Form 5 Chapter 6
Ratios and Graphs of Trigonometric Functions
Fully-Worked Solutions

UPSKILL 6.1

1

Angle	*Quadrant*	*sine*	*cosine*	*tangent*
α	II	Coordinate-$y = 0.6$	Coordinate-$x = -0.8$	$\frac{\text{Coordinate}-y}{\text{Coordinate}-x} = -0.75$
β	III	Coordinate-$y = -0.8$	Coordinate-$x = -0.6$	$\frac{\text{Coordinate}-y}{\text{Coordinate}-x} = 1.33$
δ	IV	Coordinate-$y = -0.92$	Coordinate-$x = 0.4$	$\frac{\text{Coordinate}-y}{\text{Coordinate}-x} = -2.3$

2 (a) Positive, $\sin 56^\circ$
(b) Negative, $-\sin 15^\circ$
(c) Negative, $-\sin 71^\circ$
(d) Negative, $-\cos 75^\circ$
(e) Negative, $-\cos 9^\circ$
(f) Positive, $\cos 56^\circ$
(g) Negative, $-\tan 6^\circ$
(h) Positive, $\tan 75^\circ$
(i) Negative, $-\tan 19^\circ$

3 (a) $\cos = 150^\circ = -\cos(180^\circ - 150^\circ)$

$= -\cos 30^\circ$

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

(b) $\sin\ 225^\circ = -\sin(225^\circ - 180^\circ)$

$= -\sin 45^\circ$

$= -\frac{1}{\sqrt{2}}$

(c) $\sin 240^\circ = -\sin(240^\circ - 180^\circ)$

$= -\sin 60^\circ$

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

(d) $\cos 315^\circ = \cos(360^\circ - 315^\circ)$

$= \cos 45^\circ$

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

(e) $\cos 210^\circ = -\cos(210^\circ - 180^\circ)$

$= -\cos 30^\circ$

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

(f) $\tan 150^\circ = -\tan\ (180^\circ - 150^\circ)$

$= -\tan 30^\circ$

$= -\frac{1}{\sqrt{3}}$

(g) $\tan 240^\circ = \tan(240^\circ - 180^\circ)$

$= \tan 60^\circ$

$= \sqrt{3}$

(h) $\tan 330^\circ = -\tan(360^\circ - 330^\circ)$

$= -\tan 30^\circ$

$= -\frac{1}{\sqrt{3}}$

4 (a) $\sin\alpha = 0.6124$

Basic $\angle = 37.76^\circ$

$\alpha = 37.76^\circ$ or 142.24°

(b) $\text{kos}\,\alpha = 0.2388$

Basic $\angle = 76.18^\circ$

$\alpha = 76.18^\circ$ or 283.82°

(c) $\tan\alpha = 2.7892$

Basic $\angle = 70.28^\circ$

$\alpha = 70.28^\circ$ or 250.28°

(d) $\sin\alpha = -0.8552$

Basic $\angle = 58.78^\circ$

$\alpha = 238.78^\circ$ or 301.22°

(e) $\cos\alpha = -0.7268$

Basic $\angle = 43.38^\circ$

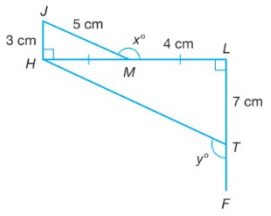
$\alpha = 136.62^\circ$ or 223.38°

(f) $\tan\alpha = -2.3578$

Basic $\angle = 67.02^\circ$

$\alpha = 112.98^\circ$ or 292.98°

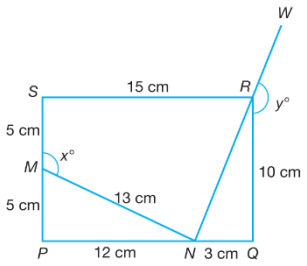
5



$\cos x^\circ = -\cos\angle JMH = -\frac{4}{5}$

(b) $\tan y^\circ = -\tan\angle HTL = -\frac{8}{7}$

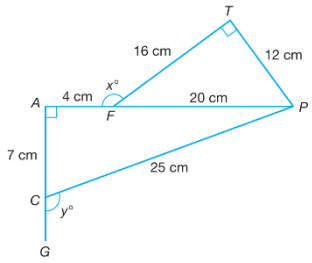
6 (a)



