Angles in Standard Position in All Quadrants

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PRE-CALCULUS 11
TRIGONOMETRY
ANGLES IN STANDARD POSITION IN ALL QUADRANTS

A. Definitions

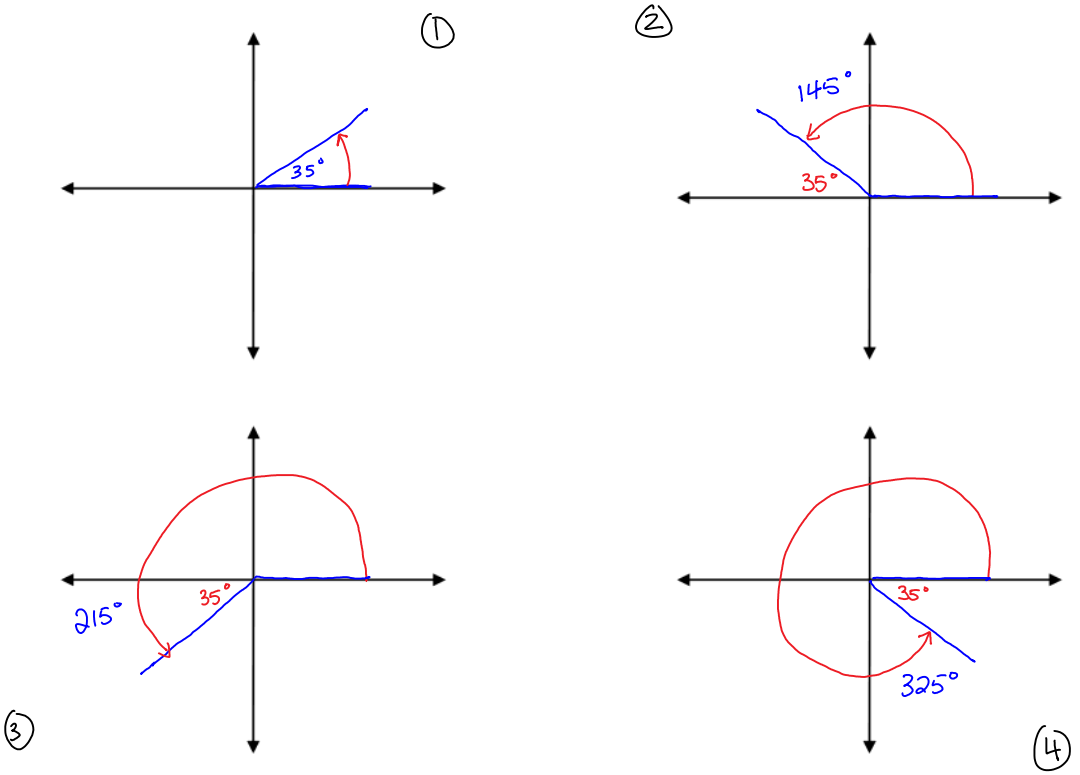
1. **Quadrant:** the area of the coordinate graph that the point or shape is located.

2. **Standard Position:** an angle whose endpoints are at the origin and whose initial arm lies on the positive side of the x-axis.

3. **Reference Angle:** the acute angle whose vertex is the origin and whose arms are the terminal arm of the angle and the x-axis. The reference angle is always a positive acute angle between 0^o and 90^o.

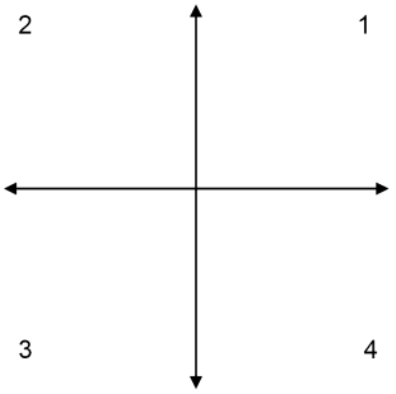
B. Determining Reference Angles

The terminal arm of an angle in Quadrant 1 can be successively reflected in both axes to form 4 different angles in standard position. The reference angles for all 4 angles is the acute angle that the terminal arm makes with the x-axis. Lets look at the angles in standard position that have a reference angle of 35^o



C. Quadrant Rule for Trigonometric Functions

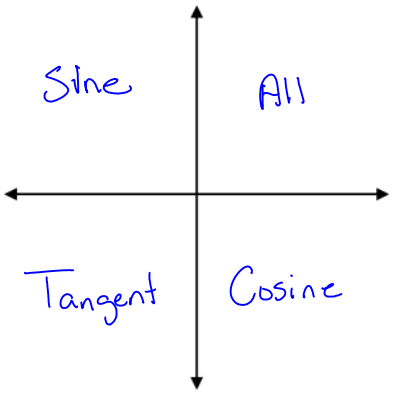
Remember from Grade 9 the way the coordinate graph is divided into quadrants.



① All trig functions are positive.
② Only Sine values are positive
③ Only Tangent values are positive.
④ Only Cosine values are positive

Quadrant Rule
All Students Trust Crawford Or All Students Take Calculus

Example:



Angle	Sin	Cos	Tan
35^o	0.574	0.819	0.700
145^o	0.574	-0.819	-0.700
215^o	-0.574	-0.819	0.700
325^o	-0.574	0.819	-0.700

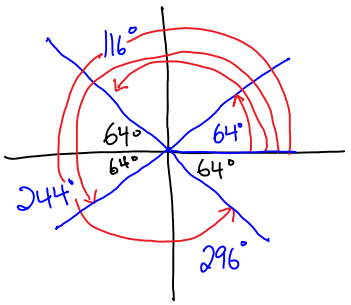
* An angle in Standard Position and its reference angle will have almost the same trig functions. Some will be positive, others will be negative.

D. Examples

Q1 – Q4

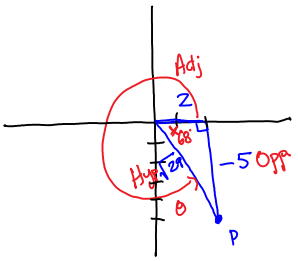
1) Determine the other angles between 0^o and 360^o that have the same reference angle.

116^o



64°, 116°, 244°, 296°

2) The point $P(2,-5)$ lies on the terminal arm of an angle θ in standard position.
   a) Determine the primary trigonometric ratios of θ.
   b) Determine the measure of θ to the nearest degree.



$a^2 + b^2 = c^2$
$(2)^2 + (-5)^2 = c^2$
$4 + 25 = c^2$
$29 = c^2$
$c = \pm\sqrt{29}$
$c = \sqrt{29}$

a) $\sin\theta = \frac{-5}{\sqrt{29}} \times \frac{\sqrt{29}}{\sqrt{29}} = \frac{-5\sqrt{29}}{29}$

$\cos\theta = \frac{2}{\sqrt{29}} \times \frac{\sqrt{29}}{\sqrt{29}} = \frac{2\sqrt{29}}{29}$

$\tan\theta = \frac{-5}{2}$

b) -68° angle measures clockwise

* This is the refence angle.

$\angle\theta = 292^\circ$

Assignment: Pg. 448 #3 - 8