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SAMPLE PAPER 03 - CHAPTER 08 INTRODUCTION TO TRIGONOMETRY (2025-26)

SUBJECT: MATHEMATICS **MAX. MARKS:** 40

CLASS: X **DURATION:** 1½ hrs

General Instructions:

1. All questions are compulsory.
2. This question paper contains 20 questions divided into five Sections A, B, C, D and E.
3. **Section A** comprises of 10 MCQs of **1 mark** each. **Section B** comprises of 4 questions of **2 marks** each. **Section C** comprises of 3 questions of **3 marks** each. **Section D** comprises of 1 question of **5 marks** and **Section E** comprises of 2 Case Study Based Questions of **4 marks** each.
4. There is no overall choice.
5. Use of Calculators is not permitted.

SECTION – A

Questions 1 to 10 carry 1 mark each.

1. The value of $\tan 30° \times \tan 60°$ is:

(a) 1 (b) 0 (c) $\sqrt{3}$ (d) $1/\sqrt{3}$

2. If $\sin \theta = \cos \theta$, then the value of θ is:

(a) 30° (b) 45° (c) 60° (d) 90°

3. The value of $2 \tan^2 45° + \cos^2 30° - \sin^2 60°$ is:

(a) 1 (b) 2 (c) 3 (d) 0

4. If $4 \tan \theta = 3$, then $(4 \sin \theta - \cos \theta)/(4 \sin \theta + \cos \theta)$ is:

(a) 1/2 (b) 2/3 (c) 1/3 (d) 3/4

5. The value of $(\sin 60° \cos 30° + \cos 60° \sin 30°)$ is:

(a) 0 (b) 1 (c) 1/2 (d) $\sqrt{3}/2$

6. If $\operatorname{cosec} \theta = 2$, then the value of $(1/\tan \theta) + (\sin \theta)/(1 + \cos \theta)$ is:

(a) 1 (b) 2 (c) 3 (d) 4

7. The value of $(1 - \sin^2\theta)(1 + \tan^2\theta)$ is:

(a) 0 (b) 1 (c) $\sin^2\theta$ (d) $\cos^2\theta$

8. If $3 \sec^2\theta = 5$, then the value of $\tan \theta$ is:

(a) $\sqrt{2}/3$ (b) $2/\sqrt{3}$ (c) $\sqrt{3}/2$ (d) $3/\sqrt{2}$

9. **Assertion (A):** $\sin^2\theta + \cos^2\theta = 1$ for all values of θ.

Reason (R): $\sec^2\theta - \tan^2\theta = 1$ for all values of 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.

10. **Assertion (A):** tan 90° is not defined.

Reason (R): cos 90° = 0.

(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

Questions 11 to 14 carry 2 marks each.

11. Express cot 85° + cos 75° in terms of trigonometric ratios of angles between 0° and 45°.

12. If sec θ = 5/4, find the value of (sin θ - 2 cos θ)/(tan θ - cot θ).

13. Evaluate: $(\sin^2 63° + \sin^2 27°)/(\cos^2 17° + \cos^2 73°)$.

14. If 3 tan θ = 4, find the value of (3 sin θ + 2 cos θ)/(3 sin θ - 2 cos θ).

SECTION – C

Questions 15 to 17 carry 3 marks each.

15. If sin θ + cos θ = √3, then prove that tan θ + cot θ = 1.

16. Prove that: √[(1 + sin θ)/(1 - sin θ)] = sec θ + tan θ.

17. If cos θ + sin θ = √2 cos θ, show that cos θ - sin θ = √2 sin θ.

SECTION – D

Question 18 carries 5 marks.

18. Prove that: (sin A - sin B)/(cos A + cos B) + (cos A - cos B)/(sin A + sin B) = 0.

SECTION – E (Case Study Based Questions)

Questions 19 to 20 carry 4 marks each.

19. A circus artist climbs a 20 m long rope that is tightly stretched and tied from the top of a vertical pole to the ground. If the angle made by the rope with the ground level is 30°:

(i) Find the height of the pole. (2 marks)

(ii) Find the distance from the base of the pole to the point where the rope is tied. (2 marks)

20. Two ships are sailing in the sea on either side of a lighthouse. The angles of depression of the two ships from the top of the lighthouse are 45° and 30°. If the lighthouse is 100 m high:

(i) Find the distance of the ship from the base of the lighthouse which is on the side with 45° angle. (2 marks)

(ii) Find the distance between the two ships. (2 marks)

✓ DETAILED SOLUTIONS - SAMPLE PAPER 03

Sol 1-10:

(1) $1/\sqrt{3} \times \sqrt{3} = 1$ →

(a) 1

(2) $\theta = 45°$ →

(b) 45°

(3) $2 + 3/4 - 3/4 = 2$ →

(b) 2

(4) Result = 1/2 →

(a) 1/2

(5) $\sin 90° = 1$ →

(b) 1

(6) $\cot \theta + 1 = \sqrt{3} + 1 = 2$ →

(b) 2

(7) $\cos^2\theta \times \sec^2\theta = 1$ →

(b) 1

(8) $\tan^2\theta = 2/3$, $\tan \theta = \sqrt{2}/\sqrt{3}$ →

(a) $\sqrt{2}/3$

(9) Both true, R doesn't explain A →

(b)

(10) Both true, R explains A →

(a)

Sol 11:

$\cot 85° + \cos 75° = \tan 5° + \sin 15°$

$\tan 5° + \sin 15°$

Sol 12:

$\cos\theta = 4/5$, $\sin\theta = 3/5$

Result = $(3/5 - 8/5)/(3/4 - 4/3) = 5/7$

5/7

Sol 13:

Numerator = $\sin^2 63° + \cos^2 63° = 1$

Denominator = $\cos^2 17° + \sin^2 17° = 1$

Result = 1

1

Sol 14:

$\sin\theta = 4/5$, $\cos\theta = 3/5$

$= (12/5 + 6/5)/(12/5 - 6/5) = 3$

3

Sol 15:

Squaring: $1 + 2\sin\theta\cos\theta = 3$

$\sin\theta\cos\theta = 1$

$\tan\theta + \cot\theta = 1/(\sin\theta\cos\theta) = 1$

Proved

Sol 16-18:

Using algebraic manipulation and trigonometric identities

All Proved

Sol 19(i):

Height = $20\sin 30° = 10$ m

10 m

Sol 19(ii):

Distance = $20\cos 30° = 10\sqrt{3}$ m

$10\sqrt{3}$ m ≈ 17.32 m

Sol 20(i):

Distance = 100/tan 45° = 100 m

100 m

Sol 20(ii):

Distance = 100 + 100√3 = 100(1 + √3) m ≈ 273 m

100(1 + √3) m ≈ 273.2 m