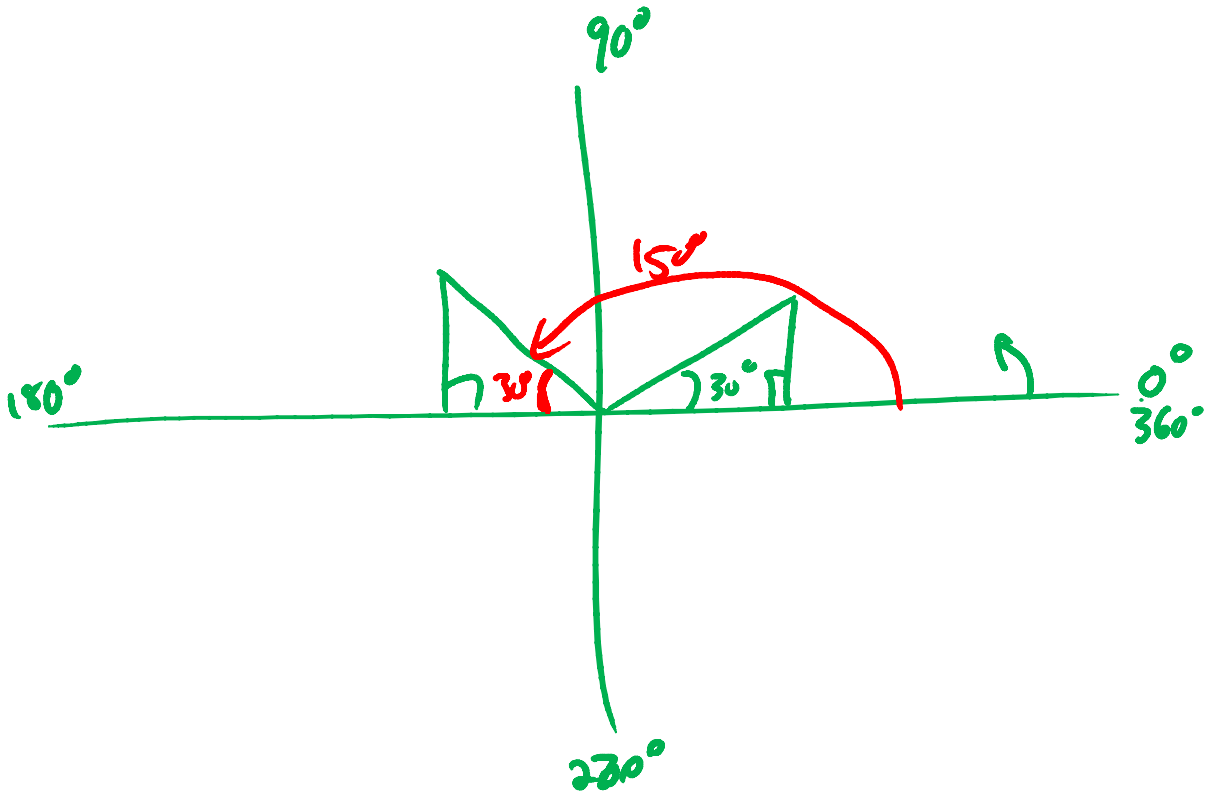
Mathematics 11U

5.3 & 5.4 – Trigonometric Ratios for Angles over 90^{o}

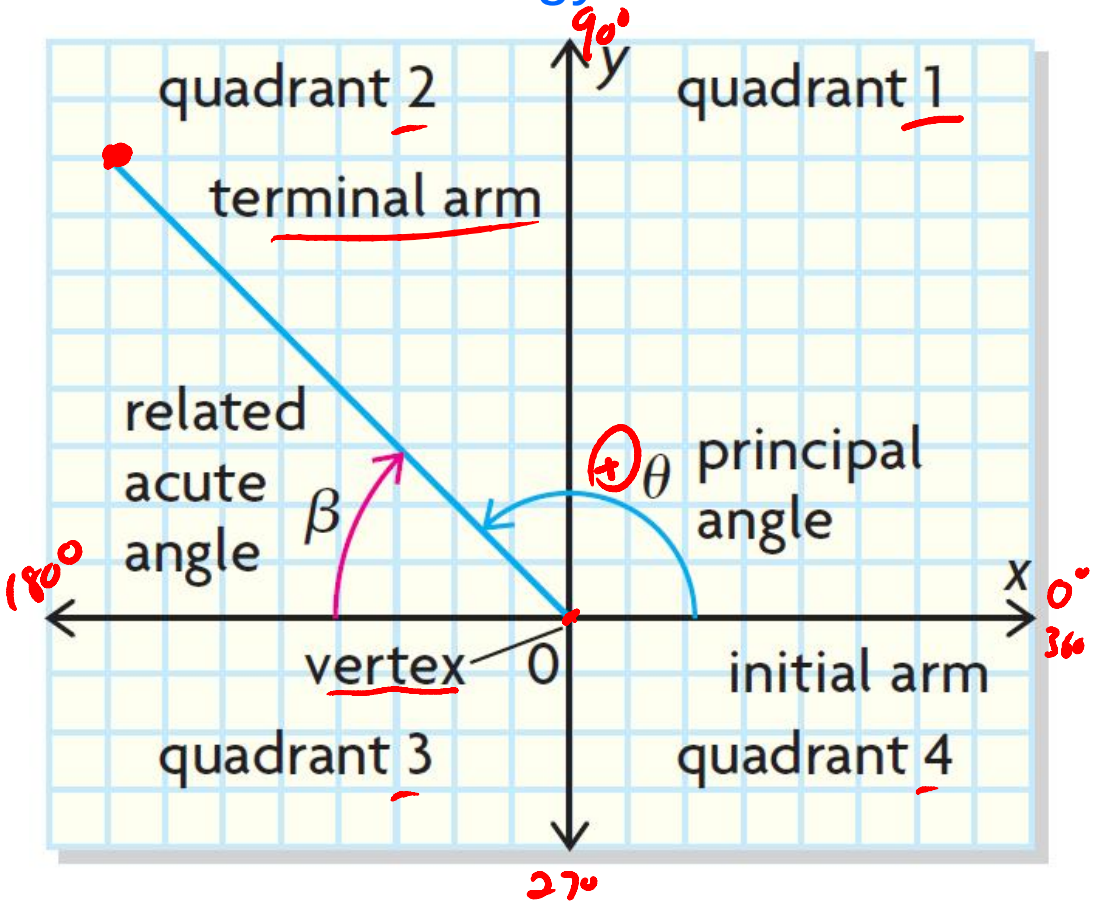
Mr. D. Hagen

The Big Idea: Every ratio exists twice between 0^o and 360^o

$\sin 30 =$ 0.5 $\sin 150 =$ 0.5



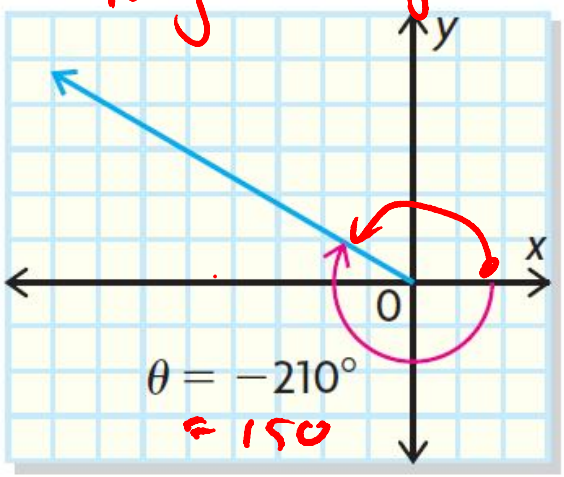
Lots of Terminology:



