-250^{\circ} + 360^{\circ}n, n \in I}$

coterminal angles

$\frac{5\pi}{3} + 2\pi \frac{\times 3}{\times 3} = \frac{5\pi}{3} + \frac{6\pi}{3} \rightarrow \boxed{\frac{11\pi}{3}}$

$\frac{5\pi}{3} - \frac{6\pi}{3} = \boxed{-\frac{\pi}{3}}$

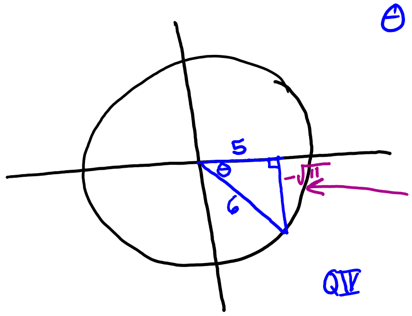
any coterminal : $\boxed{\frac{5\pi}{3} + 2\pi n, n \in I}$

4. Given that $\cos\theta = \frac{5}{6}$ in Quadrant IV, draw the triangle, determine the hypothenuse of the triangle and determine the exact value of the other trig ratios.

3 marks

$\cos\theta = \frac{5}{6}$ adjacent / hypothenuse. QIV

θ is always next to x-axis !!



CAH reciprocal

$\sec\theta = \frac{6}{5}$

pythag:

$a^2 + b^2 = c^2$

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

$5^2 + y^2 = 6^2$

$25 + y^2 = 36 - 25$

$\sqrt{y^2} = \sqrt{11}$

$y = \pm\sqrt{11}$

$y = -\sqrt{11}$ in QIV

SOH

$\sin\theta = -\frac{\sqrt{11}}{6}$

$\csc\theta = -\frac{6}{\sqrt{11}} \rightarrow -\frac{6}{\sqrt{11}} \times \frac{\sqrt{11}}{\sqrt{11}} = -\frac{6\sqrt{11}}{11}$ rationalized.

TOA

$\tan\theta = -\frac{\sqrt{11}}{5}$

$\cot\theta = -\frac{5}{\sqrt{11}} \rightarrow -\frac{5}{\sqrt{11}} \times \frac{\sqrt{11}}{\sqrt{11}} = -\frac{5\sqrt{11}}{11}$ rationalized.

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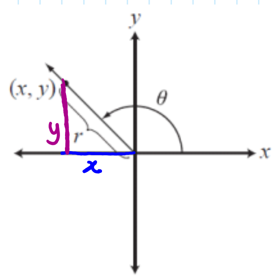
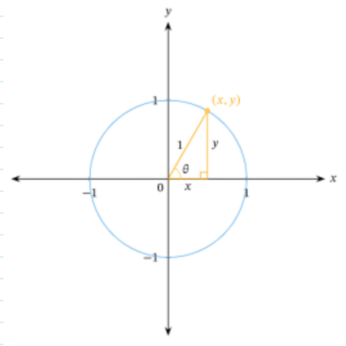
$\sin\theta = \frac{y}{r}$ $\quad \csc\theta = \frac{r}{y}$

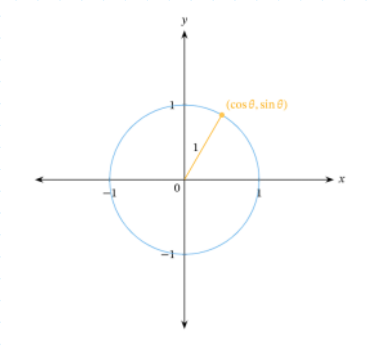
$\cos\theta = \frac{x}{r}$ $\quad \sec\theta = \frac{r}{x}$

