

Trigonometry Test Review Paper 1

1. Solve the equation $2\cos x = \sin 2x$, for $0 \leq x \leq 3\pi$.

(Total 7 marks)

3. The straight line with equation $y = \frac{3}{4}x$ makes an acute angle θ with the x -axis.

(a) Write down the value of $\tan \theta$.

(1)

(b) Find the value of

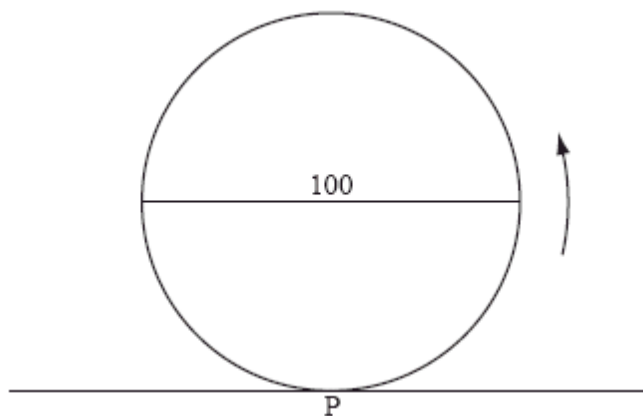
(i) $\sin 2\theta$;

(ii) $\cos 2\theta$.

(6)
(Total 7 marks)

Trigonometry Test Review Paper 1

2. The following diagram represents a large Ferris wheel, with a diameter of 100 metres.



Let P be a point on the wheel. The wheel starts with P at the lowest point, at ground level. The wheel rotates at a constant rate, in an anticlockwise (counterclockwise) direction. One revolution takes 20 minutes.

- (a) Write down the height of P above ground level after

- (i) 10 minutes;
- (ii) 15 minutes.

(2)

Let $h(t)$ metres be the height of P above ground level after t minutes. Some values of $h(t)$ are given in the table below.

t	$h(t)$
0	0.0
1	2.4
2	9.5
3	20.6
4	34.5
5	50.0

- (b) (i) Show that $h(8) = 90.5$.

- (ii) Find $h(21)$.

(4)

- (c) **Sketch** the graph of h , for $0 \leq t \leq 40$.

(3)

- (d) Given that h can be expressed in the form $h(t) = a \cos bt + c$, find a , b and c .

(5)

(Total 14 marks)

Trigonometry Test Review Paper 1

4. Let $f(x) = \sqrt{3}e^{2x} \sin x + e^{2x} \cos x$, for $0 \leq x \leq \pi$. Given that $\tan \frac{\pi}{6} = \frac{1}{\sqrt{3}}$, solve the equation $f(x) = 0$.

(Total 6 marks)

5. (a) Show that $4 - \cos 2\theta + 5 \sin \theta = 2 \sin^2 \theta + 5 \sin \theta + 3$.

(2)

- (b) Hence, solve the equation $4 - \cos 2\theta + 5 \sin \theta = 0$ for $0 \leq \theta \leq 2\pi$.

(5)

(Total 7 marks)

6. Let $p = \sin 40^\circ$ and $q = \cos 110^\circ$. Give your answers to the following in terms of p and/or q .

- (a) Write down an expression for

(i) $\sin 140^\circ$;

(ii) $\cos 70^\circ$.

(2)

- (b) Find an expression for $\cos 140^\circ$.

(3)

- (c) Find an expression for $\tan 140^\circ$.

(1)

(Total 6 marks)

7. Let $f(x) = \sin^3 x + \cos^3 x \tan x$, $\frac{\pi}{2} < x < \pi$.

- (a) Show that $f(x) = \sin x$.

(2)

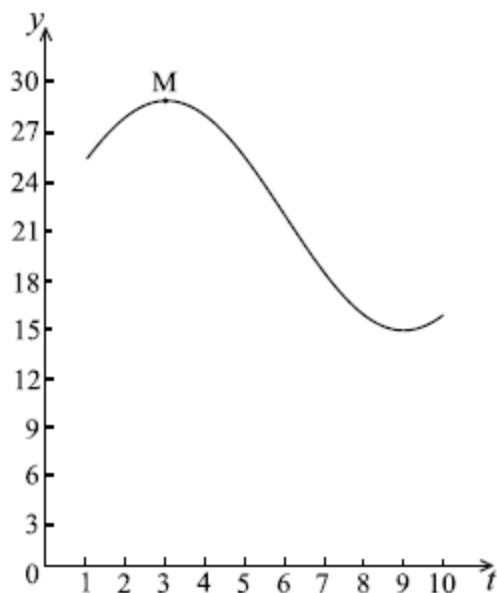
- (b) Let $\sin x = \frac{2}{3}$. Show that $f(2x) = -\frac{4\sqrt{5}}{9}$.

