

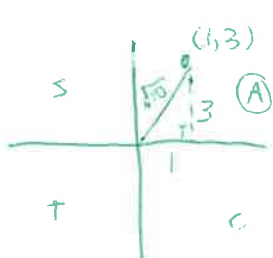
### W3 – Solving Trig Equations

MCR3U

Jensen

1. For each point given on the terminal arm of the angle, determine the exact primary values for the trigonometric ratios of the angle.

a) (1, 3)

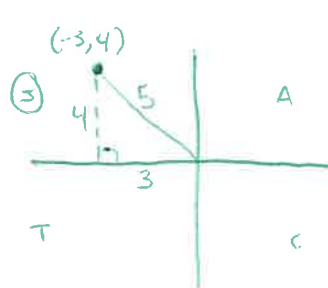


$$\sin \theta = \frac{3}{\sqrt{10}}$$

$$\cos \theta = \frac{1}{\sqrt{10}}$$

$$\tan \theta = 3$$

b) (-3, 4)

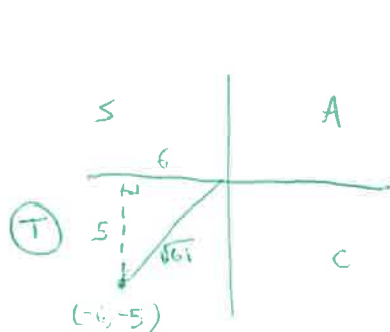


$$\sin \theta = \frac{4}{5}$$

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

$$\tan \theta = -\frac{4}{3}$$

c) (-6, -5)

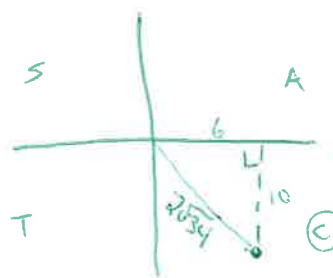


$$\sin \theta = -\frac{5}{\sqrt{61}}$$

$$\cos \theta = -\frac{6}{\sqrt{61}}$$

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

d) (6, -10)



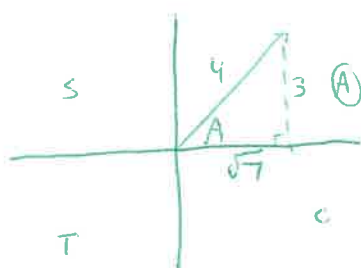
$$\sin \theta = \frac{-10}{\sqrt{134}} = -\frac{5}{\sqrt{34}}$$

$$\cos \theta = \frac{6}{\sqrt{134}} = \frac{3}{\sqrt{34}}$$

$$\tan \theta = \frac{-10}{6} = -\frac{5}{3}$$

2. One of the primary trigonometric ratios for an angle is given, as well as the quadrant in which each angle is located. Find the other two trigonometric ratios of the angle.

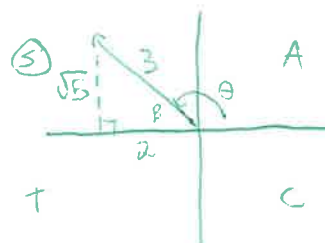
a)  $\sin A = \frac{3}{4}$ , first quadrant



