

Trig functions and radians

NCEA Level 3 · AS 91575 · Worksheet

Name _____ Date _____

Achieved

1. Convert to radians: (a) 60° (b) 210°

2. Convert to degrees: (a) $3\pi/2$ (b) $2\pi/3$

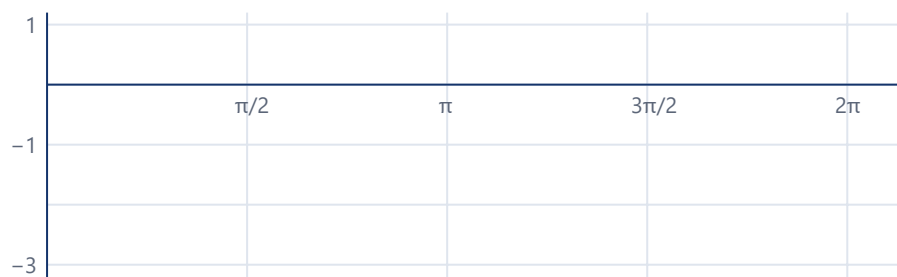
3. Find the exact value: (a) $\sin(\pi/6)$ (b) $\cos(3\pi/4)$ (c) $\tan(5\pi/4)$

4. State the amplitude, period, midline and range of $y = 2 \sin(3x) + 5$.

5. State the amplitude, period, midline and range of $y = -4 \cos(x/2)$.

Merit

6. Sketch $y = 2 \cos(2x) - 1$ for $0 \leq x \leq 2\pi$. Mark its maximum and minimum points.



7. A sine graph has a maximum of 6, a minimum of -2 and a period of 6π . It starts on its midline, rising. Write its equation.

8. Solve $2 \sin x = -\sqrt{3}$ for $0 \leq x \leq 2\pi$, giving exact answers.

9. Solve $\tan x = \sqrt{3}$ for $0 \leq x \leq 2\pi$, giving exact answers.

Excellence

10. $y = a \cos(bx) + c$ has a maximum of 8 at $x = 0$, and its next minimum is 2 at $x = \pi/4$. Find a , b and c .

11. Solve $2 \sin(2x) + 1 = 0$ for $0 \leq x \leq \pi$, giving exact answers.

12. The depth of water in a harbour is $h = 2 \sin(\pi t/6) + 3$ metres, t hours after noon. (a) State the shallowest and deepest depths. (b) For how long in the first 12 hours is the water deeper than 4 m?

1. (a) $\pi/3$ (b) $7\pi/6$
2. (a) 270° (b) 120°
3. (a) $1/2$ (b) $-1/\sqrt{2}$ (c) 1
4. Amplitude 2, period $2\pi/3$, midline $y = 5$, range $3 \leq y \leq 7$
5. Amplitude 4, period 4π , midline $y = 0$, range $-4 \leq y \leq 4$
6. Maxima of 1 at $x = 0, \pi$ and 2π . Minima of -3 at $x = \pi/2$ and $3\pi/2$.
7. Midline 2, amplitude 4, $b = 2\pi \div 6\pi = 1/3$, so $y = 4 \sin(x/3) + 2$
8. $\sin x = -\sqrt{3}/2$. Reference angle $\pi/3$, third and fourth quadrants: $x = 4\pi/3$ or $5\pi/3$
9. Reference angle $\pi/3$, first and third quadrants: $x = \pi/3$ or $4\pi/3$
10. Midline $c = 5$ and amplitude $a = 3$. Half a period is $\pi/4$, so the period is $\pi/2$ and $b = 4$: $y = 3 \cos(4x) + 5$
11. $\sin(2x) = -1/2$ with $0 \leq 2x \leq 2\pi$, so $2x = 7\pi/6$ or $11\pi/6$, and $x = 7\pi/12$ or $11\pi/12$
12. (a) Shallowest 1 m, deepest 5 m. (b) $\sin(\pi t/6) = 1/2$ gives $t = 1$ and $t = 5$, so the water is deeper than 4 m for 4 hours.