TRIGONOMETRY

1) Write down the ratios of $\tan \theta$, $\sin \theta$ and $\cos \theta$.

2) Find the exact value of $\sin \theta$, $\csc \theta$, $\sec \theta$ and $\cot \theta$.

3) If $\tan \theta = \frac{6}{11}$, find the exact ratios of $\sin \theta$ and $\cos \theta$.

4) Find the value of $x$ if $\sin 39^\circ = \cos x$.

5) Simplify $\frac{\cot 62^\circ}{\tan 28^\circ}$.

6) Evaluate $\theta$ if $\sec (\theta + 40^\circ) = \csc (2\theta - 10^\circ)$.

7) Evaluate $\tan 56^\circ 23'$ correct to 3 decimal places.

8) Find $\theta$ in degrees and minutes if $\cos \theta = 0.235$.

9) Find the value of $p$ in the diagram below, correct to one decimal place.
10) Evaluate $x$ to one decimal place.

11) Find $\theta$ in degrees and minutes, to the nearest minute.

12) The angle of elevation from Amanda to the top of a tree is $51 \degree 34'$. If Amanda is standing 5 metres out from the base of the tree, how tall is the tree, to one decimal place?

13) A plane leaves Sydney and flies on a bearing of $235 \degree$ for 500 km. How far west of Sydney is the plane, to the nearest km?

14) A bird is perched on top of a 10 m tower, watching a worm down on the ground. If the angle of depression down to the worm is $67 \degree 20'$, how far does the bird need to fly down to catch the worm? Answer to one decimal place.

15) Lee starts a bush walk at Katoomba by walking 4 km due north. She then turns and walks due west for 5 km. Find, to the nearest degree,
   (a) Lee’s bearing from Katoomba
   (b) the bearing of Katoomba from Lee.

16) Find the exact value of $\cos 30 \degree$.

17) Find the exact value of $\tan 60 \degree$.

18) Find the exact value of $\sin 45 \degree$.

19) Find the exact value of $\cos 315 \degree$.

20) Find the exact value of $\sin 240 \degree$.

21) Find the exact value of $\tan (-210 \degree)$

22) In which quadrants is $\tan x > 0$?

23) In which quadrants is $\cos x < 0$?

24) In which quadrant is $\tan x < 0$ and $\sin x < 0$?

25) Given $\sin \theta = \frac{3}{5}$ and $\tan \theta < 0$, find the exact values of $\cos \theta$ and $\cot \theta$.

26) Solve $2 \sin \theta = 1$ for $0 \degree \leq \theta \leq 360 \degree$.

27) Solve $\tan \theta = \sqrt{3}$ for $-180 \degree \leq \theta \leq 180 \degree$.

28) Solve $2 \cos 2\theta = -1$ for $0 \degree \leq \theta \leq 360 \degree$. 

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29) Solve \( \sin^2 \theta = \frac{1}{2} \) for \( 0^\circ \leq \theta \leq 360^\circ \).

30) Solve \( \cos \theta = 1 \) for \( 0^\circ \leq \theta \leq 360^\circ \).

31) Sketch the graph of \( y = \sin x \) for \( 0^\circ \leq \theta \leq 360^\circ \).

32) Sketch the graph of \( y = \cos x \) for \( 0^\circ \leq \theta \leq 360^\circ \).

33) Sketch the graph of \( y = \tan x \) for \( 0^\circ \leq \theta \leq 360^\circ \).

34) Simplify \( \sin \theta \cdot \csc \theta \).

35) Simplify \( \sqrt{9 - 9 \cos^2 \alpha} \).

36) Simplify \( \sin \theta + \sin \theta \cdot \cot^2 \theta \).

37) Prove that \( \frac{\sec^2 \beta - \tan^2 \beta}{\sin \beta} = \csc \beta \).

38) Prove that \( \frac{1}{1 + \tan^2 \theta} = (1 - \sin \theta)(1 + \sin \theta) \).

39) Evaluate \( x \) to one decimal place.

40) Evaluate \( \theta \) in degrees and minutes, to the nearest minute.

41) (a) Evaluate \( n \) correct to one decimal place.
    (b) Find the area of the triangle correct to 3 significant figures.
42) Find $\theta$ in degrees and minutes, to the nearest minute.

