Trigonometric Functions

Standard difficulty · 20 questions · 40 marks · Time: 36 minutes

Name: _____ Date: _____ Score: ____ / 40

Show your working for Sections B and C. Answers are on the last page — try every question first!

Section A — Choose the correct answer — 8 × 1 = 8 marks

1. 60° in radians is:
(a) 2π/3 **(b)** π/3 **(c)** −π/3 **(d)** π/6

2. π/3 radians in degrees is:
(a) 60° **(b)** 120° **(c)** 150° **(d)** 61°

3. The value of sec(−585°) is:
(a) −1/√2 **(b)** √2 **(c)** 1/2 **(d)** −√2

4. An arc of a circle of radius 7 cm subtends an angle of 135° at the centre. Its length is (π = 22/7):
(a) 8.25 cm **(b)** 33 cm **(c)** 945 cm **(d)** 16.5 cm

5. One radian is the angle subtended at the centre of a circle by an arc whose length equals:
(a) half the radius **(b)** the diameter
(c) the radius **(d)** the circumference

6. The value of cos 255° is:
(a) (4 + √2 − √6)/4 **(b)** (√2 − √6)/4
(c) (√6 − √2)/4 **(d)** −(√2 + √6)/4

7. If cos x = 40/41 and x lies in the first quadrant, then sin x is:
(a) −41/9 **(b)** 9/41 **(c)** −9/41 **(d)** 41/9

8. Assertion (A): cosec 120° = 2√3/3.
Reason (R): cosec(180° − θ) = −cosec θ.
(a) Both A and R are true, and R is the correct explanation of A.
(b) Both A and R are true, but R is not the correct explanation of A.
(c) A is true, but R is false.
(d) A is false, but R is true.

Section B — Short answer — 8 × 2 = 16 marks

9. Convert (a) 18° into radians, (b) 4π radians into degrees.

10. In a circle of radius 42 cm, find the angle (in radians and in degrees) subtended at the centre by an arc of length 66 cm. (π = 22/7)

11. Find the values of $\sin(-405°)$ and $\operatorname{cosec} 660°$.

12. If $\cos x = -8/17$ and x lies in the third quadrant, find the values of the other five trigonometric functions.

13. Find the exact value of $\tan 345°$.

14. If $\sin x = 15/17$ and x lies in the first quadrant, find $\sin 2x$, $\cos 2x$ and $\tan 2x$.

15. Evaluate $\tan^2(\pi/6) - \sin^2(0) + \tan^2(0)$.

16. The minute hand of a clock is 14 cm long. How far does its tip move in 20 minutes? ($\pi = 22/7$)

Section C — Word problems — 4 × 4 = 16 marks

17. If $\cos x = 24/25$ and x lies in the first quadrant, find (a) $\sin x$, $\tan x$, $\sec x$; (b) $\sin 2x$ and $\cos 2x$.

18. If $\sin A = 12/13$ and $\cos B = 5/13$, where A and B are acute angles, find $\sin(A + B)$ and $\cos(A - B)$.

19. Find the value of $\tan 960° \times \cos 960° + \tan 660°$.

20. A wheel makes 240 revolutions in one minute. Through how many radians does it turn in one second? In 5 seconds?

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Answer key

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Q	Answer	Working
1	**(b) π/3**	× π/180
2	**(a) 60°**	× 180/π
3	**(d) −√2**	−585° is in the second quadrant; reference angle 45°
4	**(d) 16.5 cm**	l = rθ = 7 × 3π/4
5	**(c) the radius**	—
6	**(b) (√2 − √6)/4**	255° = 210° + 45°
7	**(b) 9/41**	the third side is 9; signs from the quadrant
8	**(c) A is true, but R is false.**	A is true: cosec(180° − 60°) = cosec 60° = 2√3/3. R is false.
9	**(a) π/10; (b) 720°**	180° = π radians
10	**π/2 radians = 90°**	θ = l/r = 66 ÷ 42
11	**−1/√2 and −2√3/3**	reduce each angle: −405° ≡ 315°, 660° ≡ 300°
12	**sin x = −15/17, tan x = 15/8, cosec x = −17/15, sec x = −17/8, cot x = 8/15**	the sides are 15, 8, 17; signs from the quadrant
13	**√3 − 2**	345° = 300° + 45°; use the tan(A + B) formula
14	**sin 2x = 240/289, cos 2x = −161/289, tan 2x = −240/161**	cos x = 8/17; sin 2x = 2 sin x cos x; cos 2x = $\cos^2 x - \sin^2 x$
15	**1/3**	$\tan^2(\pi/6) = 1/3$, $\sin^2(0) = 0$, $\tan^2(0) = 0$
16	**29.33 cm**	20 minutes = 120° = 2π/3 radians; l = rθ
17	**(a) sin x = 7/25, tan x = 7/24, sec x = 25/24; (b) sin 2x = 336/625, cos 2x = 527/625**	$\sin^2 x = 1 - \cos^2 x$; sign of sin x from the quadrant
18	**sin(A + B) = 120/169; cos(A − B) = 1**	cos A = 5/13, sin B = 12/13
19	**−3√3/2**	tan 960° = √3; cos 960° = −1/2; tan 660° = −√3
20	**8π radians per second; 40π radians in 5 seconds**	one revolution = 2π; 240 ÷ 60 revolutions a second

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