

Lesson Worksheet 6.3A(I)

Objective: To express trigonometric ratios of $(180^\circ \pm \theta)$ with the same trigonometric ratios of positive acute angles.

Trigonometric ratios of $(180^\circ - \theta)$:

For any angle θ ,

$$\sin (180^\circ - \theta) = \sin \theta$$

$$\cos (180^\circ - \theta) = -\cos \theta$$

$$\tan (180^\circ - \theta) = -\tan \theta$$

1. Express each of the following with the same trigonometric ratio of a positive acute angle.

(a) $\sin 110^\circ$

$$110^\circ = 180^\circ - \underline{\hspace{2cm}}$$

$$\begin{aligned} \sin 110^\circ \\ &= \sin (180^\circ - \quad) \\ &= \underline{\hspace{2cm}} \end{aligned}$$

(b) $\cos 130^\circ$

$$130^\circ = 180^\circ - \underline{\hspace{2cm}}$$

$$\begin{aligned} \cos 130^\circ \\ &= \cos (180^\circ - \quad) \\ &= \underline{\hspace{2cm}} \end{aligned}$$

(c) $\tan 105^\circ$

$$105^\circ = 180^\circ - \underline{\hspace{2cm}}$$

$$\begin{aligned} \tan 105^\circ \\ &= \tan (180^\circ - \quad) \\ &= \underline{\hspace{2cm}} \end{aligned}$$

(d) $\sin 140^\circ$

$$\begin{aligned} &= \sin (180^\circ - \quad) \\ &= \underline{\hspace{2cm}} \end{aligned}$$

(e) $\cos 125^\circ$

$$\begin{aligned} &= \cos (180^\circ - \quad) \\ &= \underline{\hspace{2cm}} \end{aligned}$$

(f) $\tan 175^\circ$

$$\begin{aligned} &= \tan (180^\circ - \quad) \\ &= \underline{\hspace{2cm}} \end{aligned}$$

Trigonometric ratios of $(180^\circ + \theta)$:

For any angle θ ,

$$\sin (180^\circ + \theta) = -\sin \theta$$

$$\cos (180^\circ + \theta) = -\cos \theta$$

$$\tan (180^\circ + \theta) = \tan \theta$$

2. Express each of the following with the same trigonometric ratio of a positive acute angle.

(a) $\sin 190^\circ$

$$190^\circ = 180^\circ + \underline{\hspace{2cm}}$$

$$\begin{aligned} \sin 190^\circ \\ &= \sin (180^\circ + \quad) \\ &= \underline{\hspace{2cm}} \end{aligned}$$

(b) $\cos 230^\circ$

$$230^\circ = 180^\circ + \underline{\hspace{2cm}}$$

$$\begin{aligned} \cos 230^\circ \\ &= \cos (180^\circ + \quad) \\ &= \underline{\hspace{2cm}} \end{aligned}$$

(c) $\tan 205^\circ$

$$205^\circ = 180^\circ + \underline{\hspace{2cm}}$$

$$\begin{aligned} \tan 205^\circ \\ &= \tan (180^\circ + \quad) \\ &= \underline{\hspace{2cm}} \end{aligned}$$

$$\begin{array}{lll}
 \text{(d)} & \sin 220^\circ & \text{(e)} & \cos 235^\circ & \text{(f)} & \tan 255^\circ \\
 & = \sin (180^\circ + \quad) & & = \cos (180^\circ + \quad) & & = \tan (180^\circ + \quad) \\
 & = \underline{\hspace{2cm}} & & = \underline{\hspace{2cm}} & & = \underline{\hspace{2cm}}
 \end{array}$$

Express each of the following with the same trigonometric ratio of a positive acute angle. (3 – 5)

3. $\sin 165^\circ$

4. $\cos 245^\circ$

5. $\tan 143^\circ$

→ Exercise 6.3: 1(a)(b) – 3(a)(b)

Try More

6. Express $\tan 232^\circ$ with the same trigonometric ratio of a positive acute angle.

Lesson Worksheet 6.3B(I)

Objective: To express trigonometric ratios of $(360^\circ \pm \theta)$ and $(-\theta)$ with the same trigonometric ratios of positive acute angles.

