MIND CURVE · INFINITY THINK BEYOND

Introduction to Trigonometry

Chapter 8 · Previous Year Questions with Answers · Class X Mathematics Standard (041)

01 TOPIC 1 Trigonometric Ratios & Values of Specific Angles

QUICK RECAP

- In right $\triangle ABC$ right-angled at B: $\sin A = \frac{BC}{AC}$, $\cos A = \frac{AB}{AC}$, $\tan A = \frac{BC}{AB}$; $\operatorname{cosec} A = \frac{1}{\sin A}$, $\sec A = \frac{1}{\cos A}$, $\cot A = \frac{1}{\tan A}$, and $\tan A = \frac{\sin A}{\cos A}$.
- Values: $\sin 0^\circ, 30^\circ, 45^\circ, 60^\circ, 90^\circ = 0, \frac{1}{2}, \frac{1}{\sqrt{2}}, \frac{\sqrt{3}}{2}, 1$; cos takes them in reverse order; $\tan = 0, \frac{1}{\sqrt{3}}, 1, \sqrt{3}$, not defined at 90°.
- For an acute angle, $0 < \sin A, \cos A < 1$; given one ratio, draw a right triangle (or use Pythagoras) to find the others.
- Recall (Class IX/Ch 6): Pythagoras theorem $AC^2 = AB^2 + BC^2$; angles of a triangle add up to 180°.

Q1 MCQ · 1 mark — **2023** – 30/C/B

If $\tan A = \frac{3}{4}$, then the value of $\frac{4\sin A - 2\cos A}{4\sin A + 2\cos A}$ is :

(A) 5 (B) $\frac{1}{5}$

(C) 6 (D) $\frac{1}{6}$

ANSWER **(B) $\frac{1}{5}$**

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Q2 MCQ · 1 mark — **2023** – 30/C/B

If $2\sin 2A = \sqrt{3}$, then $\angle A$ is equal to :

(A) 60° (B) 45°

(C) 90° (D) 30°

ANSWER **(D) 30°**

Q3 MCQ · 1 mark — **2023** – 30(B)

If $\sqrt{3}\tan 2\theta = 3$, $0^\circ < 2\theta < 90^\circ$, then the value of $\sin\theta + \sqrt{3}\cos\theta$ is :

(A) 2 (B) $\sqrt{3}$

(C) $\frac{\sqrt{3}+1}{\sqrt{2}}$ (D) 1

ANSWER *

$\tan 2\theta = \sqrt{3} \Rightarrow 2\theta = 60^\circ \Rightarrow \theta = 30^\circ$

$\sin 30^\circ + \sqrt{3}\cos 30^\circ = \frac{1}{2} + \frac{3}{2} = 2$

(A) 2

Q4 MCQ · 1 mark **2023** – 30(B)

If $\tan(A+B)=\sqrt{3}$ and $\tan(A-B)=\frac{1}{\sqrt{3}}$, $0^\circ < A+B < 90^\circ$, $A > B$, then the values of A and B respectively are :

(A) $60^\circ,\ 30^\circ$
(B) $60^\circ,\ 45^\circ$
(C) $45^\circ,\ 15^\circ$
(D) $60^\circ,\ 15^\circ$

ANSWER *
$A+B=60^\circ, A-B=30^\circ \Rightarrow A=45^\circ,\ B=15^\circ$
(C) $45^\circ,\ 15^\circ$

Q5 MCQ · 1 mark **2023** – 30/1/1, 30/1/2

If $2\tan A=3$, then the value of $\frac{4\sin A+3\cos A}{4\sin A-3\cos A}$ is

(A) $\frac{7}{\sqrt{13}}$
(B) $\frac{1}{\sqrt{13}}$
(C) 3
(D) does not exist

ANSWER *
Divide by $\cos A$: $\frac{4\tan A+3}{4\tan A-3}=\frac{6+3}{6-3}=3$
(C) 3

Q6 MCQ · 1 mark **2023** – 30/1/1, 30/1/3

$\left[\frac{3}{4}\tan^2 30^\circ-\sec^2 45^\circ+\sin^2 60^\circ\right]$ is equal to

(A) -1
(B) $\frac{5}{6}$
(C) $\frac{-3}{2}$
(D) $\frac{1}{6}$

ANSWER *
$=\frac{3}{4}\times\frac{1}{3}-2+\frac{3}{4}=\frac{1}{4}-2+\frac{3}{4}=-1$
(A) -1

Q7 MCQ · 1 mark **2023** – 30/1/2

$\left[\frac{5}{8}\sec^2 60^\circ-\tan^2 60^\circ+\cos^2 45^\circ\right]$ is equal to

(A) $\frac{-5}{3}$
(B) $\frac{-1}{2}$
(C) 0
(D) $\frac{-1}{4}$

ANSWER *
$=\frac{5}{8}\times 4-3+\frac{1}{2}=\frac{5}{2}-3+\frac{1}{2}=0$
(C) 0

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Q8 MCQ · 1 mark — **2023** – 30/5/1, 30/5/2

If $\tan\theta = \frac{5}{12}$, then the value of $\frac{\sin\theta + \cos\theta}{\sin\theta - \cos\theta}$ is :

(A) $-\frac{17}{7}$
(B) $\frac{17}{7}$
(C) $\frac{17}{13}$
(D) $-\frac{7}{13}$

ANSWER *

Divide by $\cos\theta$: $\frac{\tan\theta + 1}{\tan\theta - 1} = \frac{\frac{5}{12} + 1}{\frac{5}{12} - 1} = \frac{17}{-7}$

(A) $-\frac{17}{7}$

Q9 MCQ · 1 mark — **2023** – 30/5/1, 30/5/3

$\left(\frac{2\tan 30^\circ}{1 + \tan^2 30^\circ}\right)$ is equal to :

(A) $\sin 60^\circ$
(B) $\cos 60^\circ$
(C) $\tan 60^\circ$
(D) $\sin 30^\circ$

ANSWER *

$= \frac{2/\sqrt{3}}{1 + 1/3} = \frac{2}{\sqrt{3}} \times \frac{3}{4} = \frac{\sqrt{3}}{2} = \sin 60^\circ$

(A) $\sin 60^\circ$

Q10 MCQ · 1 mark — **2023** – 30/5/2

$\left(\frac{1 - \tan^2 30^\circ}{1 + \tan^2 30^\circ}\right)$ is equal to :

(A) $\sin 60^\circ$
(B) $\cos 60^\circ$
(C) $\tan 60^\circ$
(D) $\cos 30^\circ$

ANSWER *

$= \frac{1 - \frac{1}{3}}{1 + \frac{1}{3}} = \frac{1}{2} = \cos 60^\circ$

(B) $\cos 60^\circ$

Q11 MCQ · 1 mark — **2023** – 30/6/3

If $\tan\theta = \frac{x}{y}$, then $\cos\theta$ is equal to

(A) $\frac{x}{\sqrt{x^2 + y^2}}$
(B) $\frac{y}{\sqrt{x^2 + y^2}}$
(C) $\frac{x}{\sqrt{x^2 - y^2}}$
(D) $\frac{y}{\sqrt{x^2 - y^2}}$

ANSWER *

Opposite side x, adjacent side y, hypotenuse $\sqrt{x^2 + y^2}$; $\cos\theta = \frac{y}{\sqrt{x^2 + y^2}}$

(B) $\frac{y}{\sqrt{x^2 + y^2}}$

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Q12 MCQ · 1 mark **2024** – 30/S/1

If $\tan^2\theta + \cot^2\alpha = 2$, where $\theta = 45°$ and $0° \leq \alpha \leq 90°$, then the value of α is :

(A) $30°$
(B) $45°$
(C) $60°$
(D) $90°$

ANSWER **(B) $45°$**

Q13 MCQ · 1 mark **2024** – 30/S/2

If $\cos\theta = \frac{x}{y}$, $(x,\ y \neq 0)$, then $\tan\theta$ is equal to :

(A) $\frac{y}{\sqrt{y^2 - x^2}}$
(B) $\frac{x}{\sqrt{x^2 + y^2}}$
(C) $\frac{\sqrt{y^2 - x^2}}{x}$
(D) $\frac{x}{\sqrt{y^2 - x^2}}$

ANSWER **(C) $\frac{\sqrt{y^2 - x^2}}{x}$**

Q14 MCQ · 1 mark **2024** – 30/S/3

If $5\tan\theta = 2$, then the value of $\frac{10\sin\theta - 2\cos\theta}{5\sin\theta + 3\cos\theta}$ is :

(A) $\frac{2}{5}$
(B) $\frac{5}{2}$
(C) 1
(D) $\frac{46}{31}$

ANSWER **(A) $\frac{2}{5}$**

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Q15 MCQ · 1 mark **2024** – 30(B)/S

If $\text{cosec}\,\theta = \sqrt{10}$, then the value of $\sec\theta$ is :

(A) $\frac{3}{\sqrt{10}}$
(B) $\frac{\sqrt{10}}{3}$
(C) $\frac{1}{\sqrt{10}}$
(D) $\frac{2}{\sqrt{10}}$

ANSWER **(B) $\frac{\sqrt{10}}{3}$**

Q16 MCQ · 1 mark **2024** – 30(B)

If $\tan A = 3\cot A$, then the measure of the angle A is :

(A) $15°$
(B) $30°$
(C) $45°$
(D) $60°$

ANSWER *

$\tan^2 A = 3 \Rightarrow \tan A = \sqrt{3} \Rightarrow A = 60°$

(D) $60°$

Q17 MCQ · 1 mark **2024** – 30/1/1

If $\cos(\alpha+\beta)=0$, then value of $\cos\left(\frac{\alpha+\beta}{2}\right)$ is equal to :

(A) $\frac{1}{\sqrt{2}}$ (B) $\frac{1}{2}$
(C) 0 (D) $\sqrt{2}$

ANSWER *

$\alpha+\beta=90^\circ \Rightarrow \cos 45^\circ=\frac{1}{\sqrt{2}}$

(A) $\frac{1}{\sqrt{2}}$

Q18 MCQ · 1 mark **2024** – 30/1/2

If $\sin A=\frac{2}{3}$, then value of $\cot A$ is :

(A) $\frac{\sqrt{5}}{2}$ (B) $\frac{3}{2}$
(C) $\frac{5}{4}$ (D) $\frac{2}{3}$

ANSWER *

$\cos A=\frac{\sqrt{5}}{3} \Rightarrow \cot A=\frac{\sqrt{5}}{2}$

(A) $\frac{\sqrt{5}}{2}$

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Q19 MCQ · 1 mark **2024** – 30/1/3

For $\theta=30^\circ$, the value of $(2\sin\theta\cos\theta)$ is :

(A) 1 (B) $\frac{\sqrt{3}}{2}$
(C) $\frac{\sqrt{3}}{4}$ (D) $\frac{3}{2}$

ANSWER *

$2\times\frac{1}{2}\times\frac{\sqrt{3}}{2}=\frac{\sqrt{3}}{2}$

(B) $\frac{\sqrt{3}}{2}$

Q20 MCQ · 1 mark **2024** – 30/2/2, 30/2/3

If $\sin\theta=\cos\theta$, $(0^\circ<\theta<90^\circ)$, then value of $(\sec\theta\cdot\sin\theta)$ is :

(A) $\frac{1}{\sqrt{2}}$ (B) $\sqrt{2}$
(C) 1 (D) 0

ANSWER *

$\theta=45^\circ$; $\sec\theta\sin\theta=\tan\theta=1$

(C) 1

Q21 MCQ · 1 mark **2024** – 30/3/2

If $\cos\theta = \frac{\sqrt{3}}{2}$ and $\sin\phi = \frac{1}{2}$, then $\tan(\theta + \phi)$ is :

(A) $\sqrt{3}$
(B) $\frac{1}{\sqrt{3}}$
(C) 1
(D) not defined

ANSWER *
$\theta = 30^\circ,\ \phi = 30^\circ; \tan 60^\circ = \sqrt{3}$
(A) $\sqrt{3}$

Q22 MCQ · 1 mark **2024** – 30/4/1, 30/4/2

If $\sin\theta = 1$, then the value of $\frac{1}{2}\sin\left(\frac{\theta}{2}\right)$ is :

