Exercise 10B: Solutions

1 a
$$\begin{aligned}\cos\left(\frac{3\pi}{4}\right) &= \cos\left(\pi - \frac{\pi}{4}\right)\\ &= -\cos\left(\frac{\pi}{4}\right)\\ &= -\frac{1}{\sqrt{2}}\end{aligned}$$

b
$$\begin{aligned}\sin\left(\frac{5\pi}{4}\right) &= \sin\left(\pi + \frac{\pi}{4}\right)\\ &= -\sin\left(\frac{\pi}{4}\right)\\ &= -\frac{1}{\sqrt{2}}\end{aligned}$$

c
$$\begin{aligned}\sin\left(\frac{25\pi}{2}\right) &= \sin\left(24\pi + \frac{\pi}{2}\right)\\ &= \sin\left(\frac{\pi}{2}\right)\\ &= 1\end{aligned}$$

d 1

e $\frac{1}{\sqrt{2}}$

f $\frac{1}{\sqrt{2}}$

g 0

h $\frac{\sqrt{3}}{2}$

i 0

j 0

k 1

l 0

m $-\frac{1}{2}$

n -1

o -1

2 a
$$\begin{aligned}\sin(135^\circ) &= \sin(180 - 45)^\circ\\ &= \sin(45^\circ)\\ &= \frac{\sqrt{2}}{2}\end{aligned}$$

b
$$\begin{aligned}\cos(-300^\circ) &= \cos(300)^\circ\\ &= \cos(360 - 60)^\circ\\ &= \cos(60^\circ)\\ &= \frac{1}{2}\end{aligned}$$

c $\sin(480^\circ) = \sin(540 - 60)^\circ$
$= \sin(180 - 60)^\circ$
$= \sin(60)^\circ$
$= \frac{\sqrt{3}}{2}$

d $\cos(240^\circ) = \cos(180 + 60)^\circ$
$= -\cos(60^\circ)$
$= \frac{-1}{2}$

e $\sin(-225^\circ) = -\sin(225^\circ)$
$= -\sin(180 + 45)^\circ$
$= \sin(45^\circ)$
$= \frac{\sqrt{2}}{2}$

f $\sin(420^\circ) = \sin(360 + 60)^\circ$
$= \sin(60^\circ)$
$= \frac{\sqrt{3}}{2}$

3 **a** $\cos(-\alpha) = \cos\alpha = 0.6$

b $\sin(\frac{\pi}{2} + \alpha) = \cos\alpha = 0.6$

c $\cos(\frac{\pi}{2} - x) = \sin x = 0.3$

d $\sin(-x) = -\sin x = -0.3$

e $\cos(\frac{\pi}{2} + x) = -\sin x = -0.3$

f $\sin(\frac{\pi}{2} - \alpha) = \cos\alpha = 0.6$

g $\sin(\frac{3\pi}{2} + \alpha) = -\cos\alpha = -0.6$

h $\cos(\frac{3\pi}{2} - x) = -\sin x = -0.3$

4

$\sin^2(x^\circ) + \cos^2(x^\circ) = 1$
$\therefore 0.25 + \cos^2(x^\circ) = 1$
$\therefore \cos^2(x^\circ) = \frac{3}{4}$
$\therefore \cos(x^\circ) = \pm\sqrt{\frac{3}{4}}$
$\therefore \cos(x^\circ) = \frac{-\sqrt{3}}{2}$ as
$90 < x < 180$

$$\begin{aligned}\tan(x^\circ) &= \frac{\sin(x^\circ)}{\cos(x^\circ)} \\ &= \frac{\frac{1}{2}}{-\frac{\sqrt{3}}{2}} \\ &= -\frac{1}{2} \times \frac{2}{\sqrt{3}} \\ &= -\frac{1}{\sqrt{3}} \\ &= -\frac{\sqrt{3}}{3}\end{aligned}$$

5

$$\sin^2(x^\circ) + \cos^2(x^\circ) = 1$$

$$\therefore \sin^2(x^\circ) + 0.49 = 1$$

$$\therefore \sin^2(x^\circ) = \frac{51}{100}$$

$$\therefore \sin(x^\circ) = \pm\sqrt{\frac{51}{100}}$$

$$\therefore \sin(x^\circ) = -\frac{\sqrt{51}}{10} \text{ as } 180 < x < 270$$

$$\begin{aligned}\tan(x^\circ) &= \frac{\sin(x^\circ)}{\cos(x^\circ)} \\ &= \frac{-\frac{\sqrt{51}}{10}}{-\frac{7}{10}} \\ &= \frac{\sqrt{51}}{10} \times \frac{10}{7} \\ &= \frac{\sqrt{51}}{7}\end{aligned}$$

6

$$\sin^2(x) + \cos^2(x) = 1$$

$$\therefore 0.25 + \cos^2(x) = 1$$

$$\therefore \cos^2(x) = \frac{3}{4}$$

$$\therefore \cos(x) = \pm\sqrt{\frac{3}{4}}$$

$$\therefore \cos(x) = -\frac{\sqrt{3}}{2} \text{ as } \pi < x \leq \frac{3\pi}{2}$$

$$\begin{aligned}\tan(x) &= \frac{\sin(x)}{\cos(x)} \\ &= \frac{-\frac{1}{2}}{-\frac{\sqrt{3}}{2}} \\ &= \frac{1}{2} \times \frac{2}{\sqrt{3}} \\ &= \frac{\sqrt{3}}{3}\end{aligned}$$

7

$$\sin^2(x) + \cos^2(x) = 1$$

$$\therefore 0.09 + \cos^2(x) = 1$$

$$\therefore \cos^2(x) = \frac{91}{100}$$

$$\therefore \cos(x) = \pm\sqrt{\frac{91}{100}}$$

$$\therefore \cos(x) = \frac{\sqrt{91}}{10} \text{ as } \frac{3\pi}{2} < x \leq 2\pi$$

$$\tan(x) = \frac{\sin(x)}{\cos(x)}$$

$$= \frac{-\frac{3}{10}}{\frac{\sqrt{91}}{10}}$$

$$= -\frac{3}{10} \times \frac{10}{\sqrt{91}}$$

$$= -\frac{3\sqrt{91}}{91}$$