Trigonometric ratios of $(360^\circ + \theta)$:

For any angle θ ,

$$\sin(360^\circ + \theta) = \sin \theta$$

$$\cos(360^\circ + \theta) = \cos \theta$$

$$\tan(360^\circ + \theta) = \tan \theta$$

1. Express each of the following with the same trigonometric ratio of a positive acute angle.

(a) $\sin 370^\circ$

$$370^\circ = 360^\circ + \underline{\hspace{2cm}}$$

$$\begin{aligned} \sin 370^\circ \\ &= \sin(360^\circ + \quad) \\ &= \underline{\hspace{2cm}} \end{aligned}$$

(b) $\cos 385^\circ$

$$385^\circ = 360^\circ + \underline{\hspace{2cm}}$$

$$\begin{aligned} \cos 385^\circ \\ &= \cos(360^\circ + \quad) \\ &= \underline{\hspace{2cm}} \end{aligned}$$

(c) $\tan 430^\circ$

$$430^\circ = 360^\circ + \underline{\hspace{2cm}}$$

$$\begin{aligned} \tan 430^\circ \\ &= \tan(360^\circ + \quad) \\ &= \underline{\hspace{2cm}} \end{aligned}$$

(d) $\sin 395^\circ$

$$\begin{aligned} &= \sin(360^\circ + \quad) \\ &= \underline{\hspace{2cm}} \end{aligned}$$

(e) $\cos 400^\circ$

$$\begin{aligned} &= \cos(360^\circ + \quad) \\ &= \underline{\hspace{2cm}} \end{aligned}$$

(f) $\tan 425^\circ$

$$\begin{aligned} &= \tan(360^\circ + \quad) \\ &= \underline{\hspace{2cm}} \end{aligned}$$

Trigonometric ratios of $(-\theta)$ and $(360^\circ - \theta)$:

For any angle θ ,

$$\sin(-\theta) = \sin(360^\circ - \theta) = -\sin \theta$$

$$\cos(-\theta) = \cos(360^\circ - \theta) = \cos \theta$$

$$\tan(-\theta) = \tan(360^\circ - \theta) = -\tan \theta$$

2. Express each of the following with the same trigonometric ratio of a positive acute angle.

(a) $\sin(-25^\circ)$

$$= \underline{\hspace{2cm}}$$

(b) $\cos(-50^\circ)$

$$= \underline{\hspace{2cm}}$$

(c) $\tan(-10^\circ)$

$$= \underline{\hspace{2cm}}$$

(d) $\sin 350^\circ$

$$350^\circ = 360^\circ - \underline{\hspace{2cm}}$$

$$\begin{aligned} \sin 350^\circ \\ &= \sin(360^\circ - \quad) \\ &= \underline{\hspace{2cm}} \end{aligned}$$

(e) $\cos 280^\circ$

$$280^\circ = 360^\circ - \underline{\hspace{2cm}}$$

$$\begin{aligned} \cos 280^\circ \\ &= \cos(360^\circ - \quad) \\ &= \underline{\hspace{2cm}} \end{aligned}$$

(f) $\tan 295^\circ$

$$295^\circ = 360^\circ - \underline{\hspace{2cm}}$$

$$\begin{aligned} \tan 295^\circ \\ &= \tan(360^\circ - \quad) \\ &= \underline{\hspace{2cm}} \end{aligned}$$

(g)	$\sin 290^\circ$	(h)	$\cos 305^\circ$	(i)	$\tan 345^\circ$
	$= \sin (360^\circ - \quad)$		$= \cos (360^\circ - \quad)$		$= \tan (360^\circ - \quad)$
	$= \underline{\hspace{2cm}}$		$= \underline{\hspace{2cm}}$		$= \underline{\hspace{2cm}}$

Express each of the following with the same trigonometric ratio of a positive acute angle. (3 – 5)

3. $\cos (-83^\circ)$

4. $\sin 293^\circ$

5. $\tan 344^\circ$

→Exercise 6.3: 1(c) – 3(c)

Try More

6. Express $\tan 500^\circ$ with the same trigonometric ratio of a positive acute angle.

Lesson Worksheet 6.3C(I)

Objective: To simplify trigonometric expressions.

