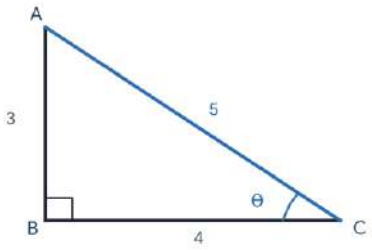
MATHS BASEMAKER

Class 10 CBSE — Chapter 8: Introduction to Trigonometry

Chapter Test Paper

Q1. In the given right triangle, if 4 tan θ = 3, then the value of (4 sin θ - cos θ) / (4 sin θ + cos θ) is:



(a) 2/3 (b) 1/3

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

Q2. The value of (sin 30° + cos 60° - tan 45°) is:

(a) 1 (b) -1

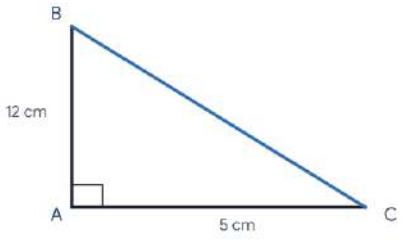
(c) 0 (d) 1/2

Q3. If sin A + $\sin^2$ A = 1, then the value of ($\cos^2$ A + $\cos^4$ A) is:

(a) 1 (b) 2

(c) 0 (d) ½

Q4. In the given figure, triangle ABC is right-angled at A with AB = 12 cm and AC = 5 cm. The value of (sin B cos C + cos B sin C) is:



(a) 1 (b) 120/169

(c) 119/169 (d) 60/169

Q5. If $\cos(A + B) = 0$ and $\sin(A - B) = 1/2$, where $0° < A + B \leq 90°$ and $A > B$, find the values of A and B.

Q6. Evaluate: $(5\cos^2 60° + 4\sec^2 30° - \tan^2 45°) / (\sin^2 30° + \cos^2 30°)$.

Q7. If $\sin\theta + \cos\theta = \sqrt{3}$, then prove that $\tan\theta + \cot\theta = 1$.

Q8. Prove the following identity: $(\sin\theta - 2\sin^3\theta) / (2\cos^3\theta - \cos\theta) = \tan\theta$.

Q9. Prove that: $(1 + \cot A - \operatorname{cosec} A)(1 + \tan A + \sec A) = 2$.

Q 10. If $\operatorname{cosec}\theta - \sin\theta = m$ and $\sec\theta - \cos\theta = n$, prove that: $(m^2n)^{2/3} + (mn^2)^{2/3} = 1$

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HINTS & STEPS

Q1. Solution & Steps

Hint: Divide numerator and denominator by cos ϑ or use sides from right triangle ABC.

From triangle ABC: $\tan\theta = AB / BC = 3 / 4$.

Using Pythagoras Theorem: $AC^2 = 3^2 + 4^2 = 25 \Rightarrow AC = 5$.

Therefore, $\sin\theta = 3/5$ and $\cos\theta = 4/5$.

Substitute into expression:

$[4(3/5) - 4/5] / [4(3/5) + 4/5]$

$= (12/5 - 4/5) / (12/5 + 4/5)$

$= (8/5) / (16/5) = 8 / 16 = 1/2$.

Answer: (c) 1/2

Q2. Solution & Steps

Hint: Substitute standard trigonometric values for 30°, 60°, and 45°.

$\sin 30° = 1/2$

$\cos 60° = 1/2$

$\tan 45° = 1$

Value $= 1/2 + 1/2 - 1 = 1 - 1 = 0$.

Answer: (c) 0

Q3. Solution & Steps

Hint: Use given relation $\sin A = 1 - \sin^2 A = \cos^2 A$, then substitute into required expression.

Given: $\sin A + \sin^2 A = 1 \Rightarrow \sin A = 1 - \sin^2 A$.

Since $1 - \sin^2 A = \cos^2 A$, we have:

$\sin A = \cos^2 A$.

Squaring both sides:

$\sin^2 A = \cos^4 A$.

Now, $\cos^2 A + \cos^4 A = \sin A + \sin^2 A = 1$.

Answer: (a) 1

Q4. Solution & Steps

Hint: Use Pythagoras Theorem to find hypotenuse BC, then evaluate ratios with respect to both angle B and angle C.

In right triangle ABC, right-angled at A:

$BC^2 = AB^2 + AC^2 = 12^2 + 5^2 = 144 + 25 = 169 \Rightarrow BC = 13$ cm.

For angle B: Opposite side = AC = 5 cm, Adjacent side = AB = 12 cm.

$\sin B = AC / BC = 5/13$

$\cos B = AB / BC = 12/13$

For angle C: Opposite side = AB = 12 cm, Adjacent side = AC = 5 cm.

$\sin C = AB / BC = 12/13$

$\cos C = AC / BC = 5/13$

Now calculate $(\sin B \cos C + \cos B \sin C)$:

$= (5/13)(5/13) + (12/13)(12/13)$

$= 25/169 + 144/169 = 169/169 = 1$.

Answer: (a) 1

Q5. Solution & Steps

Hint: Find angles from standard values, then solve the two linear equations.

$\cos(A + B) = 0 \Rightarrow A + B = 90^\circ$ ---(1)

$\sin(A - B) = 1/2 \Rightarrow A - B = 30^\circ$ ---(2)

Adding equations (1) and (2):

$2A = 120^\circ \Rightarrow A = 60^\circ$.