(A) $\frac{1}{2\sqrt{2}}$
(B) $\frac{1}{\sqrt{2}}$
(C) $\frac{1}{2}$
(D) 0

ANSWER *
$\theta = 90^\circ; \frac{1}{2}\sin 45^\circ = \frac{1}{2\sqrt{2}}$
(A) $\frac{1}{2\sqrt{2}}$

Q23 MCQ · 1 mark **2024** – 30/4/3

The value of θ for which $2\sin^2\theta = \frac{1}{2}; 0^\circ \le \theta \le 90^\circ$ is :

(A) 30°
(B) 60°
(C) 45°
(D) 90°

ANSWER *
$\sin^2\theta = \frac{1}{4} \Rightarrow \sin\theta = \frac{1}{2} \Rightarrow \theta = 30^\circ$
(A) 30°

Q24 MCQ · 1 mark **2024** – 30/5/1, 30/5/2

If $4\sec\theta - 5 = 0$, then the value of $\cot\theta$ is :

(A) $\frac{3}{4}$
(B) $\frac{4}{5}$
(C) $\frac{5}{3}$
(D) $\frac{4}{3}$

ANSWER *
$\sec\theta = \frac{5}{4} \Rightarrow \cos\theta = \frac{4}{5},\ \sin\theta = \frac{3}{5} \Rightarrow \cot\theta = \frac{4}{3}$
(D) $\frac{4}{3}$

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Q25 MCQ · 1 mark — **2024** – 30/5/3

If $5\tan\theta - 12 = 0$, then the value of $\sin\theta$ is :

(A) $\frac{5}{12}$ (B) $\frac{12}{13}$

(C) $\frac{5}{13}$ (D) $\frac{12}{5}$

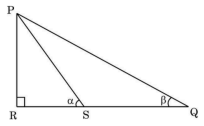
ANSWER *

$\tan\theta = \frac{12}{5}$; hypotenuse $= 13$; $\sin\theta = \frac{12}{13}$

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

Q26 MCQ · 1 mark — **2025** – 30/S/1

Find the value of $\frac{\tan\alpha}{\tan\beta}$ from the following diagram. It is given that RS : SQ = 1 : 2.



(A) 1 (B) 2

(C) 3 (D) 4

ANSWER **(C) 3**

Q27 MCQ · 1 mark — **2025** – 30/S/2

If $\cot A = \frac{7}{12}$, then the value of $(\cos A + \sin A)\,\text{cosec}\,A$ is :

(A) $\frac{5}{12}$ (B) $\frac{19}{12}$

(C) $\frac{19}{7}$ (D) $\frac{49}{144}$

ANSWER **(B) $\frac{19}{12}$**

Q28 MCQ · 1 mark — **2025** – 30/S/3

If $\cot\theta = \frac{p}{q}$ $(q \neq 0)$, then $\sin\theta$ is equal to :

(A) $\frac{p}{\sqrt{p^2+q^2}}$ (B) $\frac{\sqrt{p^2+q^2}}{p}$

(C) $\frac{q}{\sqrt{p^2+q^2}}$ (D) $\frac{q}{\sqrt{p^2-q^2}}$

ANSWER **(C) $\frac{q}{\sqrt{p^2+q^2}}$**

Q29 MCQ · 1 mark — **2025** – 30(B)/S

If $\triangle ABC$ is right-angled at C, then the value of $\cos(A+B)$ is :

(A) 1 (B) $\frac{1}{2}$

(C) $\frac{\sqrt{3}}{2}$
(D) 0

ANSWER **(D) 0**

Q30 MCQ · 1 mark — 2025 – 30(B)

If $\sin\theta + \cos\theta = \sqrt{2}\cos\theta$, $(\theta \neq 90^\circ)$, then $\tan\theta$ is equal to

(A) $\sqrt{2}+1$
(B) $\sqrt{2}-1$
(C) $-\sqrt{2}$
(D) $\sqrt{2}$

ANSWER *
Divide by $\cos\theta$: $\tan\theta + 1 = \sqrt{2} \Rightarrow \tan\theta = \sqrt{2}-1$

(B) $\sqrt{2}-1$

Q31 MCQ · 1 mark — 2025 – 30(B)

If $\sin\theta - \cos\theta = 0$, then the value of $\sin^6\theta + \cos^6\theta$ is

(A) 1
(B) $\frac{1}{8}$
(C) $\frac{3}{4}$
(D) $\frac{1}{4}$

ANSWER *
$\theta = 45^\circ$: $2\left(\frac{1}{\sqrt{2}}\right)^6 = 2 \times \frac{1}{8} = \frac{1}{4}$

(D) $\frac{1}{4}$

Q32 MCQ · 1 mark — 2025 – 30/1/1, 30/1/3

If θ is an acute angle and $7 + 4\sin\theta = 9$, then the value of θ is :

(A) 90°
(B) 30°
(C) 45°
(D) 60°

ANSWER *
$4\sin\theta = 2 \Rightarrow \sin\theta = \frac{1}{2} \Rightarrow \theta = 30^\circ$

(B) 30°

Q33 MCQ · 1 mark — 2025 – 30/1/2

If $\alpha + \beta = 90^\circ$ and $\alpha = 2\beta$, then $\cos^2\alpha + \sin^2\beta$ is equal to :

(A) 0
(B) $\frac{1}{2}$
(C) 1
(D) 2

ANSWER *
$\beta = 30^\circ$, $\alpha = 60^\circ$: $\cos^2 60^\circ + \sin^2 30^\circ = \frac{1}{4} + \frac{1}{4} = \frac{1}{2}$

(B) $\frac{1}{2}$

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Q34 MCQ · 1 mark — **2025** – 30/2/1

If $7\cos^2\theta + 3\sin^2\theta = 4$, then the value of θ is :

(A) 30°
(B) 45°
(C) 60°
(D) 90°

ANSWER *

$3 + 4\cos^2\theta = 4 \Rightarrow \cos^2\theta = \frac{1}{4} \Rightarrow \cos\theta = \frac{1}{2} \Rightarrow \theta = 60^\circ$

(C) 60°

Q35 MCQ · 1 mark — **2025** – 30/2/1, 30/2/2, 30/2/3

If $\sin 30^\circ \tan 45^\circ = \frac{\sec 60^\circ}{k}$, then the value of k is :

(A) 4
(B) 3
(C) 2
(D) 1

ANSWER *

$\frac{1}{2} \times 1 = \frac{2}{k} \Rightarrow k = 4$

(A) 4

Q36 MCQ · 1 mark — **2025** – 30/2/2

If $\sin(\alpha + \beta) = 1$, then the value of $\sin\left(\frac{\alpha + \beta}{2}\right)$ is :

(A) $\frac{1}{\sqrt{2}}$
(B) $\frac{1}{2}$
(C) 0
(D) 1

ANSWER *

$\alpha + \beta = 90^\circ \Rightarrow \sin 45^\circ = \frac{1}{\sqrt{2}}$

(A) $\frac{1}{\sqrt{2}}$

Q37 MCQ · 1 mark — **2025** – 30/2/3

If $\sin\theta = \cos\theta$ $(0^\circ < \theta < 90^\circ)$, then the value of $\sec\theta \cdot \sin\theta$ is :

(A) $\frac{1}{\sqrt{2}}$
(B) $\sqrt{2}$
(C) 0
(D) 1

ANSWER *

$\theta = 45^\circ$; $\sec\theta \sin\theta = \tan\theta = 1$

(D) 1

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Q38 MCQ · 1 mark **2025** – 30/3/2

If $\sin 4\theta = \frac{\sqrt{3}}{2}$, then $\frac{\theta}{3}$ equals :

(A) 60° (B) 20°
(C) 15° (D) 5°

ANSWER *

$4\theta = 60^\circ \Rightarrow \theta = 15^\circ \Rightarrow \frac{\theta}{3} = 5^\circ$

(D) 5°

Q39 MCQ · 1 mark **2025** – 30/4/1

$\tan 2A = 3\tan A$ is true, when the measure of $\angle A$ is :

(A) 90° (B) 60°
(C) 45° (D) 30°

ANSWER *

For $A = 30^\circ$: $\tan 60^\circ = \sqrt{3} = 3 \times \frac{1}{\sqrt{3}}$

(D) 30°

Q40 MCQ · 1 mark **2025** – 30/4/1, 30/4/2, 30/4/3

Which of the following statements is true ?

(A) $\sin 20^\circ > \sin 70^\circ$ (B) $\sin 20^\circ > \cos 20^\circ$
(C) $\cos 20^\circ > \cos 70^\circ$ (D) $\tan 20^\circ > \tan 70^\circ$

ANSWER *

As θ increases from 0° to 90°, $\cos\theta$ decreases, so $\cos 20^\circ > \cos 70^\circ$ (while $\sin 20^\circ < \sin 70^\circ$, $\sin 20^\circ < \cos 20^\circ$, $\tan 20^\circ < \tan 70^\circ$)

(C) $\cos 20^\circ > \cos 70^\circ$

Q41 MCQ · 1 mark **2025** – 30/4/3

$\sec A = 2\cos A$ is true for $A =$

(A) 0° (B) 30°
(C) 45° (D) 60°

ANSWER *

$\frac{1}{\cos A} = 2\cos A \Rightarrow \cos^2 A = \frac{1}{2} \Rightarrow A = 45^\circ$

(C) 45°

Q42 MCQ · 1 mark **2025** – 30/5/1

$\frac{1 - \tan^2 30^\circ}{1 + \tan^2 30^\circ}$ is equal to

(A) $\sin 60^\circ$ (B) $\cos 60^\circ$

(C) $\tan 60^\circ$
(D) $\sec 60^\circ$

ANSWER *

$= \dfrac{1-\frac{1}{3}}{1+\frac{1}{3}} = \dfrac{1}{2} = \cos 60^\circ$

(B) $\cos 60^\circ$

Q43 MCQ · 1 mark — **2025** – 30/5/2

The value of $\dfrac{2\tan 60^\circ}{1-\tan^2 60^\circ}$ is same as the value of

(A) $-\tan 30^\circ$
(B) $-\tan 60^\circ$
(C) $2\sin 60^\circ$
(D) $2\cos 60^\circ$

ANSWER *

$= \dfrac{2\sqrt{3}}{1-3} = -\sqrt{3} = -\tan 60^\circ$

(B) $-\tan 60^\circ$

Q44 MCQ · 1 mark — **2025** – 30/5/3

The value of $(1-2\sin^2 60^\circ)$ is same as that of

(A) $\sin 30^\circ$
(B) $-\sin 30^\circ$
(C) $\cos 60^\circ$
(D) $-\cos 30^\circ$

ANSWER *

$1-2\times\dfrac{3}{4} = -\dfrac{1}{2} = -\sin 30^\circ$

(B) $-\sin 30^\circ$

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Q45 MCQ · 1 mark — **2025** – 30/6/1

If $x\left(\dfrac{2\tan 30^\circ}{1+\tan^2 30^\circ}\right) = y\left(\dfrac{2\tan 30^\circ}{1-\tan^2 30^\circ}\right)$, then $x : y =$

(A) 1 : 1
(B) 1 : 2
(C) 2 : 1
(D) 4 : 1

ANSWER *

$x\times\dfrac{\sqrt{3}}{2} = y\times\sqrt{3} \Rightarrow x = 2y$

(C) 2 : 1

Q46 MCQ · 1 mark — **2025** – 30/6/1, 30/6/2, 30/6/3

In a right triangle ABC, right-angled at A, if $\sin B = \dfrac{1}{4}$, then the value of $\sec B$ is

(A) 4
(B) $\dfrac{\sqrt{15}}{4}$
(C) $\sqrt{15}$
(D) $\dfrac{4}{\sqrt{15}}$

ANSWER *

$\cos B = \sqrt{1 - \frac{1}{16}} = \frac{\sqrt{15}}{4} \Rightarrow \sec B = \frac{4}{\sqrt{15}}$

(D) $\frac{4}{\sqrt{15}}$

Q47 MCQ · 1 mark — **2025** – 30/6/2

If $x = \cos 30^\circ - \sin 30^\circ$ and $y = \tan 60^\circ - \cot 60^\circ$, then

