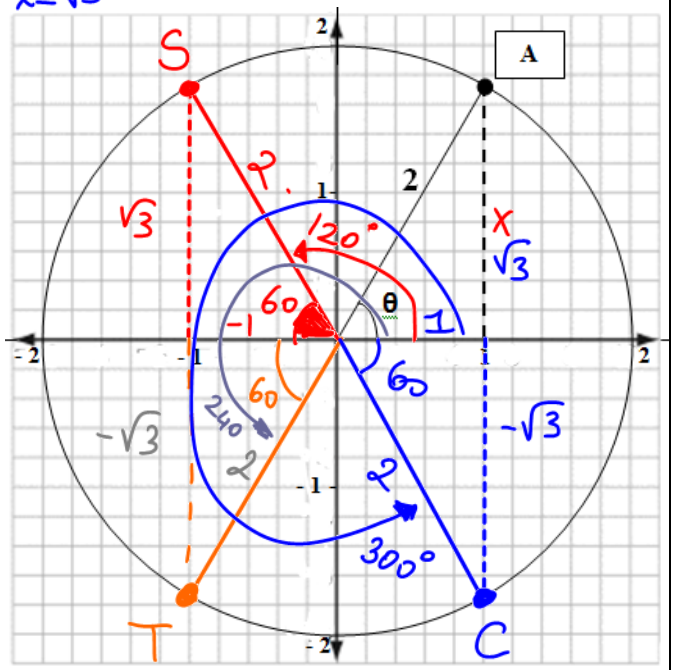
MCR3U1 - University Preparation **Date:**_____

Day 4: Evaluating Trig Ratios for Angles > 90° **Chapter 5: Trigonometric Ratios**

INVESTIGATE:

Step 1: Determine all the exact values of the sides for the right triangle that point A forms on the circle.
Step 2: Determine the principal angle, related acute angle and the three primary trig ratios for the principle angle.
Step 3: Reflect point A horizontally about the y - axis and form a right triangle. Label the point S.
Step 4: Determine the principal, related acute angle and the three primary trig ratios for the principle angle using calculator.
Step 5: Reflect point S vertically about the x - axis and form a right triangle. Label the point T.
Step 6: Determine the principal, related acute angle and the three primary trig ratios for the principle angle using calculator.
Step 7: Reflect point T horizontally about the y - axis and form a right triangle. Label the point C.
Step 8: Determine the principal, related acute angle the three primary trig ratios for the principle angle using calculator.

Angles	Quadrant	Sine Ratio	Cosine Ratio	Tangent Ratio	GRAPH
POINT A **principal ∠** 60° **related acute∠** ____	1 θ	$\sin\theta = \sqrt{3}/2$ $\sin\theta \doteq 0.8660$ (+)	$\cos\theta = 1/2$ $\cos\theta = 0.5$ (+)	$\tan\theta = \sqrt{3}/1$ $\tan\theta \doteq 1.7321$ (+)	$x^2 = 2^2 - 1^2$ $x^2 = 3$ $x = \sqrt{3}$ $\cos^{-1}(0.5) = \theta$ $\theta = 60°$
POINT S **principal ∠** 180-60 = 120 **related acute∠** 60	2 180-θ	$\sin(180-60) = \sqrt{3}/2$ $\sin 120 \doteq 0.8660$ (+) $\sin(180-60) = \sin 60$	$\cos(180-60) = -1/2$ $\cos 120 = -0.5$ (−) $\cos 120 = -\cos 60$	$\tan(180-60) = -\sqrt{3}/1$ $\tan 120 \doteq -1.7321$ (−) $\tan 120 = -\tan 60$	
POINT T **principal ∠** 180+60 **related acute∠** 60	3 180+θ	$\sin(180+60) = -\sqrt{3}/2$ $\sin(240) \doteq -0.8660$ (−) $\sin(180+60) = -\sin 60$	$\cos(180+60) = -1/2$ $\cos(240) = -0.5$ (−) $\cos(180+60) = -\cos 60$	$\tan(180+60) = -\sqrt{3}/-1$ $\tan(240) \doteq 1.7321$ (+) $\tan(180+60) = \tan 60$	
POINT C **principal ∠** 360-60 **related acute∠** 60	4 360-θ	$\sin(360-60) = -\sqrt{3}/2$ $\sin(300) \doteq -0.8660$ (−) $\sin(360-60) = -\sin 60$	$\cos(360-60) = 1/2$ $\cos(300) = 0.5$ (+) $\cos(360-60) = \cos 60$	$\tan(360-60) = -\sqrt{3}/1$ $\tan(300) \doteq -1.7321$ (−) $\tan(360-60) = -\tan 60$	



Sin(+) | All(+)

Tan(+) | Cos(+)

PRACTICE:

HINT: Determine in which quadrants the given ratio could have the same sign.

