

THE O.P. GUPTA ADVANCED MATH CLASSES

Mathematics (Standard & Basic)

Topic - Introduction to Trigonometry

RTS-08



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FOR ANSWERS

RANKERS

TEST SERIES FOR X

Max. Marks - 40

Time - 90 Minutes

SECTION A

Followings multiple choice questions are of **1 Mark** each (Q01-10).

Select the correct option in each one of them.

Q01. If $\sin \theta = \frac{3}{5}$, then $\cos \theta$ is

(A) $\frac{4}{5}$

(B) $\frac{5}{4}$

(C) $\frac{3}{4}$

(D) $\frac{2}{5}$

Q02. If $\cos A = \frac{12}{13}$, then $\tan A =$

(A) $\frac{13}{12}$

(B) $\frac{12}{5}$

(C) $\frac{5}{13}$

(D) $\frac{5}{12}$

Q03. The value of $\sec^2 \theta - \tan^2 \theta$ is always

(A) 0

(B) 1

(C) ± 1

(D) None of these

Q04. The value of $\tan 45^\circ + \cos 60^\circ - \sin 30^\circ$ is

(A) -1

(B) 0

(C) 1

(D) 2

Q05. The value of $\cos 30^\circ \times \sec 30^\circ$ is

(A) -1

(B) 0

(C) 2

(D) 1

Q06. Which of the following is **not** correct?

(A) $\sin 90^\circ = 1$

(B) $\cos 0^\circ = 1$

(C) $\tan 0^\circ = 1$

(D) $\cot 30^\circ = \sqrt{3}$

Q07. The value of $\frac{1 + \tan^2 \theta}{1 + \cot^2 \theta}$ is

(A) 1

(B) $\sec^2 \theta$

(C) $\sin^2 \theta$

(D) None of these

Q08. If $\tan A + \cot A = 2$, then the value of $\tan^2 A + \cot^2 A$ is

(A) -1

(B) 0

(C) 2

(D) 1

Followings are **Assertion-Reason based questions** (Q09 & 10).

In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R).

Choose the correct answer out of the following choices.

(A) Both A and R are true and R is the correct explanation of A.

(B) Both A and R are true and R is not the correct explanation of A.

(C) A is true but R is false.

(D) A is false but R is true.

Q09. **Assertion (A)** : If $\sec \theta + \tan \theta = p$, then the value of $\sec \theta - \tan \theta$ is $\frac{1}{p}$.

Reason (R) : If $\sin \phi = \frac{1}{2}$, then $\phi = 30^\circ$.

Q10. **Assertion (A)** : If $\sin \theta + \cos \theta = \frac{3}{2}$, then the value of $\sin^3 \theta + \cos^3 \theta = \frac{9}{16}$.

Reason (R) : In a right angled triangle with an acute angle θ , we have $\sin^2 \theta + \cos^2 \theta = \pm \frac{1}{2}$.

[1×10 = 10]

SECTION B

Followings are of **2 Marks** each (Q11-12).

Q11. Prove that : $\sqrt{\frac{\sec A - 1}{\sec A + 1}} + \sqrt{\frac{\sec A + 1}{\sec A - 1}} = 2 \operatorname{cosec} A$.

Q12. (a) If $\sin \alpha = \frac{1}{\sqrt{2}}$ and $\cot \beta = \sqrt{3}$, then find the value of $\operatorname{cosec} \alpha + \operatorname{cosec} \beta$.

OR

(b) Evaluate : $\frac{5 \cos^2 60^\circ + 4 \sec^2 30^\circ - \tan^2 45^\circ}{\sin^2 30^\circ + \sin^2 60^\circ}$.

[2 × 2 = 4]

SECTION C

Followings are of **3 Marks** each (Q13-16).

Q13. Given that $(1 + \sin A)(1 + \sin B)(1 + \sin C) = (1 - \sin A)(1 - \sin B)(1 - \sin C)$.

Then prove that both are equal to $\pm \cos A \cos B \cos C$.

Q14. (a) A rhombus of side 14 cm has two angles of 60° each. Find the length of the diagonals of the rhombus.

OR

(b) If $\cos \theta + \cos^2 \theta = 1$, prove that $\sin^{12} \theta + 3 \sin^{10} \theta + 3 \sin^8 \theta + \sin^6 \theta + 2 \sin^4 \theta + 2 \sin^2 \theta - 2 = 1$.

Q15. If $\tan^2 \alpha = 1 + 2 \tan^2 \beta$, then prove that $2 \sin^2 \alpha = 1 + \sin^2 \beta$.

Q16. In an acute angled triangle ABC, if $\tan(A + B - C) = 1$ and $\sec(B + C - A) = 2$, then find the values of angles A, B and C.

[3 × 4 = 12]

SECTION D

Followings are of **5 Marks** each (Q17-18).