(A) $x = y$
(B) $x > y$
(C) $x < y$
(D) $x > 1,\ y < 1$

ANSWER *

$x = \frac{\sqrt{3} - 1}{2} \approx 0.37, y = \sqrt{3} - \frac{1}{\sqrt{3}} = \frac{2}{\sqrt{3}} \approx 1.15$

(C) $x < y$

Q48 MCQ · 1 mark — **2025** – 30/6/3

If $x = 2 \sin 60^\circ \cos 60^\circ$ and $y = \sin^2 30^\circ - \cos^2 30^\circ$ and $x^2 = ky^2$, the value of k is

(A) $\sqrt{3}$
(B) $-\sqrt{3}$
(C) 3
(D) -3

ANSWER *

$x = \frac{\sqrt{3}}{2}, y = \frac{1}{4} - \frac{3}{4} = -\frac{1}{2}$

$\frac{3}{4} = k \times \frac{1}{4} \Rightarrow k = 3$

(C) 3

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Q49 MCQ · 1 mark — **2026 (I)** – 30(B)

If $x \tan 45^\circ \cdot \sin 30^\circ = \cos 30^\circ \cdot \cot 60^\circ$, then x is equal to

(A) $\sqrt{3}$
(B) $\frac{1}{\sqrt{3}}$
(C) 1
(D) $\frac{1}{2}$

ANSWER *

$x \times 1 \times \frac{1}{2} = \frac{\sqrt{3}}{2} \times \frac{1}{\sqrt{3}} = \frac{1}{2} \Rightarrow x = 1$

(C) 1

Q50 MCQ · 1 mark — **2026 (I)** – 30(B)

$\sin 2\theta = 2 \sin \theta$ is true, when θ is equal to

(A) 90°
(B) 60°
(C) 45°
(D) 0°

ANSWER *

At $\theta = 0°$ both sides are 0; for the other options, e.g. $\theta = 90°$: $\sin 180° = 0 \neq 2$

(D) $0°$

Q51 MCQ · 1 mark — **2026 (I)** – 30/1/1, 30/1/3

Given that $\sin\theta = \frac{a}{b}$, then $\cos\theta$ is equal to :

(A) $\frac{b}{\sqrt{b^2 - a^2}}$
(B) $\frac{b}{a}$
(C) $\frac{\sqrt{b^2 - a^2}}{b}$
(D) $\frac{a}{\sqrt{b^2 - a^2}}$

ANSWER *

Opposite a, hypotenuse b, adjacent $\sqrt{b^2 - a^2}$

(C) $\frac{\sqrt{b^2 - a^2}}{b}$

Q52 MCQ · 1 mark — **2026 (I)** – 30/1/1, 30/1/2, 30/1/3

If $\cos A = \frac{1}{2}$, then the value of $\sin^2 A + 2\cos^2 A$ is :

(A) $\frac{3}{2}$
(B) $\frac{5}{4}$
(C) -1
(D) $\frac{1}{2}$

ANSWER *

$\sin^2 A = \frac{3}{4}$; $\frac{3}{4} + 2 \times \frac{1}{4} = \frac{5}{4}$

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

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Q53 MCQ · 1 mark — **2026 (I)** – 30/1/2

If $\cos y = 0$, then what is the value of $\frac{1}{2}\cos\frac{y}{2}$?

(A) 0
(B) $\frac{1}{2}$
(C) $\frac{1}{\sqrt{2}}$
(D) $\frac{1}{2\sqrt{2}}$

ANSWER *

$y = 90°$; $\frac{1}{2}\cos 45° = \frac{1}{2\sqrt{2}}$

(D) $\frac{1}{2\sqrt{2}}$

Q54 MCQ · 1 mark — **2026 (I)** – 30/2/1, 30/2/2

If $\cos A = \frac{4}{5}$, then the value of $\tan A$ is :

(A) $\frac{3}{5}$
(B) $\frac{3}{4}$

(C) $\frac{4}{3}$
(D) $\frac{5}{3}$

ANSWER *

$\sin A = \frac{3}{5} \Rightarrow \tan A = \frac{3}{4}$

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

Q55 MCQ · 1 mark **2026 (I)** – 30/2/1, 30/2/2, 30/2/3

If $2\sin A = 1$, then the value of $\tan A + \cot A$ is :

(A) $\sqrt{3}$
(B) $\frac{4}{\sqrt{3}}$
(C) $\frac{\sqrt{3}}{2}$
(D) 1

ANSWER *

$A = 30°$: $\frac{1}{\sqrt{3}} + \sqrt{3} = \frac{4}{\sqrt{3}}$

(B) $\frac{4}{\sqrt{3}}$

Q56 MCQ · 1 mark **2026 (I)** – 30/2/3

Given $\cot\theta = 3$, the value of $\cos\theta$ is :

(A) $\frac{1}{3}$
(B) $\frac{1}{\sqrt{10}}$
(C) $\frac{3}{\sqrt{10}}$
(D) $\frac{\sqrt{10}}{3}$

ANSWER *

Adjacent 3, opposite 1, hypotenuse $\sqrt{10}$; $\cos\theta = \frac{3}{\sqrt{10}}$

(C) $\frac{3}{\sqrt{10}}$

Q57 MCQ · 1 mark **2026 (I)** – 30/3/1, 30/3/2, 30/3/3

Given that $\sin 2\alpha = \frac{\sqrt{3}}{2}$, the value of $\sin 3\alpha$ is :

(A) $\frac{3\sqrt{3}}{4}$
(B) $\frac{1}{2}$
(C) 1
(D) $\frac{\sqrt{3}}{4}$

ANSWER *

$2\alpha = 60° \Rightarrow \alpha = 30°$; $\sin 90° = 1$

(C) 1

Q58 MCQ · 1 mark **2026 (I)** – 30/3/1, 30/3/3

The value of $\left(\frac{1}{2}\tan^2 45° - \cos^2 60°\right)$ is :

(A) 0
(B) $-\frac{1}{2}$
(C) $\frac{1}{4}$
(D) $-\frac{1}{4}$

ANSWER *
$\frac{1}{2}-\frac{1}{4}=\frac{1}{4}$
(C) $\frac{1}{4}$

Q59 MCQ · 1 mark — **2026 (I)** – 30/3/2

The value of $\left(\frac{1}{3}\cot^2 30^\circ-\frac{1}{2}\sec^2 60^\circ\right)$ is :

(A) -1
(B) -2
(C) $\frac{5}{8}$
(D) $\frac{7}{8}$

ANSWER *
$\frac{1}{3}\times 3-\frac{1}{2}\times 4=1-2=-1$
(A) -1

Q60 MCQ · 1 mark — **2026 (I)** – 30/4/1

When $\sin A=\frac{1}{3}$, the value of $\cot A$ is

(A) $\frac{2\sqrt{2}}{3}$
(B) $2\sqrt{2}$
(C) $\frac{1}{2\sqrt{2}}$
(D) 3

ANSWER *
$\cos A=\frac{2\sqrt{2}}{3}\Rightarrow \cot A=2\sqrt{2}$
(B) $2\sqrt{2}$

Q61 MCQ · 1 mark — **2026 (I)** – 30/4/2

If $2\tan A=3$, then value of $\sec A$ equals

(A) $\sqrt{\frac{13}{2}}$
(B) $\frac{\sqrt{13}}{4}$
(C) $\frac{2}{\sqrt{13}}$
(D) $\frac{\sqrt{13}}{2}$

ANSWER *
$\sec^2 A=1+\frac{9}{4}=\frac{13}{4}\Rightarrow \sec A=\frac{\sqrt{13}}{2}$
(D) $\frac{\sqrt{13}}{2}$

Q62 MCQ · 1 mark — **2026 (I)** – 30/5/1, 30/5/3

For an acute angle θ, if $\sin\theta = \frac{1}{9}$, then value of $\frac{9\,\text{cosec}\,\theta + 1}{9\,\text{cosec}\,\theta - 1}$ is

(A) 0
(B) $\frac{80}{81}$
(C) 1
(D) $\frac{82}{80}$

ANSWER *

$\text{cosec}\,\theta = 9$: $\frac{81+1}{81-1} = \frac{82}{80}$

(D) $\frac{82}{80}$

Q63 MCQ · 1 mark — **2026 (II)** – 30(B)

Given that $\cos^2\theta - \sin^2\theta = \frac{1}{2}$, $(0° < \theta \leq 90°)$. The value of $\sin\theta$ is :

(A) 1
(B) $\frac{\sqrt{3}}{2}$
(C) $\frac{1}{2}$
(D) $\frac{1}{\sqrt{2}}$

ANSWER **(C) $\frac{1}{2}$**

Q64 MCQ · 1 mark — **2026 (II)** – 30(B)

If $\sin A - \cos A = 0$, then $2\tan A$ is equal to :

(A) 0
(B) 2
(C) $\frac{1}{2}$
(D) $\sqrt{3}$

ANSWER **(B) 2**

Q65 MCQ · 1 mark — **2026 (II)** – 30/7/1, 30/7/2, 30/7/3

If $p\left[\frac{2\sin 30°}{1-\sin^2 30°}\right] = q\left[\frac{2\sin 30°}{1+\sin^2 30°}\right]$, then $p : q$ is equal to :

(A) 1 : 1
(B) 4 : 3
(C) 3 : 5
(D) 4 : 5

ANSWER **(C) 3 : 5**

Q66 MCQ · 1 mark — **2026 (II)** – 30/7/1, 30/7/2, 30/7/3

In a right triangle ABC, right-angled at A, if $\cos B = \frac{1}{4}$, then the value of $\cot B$ is :

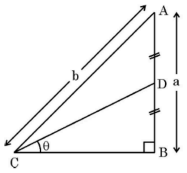
(A) $\frac{1}{4}$
(B) $\frac{1}{\sqrt{15}}$
(C) $\frac{\sqrt{15}}{1}$
(D) $\frac{4}{\sqrt{15}}$

ANSWER **(B) $\frac{1}{\sqrt{15}}$**

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Q67 MCQ · 1 mark — **2026 (II)** – 30/8/1, 30/8/2, 30/8/3

In the figure, AD = DB, $\angle B$ is a right angle and $\angle BCD = \theta$, AC = b and AB = a. Then, $\tan\theta$ is equal to



(A) $\dfrac{2a}{\sqrt{b^2-a^2}}$ (B) $\dfrac{a}{2\sqrt{b^2-a^2}}$

(C) $\dfrac{a}{2\sqrt{b^2+a^2}}$ (D) $\dfrac{a}{2(b^2-a^2)}$

ANSWER (B) $\dfrac{a}{2\sqrt{b^2-a^2}}$

Q68 Assertion–Reason · 1 mark — **2025** – 30/5/3

Assertion (A) : For an acute angle θ, value of $\operatorname{cosec}\theta$ cannot be $\dfrac{1}{\sqrt{2}}$.

Reason (R) : $\operatorname{cosec}\theta \geq 1$ for $0^\circ \leq \theta \leq 90^\circ$

(A) Both true, R explains A · (B) Both true, R does not explain A · (C) A true, R false · (D) A false, R true

ANSWER *

$\sin\theta \leq 1 \Rightarrow \operatorname{cosec}\theta \geq 1$, so $\operatorname{cosec}\theta \neq \dfrac{1}{\sqrt{2}}$; R explains A.

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

Q69 Very Short Answer · 2 marks — **2023** – 30/C/B

If $\tan A = 1$ and $\tan B = \sqrt{3}$, then evaluate : $\cos A\cos B + \sin A\sin B$.