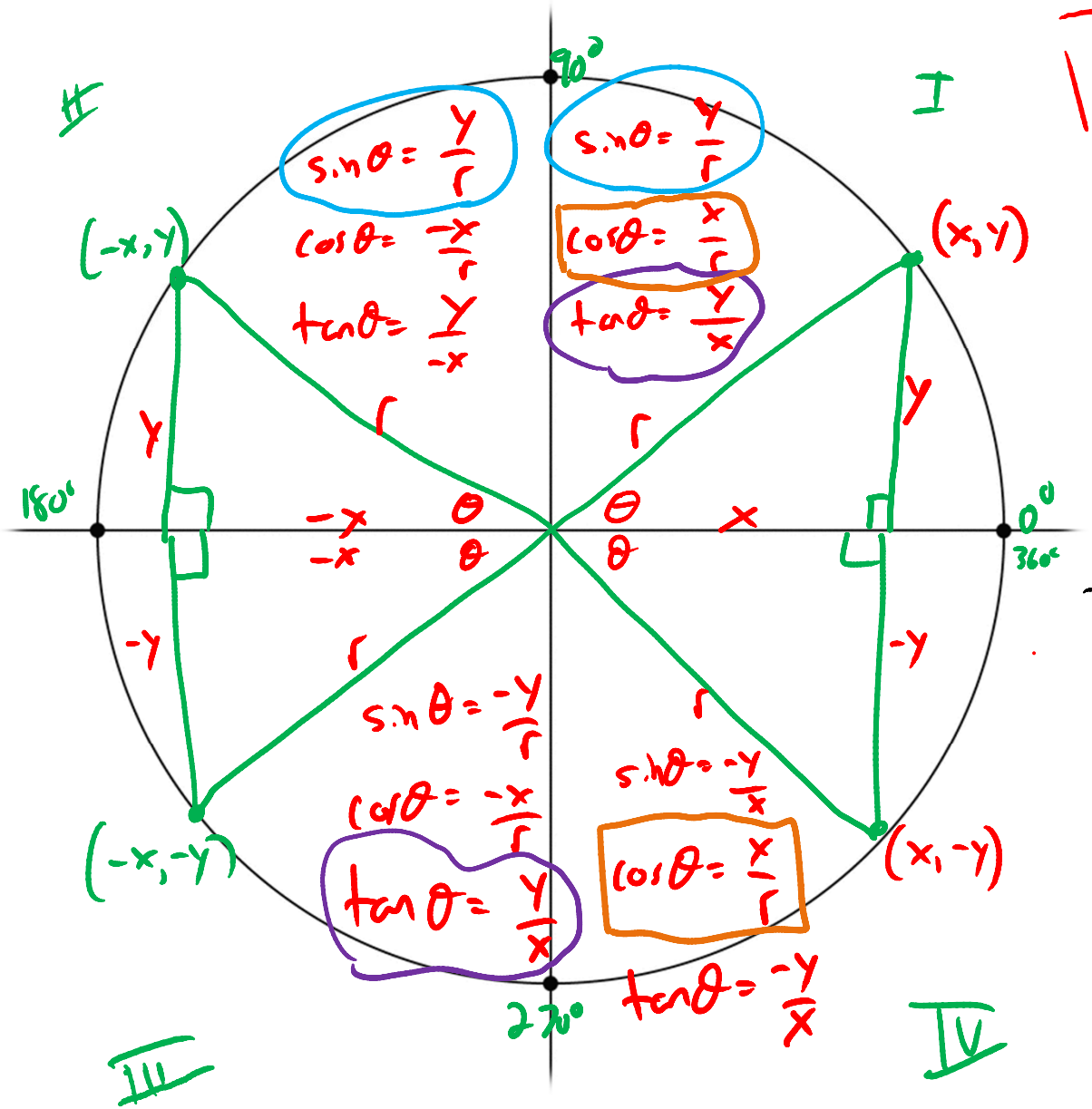
Positive Angles = counter clockwise

Negative = clockwise

Negative angles



Looking at trig ratios on a Cartesian Plane:



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

$\sin\theta = \sin(180-\theta)$

$\cos\theta = \cos(360-\theta)$

$\tan\theta = \tan(180+\theta)$

CAST RULE

S	A
T	C

Find the second equivalent trig ratio:

1. $\sin 20 = \sin(180-20) = \sin 160$
2. $\cos 280 = \cos(360-280) = \cos 80$
3. $\tan 110 = \tan(180+110) = \tan 290$
4. $\csc 192 = \csc(180-192) = \csc(-12) = \csc 348$
5. $\sec 18 = \sec(360-18) = \sec 342$
6. $\cot 215 = \cot(180+215) = \cot 395 = \cot 35$ (−360)

Each point lies on the terminal arm of angle θ in standard position.