$$\cos x^{\circ} = \cos \angle PMN = -\frac{5}{13}$$

(b) $\tan y^{\circ} = -\tan \angle NRQ \; -\frac{3}{10}$

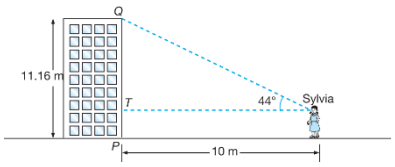
7



$$\sin x^{\circ} = \sin \angle TFP = \frac{12}{20} = \frac{3}{5}$$

(b) $\cos y^{\circ} = -\cos \angle ACP = -\frac{7}{25}$

8



$$\tan 44^{\circ} = \frac{QT}{10}$$

$$QT = 10 \times \tan 44^{\circ}$$

$$QT = 9.66 \text{ m}$$

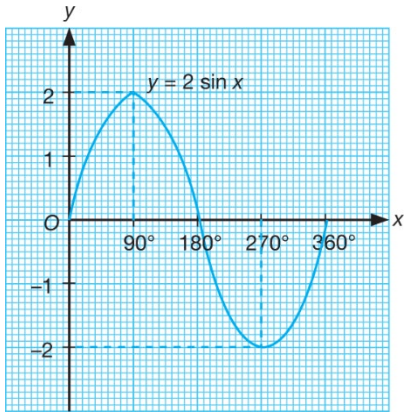
$$PT = 11.16 - 9.66 = 1.5 \text{ m}$$

$$\tan \angle TSP = \frac{1.5}{10}$$

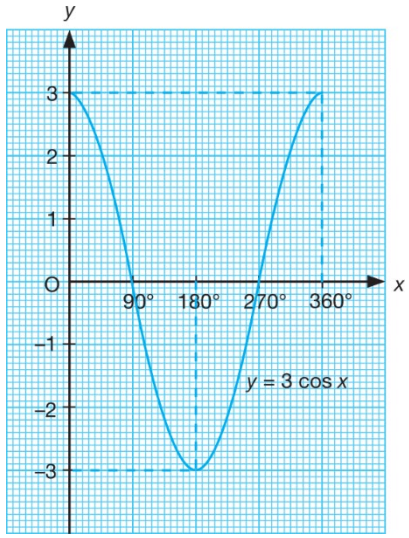
Angle of depression = $8^{\circ}33'$

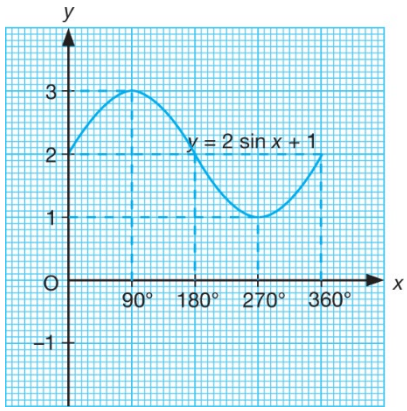
UPSKILL 6.2

1 (a)

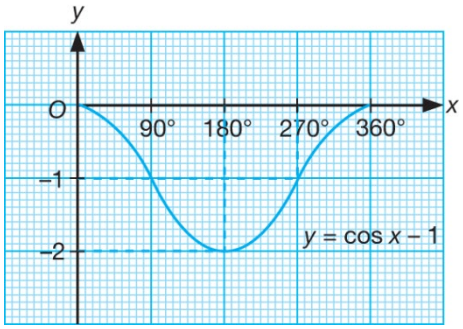


(b)

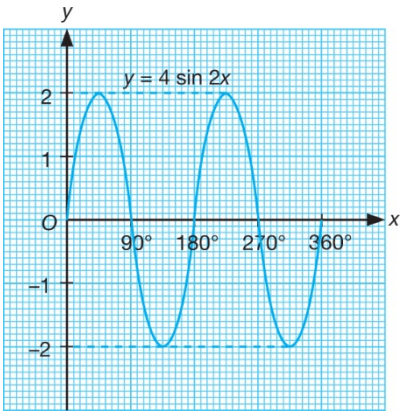


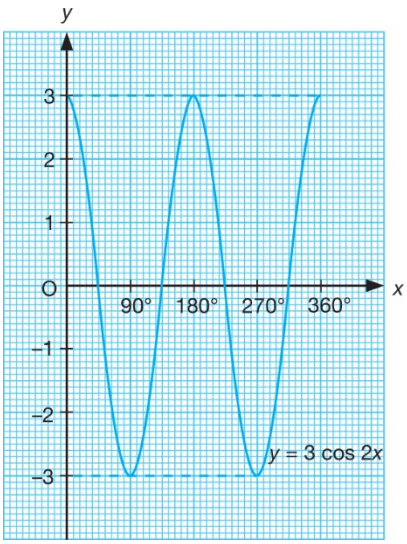


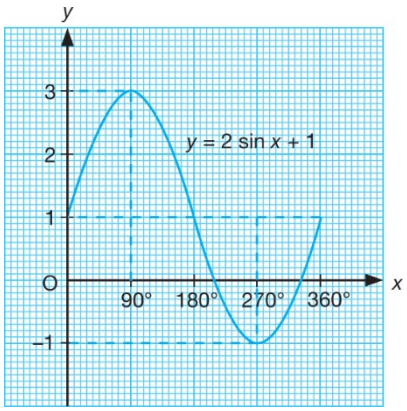
(d)