ANSWER

$A = 45^\circ,\ B = 60^\circ$ ½+½

$\cos A\cos B + \sin A\sin B = \dfrac{1}{\sqrt{2}}\cdot\dfrac{1}{2} + \dfrac{1}{\sqrt{2}}\cdot\dfrac{\sqrt{3}}{2} = \dfrac{\sqrt{3}+1}{2\sqrt{2}}$ 1

$\dfrac{\sqrt{3}+1}{2\sqrt{2}}$

Q70 Very Short Answer · 2 marks · Internal choice (OR) part — **2023** – 30(B); **2024** – 30/4/1, 30/4/2, 30/4/3

Evaluate : $\dfrac{5\cos^2 60^\circ + 4\sec^2 30^\circ - \tan^2 45^\circ}{\sin^2 30^\circ + \sin^2 60^\circ}$

ANSWER *

$= \dfrac{5\times\frac{1}{4} + 4\times\frac{4}{3} - 1}{\frac{1}{4}+\frac{3}{4}}$

$= \dfrac{5}{4} + \dfrac{16}{3} - 1 = \dfrac{67}{12}$

$\dfrac{67}{12}$

Q71 Very Short Answer · 2 marks · Internal choice (OR) part — **2023** – 30/1/1, 30/1/2

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

ANSWER *

$\sin\alpha = \frac{1}{\sqrt{2}} \Rightarrow \alpha = 45°$; $\cot\beta = \sqrt{3} \Rightarrow \beta = 30°$

$\operatorname{cosec} 45° + \operatorname{cosec} 30° = \sqrt{2} + 2$

$\boxed{\sqrt{2}+2}$

Q72 Very Short Answer · 2 marks · Internal choice (OR) part — **2023** – 30/2/1, 30/2/2, 30/2/3

If $4\cot^2 45° - \sec^2 60° + \sin^2 60° + p = \frac{3}{4}$, then find the value of p.

ANSWER *

$4(1)^2 - (2)^2 + \left(\frac{\sqrt{3}}{2}\right)^2 + p = \frac{3}{4}$

$\Rightarrow 4 - 4 + \frac{3}{4} + p = \frac{3}{4} \Rightarrow p = 0$

$\boxed{p = 0}$

Q73 Very Short Answer · 2 marks · Internal choice (OR) part — **2023** – 30/4/1; **2026 (I)** – 30/2/2

Evaluate $\frac{5\cos^2 60° + 4\sec^2 30° - \tan^2 45°}{\sin^2 30° + \cos^2 30°}$

ANSWER *

$= \frac{5 \times \frac{1}{4} + 4 \times \frac{4}{3} - 1}{1}$

$= \frac{5}{4} + \frac{16}{3} - 1 = \frac{67}{12}$

$\boxed{\frac{67}{12}}$

Q74 Very Short Answer · 2 marks · Internal choice (OR) part — **2023** – 30/4/1

If A and B are acute angles such that $\sin(A-B) = 0$ and $2\cos(A+B) - 1 = 0$, then find angles A and B.

ANSWER *

$\sin(A-B) = 0 \Rightarrow A - B = 0°$

$\cos(A+B) = \frac{1}{2} \Rightarrow A + B = 60°; \therefore A = B = 30°$

$\boxed{A = B = 30°}$

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Q75 Very Short Answer · 2 marks | Internal choice (OR) part | **2023** – 30/4/2

Evaluate : $\frac{5}{\cot^2 30^\circ} + \frac{1}{\sin^2 60^\circ} - \cot^2 45^\circ + 2\sin^2 90^\circ$

ANSWER *

$= \frac{5}{3} + \frac{4}{3} - 1 + 2$

$= 3 - 1 + 2 = 4$

4

Q76 Very Short Answer · 2 marks | Internal choice (OR) part | **2023** – 30/4/2

If θ is an acute angle and $\sin\theta = \cos\theta$, find the value of $\tan^2\theta + \cot^2\theta - 2$.

ANSWER *

$\sin\theta = \cos\theta \Rightarrow \tan\theta = 1 \Rightarrow \theta = 45^\circ$

$\tan^2\theta + \cot^2\theta - 2 = 1 + 1 - 2 = 0$

0

Q77 Very Short Answer · 2 marks | Internal choice (OR) part | **2023** – 30/4/3

Evaluate $2\sec^2\theta + 3\,\text{cosec}^2\theta - 2\sin\theta\cos\theta$ if $\theta = 45^\circ$.

ANSWER *

$= 2(\sqrt{2})^2 + 3(\sqrt{2})^2 - 2 \times \frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{2}}$

$= 4 + 6 - 1 = 9$

9

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Q78 Very Short Answer · 2 marks | Internal choice (OR) part | **2023** – 30/4/3

If $\sin\theta - \cos\theta = 0$, then find the value of $\sin^4\theta + \cos^4\theta$.

ANSWER *

$\sin\theta = \cos\theta \Rightarrow \theta = 45^\circ$

$\sin^4\theta + \cos^4\theta = \frac{1}{4} + \frac{1}{4} = \frac{1}{2}$

$\frac{1}{2}$

Q79 Very Short Answer · 2 marks · Internal choice (OR) part — **2024** – 30/S/1, 30/S/2, 30/S/3

If $\cos(A+B)=\frac{1}{2}$ and $\tan(A-B)=\frac{1}{\sqrt{3}}$, where $0\le A+B\le 90^\circ$, then find the value of $\sec(2A-3B)$.

ANSWER

$\cos(A+B)=\frac{1}{2}\Rightarrow A+B=60^\circ$ ...(i) ½

$\tan(A-B)=\frac{1}{\sqrt{3}}\Rightarrow A-B=30^\circ$ ...(ii) ½

Solving (i) and (ii), $A=45^\circ$ and $B=15^\circ$ ½

$\Rightarrow \sec(2A-3B)=\sec(90^\circ-45^\circ)=\sec 45^\circ=\sqrt{2}$ ½

$\boxed{\sqrt{2}}$

Q80 Very Short Answer · 2 marks · Internal choice (OR) part — **2024** – 30/S/1, 30/S/2, 30/S/3

Find the value of x such that, $3\tan^2 60^\circ - x\sin^2 45^\circ + \frac{3}{4}\sec^2 30^\circ = 2\,\text{cosec}^2 30^\circ$

ANSWER

$\Rightarrow 3(\sqrt{3})^2 - x\left(\frac{1}{\sqrt{2}}\right)^2 + \frac{3}{4}\left(\frac{2}{\sqrt{3}}\right)^2 = 2(2)^2 \Rightarrow 9-\frac{x}{2}+1=8$ 1

$\Rightarrow x=4$ 1

$\boxed{x=4}$

Q81 Very Short Answer · 2 marks — **2024** – 30(B)/S

If $12\,\text{cosec}\,A=13$, then find the value of $\frac{2\sin A-3\cos A}{4\sin A-9\cos A}$.

ANSWER

$\sin A=\frac{12}{13}\Rightarrow \cos A=\frac{5}{13}$ 1

Hence $\frac{2\sin A-3\cos A}{4\sin A-9\cos A}=\frac{2\times\frac{12}{13}-3\times\frac{5}{13}}{4\times\frac{12}{13}-9\times\frac{5}{13}}=3$ 1

$\boxed{3}$

Q82 Very Short Answer · 2 marks · Internal choice (OR) part — **2024** – 30(B)

If $\sin A=\frac{3}{5}$ and $\cos B=\frac{12}{13}$, then find the value of $(\tan A+\tan B)$.

ANSWER *

$\cos A=\frac{4}{5}\Rightarrow \tan A=\frac{3}{4}$; $\sin B=\frac{5}{13}\Rightarrow \tan B=\frac{5}{12}$

$\tan A+\tan B=\frac{3}{4}+\frac{5}{12}=\frac{14}{12}=\frac{7}{6}$

$\boxed{\frac{7}{6}}$

Q83 Very Short Answer · 2 marks · Internal choice (OR) part · **2024** – 30/1/1, 30/1/2, 30/1/3

Evaluate : $2\sqrt{2}\cos 45^\circ \sin 30^\circ + 2\sqrt{3}\cos 30^\circ$

ANSWER *

$= 2\sqrt{2} \times \frac{1}{\sqrt{2}} \times \frac{1}{2} + 2\sqrt{3} \times \frac{\sqrt{3}}{2}$

$= 1 + 3 = 4$

4

Q84 Very Short Answer · 2 marks · Internal choice (OR) part · **2024** – 30/1/1, 30/1/2, 30/1/3

If $A = 60^\circ$ and $B = 30^\circ$, verify that : $\sin(A + B) = \sin A \cos B + \cos A \sin B$

ANSWER *

LHS $= \sin 90^\circ = 1$

RHS $= \frac{\sqrt{3}}{2} \cdot \frac{\sqrt{3}}{2} + \frac{1}{2} \cdot \frac{1}{2} = \frac{3}{4} + \frac{1}{4} = 1$; LHS = RHS

Q85 Very Short Answer · 2 marks · Internal choice (OR) part · **2024** – 30/2/1, 30/2/2, 30/2/3

Evaluate : $2\sin^2 30^\circ \sec 60^\circ + \tan^2 60^\circ$.

ANSWER *

$= 2 \times \frac{1}{4} \times 2 + 3$

$= 1 + 3 = 4$

4

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Q86 Very Short Answer · 2 marks · Internal choice (OR) part · **2024** – 30/2/1, 30/2/2, 30/2/3

If $2\sin(A + B) = \sqrt{3}$ and $\cos(A - B) = 1$, then find the measures of angles A and B. $0 \leq A,\ B,\ (A + B) \leq 90^\circ$.

ANSWER *

$\sin(A + B) = \frac{\sqrt{3}}{2} \Rightarrow A + B = 60^\circ$; $\cos(A - B) = 1 \Rightarrow A - B = 0^\circ$

$A = B = 30^\circ$

$A = B = 30^\circ$

Q87 Very Short Answer · 2 marks — **2024** – 30/3/1

Evaluate : $\dfrac{\cos 45^\circ + \sin 60^\circ}{\sec 30^\circ + \operatorname{cosec} 30^\circ}$

ANSWER *

$= \dfrac{\frac{1}{\sqrt{2}} + \frac{\sqrt{3}}{2}}{\frac{2}{\sqrt{3}} + 2} = \dfrac{\frac{\sqrt{2}+\sqrt{3}}{2}}{\frac{2(1+\sqrt{3})}{\sqrt{3}}} = \dfrac{\sqrt{3}(\sqrt{2}+\sqrt{3})}{4(\sqrt{3}+1)}$

$= \dfrac{\sqrt{3}(\sqrt{2}+\sqrt{3})(\sqrt{3}-1)}{4 \times 2} = \dfrac{3\sqrt{2} - \sqrt{6} + 3\sqrt{3} - 3}{8}$

$\boxed{\dfrac{3\sqrt{2} - \sqrt{6} + 3\sqrt{3} - 3}{8}}$

Q88 Very Short Answer · 2 marks — **2024** – 30/3/2

Evaluate : $\dfrac{\sec^2 45^\circ - \tan^2 45^\circ}{\sin^2 45^\circ}$

ANSWER *

$= \dfrac{2 - 1}{\frac{1}{2}}$

$= 2$

$\boxed{2}$

Q89 Very Short Answer · 2 marks — **2024** – 30/3/3

Evaluate : $\dfrac{5 \tan 60^\circ}{(\sin^2 60^\circ + \cos^2 60^\circ) \tan 30^\circ}$

ANSWER *

$= \dfrac{5\sqrt{3}}{1 \times \frac{1}{\sqrt{3}}}$

$= 5\sqrt{3} \times \sqrt{3} = 15$

$\boxed{15}$

Q90 Very Short Answer · 2 marks | Internal choice (OR) part — **2024** – 30/4/1, 30/4/2, 30/4/3

If $\sin(A - B) = \dfrac{1}{2}, \cos(A + B) = \dfrac{1}{2}; 0 < A + B \leq 90^\circ, A > B$; find $\angle A$ and $\angle B$.

ANSWER *

$A - B = 30^\circ$ and $A + B = 60^\circ$

$A = 45^\circ,\ B = 15^\circ$

$\boxed{A = 45^\circ,\ B = 15^\circ}$

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Q91 Very Short Answer · 2 marks — **2024** – 30/5/1, 30/5/2, 30/5/3

Evaluate : $\dfrac{2\tan 30^\circ \cdot \sec 60^\circ \cdot \tan 45^\circ}{1-\sin^2 60^\circ}$

ANSWER *

$= \dfrac{2 \times \frac{1}{\sqrt{3}} \times 2 \times 1}{1-\frac{3}{4}} = \dfrac{4/\sqrt{3}}{1/4}$

$= \dfrac{16}{\sqrt{3}} = \dfrac{16\sqrt{3}}{3}$

$\boxed{\dfrac{16\sqrt{3}}{3}}$

Q92 Very Short Answer · 2 marks · Internal choice (OR) part — **2025** – 30/S/1, 30/S/2, 30/S/3

If $\sin(2A+3B)=1$ and $\cos(2A-3B)=\dfrac{\sqrt{3}}{2}$, $0^\circ < 2A+3B \le 90^\circ$, $A>B$, then find A and B.