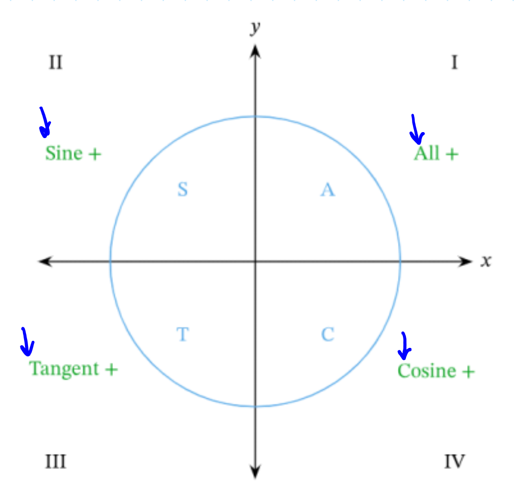
$\tan\theta = \frac{y}{x}$ $\quad \cot\theta = \frac{x}{y}$



Where $r = \sqrt{x^2 + y^2}$ $\quad r^2 = x^2 + y^2$ or $x^2 + y^2 = r^2$

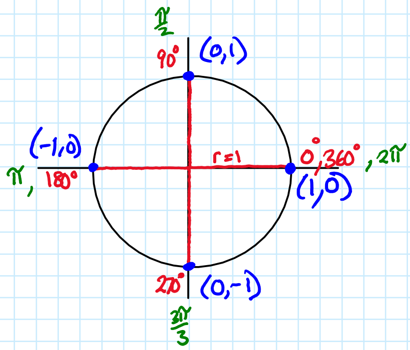






Quad
① All
② Students
③ Take
④ Calculus.

6.3 Quadrant Angles.



$\cos\theta = \frac{x}{r} = x \rightarrow \cos\theta = x$ ($r = 1$) $\sec\theta = \frac{r}{x} = \frac{1}{x}$ ($r = 1$)

$\sin\theta = \frac{y}{r} = y \rightarrow \sin\theta = y$ ($r = 1$) $\csc\theta = \frac{r}{y} = \frac{1}{y}$ ($r = 1$)

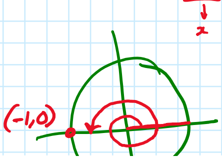
$\tan\theta = \frac{y}{x} \rightarrow \cot\theta = \frac{x}{y}$

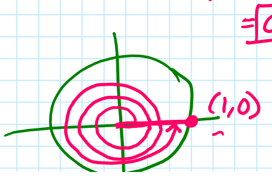
Summary:

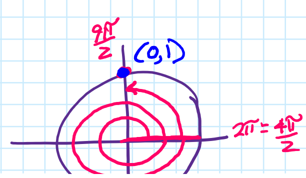
$\cos\theta = x$	$\sec\theta = \frac{1}{x}$
$\sin\theta = y$	$\csc\theta = \frac{1}{y}$
$\tan\theta = \frac{y}{x}$	$\cot\theta = \frac{x}{y}$.

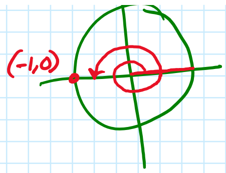
Ex1 a) $\cos 0° = \boxed{1}$ b) $\tan 90° = \frac{1}{0}$ $\boxed{= \varnothing \text{ undefined}}$ c) $\sin \pi = \boxed{0}$ d) $\csc\frac{3\pi}{2} = \frac{1}{-1} = \boxed{-1}$

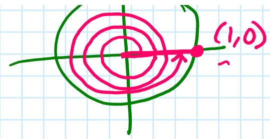
Ex2 a) $\cos 540° = \boxed{-1}$ (x) b) $\tan 6\pi = \frac{y}{x} \rightarrow \frac{0}{1} = \boxed{0}$ c) $\csc\frac{9\pi}{2} = \frac{1}{1} = \boxed{1}$

