Higher

Mathematics

Trigonometry

Examples

Contents

3 Solving Trigonometric Equations RC

1. Solve $\sin x° = \frac{1}{2}$ for $0 < x < 360$.

3 Solving Trigonometric Equations RC

2. Solve $\cos x° = -\frac{1}{\sqrt{5}}$ for $0 < x < 360$.

3 Solving Trigonometric Equations RC

3. Solve $\sin x° = 3$ for $0 < x < 360$.

3 Solving Trigonometric Equations RC

4. Solve $\tan x° = -5$ for $0 < x < 360$.

3 Solving Trigonometric Equations RC

5. Solve $2\sin 2x° - 1 = 0$ where $0 \leq x \leq 360$.

3 Solving Trigonometric Equations RC

6. Solve $\sqrt{2}\cos 2x = 1$ where $0 \leq x \leq \pi$.

3 Solving Trigonometric Equations RC

7. Solve $4\cos^2 x = 3$ where $0 < x < 2\pi$.

3 Solving Trigonometric Equations RC

8. Solve $3\tan(3x° - 20°) = 5$ where $0 \leq x \leq 360$.

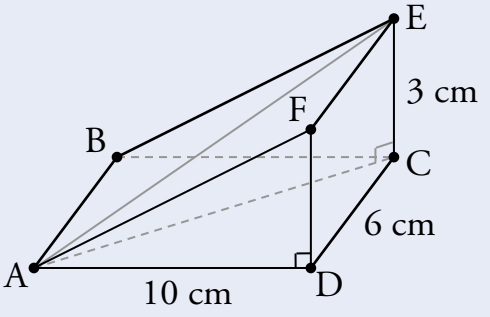
3 Solving Trigonometric Equations RC

9. Solve $\cos\left(2x+\frac{\pi}{3}\right)=0{\cdot}812$ for $0<x<2\pi$.

4 Trigonometry in Three Dimensions

EF

1. The triangular prism ABCDEF is shown below.



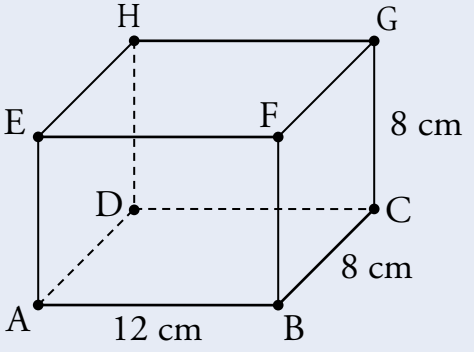
Calculate the acute angle between:

(a) The line AF and the plane ABCD.

(b) AE and ABCD.

4 Trigonometry in Three Dimensions EF

2. ABCDEFGH is a cuboid with dimensions $12 \times 8 \times 8$ cm as shown below.



(a) Calculate the size of the angle between the planes AFGD and ABCD.

(b) Calculate the size of the acute angle between the diagonal planes AFGD and BCHE.

5 Compound Angles EF

1. Expand and simplify $\cos(x° + 60°)$.

5 Compound Angles

EF

2. Show that $\sin(a+b) = \sin a \cos b + \cos a \sin b$ for $a = \frac{\pi}{6}$ and $b = \frac{\pi}{3}$.

5 Compound Angles EF

3. Find the exact value of $\sin 75°$.

5 Compound Angles

EF

Finding Trigonometric Ratios

4. Acute angles p and q are such that $\sin p = \frac{4}{5}$ and $\sin q = \frac{5}{13}$. Show that $\sin(p+q) = \frac{63}{65}$.

5 Compound Angles

EF

Using compound angle formulae to confirm identities

5. Show that $\sin\left(x-\frac{\pi}{2}\right)=-\cos x$.

5 Compound Angles EF

Using compound angle formulae to confirm identities

6. Show that $\dfrac{\sin(s+t)}{\cos s \cos t} = \tan s + \tan t$ for $\cos s \neq 0$ and $\cos t \neq 0$.

6 Double-Angle Formulae EF

1. Given that $\tan\theta = \frac{4}{3}$, where $0 < \theta < \frac{\pi}{2}$, find the exact value of $\sin 2\theta$ and $\cos 2\theta$.

6 Double-Angle Formulae EF

2. Given that $\cos 2x = \frac{5}{13}$, where $0 < x < \pi$, find the exact values of $\sin x$ and $\cos x$.

7 Further Trigonometric Equations

RC

Solving equations involving sin2*x* and either sin*x* or cos*x*

1. Solve $\sin 2x° = -\sin x°$ for $0 \leq x < 360$.

7 Further Trigonometric Equations RC

Solving equations involving cos2*x* and cos*x*

2. Solve $\cos 2x = \cos x$ for $0 \le x \le 2\pi$.

7 Further Trigonometric Equations RC

Solving equations involving cos2*x* and sin*x*

3. Solve $\cos 2x = \sin x$ for $0 < x < 2\pi$.

8 Expressing *p*cos*x* + *q*sin*x* in the form *k*cos(*x* – *a*) EF

1. Write $5\cos x° + 12\sin x°$ in the form $k\cos(x° - a°)$ where $0 \leq a < 360$.

8 Expressing *p*cos*x* + *q*sin*x* in the form *k*cos(*x* – *a*) EF

2. Write $5\cos x - 3\sin x$ in the form $k\cos(x-a)$ where $0 \le a < 2\pi$.

9 Expressing *p*cos*x* + *q*sin*x* in other forms EF

1. Write $4\cos x° + 3\sin x°$ in the form $k\sin(x° + a°)$ where $0 \le a < 360$.

9 Expressing *p*cos*x* + *q*sin*x* in other forms EF

2. Write $\cos x - \sqrt{3}\sin x$ in the form $k\cos(x+a)$ where $0 \le a < 2\pi$.

10 Multiple Angles

EF

Write $5\cos 2x° + 12\sin 2x°$ in the form $k\sin(2x° + a°)$ where $0 \leq a < 360$.

11 Maximum and Minimum Values

EF

Write $4\sin x + \cos x$ in the form $k\cos(x - a)$ where $0 \le a \le 2\pi$ and state:

(i) the maximum value and the value of $0 \le x < 2\pi$ at which it occurs

(ii) the minimum value and the value of $0 \le x < 2\pi$ at which it occurs.

12 Solving Equations

RC

1. Solve $5\cos x° + \sin x° = 2$ where $0 \leq x < 360$.

12 Solving Equations

RC

2. Solve $2\cos 2x + 3\sin 2x = 1$ where $0 \leq x < 2\pi$.

13 Sketching Graphs of $y = p\cos x + q\sin x$ EF

1. (a) Write $7\cos x° + 6\sin x°$ in the form $k\cos(x° - a°)$, $0 \le a < 360$.

   (b) Hence sketch the graph of $y = 7\cos x° + 6\sin x°$ for $0 \le x \le 360$.

13 Sketching Graphs of $y = p\cos x + q\sin x$ EF

2. Sketch the graph of $y = \sin x° + \sqrt{3}\cos x°$ for $0 \le x \le 360$.

13 Sketching Graphs of $y = p\cos x + q\sin x$ EF

3. (a) Write $5\sin x° - \sqrt{11}\cos x°$ in the form $k\sin(x° - a°)$, $0 \le a < 360$.

   (b) Hence sketch the graph of $y = 5\sin x° - \sqrt{11}\cos x° + 2$, $0 \le x \le 360$.