Solve each of the following for $0 \le \theta \le 360°$.

a) $\sin\theta = 0.4226$

$\sin^{-1}(0.4226) = \theta$

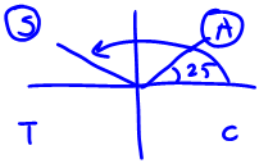
$\theta \doteq 25°$

or

$180 - \theta = 180 - 25$

$= 155°$

∴ The angles are 25° or 155°



b) $\cos\theta = -0.3420$

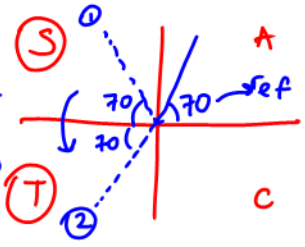
Method 1

$\cos(0.3420) = \theta$

ref angle $\leftarrow \theta \doteq 70$

first angle is 110°

second angle is $180 + 70 = 250°$



CHECK

cos 110° ✓

cos 250° ✓

c) $\cot\theta = 8.1516$

$\frac{1}{\tan\theta} = \frac{8.1516}{1}$ flip each side

$\tan\theta = \frac{1}{8.1516} \doteq 0.1227$

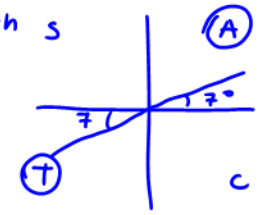
$\tan^{-1}(0.1227) = \theta$

$\theta \doteq 7°$

or

$180 + 7 = 187°$

∴ The angles are 7° or 187°.



d) $\csc\theta = -2.3424$

$\frac{1}{\sin\theta} = \frac{-2.3424}{1}$ flip both sides

Method 2

$\sin\theta = \frac{1}{-2.3424}$

$\sin\theta = -0.4269$

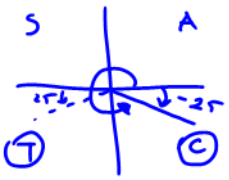
$\sin^{-1}(0.4269) = \theta$

$\theta \doteq -25 = 335°$

or

$180 + 25 = 205°$

∴ The ∠s are 205 or 335°



e) $\sin\theta = 0.4815$

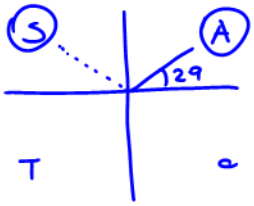
$\sin^{-1}(0.4815) = \theta$

$\theta \doteq 29°$

or

$180 - 29 = 151°$

∴ The angles are 29° or 151°.



f) $\tan\theta = -0.1623$

$\tan^{-1}(-0.1623) = \theta$

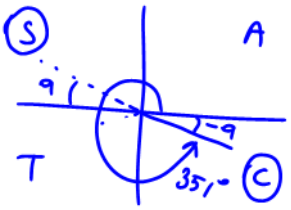
$\theta \doteq -9$

$\theta \doteq 351$

or

$180 - 9 = 171$

∴ The ∠s are 171° or 351°.



g) $\cos\theta = -0.8722$

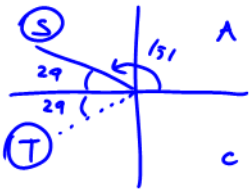
$\cos^{-1}(-0.8722) = \theta$

$\theta \doteq 151°$

or

$180 + 29 = 209$

∴ The angles are 151° or 209°.



h) $\sin\theta = -0.3154$

$\sin^{-1}(-0.3154) = \theta$

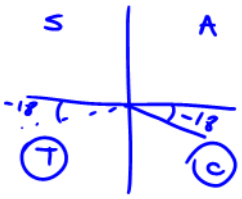
$\theta \doteq -18$

$\theta \doteq 342°$

or

$180 + 18 = 198°$

∴ The angles are 198° or 342°.



i) $\cos\theta = 0.6951$

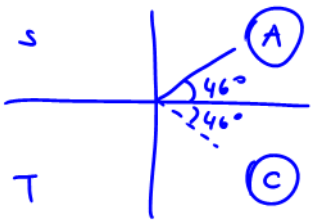
$\cos^{-1}(0.6951) = \theta$

$\theta \doteq 46°$

or

$360 - 46 = 314°$

∴ The angles are 46° and 314°.



j) $\sin\theta = -0.3154$