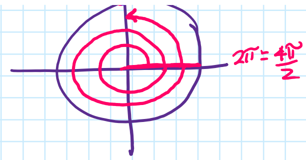






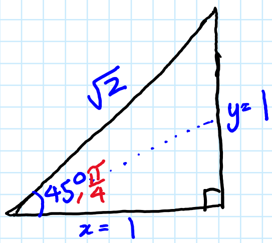


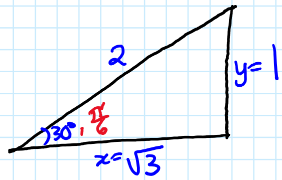


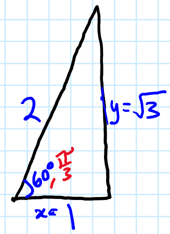


Special Angles $30^\circ - 45^\circ - 60^\circ$

$\frac{\pi}{6} - \frac{\pi}{4} - \frac{\pi}{3}$

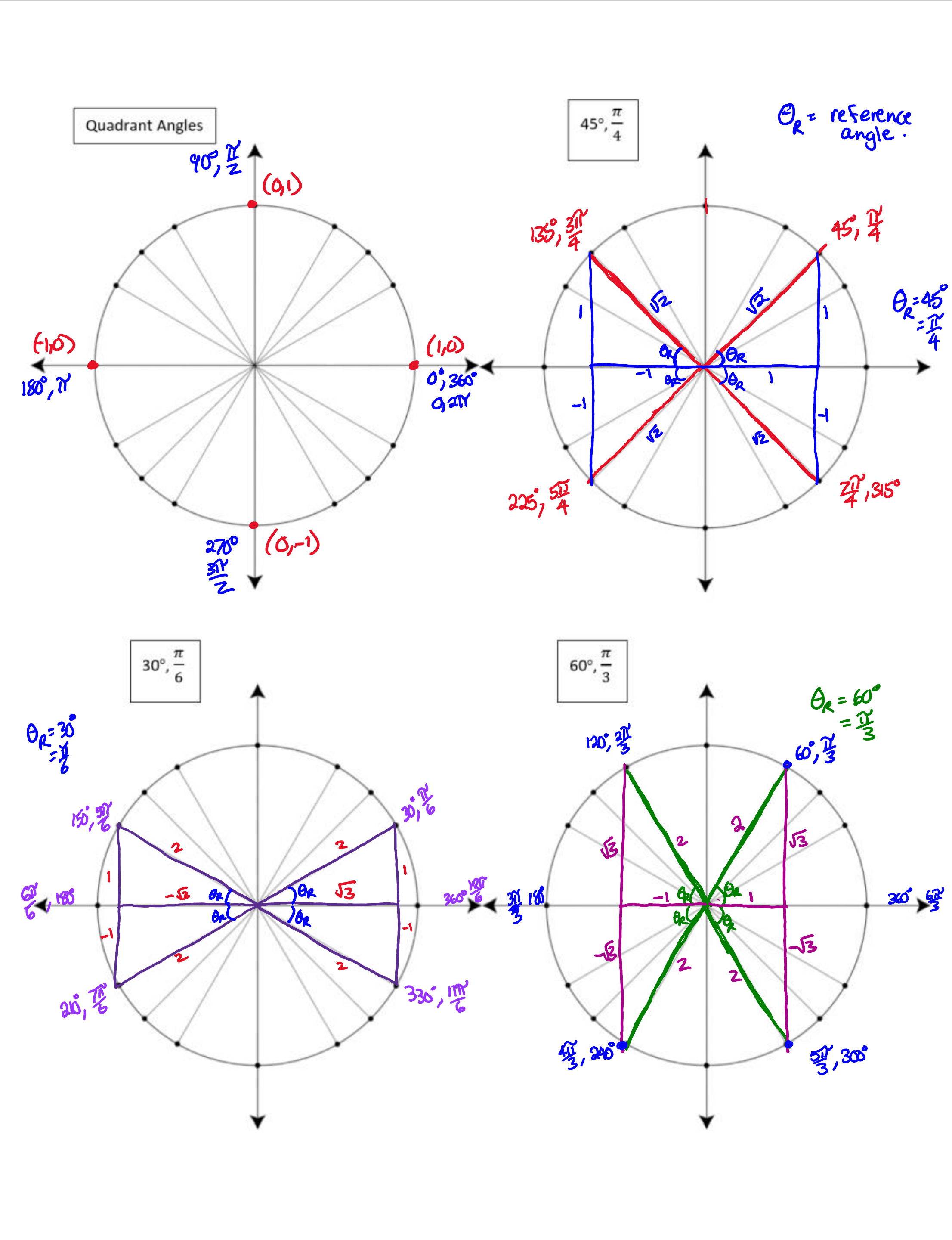






Reference Angle = acute angle next to x-axis.

