PreCalculus 11 Date _____

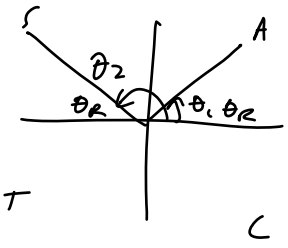
Unit 6: Standard Position Trigonometry

6.4 Solving Trigonometric Equations I

Trigonometric Equation: an equation involving a trigonometric ratio with an unknown angle

ex. Solve to the nearest tenth of a degree. $0 \le \theta < 360°$

a) $\sin\theta = 0.7562$ (>0)



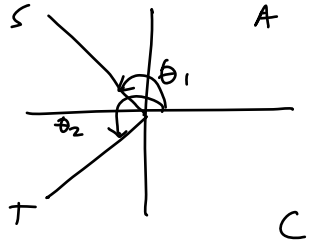
$\theta_R = \sin^{-1}(0.7562)$
$= 49.1°$

$\theta_1 = \boxed{49.1°}$
$\theta_2 = 180 - 49.1° = \boxed{130.9°}$

Solution Steps (show your work!)

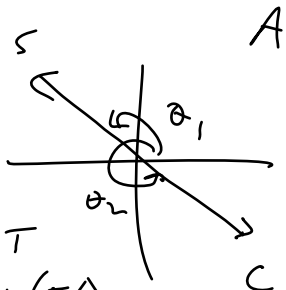
1. Identify your quadrants & sketch ✓
2. Determine your reference angle ✓
3. Determine the solutions ✓

b) $\cos\theta = -0.2491$ (<0)



$\theta_R = \cos^{-1}(0.2491)$
$= 75.6°$
$\theta_1 = 180 - 75.6 = \boxed{104.4°}$
$\theta_2 = 180 + 75.6 = \boxed{255.6°}$

c) $\tan\theta = -\frac{5}{3}$ (<0)

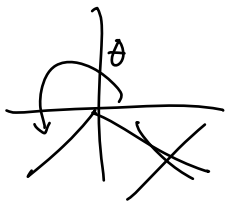


$\theta_R = \tan^{-1}(5/3)$
$= 59.0°$
$\theta_1 = 180 - 59.0 = \boxed{121.0°}$
$\theta_2 = 360 - 59.0 = \boxed{301.0°}$

Watch the given restriction on the angle!

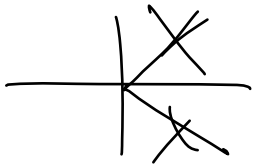
ex. Solve to the nearest degree. $90° < \theta < 270°$ (QII & QIII only)

a) $\sin\theta = -\frac{2}{7}$ (<0)



$\theta_R = \sin^{-1}(2/7)$
$= 17°$
$\theta = 180 + 17$
$= \boxed{197°}$

b) $\cos\theta = 0.5667$ (>0)



$\therefore$ **no solution**

Sometimes we need to isolate the trigonometric ratio before we can solve.

ex. Solve to the nearest degree. $0 \leq \theta < 360°$

a) $5\tan\theta + 1 = 4$

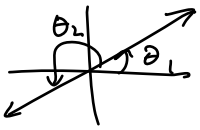
$-1 \quad -1$

$\frac{5\tan\theta}{5} = \frac{3}{5}$

$\tan\theta = 3/5$

$\theta_R = \tan^{-1}(3/5)$

$= 31°$



$\theta_1 = 31°$

$\theta_2 = 180+31 = 211°$

b) $10\sin\theta + 5 = 4\sin\theta$

$-4\sin\theta \quad -4\sin\theta$

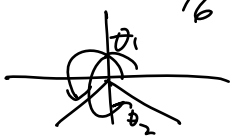
$\frac{6\sin\theta}{6} = \frac{-5}{6}$

$\sin\theta = -5/6$

* $10x + 5 = 4x$

$\theta_R = \sin^{-1}(5/6)$

$= 56°$



$\theta_1 = 180 + 56° = 236°$

$\theta_2 = 360 - 56° = 304°$

c) $3(2\cos\theta - 1) + 5 = 3\cos\theta + 7$

$6\cos\theta - 3 + 5 = 3\cos\theta + 7$

$6\cos\theta + 2 = 3\cos\theta + 7$

$-3\cos\theta \quad +2 \quad -3\cos\theta \quad -2$

$3\cos\theta = 5$

$\frac{3\cos\theta}{3} = \frac{5}{3}$

$\cos\theta = 5/3$

not possible because adj ⊅ hypotenuse

∴ no solution

* cosine & sine ratios only exist from −1 to +1

Practice: WS 2B.4