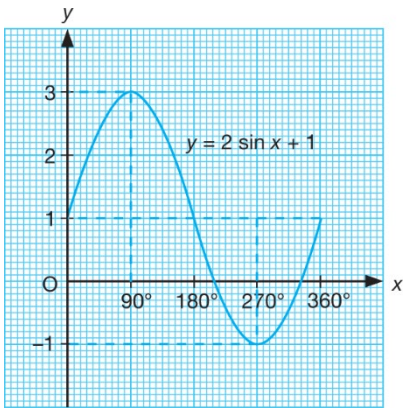


2 (a)









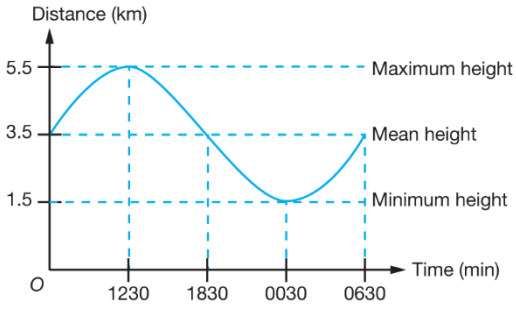
3 $V = A\sin 93\,600t$

$93\,600t = 360$

$$t = \frac{1}{260}$$

$$\text{Period} = \frac{1}{260} \text{ seconds}$$

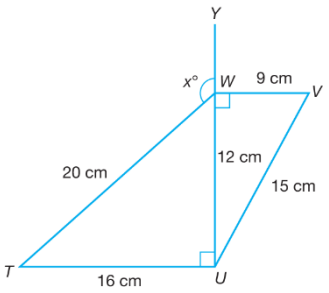
4



Summative Practice 6

Multiple-Choice Questions

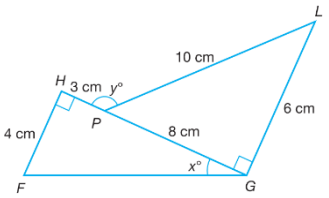
1



$\cos x^\circ = -\cos \angle TWU = -\frac{12}{20} = -\frac{3}{5}$

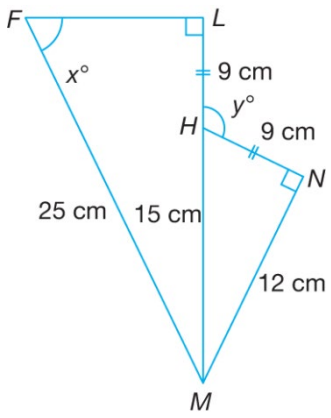
Answer: B

2



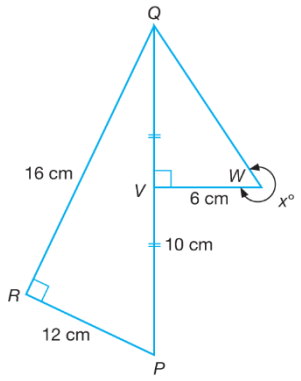
$\cos y^\circ = -\cos \angle LPQ = -\frac{8}{10} = -\frac{3}{5}$

Answer: A



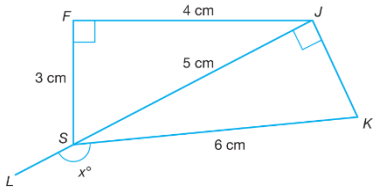
$\cos y^\circ = -\frac{9}{15} = -\frac{3}{5}$

Answer: A



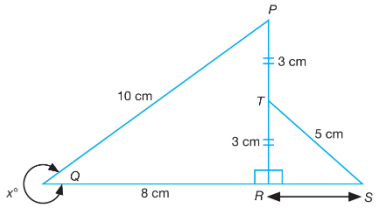
$\tan x^\circ = -\tan \angle VWQ = -\frac{10}{6} = -\frac{5}{3}$