Q17. If $4 \sin \theta = 3$, then find the value of x, if it is given that $\sqrt{\frac{\operatorname{cosec}^2 \theta - \cot^2 \theta}{\sec^2 \theta - 1}} + \cot \theta = \frac{\sqrt{7}}{x} + \cos \theta$.

Q18. (a) If $\sec \theta = x + \frac{1}{4x}$, prove that $\sec \theta + \tan \theta = 2x$ or $\frac{1}{2x}$.

OR

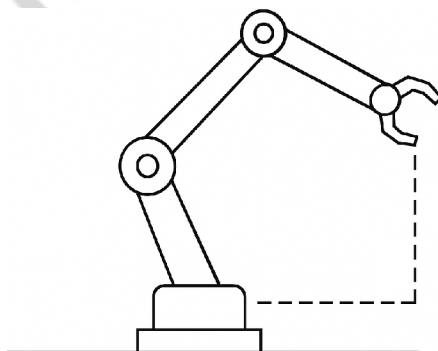
(b) If $\frac{\cos \alpha}{\cos \beta} = m$ and $\frac{\cos \alpha}{\sin \beta} = n$, then prove that $(m^2 + n^2) \cos^2 \beta = n^2$.

[5 × 2 = 10]

SECTION E

Following is a case-study based question of **4 Marks** (Q19); having three sub-parts (i), (ii) and (iii).

Q19. A software company is testing an AI-controlled robotic arm that rotates from a fixed base. The control system continuously measures the horizontal and vertical components of the arm's extension using trigonometric ratios.



If $\sin \theta + \cos \theta = \frac{5}{4}$, where θ is the angle made by arm with horizontal, then answer the following questions.

- (i) Find the value of $\sin \theta - \cos \theta$.
- (ii) Find the value of $\cos \theta$.
- (iii) (a) Find the value of $\sin \theta$. Using values of $\sin \theta$ and $\cos \theta$ (as obtained in sub-part ii), show that $\sin^2 \theta + \cos^2 \theta = 1$.

OR

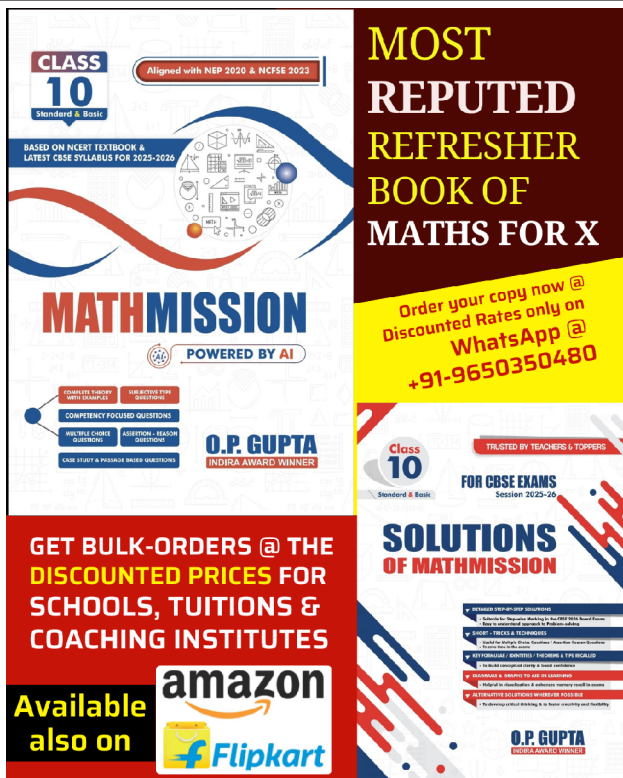
(b) If the arm makes an angle ϕ such that $\tan \phi = \frac{7}{24}$, find the value of $\frac{1 - \tan^2 \phi}{1 + \tan^2 \phi}$. Hence show that $\sec^2 \phi - \tan^2 \phi = 1$.

$$[1 + 1 + 2 = 4]$$

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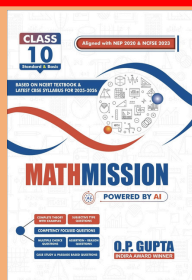
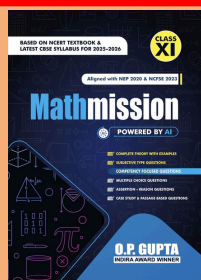
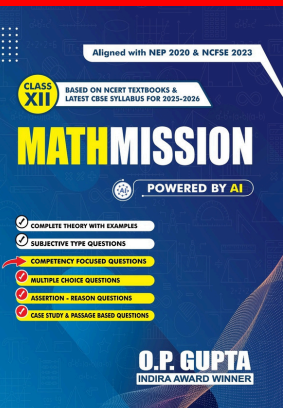
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