$<90^\circ$



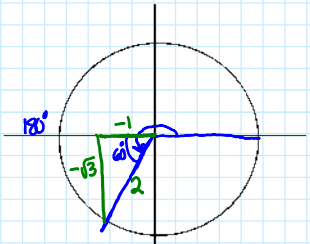
Determine exact value of:

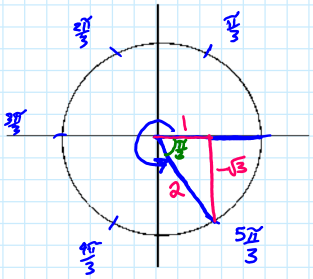
p.220 Ex:4 a) $\sin 240°$ b) $\sec \frac{5\pi}{3}$ c) $\tan\left(-\frac{19\pi}{6}\right)$

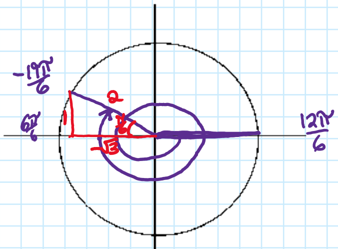
① draw angle in standard position.

② Determine θ_R

③ draw special triangle







$\sin 240° = \frac{y}{r}$ $\frac{opp}{hyp}$

$= \boxed{-\frac{\sqrt{3}}{2}}$

$\sec \frac{5\pi}{3} = \frac{r}{x}$ $\frac{hyp}{adj}$

$\tan -\frac{19\pi}{6} = \frac{y}{x}$ $\frac{opp}{adj}$

$\boxed{-\frac{1}{\sqrt{3}}} \rightarrow \times \frac{\sqrt{3}}{\sqrt{3}} = \boxed{-\frac{\sqrt{3}}{3}}$ rationalized.

(3) draw special triangle

(4) use triangle to answer question.

$\sin 240° = \frac{y}{r}$ $\frac{opp}{hyp}$ $= \boxed{-\frac{\sqrt{3}}{2}}$

$\sec \frac{5\pi}{3} = \frac{r}{x}$ $\frac{hyp}{adj}$ $= \frac{2}{1} = \boxed{2}$

$\tan -\frac{19\pi}{6} = \frac{y}{x}$ $\frac{opp}{adj}$ $= \boxed{-\frac{1}{\sqrt{3}}} \rightarrow \times \frac{\sqrt{3}}{\sqrt{3}} = \boxed{-\frac{\sqrt{3}}{3}}$ rationalized.

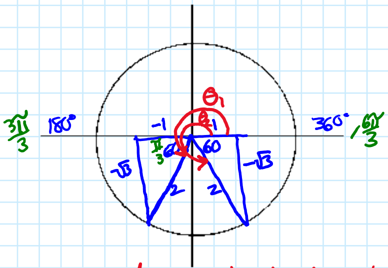
Finding θ instead

ex: Solve : $\sin\theta = -\frac{\sqrt{3}}{2}$ within $0 \leq \theta < 2\pi$, $0° \leq \theta < 360°$ } solutions within one rotation of a circle

(1) $\sin\theta = \frac{y}{r}$ $\frac{opp}{hyp}$ $= -\frac{\sqrt{3}}{2}$ ← y/opp, ← r/hyp

(2) $(-) \rightarrow \sin (-)$ in QIII & QIV

(3) Draw the angles. with matching reference angle.



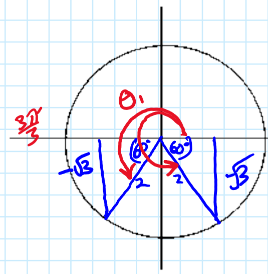
(4) determine angles in standard position.

