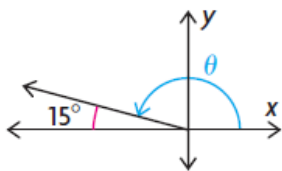


Solutions

5. i) For each angle θ , predict which primary trigonometric ratios are positive.
 ii) Determine the primary trigonometric ratios to the nearest hundredth.

a)



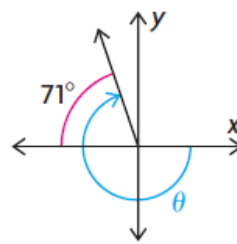
θ in Quadrant 2
 $\Rightarrow \sin \theta$ is positive
 $\theta = 180 - 15 = 165^\circ$

$$\sin 165 = 0.2588$$

$$\cos 165 = -0.9659$$

$$\tan 165 = -0.2679$$

c)



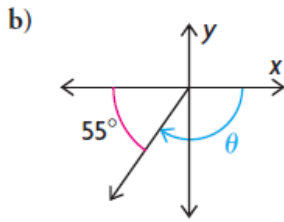
θ in Quadrant 2
 $\Rightarrow \sin \theta$ is positive
 $\theta = -(180 + 71) = -251^\circ$

$$\sin(-251) = 0.9455$$

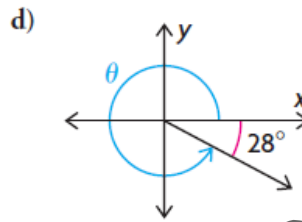
$$\cos(-251) = -0.3256$$

$$\tan(-251) = -2.9042$$

5. i) For each angle θ , predict which primary trigonometric ratios are positive.
 ii) Determine the primary trigonometric ratios to the nearest hundredth.



θ in Quadrant 3
 \Rightarrow TAN θ is positive
 $\theta = -(180 - 55) = -125^\circ$
 $\sin(-125) = -0.8192$
 $\cos(-125) = -0.5736$
 $\tan(-125) = 1.4281$



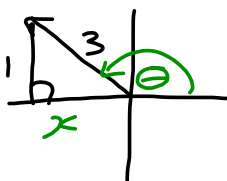
θ in Quadrant 4
 \Rightarrow COS θ is positive
 $\theta = 360 - 28 = 332^\circ$
 $\sin(332) = -0.4695$
 $\cos(332) = 0.8829$
 $\tan(332) = -0.5317$

6. Angle θ is a principal angle that lies in quadrant 2 such that $0^\circ \leq \theta \leq 360^\circ$.

Given each trigonometric ratio,

- i) determine the exact values of x , y , and r
 ii) sketch angle θ in standard position
 iii) determine the principal angle θ and the related acute angle β to the nearest degree

a) $\sin \theta = \frac{1}{3}$



$r = 3$
 $y = 1$
 $x = \sqrt{3^2 - 1^2}$
 $x = \sqrt{8} = 2\sqrt{2}$
 $\theta = \sin^{-1}(\frac{1}{3})$
 $\theta = 19^\circ (\beta)$
 $\Rightarrow = 180 - 19$
 $= 161^\circ$

c) $\cos \theta = -\frac{1}{4}$



$r = 4$
 $x = -1$
 $y = \sqrt{4^2 - (-1)^2}$
 $y = \sqrt{15}$
 $\theta = \cos^{-1}(-\frac{1}{4})$
 $\theta = 104^\circ$
 $\Rightarrow \beta = 180 - 104$
 $= 76^\circ$

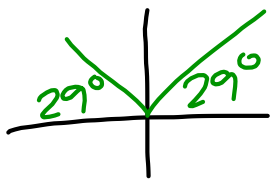
e) $\tan \theta = -1.1$



$x = -10$
 $y = 11$
 $r = \sqrt{(-10)^2 + 11^2}$
 $r = \sqrt{221}$
 $\theta = \tan^{-1}(-1.1)$
 $\theta = -48^\circ (\beta)$
 $\Rightarrow = 180 - 48$
 $= 132^\circ$

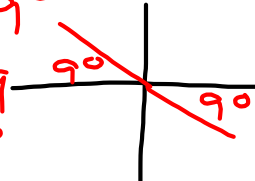
8. Use each trigonometric ratio to determine all values of θ , to the nearest degree if $0^\circ \leq \theta \leq 360^\circ$.

a) $\sin \theta = 0.4815$
 $\theta = \sin^{-1}(0.4815)$
 $\theta = 29^\circ$



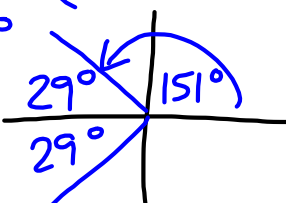
$\theta = 180 - 29$
 $\theta = 151^\circ$

b) $\tan \theta = -0.1623$
 $\theta = \tan^{-1}(-0.1623)$
 $\theta = -9^\circ$



$\theta = 360 - 9 = 351^\circ$
 $\theta = 180 - 9 = 171^\circ$


c) $\cos \theta = -0.8722$
 $\theta = \cos^{-1}(-0.8722)$
 $\theta = 151^\circ$



$\theta = 180 + 29 = 209^\circ$

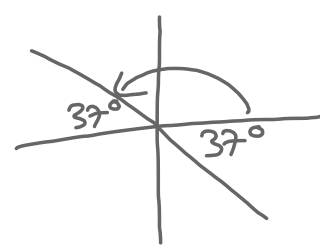
9. Given angle θ , where $0^\circ \leq \theta \leq 360^\circ$, determine two possible values of θ where each ratio would be true. Sketch both principal angles.