Answer: D



$\cos x^\circ = -\frac{5}{6}$

Answer: A

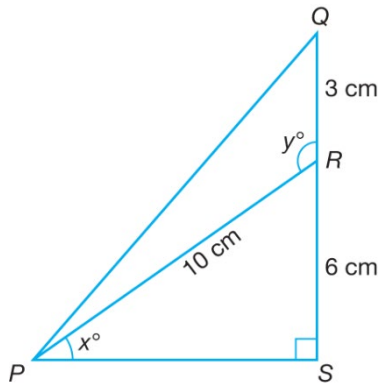


$\tan x^\circ = -\tan \angle PQR = -\frac{6}{8} = -\frac{3}{4}$

Answer: C

Structured Questions

1



(a) $\sin x^\circ = \frac{6}{10}$

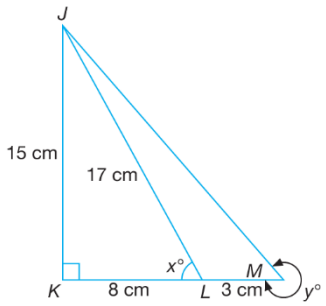
Basic $\angle = 26^\circ 53'$

$x^\circ = 36^\circ 52'$

(b) $\cos y^\circ = -\frac{6}{10}$

$y = 180^\circ - 53^\circ 8' = 126^\circ 52'$

2



(a) $\sin x^\circ = \frac{15}{17}$

$x = 61^\circ 56'$

(b) $\tan y^\circ = -\tan \angle JMK$

$= -\frac{15}{11}$

$\angle = 53^\circ 45'$

$y = 306^\circ 15'$

3 (a) $\sin x = 0.8290$

Basic $\angle = 56^\circ$

$x = 56^\circ, 124^\circ$

(b) $\cos x = -0.8290$

Basic $\angle = 34^\circ$

$x = 146^\circ, 214^\circ$

4 (a) $\cos y = 0.2588$

Basic $\angle = 75^\circ$

$y = 75^\circ, 285^\circ$

(b) $\tan y = -0.6249$

Basic $\angle = 32^\circ$

$y = 148^\circ, 328^\circ$

5 (a) $\cos z = 0.9659$

Basic $\angle = 15^\circ$

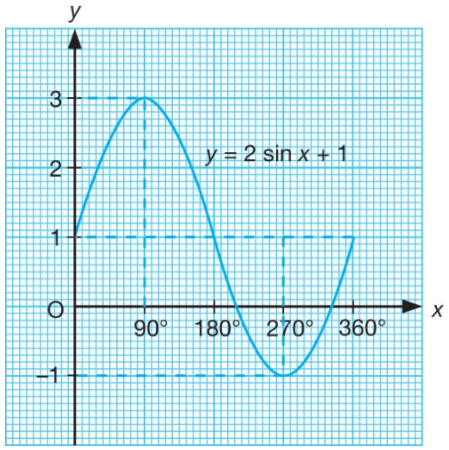
$z = 15^\circ, 345^\circ$

(b) $\sin z = -0.2588$

Basic $\angle = 15^\circ$

$z = 195^\circ, 345^\circ$

6



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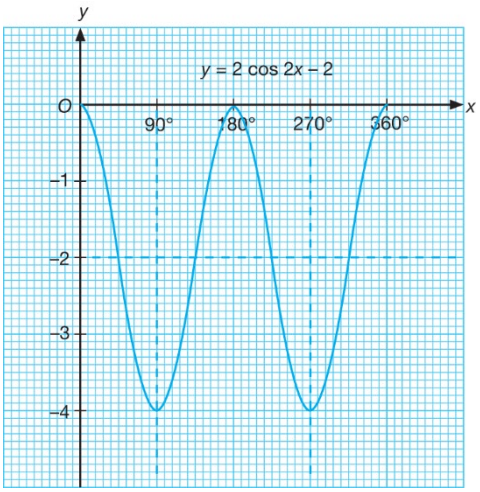

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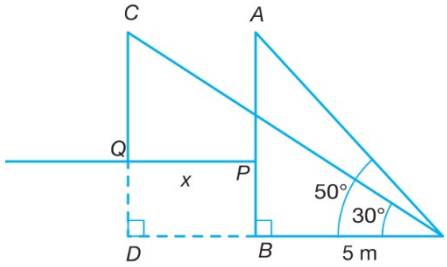

In ΔAOB,

$$\tan 50^\circ = \frac{AB}{5}$$

$$AB = 5\tan 50^\circ$$

In ΔCOD,

$$\tan 30^\circ = \frac{CD}{x+5}$$

$$\tan 30^\circ = \frac{5\tan 50^\circ}{x+5} \quad \leftarrow CD = AB$$

$$0.5774(x+5) = 5.9588$$

$$x + 5 = 10.32$$

$$x = 5.32$$

$$PQ = 5.32 \text{ cm}$$

$$y = 6 + 2\sin 30t$$

When $30t = 360$,

$$t = 12$$

Period = 12 house

(b) $y = 6 + 2(1) = 8$

$$\sin 30t = 1$$

$$30t = 90$$

$$t = 3$$

The level of sea water is the highest at 3 a.m. with a depth of 8 m.

(c) $y = 6 + 2(-1) = 4$

$$\sin 30t = -1$$

$$30t = 270$$

$$t = 9$$

The level of sea water is the lowest at 9 a.m. with a depth of 4 m.