(5)

(Total 7 marks)

Trigonometry Test Review Paper 1

8. Let $f(t) = a \cos b(t - c) + d$, $t \geq 0$. Part of the graph of $y = f(t)$ is given below.



When $t = 3$, there is a maximum value of 29, at M.

When $t = 9$, there is a minimum value of 15.

- (a) (i) Find the value of a .
- (ii) Show that $b = \frac{\pi}{6}$.
- (iii) Find the value of d .
- (iv) Write down a value for c .

(7)

The transformation P is given by a horizontal stretch of a scale factor of $\frac{1}{2}$, followed by a translation of $\begin{pmatrix} 3 \\ -10 \end{pmatrix}$.

- (b) Let M' be the image of M under P . Find the coordinates of M' .

(2)

The graph of g is the image of the graph of f under P .

- (c) Find $g(t)$ in the form $g(t) = 7 \cos B(t - C) + D$.

(4)

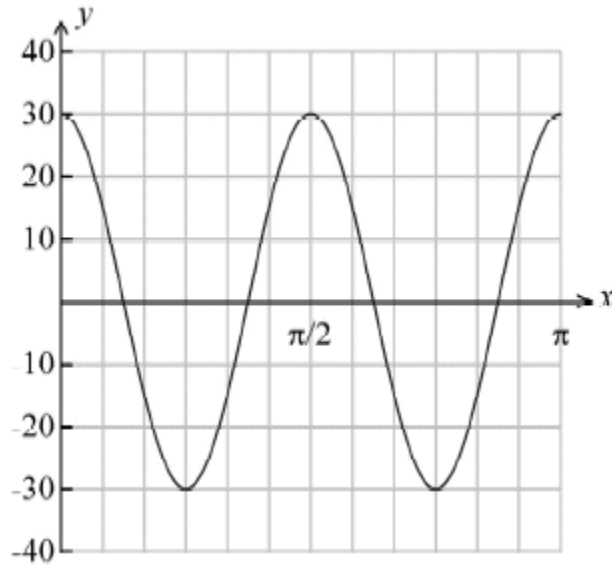
- (d) Give a full geometric description of the transformation that maps the graph of g to the graph of f .

(3)

(Total 16 marks)

Trigonometry Test Review Paper 1

9. The graph of a function of the form $y = p \cos qx$ is given in the diagram below.



(a) Write down the value of p .

(2)

(b) Calculate the value of q .

(4)

(Total 6 marks)

10. Given that $\frac{\pi}{2} \leq \theta \leq \pi$ and that $\cos \theta = -\frac{12}{13}$, find

(a) $\sin \theta$;

(3)

(b) $\cos 2\theta$;

(3)

(c) $\sin(\theta + \pi)$.

(1)

(Total 7 marks)

11. (a) Given that $2 \sin^2 \theta + \sin \theta - 1 = 0$, find the two values for $\sin \theta$.

(4)

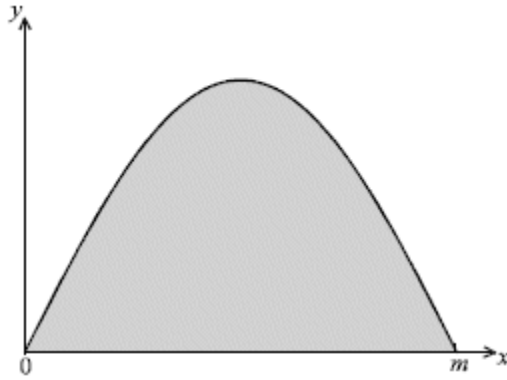
(b) Given that $0^\circ \leq \theta \leq 360^\circ$ and that one solution for θ is 30° , find the other two possible values for θ .

(2)

(Total 6 marks)

Trigonometry Test Review Paper 1

12. The diagram below shows part of the graph of $y = \sin 2x$.



(a) Write down the period of this function.

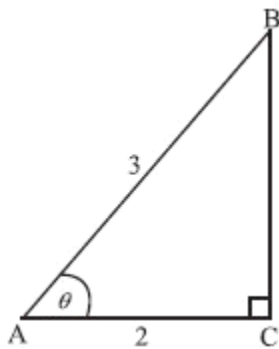
(2)

(b) Hence or otherwise write down the value of m .