ANSWER

$\sin(2A+3B)=1 \Rightarrow 2A+3B=90^\circ$ ...(1) ½

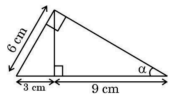
$\cos(2A-3B)=\dfrac{\sqrt{3}}{2} \Rightarrow 2A-3B=30^\circ$ ...(2) ½

Solving (1) and (2), $A=30^\circ$ and $B=10^\circ$ ½+½

$\boxed{A=30^\circ,\ B=10^\circ}$

Q93 Very Short Answer · 2 marks · Internal choice (OR) part — **2025** – 30/S/1, 30/S/2, 30/S/3

From the given figure, find the value of $\sin\alpha$.



ANSWER

$\sin\alpha = \dfrac{\text{Perpendicular}}{\text{Hypotenuse}} = \dfrac{6}{3+9} = \dfrac{1}{2}$ 2

$\boxed{\dfrac{1}{2}}$

Q94 Very Short Answer · 2 marks · Internal choice (OR) part — **2025** – 30(B)

Evaluate : $\dfrac{5\tan^2 30^\circ + 3\cos^2 45^\circ - 4\sin^2 30^\circ}{\sqrt{3}\sin 60^\circ \cos 60^\circ + \cot^2 45^\circ}$

ANSWER *

Numerator $= \dfrac{5}{3}+\dfrac{3}{2}-1 = \dfrac{13}{6}$; denominator $= \sqrt{3}\times\dfrac{\sqrt{3}}{2}\times\dfrac{1}{2}+1 = \dfrac{7}{4}$

Value $= \dfrac{13}{6}\times\dfrac{4}{7} = \dfrac{26}{21}$

$\boxed{\dfrac{26}{21}}$

Q95 Very Short Answer · 2 marks | Internal choice (OR) part | **2025** – 30/1/1, 30/1/2, 30/1/3

If $x\cos 60^\circ + y\cos 0^\circ + \sin 30^\circ - \cot 45^\circ = 5$, then find the value of $x + 2y$.

ANSWER *

$\frac{x}{2} + y + \frac{1}{2} - 1 = 5$

$\Rightarrow \frac{x}{2} + y = \frac{11}{2} \Rightarrow x + 2y = 11$

11

Q96 Very Short Answer · 2 marks | Internal choice (OR) part | **2025** – 30/1/1, 30/1/2, 30/1/3

Evaluate : $\frac{\tan^2 60^\circ}{\sin^2 60^\circ + \cos^2 30^\circ}$

ANSWER *

$= \frac{3}{\frac{3}{4} + \frac{3}{4}}$

$= \frac{3}{3/2} = 2$

2

Q97 Very Short Answer · 2 marks | **2025** – 30/2/1, 30/2/2, 30/2/3

If $\tan A = \sqrt{3}$; where A is an acute angle, then find the value of $\frac{\sin^2 A}{1 + \cos^2 A}$.

ANSWER *

$\tan A = \sqrt{3} \Rightarrow A = 60^\circ$

$\frac{\frac{3}{4}}{1 + \frac{1}{4}} = \frac{3}{5}$

$\frac{3}{5}$

Q98 Very Short Answer · 2 marks | **2025** – 30/3/1, 30/3/2

If $4k = \tan^2 60^\circ - 2\,\text{cosec}^2 30^\circ - 2\tan^2 30^\circ$, then find the value of k.

ANSWER *

$4k = 3 - 2(4) - 2\left(\frac{1}{3}\right) = -5 - \frac{2}{3} = -\frac{17}{3}$

$k = -\frac{17}{12}$

$k = -\frac{17}{12}$

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Q99 Very Short Answer · 2 marks | Internal choice (OR) part | **2025** – 30/4/1, 30/4/2, 30/4/3

Evaluate the following : $\dfrac{3\sin 30^\circ - 4\sin^3 30^\circ}{2\sin^2 50^\circ + 2\cos^2 50^\circ}$

ANSWER *

Numerator $= 3 \times \dfrac{1}{2} - 4 \times \dfrac{1}{8} = 1$; denominator $= 2(\sin^2 50^\circ + \cos^2 50^\circ) = 2$

Value $= \dfrac{1}{2}$

$\boxed{\dfrac{1}{2}}$

Q100 Very Short Answer · 2 marks | Internal choice (OR) part | **2025** – 30/5/1, 30/5/2, 30/5/3

It is given that $\sin(A - B) = \sin A \cos B - \cos A \sin B$. Use it to find the value of $\sin 15^\circ$.

ANSWER *

$\sin 15^\circ = \sin(45^\circ - 30^\circ) = \sin 45^\circ \cos 30^\circ - \cos 45^\circ \sin 30^\circ$

$= \dfrac{1}{\sqrt{2}} \cdot \dfrac{\sqrt{3}}{2} - \dfrac{1}{\sqrt{2}} \cdot \dfrac{1}{2} = \dfrac{\sqrt{3} - 1}{2\sqrt{2}}$

$\boxed{\dfrac{\sqrt{3} - 1}{2\sqrt{2}}}$

Q101 Very Short Answer · 2 marks | Internal choice (OR) part | **2026 (I)** – 30(B)

If $7\sin^2 A + 3\cos^2 A = 4$, then find the value of $\tan A$.

ANSWER *

$3 + 4\sin^2 A = 4 \Rightarrow \sin^2 A = \dfrac{1}{4} \Rightarrow \sin A = \dfrac{1}{2}$

$A = 30^\circ \Rightarrow \tan A = \dfrac{1}{\sqrt{3}}$

$\boxed{\dfrac{1}{\sqrt{3}}}$

Q102 Very Short Answer · 2 marks | Internal choice (OR) part | **2026 (I)** – 30/1/1, 30/1/2, 30/1/3

If $\tan\theta = \dfrac{24}{7}$, then find the value of $\sin\theta + \cos\theta$.

ANSWER *

Hypotenuse $= \sqrt{24^2 + 7^2} = 25$; $\sin\theta = \dfrac{24}{25}$, $\cos\theta = \dfrac{7}{25}$

$\sin\theta + \cos\theta = \dfrac{31}{25}$

$\boxed{\dfrac{31}{25}}$

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Q103 Very Short Answer · 2 marks | Internal choice (OR) part | **2026 (I)** – 30/2/3

If $\tan A = \frac{4}{3}$, find $\sin A$ and $\cos A$.

ANSWER *

Opposite 4, adjacent 3, hypotenuse 5

$\sin A = \frac{4}{5}, \cos A = \frac{3}{5}$

$\boxed{\sin A = \frac{4}{5}, \cos A = \frac{3}{5}}$

Q104 Very Short Answer · 2 marks | Internal choice (OR) part | **2026 (I)** – 30/4/1, 30/4/2

Evaluate : $\frac{3\cos^2 30^\circ - 6\,\text{cosec}^2 30^\circ}{\tan^2 60^\circ}$

ANSWER *

$= \frac{3 \times \frac{3}{4} - 6 \times 4}{3} = \frac{\frac{9}{4} - 24}{3}$

$= \frac{-87/4}{3} = -\frac{29}{4}$

$\boxed{-\frac{29}{4}}$

Q105 Very Short Answer · 2 marks | Internal choice (OR) part | **2026 (I)** – 30/4/3

Evaluate : $\frac{1 - 2\tan^2 30^\circ - \sec^2 45^\circ}{\sin^2 60^\circ}$

ANSWER *

$= \frac{1 - \frac{2}{3} - 2}{\frac{3}{4}} = \frac{-5/3}{3/4}$

$= -\frac{20}{9}$

$\boxed{-\frac{20}{9}}$

Q106 Very Short Answer · 2 marks | Internal choice (OR) part | **2026 (I)** – 30/5/1, 30/5/3

Evaluate : $\frac{\sin^3 60^\circ - \tan 30^\circ}{\cos^2 45^\circ}$

ANSWER *

$= \frac{\frac{3\sqrt{3}}{8} - \frac{\sqrt{3}}{3}}{\frac{1}{2}} = 2 \times \frac{9\sqrt{3} - 8\sqrt{3}}{24}$

$= \frac{\sqrt{3}}{12}$

$\boxed{\frac{\sqrt{3}}{12}}$

Q107 Very Short Answer · 2 marks · Internal choice (OR) part — **2026 (I)** – 30/5/1, 30/5/3

For acute angles A and B and $A+2B$ and $2A+B$ are acute if $\tan(A+2B)=\sqrt{3}$ and $\sin(2A+B)=\frac{1}{\sqrt{2}}$, then find the measures of angles A and B.

ANSWER *

$A+2B=60^\circ,\ 2A+B=45^\circ$

Solving: $A=10^\circ,\ B=25^\circ$

$\boxed{A=10^\circ,\ B=25^\circ}$

Q108 Very Short Answer · 2 marks · Internal choice (OR) part — **2026 (I)** – 30/5/2

For acute angles A and B, if $\sec(2A-B)=\sqrt{2}$ and $\text{cosec}(A+B)=2$, then find the values of A and B.

ANSWER *

$2A-B=45^\circ,\ A+B=30^\circ$

$3A=75^\circ \Rightarrow A=25^\circ,\ B=5^\circ$

$\boxed{A=25^\circ,\ B=5^\circ}$

Q109 Very Short Answer · 2 marks · Internal choice (OR) part — **2026 (I)** – 30/5/2

Evaluate : $\frac{2\cos 30^\circ-\cot^3 60^\circ}{\tan 30^\circ}$

ANSWER *

$=\frac{\sqrt{3}-\frac{1}{3\sqrt{3}}}{\frac{1}{\sqrt{3}}}=3-\frac{1}{3}$

$=\frac{8}{3}$

$\boxed{\frac{8}{3}}$

Q110 Very Short Answer · 2 marks — **2026 (II)** – 30(B)

Find the value of : $2\sin^2 30^\circ\cdot\tan 60^\circ-3\cos^2 60^\circ\cdot\sec 30^\circ$.

ANSWER

$=2\left(\frac{1}{2}\right)^2\cdot(\sqrt{3})-3\left(\frac{1}{2}\right)^2\cdot\left(\frac{2}{\sqrt{3}}\right)$ 1½

$=\frac{\sqrt{3}}{2}-\frac{\sqrt{3}}{2}=0$ ½

$\boxed{0}$

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Q111 Very Short Answer · 2 marks · Internal choice (OR) part — **2026 (II)** – 30/7/1, 30/7/2

If $\tan A = (\sqrt{2}-1)$, then prove that $\dfrac{\tan A}{1+\tan^2 A} = \dfrac{\sqrt{2}}{4}$.

ANSWER

$\text{LHS} = \dfrac{\tan A}{1+\tan^2 A} = \dfrac{\sqrt{2}-1}{1+(\sqrt{2}-1)^2}$ ½

$= \dfrac{\sqrt{2}-1}{4-2\sqrt{2}} = \dfrac{\sqrt{2}-1}{2\sqrt{2}(\sqrt{2}-1)} = \dfrac{1}{2\sqrt{2}}$ 1

$= \dfrac{\sqrt{2}}{4} = \text{RHS}$ ½

Q112 Very Short Answer · 2 marks · Internal choice (OR) part — **2026 (II)** – 30/7/1, 30/7/2

If $\operatorname{cosec}\theta = \dfrac{13}{12}$, then find the value of $\cot\theta + \tan\theta$.

