

Wave Function and Trigonometric Expressions

1. Express $8 \cos x^\circ - 6 \sin x^\circ$ in the form $k \cos(x^\circ + a^\circ)$ where $k > 0$ and $0 < a < 360$. 4

2. (a) Express $\sin x^\circ - 3 \cos x^\circ$ in the form $k \sin(x - a)^\circ$ where $k > 0$ and $0 \leq a < 360$. Find the values of k and a . 4

(b) Find the maximum value of $5 + \sin x^\circ - 3 \cos x^\circ$ and state a value of x for which this maximum occurs. 2

3. Solve the simultaneous equations

$$k \sin x^\circ = 5$$

$$k \cos x^\circ = 2,$$

where $k \geq 0$ and $0 \leq x \leq 360$. 4

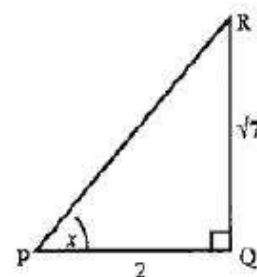
4. Express $2 \sin x^\circ - 5 \cos x^\circ$ in the form $k \sin(x - \alpha)^\circ$, $0 \leq \alpha < 360$ and $k > 0$. 4

5. Find the maximum value of $\cos x - \sin x$ and the value of x for which it occurs in the interval $0 \leq x \leq 2\pi$. 6

6. (a) Write $\sin(x) - \cos(x)$ in the form $k \sin(x - a)$ stating the values of k and a where $k > 0$ and $0 \leq a \leq 2\pi$ 4

(b) Sketch the graph of $y = \sin(x) - \cos(x)$ for $0 \leq x \leq 2\pi$, showing clearly the graph's maximum and minimum values and where it cuts the x -axis and the y -axis. 3

7. Using triangle PQR, as shown, find the exact value of $\cos 2x$. 3



8. Given that $\cos D = \frac{2}{\sqrt{5}}$ and $0 < D < \frac{\pi}{2}$, find the exact values of $\sin D$ and $\cos 2D$. 3
9. Given that $\sin A = \frac{3}{4}$, where $0 < A < \frac{\pi}{2}$, find the exact value of $\sin 2A$. 3
10. Find the exact value of $\sin \theta^\circ + \sin(\theta^\circ + 120^\circ) + \cos(\theta^\circ + 150^\circ)$. 3
11. If x° is an acute angle such that $\tan x^\circ = \frac{4}{3}$, show that the exact value of $\sin(x^\circ + 30^\circ)$ is $\frac{4\sqrt{3} + 3}{10}$. 3