(2)

(Total 4 marks)

13. The following diagram shows a triangle ABC, where \hat{ACB} is 90° , $AB = 3$, $AC = 2$ and \hat{BAC} is θ .



(a) Show that $\sin \theta = \frac{\sqrt{5}}{3}$.

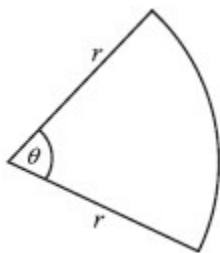
(b) Show that $\sin 2\theta = \frac{4\sqrt{5}}{9}$.

(c) Find the **exact** value of $\cos 2\theta$.

(Total 6 marks)

Trigonometry Test Review Paper 1

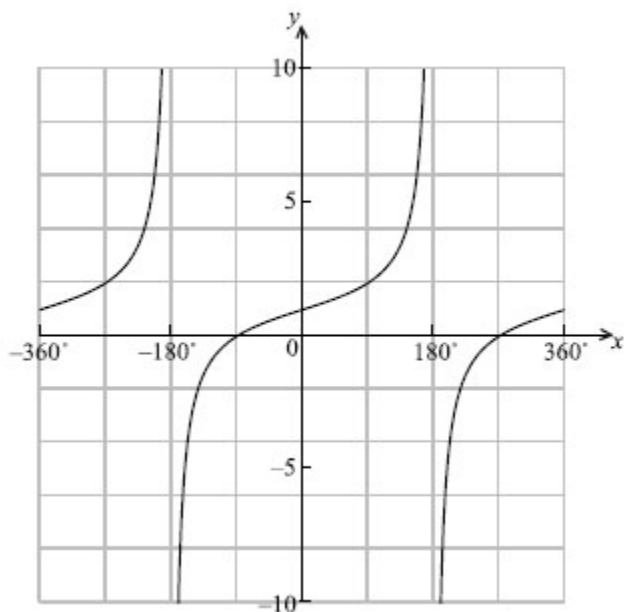
14. The following diagram shows a sector of a circle of radius r cm, and angle θ at the centre. The perimeter of the sector is 20 cm.



- (a) Show that $\theta = \frac{20 - 2r}{r}$.
- (b) The area of the sector is 25 cm^2 . Find the value of r .

(Total 6 marks)

15. The diagram below shows the graph of $f(x) = 1 + \tan\left(\frac{x}{2}\right)$ for $-360^\circ \leq x \leq 360^\circ$.

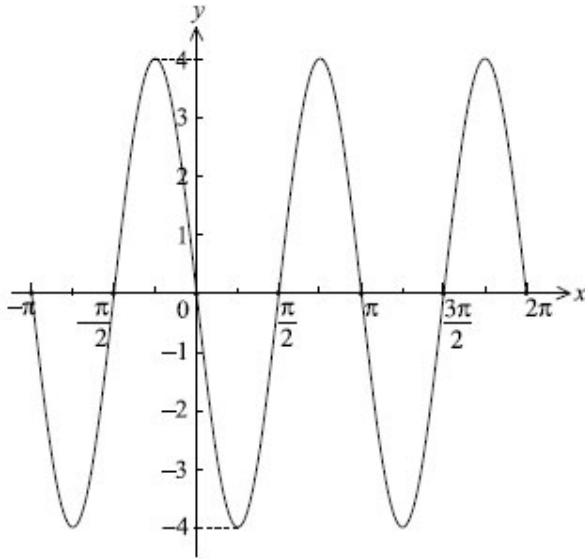


- (a) On the same diagram, draw the asymptotes. (2)
- (b) Write down
- the period of the function;
 - the value of $f(90^\circ)$.
- (2)
- (c) Solve $f(x) = 0$ for $-360^\circ \leq x \leq 360^\circ$.

(2)
(Total 6 marks)

Trigonometry Test Review Paper 1

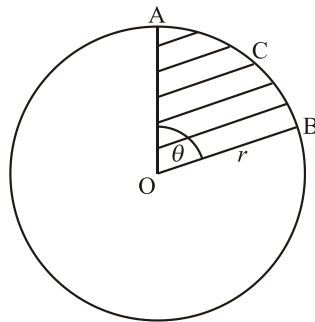
16. Let $f(x) = a \sin b(x - c)$. Part of the graph of f is given below.



Given that a , b and c are positive, find the value of a , of b and of c .

(Total 6 marks)

17. The following diagram shows a circle of centre O , and radius r . The shaded sector $OACB$ has an area of 27 cm^2 . Angle $\hat{AOB} = \theta = 1.5$ radians.



- (a) Find the radius.
- (b) Calculate the length of the minor arc ACB .

Working:

Answers:

(a)

(b)

(Total 6 marks)