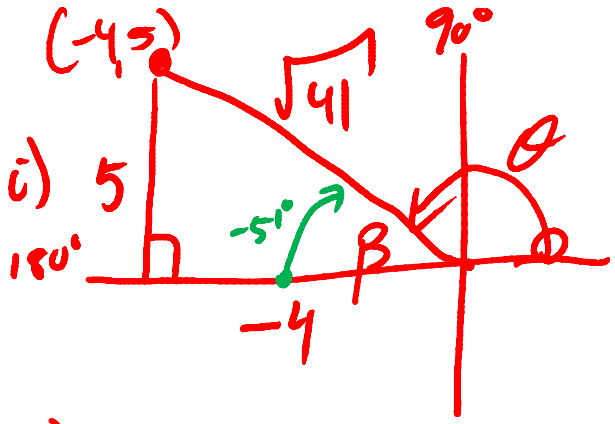
i) Draw a sketch of each angle θ.

ii) Determine the value of r to the nearest tenth.

iii) Determine the primary trigonometric ratios for angle θ.

iv) Calculate the value of θ to the nearest degree.

P(-4,5)



ii)

$r^2 = (-4)^2 + 5^2$

$r^2 = 16 + 25$

$r = \sqrt{41}$

iii) $\sin\theta = \frac{5}{\sqrt{41}}$

$\cos\theta = \frac{-4}{\sqrt{41}}$

$\tan\theta = \frac{5}{-4}$

iv) $\tan\theta = \frac{5}{-4}$

$\theta = \tan^{-1}\left(\frac{5}{-4}\right)$

$\theta = -51°$

$\theta = 180 - 51$

$\theta = 129°$

$\tan(180 + -51) = \tan\theta$

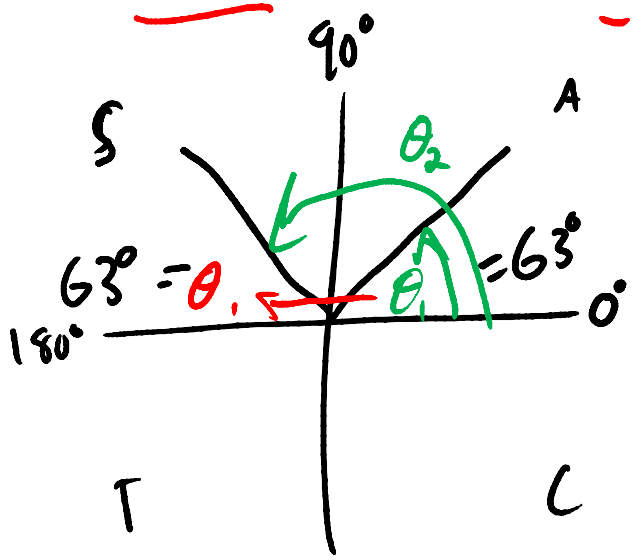
Use each trigonometric ratio to determine BOTH values of θ between 0^o and 360^o.