Substituting $A = 60^\circ$ in (1):

$60^\circ + B = 90^\circ \Rightarrow B = 30^\circ$.

Answer: A = 60°, B = 30°

Q6. Solution & Steps

Hint: Use identity $\sin^2 30^\circ + \cos^2 30^\circ = 1$ in denominator and substitute values in numerator.

Denominator $= \sin^2 30^\circ + \cos^2 30^\circ = 1$.

Numerator $= 5(1/2)^2 + 4(2/\sqrt{3})^2 - (1)^2$

$= 5(1/4) + 4(4/3) - 1$

$= 5/4 + 16/3 - 1$

Taking LCM of 4 and 3 = 12:

$= (15 + 64 - 12) / 12 = 67/12$.

Answer: 67/12

Q7. Solution & Steps

Hint: Square both sides of sin ϑ + cos ϑ = √3 to find sin ϑ cos ϑ, then express tan ϑ + cot ϑ in terms of sin and cos.

Given: sin θ + cos θ = √3.

Squaring both sides:

$(\sin\theta + \cos\theta)^2 = (\sqrt{3})^2$

$\sin^2\theta + \cos^2\theta + 2\sin\theta\cos\theta = 3$

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

$2\sin\theta\cos\theta = 2 \Rightarrow \sin\theta\cos\theta = 1.$

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

$= (\sin^2\theta + \cos^2\theta) / (\sin\theta\cos\theta)$

$= 1 / (\sin\theta\cos\theta) = 1 / 1 = 1.$ (Hence Proved)

Answer: 1 (Proved)

Q8. Solution & Steps

Hint: Factor out sin ϑ from numerator and cos ϑ from denominator, then apply 1 - 2 sin² ϑ = 2 cos² ϑ - 1.

LHS = $[\sin\theta(1 - 2\sin^2\theta)] / [\cos\theta(2\cos^2\theta - 1)]$

In numerator, replace 1 by $\sin^2\theta + \cos^2\theta$:

$1 - 2\sin^2\theta = (\sin^2\theta + \cos^2\theta) - 2\sin^2\theta = \cos^2\theta - \sin^2\theta.$

In denominator, replace 1 by $\sin^2\theta + \cos^2\theta$:

$2\cos^2\theta - 1 = 2\cos^2\theta - (\sin^2\theta + \cos^2\theta) = \cos^2\theta - \sin^2\theta.$

LHS = $[\sin\theta(\cos^2\theta - \sin^2\theta)] / [\cos\theta(\cos^2\theta - \sin^2\theta)]$

$= \sin\theta / \cos\theta = \tan\theta$ = RHS. (Hence Proved)

Answer: tan θ (Proved)

Q9. Solution & Steps

Hint: Convert all trigonometric ratios into sin A and cos A, then simplify using (a + b)(a - b) = a² - b².

$1 + \cot A - \operatorname{cosec} A = 1 + (\cos A / \sin A) - (1 / \sin A) = (\sin A + \cos A - 1) / \sin A$

$1 + \tan A + \sec A = 1 + (\sin A / \cos A) + (1 / \cos A) = (\cos A + \sin A + 1) / \cos A$

Multiplying both:

$= [(\sin A + \cos A - 1)(\sin A + \cos A + 1)] / (\sin A\cos A)$

$= [(\sin A + \cos A)^2 - 1^2] / (\sin A\cos A)$

$= [\sin^2 A + \cos^2 A + 2\sin A\cos A - 1] / (\sin A\cos A)$

$= [1 + 2\sin A\cos A - 1] / (\sin A\cos A)$

$= (2\sin A\cos A) / (\sin A\cos A) = 2$ = RHS. (Hence Proved)

Answer: 2 (Proved)

Q10. Solution & Steps [HOTS / Olympiad / Sample Paper]

Hint: Express m and n in terms of sin ϑ and cos ϑ using identities, then calculate m²n and mn².

$m = \operatorname{cosec}\theta - \sin\theta = (1 / \sin\theta) - \sin\theta = (1 - \sin^2\theta) / \sin\theta = \cos^2\theta / \sin\theta$

$n = \sec\theta - \cos\theta = (1 / \cos\theta) - \cos\theta = (1 - \cos^2\theta) / \cos\theta = \sin^2\theta / \cos\theta$

Now compute m^2n:

$m^2n = [(\cos^2\theta / \sin\theta)^2] * [\sin^2\theta / \cos\theta]$

$= (\cos^4\theta / \sin^2\theta) * (\sin^2\theta / \cos\theta) = \cos^3\theta$

Therefore, $(m^2n)^{2/3} = (\cos^3\theta)^{(2/3)} = \cos^2\theta$

Now compute mn^2:

$mn^2 = [\cos^2\theta / \sin\theta] * [(\sin^2\theta / \cos\theta)^2]$

$= (\cos^2\theta / \sin\theta) * (\sin^4\theta / \cos^2\theta) = \sin^3\theta$

Therefore, $(mn^2)^{2/3} = (\sin^3\theta)^{(2/3)} = \sin^2\theta$

Adding both terms:

LHS = $(m^2n)^{2/3} + (mn^2)^{2/3} = \cos^2\theta + \sin^2\theta = 1$ = RHS. (Hence Proved)

Answer: 1 (Proved)

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