ANSWER

$\operatorname{cosec}\theta = \dfrac{13}{12}$; getting $\cot\theta = \dfrac{5}{12}$ 1

and $\tan\theta = \dfrac{12}{5}$ ½

$\therefore\ \tan\theta + \cot\theta = \dfrac{5}{12} + \dfrac{12}{5} = \dfrac{169}{60}$ ½

$\boxed{\dfrac{169}{60}}$

Q113 Very Short Answer · 2 marks · Internal choice (OR) part — **2026 (II)** – 30/7/3

Find the value of x, if : $2\operatorname{cosec}^2 30^\circ + x\sin^2 60^\circ - \dfrac{3}{4}\tan^2 30^\circ = 10$

ANSWER

$\Rightarrow 2\times(2)^2 + x\times\left(\dfrac{\sqrt{3}}{2}\right)^2 - \dfrac{3}{4}\times\left(\dfrac{1}{\sqrt{3}}\right)^2 = 10$ 1

$\Rightarrow 8 + \dfrac{3x}{4} - \dfrac{1}{4} = 10$ ½

$\Rightarrow x = 3$ ½

$\boxed{x = 3}$

Q114 Short Answer · 3 marks · Internal choice (OR) part — **2025** – 30/5/1, 30/5/2, 30/5/3

Let $2A+B$ and $A+2B$ be acute angles such that $\sin(2A+B) = \dfrac{\sqrt{3}}{2}$ and $\tan(A+2B) = 1$. Find the value of $\cot(4A-7B)$.

ANSWER *

$2A+B = 60^\circ$ and $A+2B = 45^\circ$

Solving, $A = 25^\circ,\ B = 10^\circ$

$\cot(4A-7B) = \cot(100^\circ - 70^\circ) = \cot 30^\circ = \sqrt{3}$

$\boxed{\sqrt{3}}$

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Q115 Short Answer · 3 marks · Internal choice (OR) part — **2026 (II)** – 30/7/1, 30/7/2

If $\sin(A+2B)=\frac{\sqrt{3}}{2}$ and $\cos(A+4B)=0$, then find the values of A and B.

ANSWER

$\sin(A+2B)=\frac{\sqrt{3}}{2} \Rightarrow A+2B=60^\circ$ ...(i) — 1

$\cos(A+4B)=0 \Rightarrow A+4B=90^\circ$ ...(ii) — 1

Solving (i) and (ii), $A=30^\circ,\ B=15^\circ$ — ½+½

$A=30^\circ,\ B=15^\circ$

Q116 Long Answer · 5 marks · Internal choice (OR) part — **2023** – 30/C/3

If in an acute angle $\triangle ABC$, $\sec(B+C-A)=2$ and $\tan(C+A-B)=\frac{1}{\sqrt{3}}$; find the three angles of $\triangle ABC$.

ANSWER

$\sec(B+C-A)=2 \Rightarrow B+C-A=60^\circ$ ...(1) — 1

$\tan(C+A-B)=\frac{1}{\sqrt{3}} \Rightarrow C+A-B=30^\circ$ ...(2) — 1

Also, $A+B+C=180^\circ$ ...(3) — 1

Solving (1), (2) and (3): $A=60^\circ,\ B=75^\circ$ and $C=45^\circ$ — 2

$A=60^\circ,\ B=75^\circ,\ C=45^\circ$

02 TOPIC 2 Trigonometric Identities

QUICK RECAP

- $\sin^2 A+\cos^2 A=1,\ 1+\tan^2 A=\sec^2 A\ (0^\circ \le A<90^\circ),\ 1+\cot^2 A=\operatorname{cosec}^2 A\ (0^\circ<A\le 90^\circ)$.
- Useful forms: $\sec^2 A-\tan^2 A=1$, $\operatorname{cosec}^2 A-\cot^2 A=1$, so $(\sec A+\tan A)(\sec A-\tan A)=1$.
- To prove an identity, usually start from the more complicated side and convert everything to sin and cos, or use the identities above; rationalise by multiplying with a conjugate.

Q117 MCQ · 1 mark — **2023** – 30/C/1

$\cot^2\theta-\frac{1}{\sin^2\theta}$ is equal to :

(A) 1 (B) 2
(C) -2 (D) -1

ANSWER (D) -1

Q118 MCQ · 1 mark — **2023** – 30/C/2

$2\cos^2\theta(1+\tan^2\theta)$ is equal to :

(A) 0 (B) 1
(C) 2 (D) 3

ANSWER (C) 2

Q119 MCQ · 1 mark — **2023** – 30/C/3

$(\sec^2\theta - 1)(1 - \text{cosec}^2\theta)$ is equal to :

(A) 1
(B) -1
(C) 2
(D) -2

ANSWER **(B) -1**

Q120 MCQ · 1 mark — **2023** – 30(B)

If $\cos\theta + \sin\theta = \sqrt{2}\cos\theta$, then $\cos\theta - \sin\theta$ equals :

(A) $\frac{1}{\sqrt{2}}\sin\theta$
(B) $\sqrt{2}\sin\theta$
(C) $2\sin\theta$
(D) $\frac{1}{2}\sin\theta$

ANSWER *

$\sin\theta = (\sqrt{2}-1)\cos\theta \Rightarrow \cos\theta = \frac{\sin\theta}{\sqrt{2}-1} = (\sqrt{2}+1)\sin\theta$

$\cos\theta - \sin\theta = (\sqrt{2}+1)\sin\theta - \sin\theta = \sqrt{2}\sin\theta$

(B) $\sqrt{2}\sin\theta$

Q121 MCQ · 1 mark — **2023** – 30/4/1

$\sec\theta$ when expressed in terms of $\cot\theta$, is equal to :

(A) $\frac{1+\cot^2\theta}{\cot\theta}$
(B) $\sqrt{1+\cot^2\theta}$
(C) $\frac{\sqrt{1+\cot^2\theta}}{\cot\theta}$
(D) $\frac{\sqrt{1-\cot^2\theta}}{\cot\theta}$

ANSWER *

$\sec\theta = \sqrt{1+\tan^2\theta} = \sqrt{1+\frac{1}{\cot^2\theta}} = \frac{\sqrt{1+\cot^2\theta}}{\cot\theta}$

(C) $\frac{\sqrt{1+\cot^2\theta}}{\cot\theta}$

Q122 MCQ · 1 mark — **2023** – 30/4/2

Which of the following is true for all values of θ $(0^\circ \le \theta \le 90^\circ)$?

(A) $\cos^2\theta - \sin^2\theta = 1$
(B) $\text{cosec}^2\theta - \sec^2\theta = 1$
(C) $\sec^2\theta - \tan^2\theta = 1$
(D) $\cot^2\theta - \tan^2\theta = 1$

ANSWER *

Identity $1 + \tan^2\theta = \sec^2\theta$ (wherever defined)

(C) $\sec^2\theta - \tan^2\theta = 1$

Q123 MCQ · 1 mark — **2023** – 30/4/3

$(\sec^2\theta - 1)(\text{cosec}^2\theta - 1)$ is equal to :

(A) -1
(B) 1

(C) 0 (D) 2

ANSWER *

$= \tan^2\theta \cdot \cot^2\theta = 1$

(B) 1

Q124 MCQ · 1 mark **2023** – 30/6/1, 30/6/3

If θ is an acute angle of a right angled triangle, then which of the following equation is **not** true ?

(A) $\sin\theta \cot\theta = \cos\theta$ (B) $\cos\theta \tan\theta = \sin\theta$

(C) $\text{cosec}^2\theta - \cot^2\theta = 1$ (D) $\tan^2\theta - \sec^2\theta = 1$

ANSWER *

$\sec^2\theta - \tan^2\theta = 1$, so $\tan^2\theta - \sec^2\theta = -1$

(D) $\tan^2\theta - \sec^2\theta = 1$

Q125 MCQ · 1 mark **2023** – 30/6/2

$\dfrac{\cos^2\theta}{\sin^2\theta} - \dfrac{1}{\sin^2\theta}$, in simplified form, is :

(A) $\tan^2\theta$ (B) $\sec^2\theta$

(C) 1 (D) -1

ANSWER *

$= \dfrac{\cos^2\theta - 1}{\sin^2\theta} = \dfrac{-\sin^2\theta}{\sin^2\theta} = -1$

(D) -1

Q126 MCQ · 1 mark **2023** – 30/6/2

$(\cos^4 A - \sin^4 A)$ on simplification, gives

(A) $2\sin^2 A - 1$ (B) $2\sin^2 A + 1$

(C) $2\cos^2 A + 1$ (D) $2\cos^2 A - 1$

ANSWER *

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

(D) $2\cos^2 A - 1$

Q127 MCQ · 1 mark **2024** – 30/S/1, 30/S/2, 30/S/3

The value of $\left(\sin^2\theta + \dfrac{1}{1+\tan^2\theta}\right)$ is :

(A) 0 (B) 2

(C) 1 (D) -1

ANSWER **(C) 1**

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Q128 MCQ · 1 mark **2024** – 30(B)/S

$\frac{\sin^3 A + \cos^3 A}{\sin A + \cos A} + \sin A \cos A$ on simplification gives :

(A) 1
(B) 2
(C) $1 + 2\sin A \cos A$
(D) 0

ANSWER **(A) 1**

Q129 MCQ · 1 mark **2024** – 30(B)

$(\sec\theta + \tan\theta)(1 - \sin\theta)$ is equal to :

(A) $\sec\theta$
(B) $\sin\theta$
(C) $\text{cosec}\,\theta$
(D) $\cos\theta$

ANSWER *
$= \frac{1+\sin\theta}{\cos\theta}(1-\sin\theta) = \frac{\cos^2\theta}{\cos\theta} = \cos\theta$
(D) $\cos\theta$

Q130 MCQ · 1 mark **2024** – 30/1/1, 30/1/2, 30/1/3

If $\sec\theta - \tan\theta = m$, then the value of $\sec\theta + \tan\theta$ is :

(A) $1 - \frac{1}{m}$
(B) $m^2 - 1$
(C) $\frac{1}{m}$
(D) $-m$

ANSWER *
$(\sec\theta + \tan\theta)(\sec\theta - \tan\theta) = 1 \Rightarrow \sec\theta + \tan\theta = \frac{1}{m}$
(C) $\frac{1}{m}$

Q131 MCQ · 1 mark **2025** – 30/S/1, 30/S/2, 30/S/3

If $x = p\cos^3\alpha$ and $y = q\sin^3\alpha$, then the value of $\left(\frac{x}{p}\right)^{2/3} + \left(\frac{y}{q}\right)^{2/3}$ is :

(A) 1
(B) 2
(C) p
(D) q

ANSWER **(A) 1**

Q132 MCQ · 1 mark **2025** – 30(B)/S

If $\sin\theta + \sin^2\theta = 1$, then the value of $\cos^2\theta + \cos^4\theta$ is :

(A) 1
(B) $\frac{1}{2}$
(C) 2
(D) 3

ANSWER **(A) 1**

Q133 MCQ · 1 mark **2025** – 30/1/1, 30/1/2

The value of $\tan^2\theta - \left(\frac{1}{\cos\theta} \times \sec\theta\right)$ is :

(A) 1 (B) 0
(C) -1 (D) 2

ANSWER *
$= \tan^2\theta - \sec^2\theta = -1$
(C) -1

Q134 MCQ · 1 mark **2025** – 30/1/3

The value of $(\tan A \operatorname{cosec} A)^2 - (\sin A \sec A)^2$ is :

(A) 0 (B) 1
(C) -1 (D) 2

ANSWER *
$\tan A \operatorname{cosec} A = \sec A$ and $\sin A \sec A = \tan A$; $\sec^2 A - \tan^2 A = 1$
(B) 1

Q135 MCQ · 1 mark **2025** – 30/3/1, 30/3/3

$(\cot\theta + \tan\theta)$ equals :

(A) $\operatorname{cosec}\theta \sec\theta$ (B) $\sin\theta \sec\theta$
(C) $\cos\theta \tan\theta$ (D) $\sin\theta \cos\theta$

ANSWER *
$= \frac{\cos^2\theta + \sin^2\theta}{\sin\theta\cos\theta} = \frac{1}{\sin\theta\cos\theta} = \operatorname{cosec}\theta \sec\theta$
(A) $\operatorname{cosec}\theta \sec\theta$

Q136 MCQ · 1 mark **2025** – 30/3/2

$\frac{\cos\theta}{\sqrt{1-\cos^2\theta}}$ is equal to :

(A) $\cot\theta$ (B) $\sqrt{\cos\theta}$
(C) $\frac{\cos\theta}{\sqrt{\sin\theta}}$ (D) $\tan\theta$

ANSWER *
$= \frac{\cos\theta}{\sin\theta} = \cot\theta$
(A) $\cot\theta$

Q137 MCQ · 1 mark **2025** – 30/4/2

Which of the following is a trigonometric identity ?