![Diagram](image)

43) Adrian measures the angle of elevation of the top of a tower as $25^\circ$ and Jane measures the angle of elevation as $30^\circ$. Jane is standing 10 metres closer to the tower than Adrian.

![Diagram](image)

(a) Find the length of BJ to two decimal places.
(b) Hence find the height of the tower to one decimal place.

44) A ship sails for 270 km from Sydney on a bearing of $055^\circ$. It then turns and sails for 380 km on a bearing of $120^\circ$. How far is the ship from Sydney, to the nearest km?

45) ABCDE is a regular pentagon with sides 3 cm. Point F is drawn so that $AF = BF = CF = DF = EF$.

(a) Find the size of $\angle AFB$.
(b) Show that the interior angle sum of the pentagon is $540^\circ$.
(c) Find the length of AF to one decimal place.
ANSWERS

1) $\tan \theta = \frac{4}{3}, \sin \theta = \frac{4}{5}, \cos \theta = \frac{3}{5}$
2) $\sin \theta = \frac{\sqrt{95}}{12}, \csc \theta = \frac{12}{\sqrt{95}}, \sec \theta = \frac{12}{7}, \cot \theta = \frac{7}{\sqrt{95}}$
3) $\sin \theta = \frac{6}{\sqrt{157}}, \cos \theta = \frac{11}{\sqrt{157}}$
4) $x = 51^0$
5) 1
6) $\theta = 20^0$
7) 1.504
8) $\theta = 76^0 25'$
9) $p = 5.8$
10) $x = 9.2$
11) $\theta = 37^0 42'$
12) 6.3 metres
13) 410 km
14) 10.8 metres
15) (a) $309^0$ (b) $129^0$
16) $\frac{\sqrt{3}}{2}$
17) $\sqrt{3}$
18) $\frac{1}{\sqrt{2}}$
19) $\frac{1}{\sqrt{2}}$
20) $-\frac{\sqrt{3}}{2}$
21) $-\frac{1}{\sqrt{3}}$
22) 1st and 3rd
23) 2nd and 3rd
24) 4th
25) $\cos \theta = -\frac{4}{5}, \cot \theta = -\frac{4}{3}$
26) $\theta = 30^0, 150^0$
27) $\theta = 60^0, -120^0$
28) $\theta = 60^0, 120^0, 240^0, 300^0$
29) $\theta = 45^0, 135^0, 225^0, 315^0$
30) $\theta = 0^0, 360^0$
34) \( 1 \)
35) \( 3\sin \alpha \)
36) \( \cosec \theta \)
37) LHS
   \[ \frac{\sec^2 \beta - \tan^2 \beta}{\sin \beta} = \frac{1 + \tan^2 \beta - \tan^2 \beta}{\sin \beta} \]
   \[ = \frac{1}{\sin \beta} \]
   \[ = \cosec \beta \]
   RHS
   \[ \therefore \frac{\sec^2 \beta - \tan^2 \beta}{\sin \beta} = \cosec \beta \]
38) LHS
   \[ \frac{1}{1 + \tan^2 \theta} \]
   \[ = \frac{1}{\frac{\sec^2 \theta}{\sec^2 \theta}} \]
   \[ = \cos^2 \theta \]
   RHS
   \[ = (1 - \sin \theta)(1 + \sin \theta) \]
   \[ = 1 - \sin^2 \theta \]
   \[ = \cos^2 \theta \]
\[ LHS = RHS \]

\[ \therefore \frac{1}{1 + \tan^2 \theta} = (1 - \sin \theta)(1 + \sin \theta) \]

39) \( x = 9.4 \text{ cm} \)

40) \( \theta = 52^\circ 25' \)

41) (a) \( n = 4.9 \text{ m} \) (b) \( 4.61 \text{ m}^2 \)

42) \( \theta = 113^\circ 32' \)

43) (a) \( BJ = 48.49 \text{ m} \) (b) \( 24.2 \text{ m} \)

44) \( 551 \text{ km} \)

45) (a) \( 72^\circ \) (b) \( S = 180n - 360^\circ = 540^\circ \) (when \( n = 5 \)) (c) \( 2.6 \text{ cm} \)