1. $\sin\theta = 0.8942$

$\theta = \sin^{-1}(0.8942)$

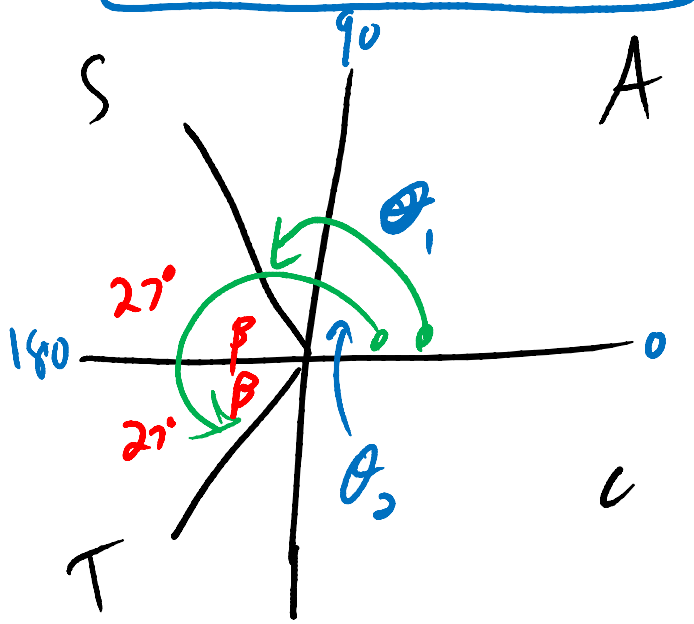
$\theta_1 = 63^\circ$

$\theta_2 = 180^\circ - 63^\circ = 117^\circ$



Use each trigonometric ratio to determine BOTH values of θ between 0^o and 360^o.

2. $\cos\theta = -0.8931$



Solve: $\cos\beta = 0.8931$

$\beta = \cos^{-1}(0.8931)$

$\beta = 27^\circ$

$\theta_1 = 180 - 27 = 153^\circ$

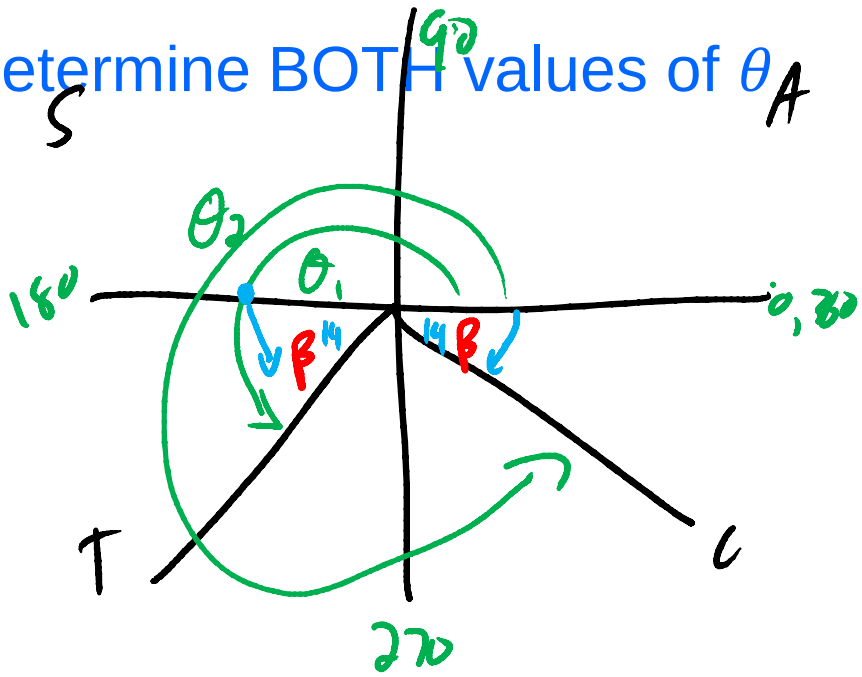
$\theta_2 = 180 + 27 = 207^\circ$

$\cos 153 = -0.891$

$\cos 207 = -0.891$

Use each trigonometric ratio to determine BOTH values of θ between 0^o and 360^o.

3. $\csc\theta = -4.2013$



Solve $\csc\beta = 4.2013$

$\sin\beta = \frac{1}{4.2013}$

$\beta = \sin^{-1}\left(\frac{1}{4.2013}\right)$

$\beta = 14°$

$\theta_1 = 180 + 14 = 194°$

$\theta_2 = 360 - 14 = 346°$