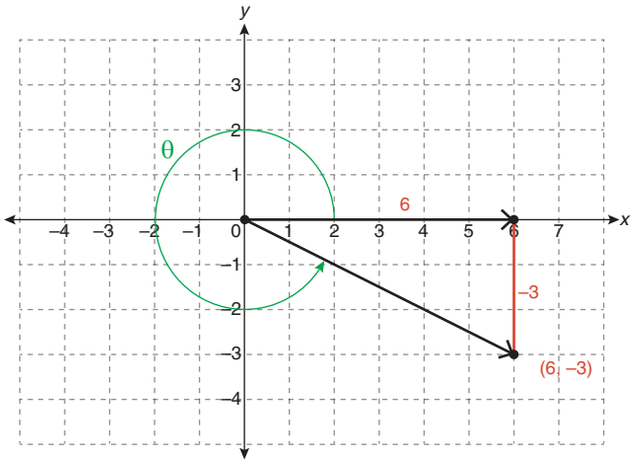
## Lesson 4.2: Trigonometric Ratios for Any Angle

### Practice Solutions – II

1. Given the following points that lie on the terminal arm of an angle θ in standard position, determine the **exact** trigonometric ratios for $\sin\theta$, $\cos\theta$, and $\tan\theta$.

   a. $(6, -3)$



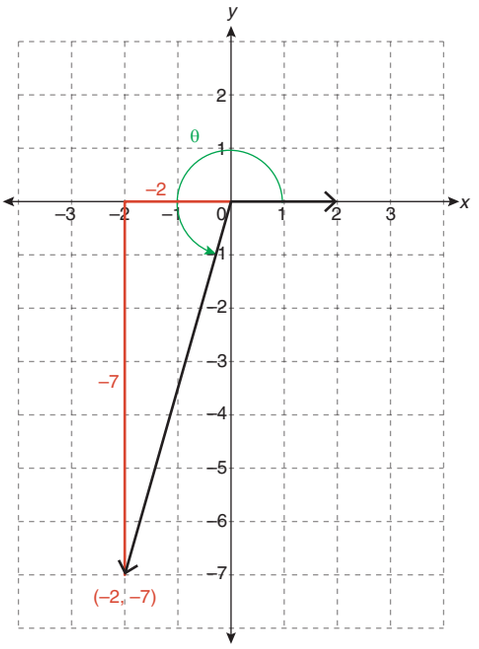

$r = \sqrt{6^2 + (-3)^2}$
$r = \sqrt{36 + 9}$
$r = \sqrt{45}$
$r = 3\sqrt{5}$

$\sin\theta = \frac{y}{r}$
$= \frac{-3}{3\sqrt{5}}$
$= -\frac{1}{\sqrt{5}}$
$= -\frac{\sqrt{5}}{5}$

$\cos\theta = \frac{x}{r}$
$= \frac{6}{3\sqrt{5}}$
$= \frac{2}{\sqrt{5}}$
$= \frac{2\sqrt{5}}{5}$

$\tan\theta = \frac{y}{x}$
$= \frac{-3}{6}$
$= -\frac{1}{2}$

b. $(-2, -7)$



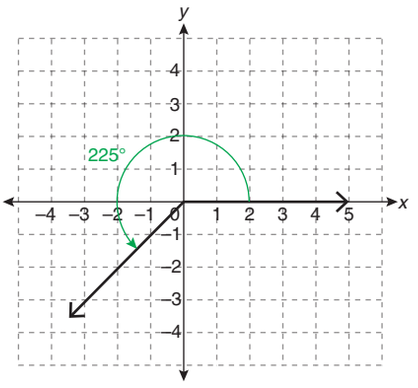

$r = \sqrt{(-2)^2 + (-7)^2}$
$r = \sqrt{4 + 49}$
$r = \sqrt{53}$

$\sin\theta = \frac{y}{r}$ $\cos\theta = \frac{x}{r}$
$= \frac{-7}{\sqrt{53}}$ $= \frac{-2}{\sqrt{53}}$
$= -\frac{7\sqrt{53}}{53}$ $= -\frac{2\sqrt{53}}{53}$

$\tan\theta = \frac{y}{x}$
$= \frac{-7}{-2}$
$= \frac{7}{2}$
$= 3.5$

2. Determine the exact values of the trigonometric ratios for each angle.

a.



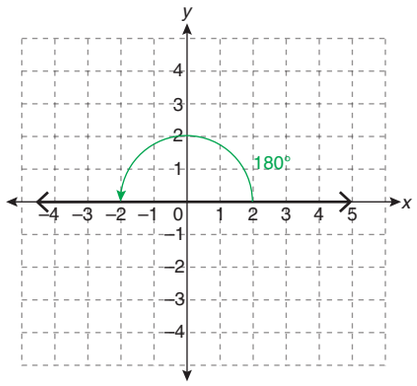

This angle terminates in Quadrant III; therefore, the reference angle is:

$\theta_R = \theta - 180°$
$= 225° - 180°$
$= 45°$

In Quadrant III, only tangent is positive.

$\sin 225° = -\sin 45°$ $\cos 225° = -\cos 45°$ $\tan 225° = \tan 45°$
$= -\frac{\sqrt{2}}{2}$ $= -\frac{\sqrt{2}}{2}$ $= 1$

b.




This angle is one of the quadrantal angles.

$\sin 180^\circ = 0$

$\cos 180^\circ = -1$

$\tan 180^\circ = 0$

3. Without using a calculator, determine whether each ratio is positive or negative.

   a. $\sin 150^\circ$

   This angle terminates in Quadrant II, where only sine is positive; therefore, $\sin 150^\circ$ will be positive.

   b. $\cos 315^\circ$

   This angle terminates in Quadrant IV, where only cosine is positive; therefore, $\cos 315^\circ$ will be positive.

   c. $\tan 115^\circ$

   This angle terminates in Quadrant II, where only sine is positive; therefore, $\tan 115^\circ$ will be negative.

Please return to *Unit 4: Trigonometry Lesson 4.2* to continue your exploration.