a) $\cos \theta = 0.6951$
 $\theta = \cos^{-1}(0.6951)$
 $\theta = 46^\circ$



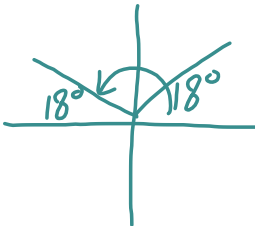
$\theta = 360 - 46$
 $\theta = 314^\circ$

b) $\theta = \tan^{-1}(-0.7571)$
 $\theta = -37^\circ$



$\theta = 180 - 37 = 143^\circ$
 $\theta = 360 - 37 = 323^\circ$

c) $\theta = \sin^{-1}(0.3154)$
 $\theta = 18^\circ$




$\theta = 180 - 18 = 162^\circ$

9. Given angle θ , where $0^\circ \leq \theta \leq 360^\circ$, determine two possible values of θ where each ratio would be true. Sketch both principal angles.

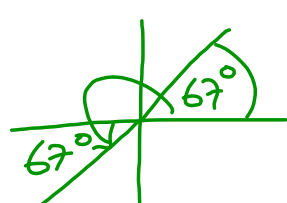
d) $\cos \theta = -0.2882$
 e) $\tan \theta = 2.3151$
 f) $\sin \theta = -0.7503$

d) $\theta = \cos^{-1}(-0.2882)$
 $\theta = 107^\circ$



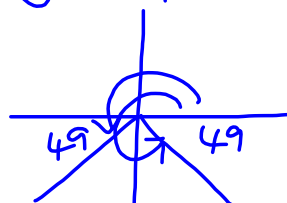
$\theta = 180 + 73$
 $= 253^\circ$

e) $\theta = \tan^{-1}(2.3151)$
 $\theta = 67^\circ$



$\theta = 180 + 67 = 247^\circ$

f) $\theta = \sin^{-1}(-0.7503)$
 $\theta = -49^\circ$



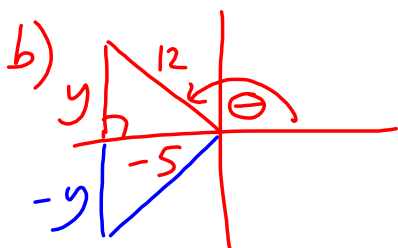
$\theta = 180 + 49 = 229^\circ$
 $\theta = 360 - 49 = 311^\circ$

12. Given $\cos \theta = -\frac{5}{12}$, where $0^\circ \leq \theta \leq 360^\circ$,

a) in which quadrant could the terminal arm of θ lie?
 b) determine all possible primary trigonometric ratios for θ .
 c) evaluate all possible values of θ to the nearest degree.

a) If \cos is negative, it could be in Q2 or Q3

b)



$y = \sqrt{(12)^2 - (-5)^2}$
 $y = \sqrt{144 - 25}$
 $y = \sqrt{119}$

$\sin \theta = \frac{\sqrt{119}}{12}$ $\cos \theta = \frac{-5}{12}$ $\tan \theta = \frac{-\sqrt{119}}{5}$

$\sin \theta = \frac{-\sqrt{119}}{12}$ $\cos \theta = \frac{-5}{12}$ $\tan \theta = \frac{\sqrt{119}}{5}$

$\theta = \cos^{-1}\left(\frac{-5}{12}\right)$
 $\theta = 115^\circ$

$\beta = 180 - 115 = 65^\circ$
 $\theta = 180 + 65 = 245^\circ$

15. Given angle θ , where $0^\circ \leq \theta \leq 360^\circ$, solve for θ to the nearest degree.

- a) $\cos 2\theta = 0.6420$
- b) $\sin(\theta + 20^\circ) = 0.2045$
- c) $\tan(90^\circ - 2\theta) = 1.6443$

a) $\cos 2\theta = 0.6420$
 $2\theta = \cos^{-1}(0.6420)$
 $2\theta = 50^\circ$ or 310°
 $\theta = 25^\circ$ or 155°

ALSO get extra solutions
of $180 + 25 = 205^\circ$
and $180 + 155 = 335^\circ$

[Graph $\cos 2x$ and $y = 0.642$
and click where they cross]

[Graph $\tan(90 - 2x)$ and
 $y = 1.6443$ and click
where they cross]

b) $\sin(\theta + 20) = 0.2045$
 $\theta + 20 = \sin^{-1}(0.2045)$
 $\theta + 20 = 12^\circ$ or 168°
 $\theta = -8^\circ$ or 148°
 $\theta = 352^\circ$ or 148°

c) $\tan(90 - 2\theta) = 1.6443$
 $90 - 2\theta = \tan^{-1}(1.6443)$
 $90 - 2\theta = 59^\circ$ or 239°
 $\frac{-2\theta}{-2} = \frac{-31^\circ}{-2}$ or $\frac{149^\circ}{-2}$
 $\theta = 15.5$ or -74.5
 $\theta = 16^\circ$ or 285°

AGAIN get extra solutions
 $\theta = 180 + 16 = 196^\circ$
 $\theta = 285 - 180 = 105^\circ$