$\boxed{\theta_1 = 240° \quad \theta_2 = 300°}$

$\boxed{\theta_1 = \frac{4\pi}{3} \quad \theta_2 = \frac{5\pi}{3}}$

Ex 7 $\csc x = -\frac{2}{\sqrt{3}}$ $\frac{r}{y}$ $\frac{hyp}{opp}$

(−) sin QIII QIV

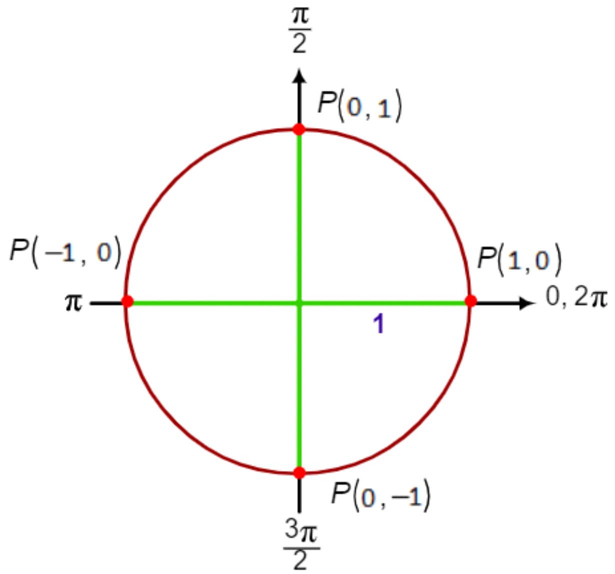


$\boxed{\theta = 240°, 300° \quad \theta = \frac{4\pi}{3}, \frac{5\pi}{3}}$

6.3 Trig Functions of General & Special Angles

Quadrant Angles

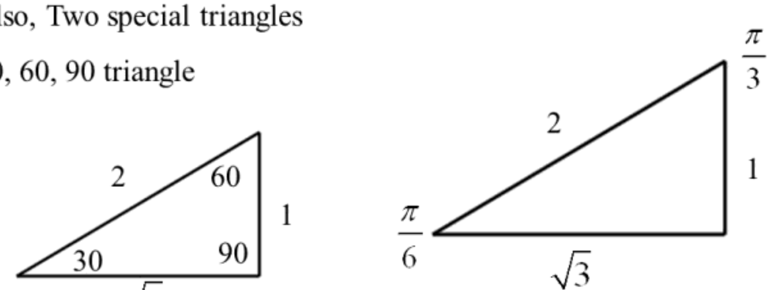
$\cos\theta = x \quad \sin\theta = y \quad \tan\theta = \frac{y}{x}$