$$\cos \theta = \frac{\sqrt{7}}{4}$$

$$\tan \theta = \frac{3}{\sqrt{7}}$$

b)  $\cos B = -\frac{2}{3}$ , second quadrant



$$\sin \theta = \frac{\sqrt{5}}{3}$$

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

3. Determine any three positive angles that are co-terminal with  $150^\circ$ .

$$\theta_1 = 150^\circ + 360^\circ = 510^\circ$$

$$\theta_2 = 510^\circ + 360^\circ = 870^\circ$$

$$\theta_3 = 870^\circ + 360^\circ = 1230^\circ$$

4. Solve the following equations for  $0^\circ \leq \theta \leq 360^\circ$ . Round answers to the nearest degree.

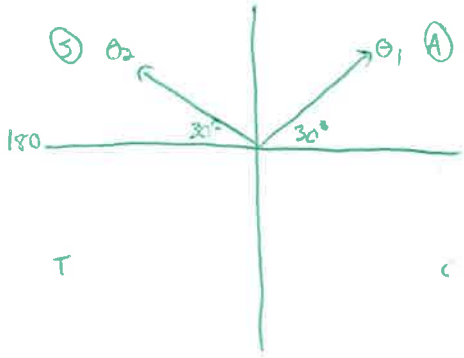
a)  $\sin \theta = \frac{1}{2}$

$$\theta_1 = \sin^{-1}\left(\frac{1}{2}\right)$$

$$\theta_1 = 30^\circ$$

$$\theta_2 = 180 - 30$$

$$\theta_2 = 150^\circ$$



b)  $2 \cos \theta = -\sqrt{3}$

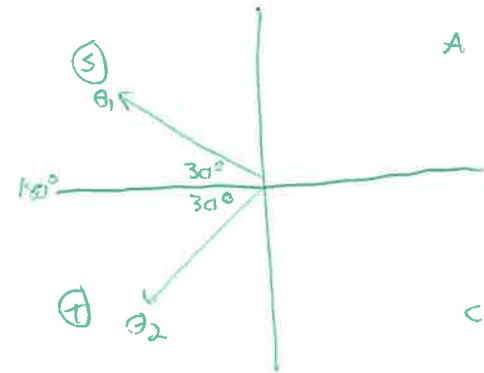
$$\cos \theta = -\frac{\sqrt{3}}{2}$$

$$\theta_1 = \cos^{-1}\left(-\frac{\sqrt{3}}{2}\right)$$

$$\theta_1 = 150^\circ$$

$$\theta_2 = 180 + 30$$

$$\theta_2 = 210^\circ$$



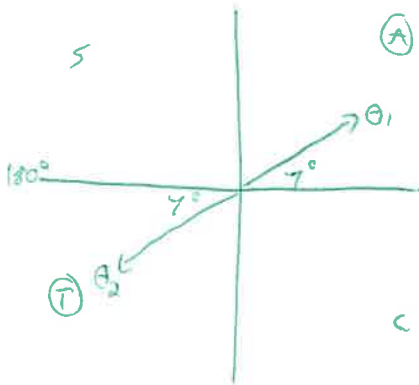
c)  $\tan \theta = \frac{1}{8.1516}$

$$\theta_1 = \tan^{-1}\left(\frac{1}{8.1516}\right)$$

$$\theta_1 \approx 7^\circ$$

$$\theta_2 = 180 + 7$$

$$\theta_2 = 187^\circ$$



d)  $5 \cos \theta + 3 = 0$

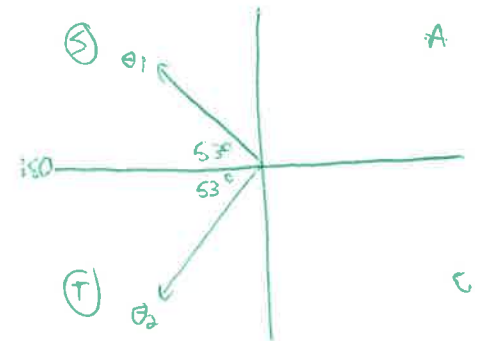
$$\cos \theta = -\frac{3}{5}$$

$$\theta_1 = \cos^{-1}\left(-\frac{3}{5}\right)$$

$$\theta_1 \approx 127^\circ$$

$$\theta_2 = 180 + 53$$

$$\theta_2 \approx 233^\circ$$

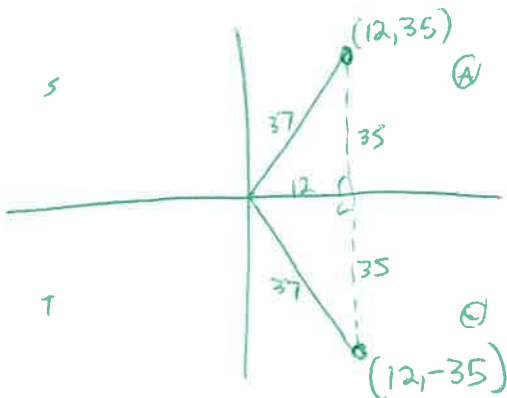


5. Consider  $\angle F$  such that  $\cos F = \frac{12}{37}$ .

a) Which quadrants can  $\angle F$  be in?

1 and 4

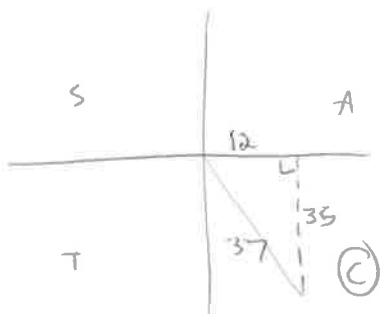
b) Find the coordinates of a point on the terminal arm of the angle in each quadrant.



c) If you are also told that the sine of the angle is negative, in which quadrant is  $\angle F$ ?

Q4

d) Write the other primary trigonometric ratios for  $\angle F$  in the quadrant identified in part c.



$$\sin \theta = -\frac{35}{37}$$

$$\tan \theta = -\frac{35}{12}$$

**Answers**

1. a)  $\sin \theta = \frac{3}{\sqrt{10}}$ ,  $\cos \theta = \frac{1}{\sqrt{10}}$ ,  $\tan \theta = 3$

b)  $\sin \theta = \frac{4}{5}$ ,  $\cos \theta = -\frac{3}{5}$ ,  $\tan \theta = -\frac{4}{3}$

c)  $\sin \theta = -\frac{5}{\sqrt{61}}$ ,  $\cos \theta = -\frac{6}{\sqrt{61}}$ ,  $\tan \theta = \frac{5}{6}$

d)  $\sin \theta = -\frac{5}{\sqrt{34}}$ ,  $\cos \theta = \frac{3}{\sqrt{34}}$ ,  $\tan \theta = -\frac{5}{3}$

2. a)  $\cos A = \frac{\sqrt{7}}{4}$ ,  $\tan A = \frac{3}{\sqrt{7}}$

b)  $\sin B = \frac{\sqrt{5}}{3}$ ,  $\tan B = -\frac{\sqrt{5}}{2}$

3. Answers may vary. Sample answer:  $510^\circ$ ,  $870^\circ$

4. a)  $30^\circ$ ,  $150^\circ$  b)  $150^\circ$ ,  $210^\circ$  c)  $97^\circ$ ,  $277^\circ$  d)  $127^\circ$ ,  $233^\circ$

5. a) the first and fourth quadrants

b) first quadrant:  $(12, 35)$ ; fourth quadrant:  $(12, -35)$

c) fourth quadrant

d)  $\sin F = -\frac{35}{37}$ ,  $\tan F = -\frac{35}{12}$