(A) $\sin^2\theta = 1 + \cos^2\theta$ (B) $\operatorname{cosec}^2\theta + \cot^2\theta = 1$

(C) $\sec^2\theta = 1 + \tan^2\theta$
(D) $\sin 2\theta = 2\sin\theta$

ANSWER *
$1 + \tan^2\theta = \sec^2\theta$ holds for all θ where defined
(C) $\sec^2\theta = 1 + \tan^2\theta$

Q138 MCQ · 1 mark — **2026 (I)** – 30/4/1, 30/4/2, 30/4/3

$\dfrac{1+\tan^2 A}{1+\cot^2 A}$ equals to :

(A) $\tan^2 A$
(B) -1
(C) $-\tan^2 A$
(D) $\cot^2 A$

ANSWER *
$= \dfrac{\sec^2 A}{\text{cosec}^2 A} = \dfrac{\sin^2 A}{\cos^2 A} = \tan^2 A$
(A) $\tan^2 A$

Q139 MCQ · 1 mark — **2026 (I)** – 30/4/3

$\dfrac{\sec^2 A - 1}{\sin^2 A}$ is same as

(A) $\cos^2 A$
(B) $\sec^2 A$
(C) $-\sec^2 A$
(D) $\cot^2 A$

ANSWER *
$= \dfrac{\tan^2 A}{\sin^2 A} = \dfrac{1}{\cos^2 A} = \sec^2 A$
(B) $\sec^2 A$

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Q140 MCQ · 1 mark — **2026 (I)** – 30/5/1, 30/5/2, 30/5/3

Simplest form of $\dfrac{\sec A}{\sqrt{\sec^2 A - 1}}$ is

(A) $\sin A$
(B) $\tan A$
(C) $\text{cosec } A$
(D) $\cos A$

ANSWER *
$= \dfrac{\sec A}{\tan A} = \dfrac{1}{\sin A} = \text{cosec } A$
(C) $\text{cosec } A$

Q141 Assertion–Reason · 1 mark — **2023** – 30/6/1, 30/6/2, 30/6/3

Assertion (A) : For $0 < \theta \leq 90°$, $\text{cosec}\,\theta - \cot\theta$ and $\text{cosec}\,\theta + \cot\theta$ are reciprocal of each other.
Reason (R) : $\text{cosec}^2\theta - \cot^2\theta = 1$

(A) Both true, R explains A · (B) Both true, R does not explain A · (C) A true, R false · (D) A false, R true

ANSWER *

$(\operatorname{cosec}\theta - \cot\theta)(\operatorname{cosec}\theta + \cot\theta) = \operatorname{cosec}^2\theta - \cot^2\theta = 1$; R explains A.

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

Q142 Assertion–Reason · 1 mark — **2024** – 30/2/1, 30/2/3

Assertion (A) : If $\sin A = \frac{1}{3}$ $(0° < A < 90°)$, then the value of $\cos A$ is $\frac{2\sqrt{2}}{3}$.
Reason (R) : For every angle θ, $\sin^2\theta + \cos^2\theta = 1$.

(A) Both true, R explains A · (B) Both true, R does not explain A · (C) A true, R false · (D) A false, R true

ANSWER *

$\cos A = \sqrt{1 - \frac{1}{9}} = \frac{2\sqrt{2}}{3}$, obtained using R; so R explains A.

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

Q143 Assertion–Reason · 1 mark — **2025** – 30/5/1

Assertion (A) : For an acute angle θ, $\sin\theta = \frac{3}{5} \Rightarrow \cos\theta = -\frac{4}{5}$.
Reason (R) : For any value of θ, $(0° \le \theta \le 90°)$ $\sin^2\theta + \cos^2\theta = 1$.

(A) Both true, R explains A · (B) Both true, R does not explain A · (C) A true, R false · (D) A false, R true

ANSWER *

For an acute angle $\cos\theta > 0$, so $\cos\theta = +\frac{4}{5}$; A is false, R is true.

(D) Assertion (A) is false, but Reason (R) is true.

Q144 Assertion–Reason · 1 mark — **2025** – 30/5/2

Assertion (A) : For an acute angle θ, $\sec\theta = 3 \Rightarrow \tan\theta = 2\sqrt{2}$.
Reason (R) : $\sec^2\theta = 1 - \tan^2\theta$ for all values of θ.

(A) Both true, R explains A · (B) Both true, R does not explain A · (C) A true, R false · (D) A false, R true

ANSWER *

$\tan\theta = \sqrt{\sec^2\theta - 1} = \sqrt{8} = 2\sqrt{2}$, so A is true. The identity is $\sec^2\theta = 1 + \tan^2\theta$, so R is false.

(C) Assertion (A) is true, but Reason (R) is false.

Q145 Very Short Answer · 2 marks · Internal choice (OR) part — **2023** – 30/C/B

Prove that $\frac{1 - \cos\theta}{1 + \cos\theta} = (\cot\theta - \operatorname{cosec}\theta)^2$

ANSWER

$\text{LHS} = \frac{1 - \cos\theta}{1 + \cos\theta} \times \frac{1 - \cos\theta}{1 - \cos\theta}$ — 1

$= \frac{(1 - \cos\theta)^2}{\sin^2\theta}$ — ½

$= (\operatorname{cosec}\theta - \cot\theta)^2 = \text{RHS}$ — ½

Q146 Very Short Answer · 2 marks · Internal choice (OR) part · **2023** – 30/C/B

Prove that $\frac{\tan A}{1-\cot A}+\frac{\cot A}{1-\tan A}=1+\sec A\,\text{cosec}\,A$

ANSWER

Getting $\frac{\sin^2 A}{\cos A(\sin A-\cos A)}+\frac{\cos^2 A}{\sin A(\cos A-\sin A)}$ — 1

$=\frac{\sin^3 A-\cos^3 A}{\sin A\cos A(\sin A-\cos A)}=\frac{\sin^2 A+\cos^2 A+\sin A\cos A}{\sin A\cos A}$ — ½

$=1+\sec A\,\text{cosec}\,A=\text{RHS}$ — ½

Q147 Very Short Answer · 2 marks · Internal choice (OR) part · **2023** – 30(B)

Prove that : $\frac{\cos A}{1+\sin A}+\frac{1+\sin A}{\cos A}=2\sec A$

ANSWER *

$\text{LHS}=\frac{\cos^2 A+(1+\sin A)^2}{(1+\sin A)\cos A}=\frac{\cos^2 A+1+2\sin A+\sin^2 A}{(1+\sin A)\cos A}$

$=\frac{2(1+\sin A)}{(1+\sin A)\cos A}=\frac{2}{\cos A}=2\sec A=\text{RHS}$

Q148 Very Short Answer · 2 marks · Internal choice (OR) part · **2023** – 30/1/3

If $\sin\theta+\sin^2\theta=1$, then prove that $\cos^2\theta+\cos^4\theta=1$.

ANSWER *

$\sin\theta=1-\sin^2\theta=\cos^2\theta$

$\cos^2\theta+\cos^4\theta=\sin\theta+\sin^2\theta=1$

Q149 Very Short Answer · 2 marks · Internal choice (OR) part · **2023** – 30/1/3; **2024** – 30/2/3

If $\tan\theta=\frac{1}{\sqrt{7}}$, then show that $\frac{\text{cosec}^2\theta-\sec^2\theta}{\text{cosec}^2\theta+\sec^2\theta}=\frac{3}{4}$.

ANSWER *

$\text{cosec}^2\theta=1+\cot^2\theta=1+7=8;\ \sec^2\theta=1+\tan^2\theta=1+\frac{1}{7}=\frac{8}{7}$

$\frac{8-\frac{8}{7}}{8+\frac{8}{7}}=\frac{48/7}{64/7}=\frac{3}{4}$

Q150 Very Short Answer · 2 marks · Internal choice (OR) part · **2023** – 30/2/1, 30/2/2, 30/2/3

If $\cos A+\cos^2 A=1$, then find the value of $\sin^2 A+\sin^4 A$.

ANSWER *

$\cos A=1-\cos^2 A=\sin^2 A$

$\sin^2 A+\sin^4 A=\cos A+\cos^2 A=1$

1

Q151 Very Short Answer · 2 marks · Internal choice (OR) part — **2024** – 30(B)

If $\tan\theta + \sec\theta = m$, then prove that $\sec\theta = \dfrac{m^2+1}{2m}$.

ANSWER *

$\sec^2\theta - \tan^2\theta = 1 \Rightarrow \sec\theta - \tan\theta = \dfrac{1}{m}$

Adding: $2\sec\theta = m + \dfrac{1}{m} \Rightarrow \sec\theta = \dfrac{m^2+1}{2m}$

Q152 Very Short Answer · 2 marks — **2025** – 30(B)/S

If $1 + \sin^2\theta = 3\sin\theta\cos\theta$, then prove that $\tan\theta = 1$ or $\dfrac{1}{2}$.

ANSWER

$\Rightarrow (\sin^2\theta + \cos^2\theta) + \sin^2\theta - 3\sin\theta\cos\theta = 0 \Rightarrow 2\sin^2\theta + \cos^2\theta - 3\sin\theta\cos\theta = 0$ ½

Dividing by $\cos^2\theta$: $2\tan^2\theta - 3\tan\theta + 1 = 0$ ½

$\Rightarrow (2\tan\theta - 1)(\tan\theta - 1) = 0$ ½

$\Rightarrow \tan\theta = \dfrac{1}{2}$ or 1 ½

Q153 Very Short Answer · 2 marks · Internal choice (OR) part — **2025** – 30(B)

Prove that $(\operatorname{cosec}\theta + \sin\theta)(\operatorname{cosec}\theta - \sin\theta) = \cot^2\theta + \cos^2\theta$.

ANSWER *

LHS $= \operatorname{cosec}^2\theta - \sin^2\theta$

$= (1 + \cot^2\theta) - (1 - \cos^2\theta) = \cot^2\theta + \cos^2\theta = \text{RHS}$

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Q154 Very Short Answer · 2 marks — **2025** – 30/3/3

If $\tan A + \cot A = 6$, then find the value of $\tan^2 A + \cot^2 A - 4$.

ANSWER *

Squaring: $\tan^2 A + \cot^2 A + 2 = 36 \Rightarrow \tan^2 A + \cot^2 A = 34$

$\tan^2 A + \cot^2 A - 4 = 30$

30

Q155 Very Short Answer · 2 marks · Internal choice (OR) part — **2025** – 30/4/1, 30/4/2, 30/4/3

Find the value of x for which $(\sin A + \operatorname{cosec} A)^2 + (\cos A + \sec A)^2 = x + \tan^2 A + \cot^2 A$

ANSWER *

LHS $= \sin^2 A + \cos^2 A + 2 + 2 + \operatorname{cosec}^2 A + \sec^2 A = 5 + (1 + \cot^2 A) + (1 + \tan^2 A)$

$= 7 + \tan^2 A + \cot^2 A \Rightarrow x = 7$

$x = 7$

Q156 Very Short Answer · 2 marks | Internal choice (OR) part | **2025** – 30/5/1, 30/5/2, 30/5/3

If $\sin A = y$, then express $\cos A$ and $\tan A$ in terms of y.

ANSWER *

$\cos A = \sqrt{1 - \sin^2 A} = \sqrt{1 - y^2}$

$\tan A = \dfrac{\sin A}{\cos A} = \dfrac{y}{\sqrt{1 - y^2}}$

$\boxed{\cos A = \sqrt{1 - y^2}, \tan A = \dfrac{y}{\sqrt{1 - y^2}}}$

Q157 Very Short Answer · 2 marks | Internal choice (OR) part | **2025** – 30/6/1, 30/6/2, 30/6/3

If $a \sec\theta + b \tan\theta = m$ and $b \sec\theta + a \tan\theta = n$, prove that $a^2 + n^2 = b^2 + m^2$

ANSWER *

$m^2 - n^2 = (a^2 \sec^2\theta + b^2 \tan^2\theta + 2ab \sec\theta \tan\theta) - (b^2 \sec^2\theta + a^2 \tan^2\theta + 2ab \sec\theta \tan\theta)$

$= (a^2 - b^2)(\sec^2\theta - \tan^2\theta) = a^2 - b^2 \Rightarrow a^2 + n^2 = b^2 + m^2$

Q158 Very Short Answer · 2 marks | Internal choice (OR) part | **2025** – 30/6/1, 30/6/2, 30/6/3

Use the identity : $\sin^2 A + \cos^2 A = 1$ to prove that $\tan^2 A + 1 = \sec^2 A$. Hence, find the value of $\tan A$, when $\sec A = \dfrac{5}{3}$, where A is an acute angle.