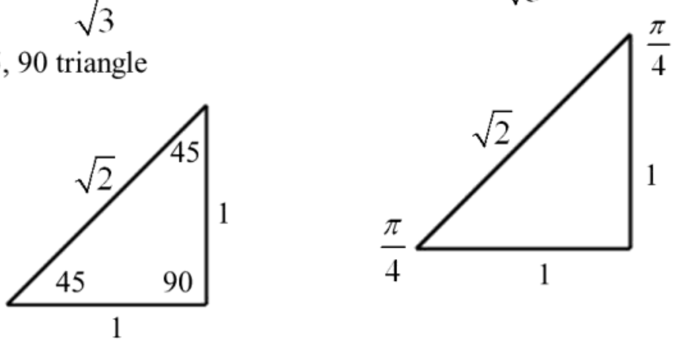
30-45-60 Special Triangles

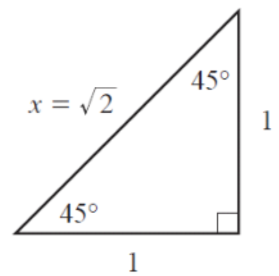
Also, Two special triangles

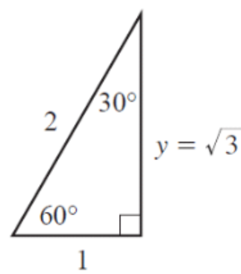
30, 60, 90 triangle



45, 45, 90 triangle

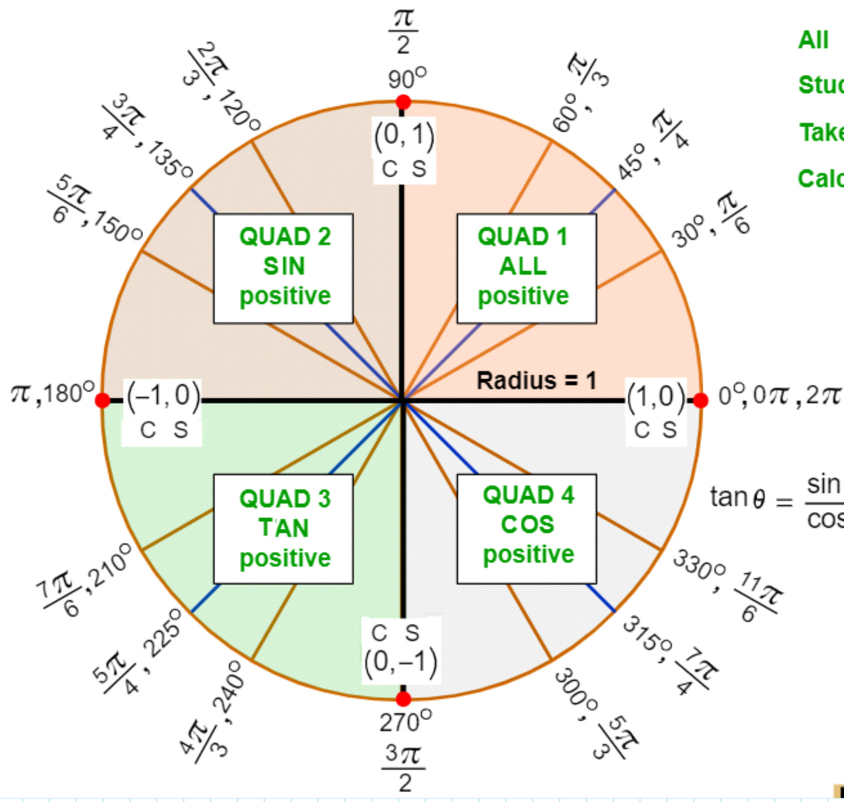






3.6 Exact Values of Special Angles

THE TRIG CIRCLE



All
Students
Take
Calculus

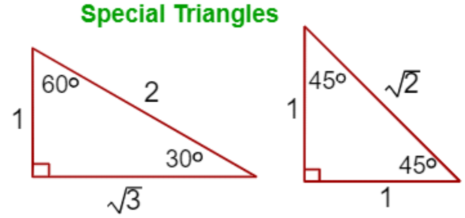
$\tan\theta = \frac{\sin\theta}{\cos\theta} = \frac{S}{C}$

$\sin = \frac{\text{opp}}{\text{hyp}}$

$\cos = \frac{\text{adj}}{\text{hyp}}$

$\tan = \frac{\text{opp}}{\text{adj}}$

Special Triangles



	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	$\sqrt{3}$

Reciprocal Trig Ratios

cosecant $\longrightarrow$ $\csc\theta = \frac{1}{\sin\theta}$

secant $\longrightarrow$ $\sec\theta = \frac{1}{\cos\theta}$

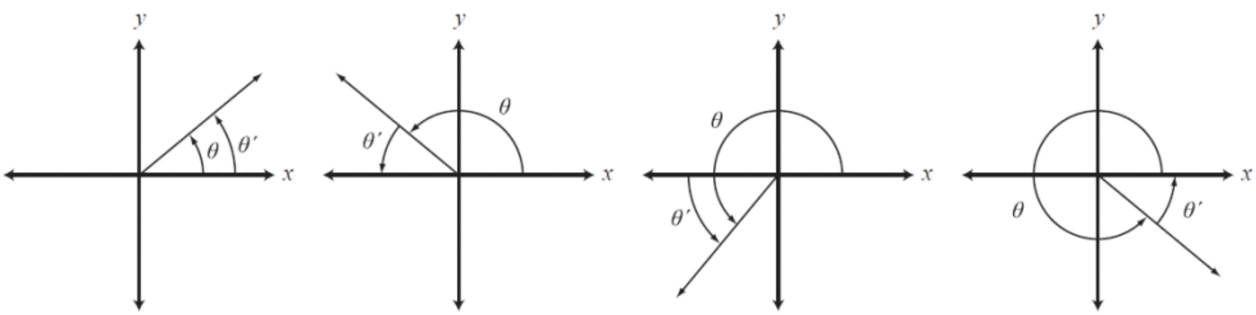
cotangent $\longrightarrow$ $\cot\theta = \frac{1}{\tan\theta}$

Reference Angle

Definition of a Reference Angle

For angle θ in standard position, the reference angle is the positive acute angle θ' that is formed with the terminal side of θ and the x-axis.