Trigonometric ratios of $(180^\circ \pm \theta)$	Trigonometric ratios of $(360^\circ \pm \theta)$	Trigonometric ratios of $(-\theta)$
$\sin(180^\circ - \theta) = \sin \theta$	$\sin(360^\circ - \theta) = -\sin \theta$	$\sin(-\theta) = -\sin \theta$
$\cos(180^\circ - \theta) = -\cos \theta$	$\cos(360^\circ - \theta) = \cos \theta$	$\cos(-\theta) = \cos \theta$
$\tan(180^\circ - \theta) = -\tan \theta$	$\tan(360^\circ - \theta) = -\tan \theta$	$\tan(-\theta) = -\tan \theta$
$\sin(180^\circ + \theta) = -\sin \theta$	$\sin(360^\circ + \theta) = \sin \theta$	
$\cos(180^\circ + \theta) = -\cos \theta$	$\cos(360^\circ + \theta) = \cos \theta$	
$\tan(180^\circ + \theta) = \tan \theta$	$\tan(360^\circ + \theta) = \tan \theta$	

1. Simplify the following expressions.

(a) $\sin(90^\circ - \theta) + \cos(360^\circ - \theta)$

$= \underline{\hspace{2cm}} + \cos(\quad)$
 $=$

$\sin(90^\circ - \theta) = \cos \underline{\hspace{1cm}}$

(b) $\cos(180^\circ - \theta) \tan(360^\circ + \theta)$

$= (\quad) \tan(\quad)$
 $=$

$\tan \theta = \frac{\quad}{\cos \theta}$

(c) $\frac{\sin(180^\circ - \theta)}{\cos(-\theta)}$

$= \frac{\sin(\quad)}{(\quad)}$
 $=$

(d) $\frac{\sin(180^\circ + \theta)}{\cos(360^\circ + \theta)}$

$= \frac{(\quad)}{(\quad)}$
 $=$

2. Simplify the following expressions.

(a) $\frac{\sin(360^\circ - \theta)}{\sin(-\theta)}$

(b) $\tan(180^\circ - \theta) \cos(180^\circ + \theta)$

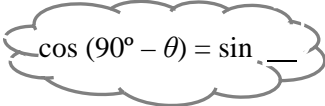
(c) $\tan(90^\circ - \theta) \sin(180^\circ - \theta)$

$\tan(90^\circ - \theta)$
 $= \frac{1}{\tan(\quad)}$

(d) $1 - \cos(360^\circ + \theta) \cos(-\theta)$

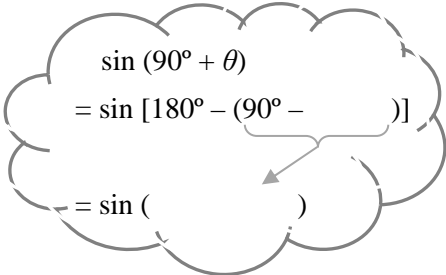
$\sin^2 \theta + \cos^2 \theta = \underline{\hspace{1cm}}$

3. Simplify the following expressions.

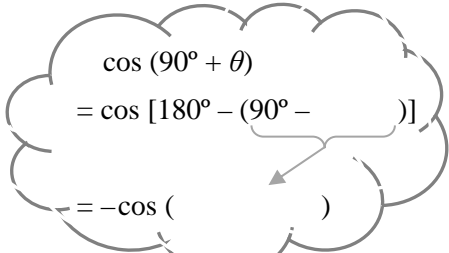
(a) $\frac{\tan(180^\circ + \theta)}{\cos(90^\circ - \theta)}$  (b) $\frac{\sin(360^\circ + \theta)}{\cos(180^\circ + \theta) \tan(-\theta)}$

4. Simplify the following expressions.

(a) $\sin(90^\circ + \theta) \tan \theta$
 $= \sin [\quad - (\quad)] \tan \theta$
 $= \sin (\quad) \tan \theta$
 $=$



(b) $\sin \theta - \cos(90^\circ + \theta)$
 $= \sin \theta - \cos [\quad - (\quad)]$
 $=$



5. Simplify $\frac{\cos(90^\circ + \theta)}{\tan(360^\circ - \theta)}$.

→Exercise 6.3: 9 – 18

Try More

6. Simplify $\tan(90^\circ - \theta) \sin(90^\circ + \theta) - \sin(180^\circ + \theta)$.