A reference angle is $0° \le \theta' \le 90°$ or $0 \le \theta' \le \frac{\pi}{2}$



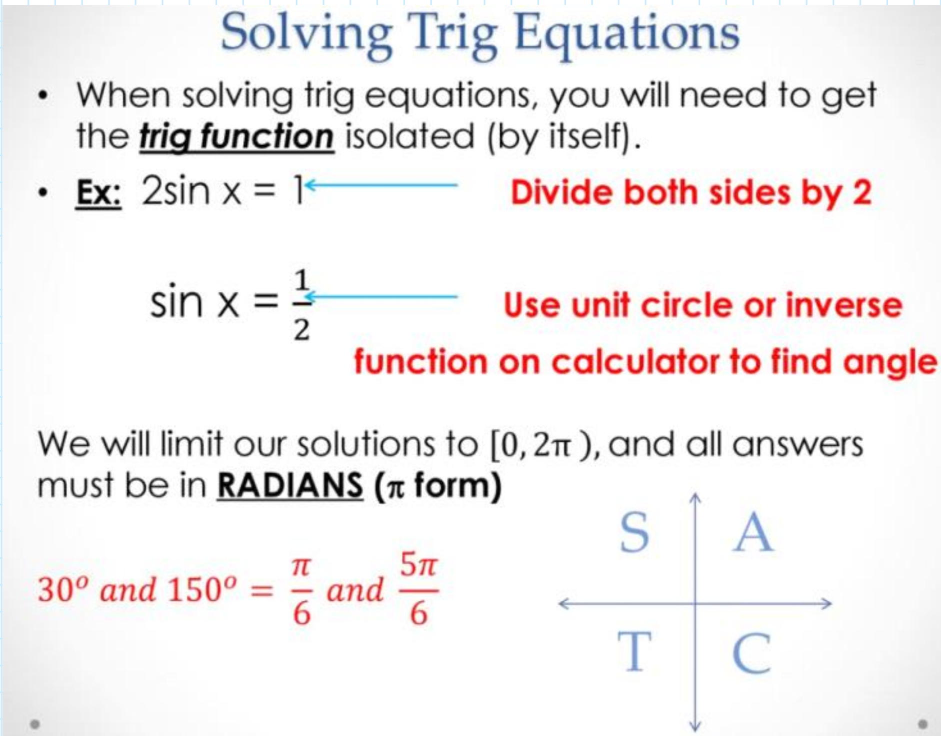
Reference angle θ' in quadrant I	Reference angle θ' in quadrant II	Reference angle θ' in quadrant III	Reference angle θ' in quadrant IV
$\theta' = \theta$	$\theta' = 180° - \theta$	$\theta' = \theta - 180°$	$\theta' = 360° - \theta$

https://www.sporcle.com/games/sproutcm/special-angle-trigonometric-match

https://www.purposegames.com/game/15c86db5b3

https://www.purposegames.com/game/trig-values-level-2-quiz

Solving Trig Equations Algebraically:



NOTE

Solving Trigonometric Equations using Quadrants

Trigonometric equations can also be solved **algebraically** using quadrants.

The 'X-Wing' Diagram

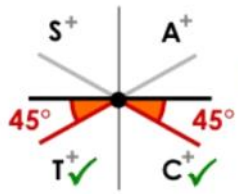
Example

Solve $\sqrt{2}\sin x + 1 = 0$

for $0° \leqslant x \leqslant 360°$

$\sin x = -\frac{1}{\sqrt{2}}$

sin negative



$\therefore$ solutions are in the 3rd and 4th quadrants

acute angle:

$\sin^{-1}\left(\frac{1}{\sqrt{2}}\right) = 45°$

$\therefore \; x = 180° + 45°$ or $x = 360° - 45°$

$= \underline{\underline{225°}}$ $\qquad$ $= \underline{\underline{315°}}$