ANSWER *

Dividing $\sin^2 A + \cos^2 A = 1$ by $\cos^2 A$: $\tan^2 A + 1 = \sec^2 A$

$\tan^2 A = \dfrac{25}{9} - 1 = \dfrac{16}{9} \Rightarrow \tan A = \dfrac{4}{3}$

$\boxed{\tan A = \dfrac{4}{3}}$

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Q159 Very Short Answer · 2 marks | Internal choice (OR) part | **2026 (I)** – 30(B)

If $4 \tan A = 3$, then find the value of $\dfrac{\text{cosec}^2 A + 1}{\text{cosec}^2 A - 1}$.

ANSWER *

$\cot A = \dfrac{4}{3} \Rightarrow \text{cosec}^2 A = 1 + \dfrac{16}{9} = \dfrac{25}{9}$

$\dfrac{\frac{25}{9} + 1}{\frac{25}{9} - 1} = \dfrac{34}{16} = \dfrac{17}{8}$

$\boxed{\dfrac{17}{8}}$

Q160 Very Short Answer · 2 marks | Internal choice (OR) part | **2026 (I)** – 30/1/1, 30/1/2, 30/1/3

If $\cot\theta = \frac{7}{8}$, then find the value of $\frac{(1+\sin\theta)(1-\sin\theta)}{(1+\cos\theta)(1-\cos\theta)}$.

ANSWER *

$= \frac{1-\sin^2\theta}{1-\cos^2\theta} = \frac{\cos^2\theta}{\sin^2\theta} = \cot^2\theta$

$= \frac{49}{64}$

$\boxed{\frac{49}{64}}$

Q161 Very Short Answer · 2 marks | Internal choice (OR) part | **2026 (I)** – 30/2/1

If $\tan\theta + \frac{1}{\tan\theta} = 2$, find the value of $\tan^2\theta + \frac{1}{\tan^2\theta}$.

ANSWER *

Squaring: $\tan^2\theta + \frac{1}{\tan^2\theta} + 2 = 4$

$\Rightarrow \tan^2\theta + \frac{1}{\tan^2\theta} = 2$

$\boxed{2}$

Q162 Very Short Answer · 2 marks | Internal choice (OR) part | **2026 (I)** – 30/2/1

Prove that : $\sqrt{\frac{1-\sin\theta}{1+\sin\theta}} = \sec\theta - \tan\theta$

ANSWER *

$\text{LHS} = \sqrt{\frac{(1-\sin\theta)^2}{1-\sin^2\theta}} = \frac{1-\sin\theta}{\cos\theta}$

$= \sec\theta - \tan\theta = \text{RHS}$

Q163 Very Short Answer · 2 marks | Internal choice (OR) part | **2026 (I)** – 30/2/2

Prove that : $1 + \frac{\cot^2\alpha}{1+\text{cosec}\,\alpha} = \text{cosec}\,\alpha$

ANSWER *

$\cot^2\alpha = \text{cosec}^2\alpha - 1 = (\text{cosec}\,\alpha - 1)(\text{cosec}\,\alpha + 1)$

$\text{LHS} = 1 + \text{cosec}\,\alpha - 1 = \text{cosec}\,\alpha = \text{RHS}$

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Q164 Very Short Answer · 2 marks · Internal choice (OR) part — **2026 (I)** – 30/2/3

Express $\cos A$ and $\tan A$ in terms of $\sin A$.

ANSWER *

$\cos A = \sqrt{1 - \sin^2 A}$

$\tan A = \dfrac{\sin A}{\cos A} = \dfrac{\sin A}{\sqrt{1 - \sin^2 A}}$

$\cos A = \sqrt{1 - \sin^2 A}, \tan A = \dfrac{\sin A}{\sqrt{1 - \sin^2 A}}$

Q165 Very Short Answer · 2 marks · Internal choice (OR) part — **2026 (I)** – 30/4/1, 30/4/2

Prove that : $\sqrt{\dfrac{1 + \sin A}{1 - \sin A}} = \sec A + \tan A$

ANSWER *

$\text{LHS} = \sqrt{\dfrac{(1 + \sin A)^2}{1 - \sin^2 A}} = \dfrac{1 + \sin A}{\cos A}$

$= \sec A + \tan A = \text{RHS}$

Q166 Very Short Answer · 2 marks · Internal choice (OR) part — **2026 (I)** – 30/4/3

Prove that : $\dfrac{\tan \theta}{1 + \tan^2 \theta} + \dfrac{\cot \theta}{1 + \cot^2 \theta} = 2 \sin \theta \cos \theta.$

ANSWER *

$\text{LHS} = \dfrac{\tan \theta}{\sec^2 \theta} + \dfrac{\cot \theta}{\text{cosec}^2 \theta} = \dfrac{\sin \theta}{\cos \theta} \cos^2 \theta + \dfrac{\cos \theta}{\sin \theta} \sin^2 \theta$

$= \sin \theta \cos \theta + \sin \theta \cos \theta = 2 \sin \theta \cos \theta = \text{RHS}$

Q167 Very Short Answer · 2 marks · Internal choice (OR) part — **2026 (II)** – 30/7/3

If $\cos A = \dfrac{2}{5}$, then find the value of $4 + 4 \tan^2 A$.

ANSWER

$4 + 4 \tan^2 A = 4(1 + \tan^2 A) = 4 \sec^2 A = \dfrac{4}{\cos^2 A}$ — 1

$= 4 \times \left(\dfrac{25}{4}\right) = 25$ — 1

25

Q168 Short Answer · 3 marks — **2023** – 30/1/2, 30/2/1; **2025** – 30/3/1, 30/3/2, 30/3/3; **2026 (II)** – 30/8/1, 30/8/2, 30/8/3

Prove that : $(\text{cosec } A - \sin A)(\sec A - \cos A) = \dfrac{1}{\tan A + \cot A}$

ANSWER

$\text{LHS} = \left(\dfrac{1}{\sin A} - \sin A\right)\left(\dfrac{1}{\cos A} - \cos A\right) = \left(\dfrac{1 - \sin^2 A}{\sin A}\right)\left(\dfrac{1 - \cos^2 A}{\cos A}\right) = \sin A \cos A$ — 1½

$\text{RHS} = \dfrac{1}{\dfrac{\sin A}{\cos A} + \dfrac{\cos A}{\sin A}} = \dfrac{\sin A \cos A}{\sin^2 A + \cos^2 A} = \sin A \cos A; \therefore \text{LHS} = \text{RHS}$ — 1½

Q169 Short Answer · 3 marks — **2023** – 30(B), 30/5/1, 30/5/2; **2024** – 30/1/1, 30/1/2, 30/5/1; **2025** – 30/1/1, 30/1/2, 30/1/3

Prove that $\frac{\tan A}{1-\cot A}+\frac{\cot A}{1-\tan A}=1+\sec A\,\text{cosec}\,A.$

ANSWER *

$$\text{LHS}=\frac{\sin^2 A}{\cos A(\sin A-\cos A)}+\frac{\cos^2 A}{\sin A(\cos A-\sin A)}=\frac{\sin^3 A-\cos^3 A}{\sin A\cos A(\sin A-\cos A)}$$
$$=\frac{(\sin A-\cos A)(\sin^2 A+\cos^2 A+\sin A\cos A)}{\sin A\cos A(\sin A-\cos A)}=\frac{1+\sin A\cos A}{\sin A\cos A}$$
$$=\frac{1}{\sin A\cos A}+1=1+\sec A\,\text{cosec}\,A=\text{RHS}$$

Q170 Short Answer · 3 marks — **2023** – 30/1/1

Prove that : $\frac{\tan\theta+\sec\theta-1}{\tan\theta-\sec\theta+1}=\frac{1+\sin\theta}{\cos\theta}$

ANSWER *

$$\text{LHS}=\frac{(\tan\theta+\sec\theta)-(\sec^2\theta-\tan^2\theta)}{\tan\theta-\sec\theta+1}$$
$$=\frac{(\tan\theta+\sec\theta)(1-\sec\theta+\tan\theta)}{\tan\theta-\sec\theta+1}=\tan\theta+\sec\theta$$
$$=\frac{\sin\theta}{\cos\theta}+\frac{1}{\cos\theta}=\frac{1+\sin\theta}{\cos\theta}=\text{RHS}$$

Q171 Short Answer · 3 marks — **2023** – 30/1/3; **2025** – 30(B)

Prove that : $2(\sin^6\theta+\cos^6\theta)-3(\sin^4\theta+\cos^4\theta)+1=0.$

ANSWER *

$$\sin^6\theta+\cos^6\theta=(\sin^2\theta+\cos^2\theta)^3-3\sin^2\theta\cos^2\theta(\sin^2\theta+\cos^2\theta)=1-3\sin^2\theta\cos^2\theta$$
$$\sin^4\theta+\cos^4\theta=(\sin^2\theta+\cos^2\theta)^2-2\sin^2\theta\cos^2\theta=1-2\sin^2\theta\cos^2\theta$$
$$\text{LHS}=2-6\sin^2\theta\cos^2\theta-3+6\sin^2\theta\cos^2\theta+1=0=\text{RHS}$$

Q172 Short Answer · 3 marks — **2023** – 30/2/2; **2024** – 30/5/2

Prove that : $\frac{\sin\theta}{1+\cos\theta}+\frac{1+\cos\theta}{\sin\theta}=2\,\text{cosec}\,\theta$

ANSWER *

$$\text{LHS}=\frac{\sin^2\theta+(1+\cos\theta)^2}{(1+\cos\theta)\sin\theta}=\frac{\sin^2\theta+1+2\cos\theta+\cos^2\theta}{(1+\cos\theta)\sin\theta}$$
$$=\frac{2(1+\cos\theta)}{(1+\cos\theta)\sin\theta}$$
$$=\frac{2}{\sin\theta}=2\,\text{cosec}\,\theta=\text{RHS}$$

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Q173 Short Answer · 3 marks **2023** – 30/2/3

Prove that : $\frac{\cos^2\theta}{1-\tan\theta}+\frac{\sin^3\theta}{\sin\theta-\cos\theta}=1+\sin\theta\cos\theta$

ANSWER *

$\frac{\cos^2\theta}{1-\tan\theta}=\frac{\cos^3\theta}{\cos\theta-\sin\theta}$

$\text{LHS}=\frac{\cos^3\theta-\sin^3\theta}{\cos\theta-\sin\theta}=\frac{(\cos\theta-\sin\theta)(\cos^2\theta+\sin^2\theta+\sin\theta\cos\theta)}{\cos\theta-\sin\theta}$

$=1+\sin\theta\cos\theta=\text{RHS}$

Q174 Short Answer · 3 marks Internal choice (OR) part **2023** – 30/4/1, 30/4/2, 30/4/3; **2024** – 30/3/1

Prove that $\frac{\sin A-2\sin^3 A}{2\cos^3 A-\cos A}=\tan A$

ANSWER *

$\text{LHS}=\frac{\sin A(1-2\sin^2 A)}{\cos A(2\cos^2 A-1)}$

$1-2\sin^2 A=1-2(1-\cos^2 A)=2\cos^2 A-1$

$\therefore \text{LHS}=\frac{\sin A}{\cos A}=\tan A=\text{RHS}$

Q175 Short Answer · 3 marks Internal choice (OR) part **2023** – 30/4/1, 30/4/2, 30/4/3

Prove that $\sec A(1-\sin A)(\sec A+\tan A)=1$.

ANSWER *

$\text{LHS}=\frac{1}{\cos A}(1-\sin A)\left(\frac{1+\sin A}{\cos A}\right)$

$=\frac{1-\sin^2 A}{\cos^2 A}=\frac{\cos^2 A}{\cos^2 A}$

$=1=\text{RHS}$

Q176 Short Answer · 3 marks **2023** – 30/5/3; **2026 (I)** – 30/1/1, 30/1/2, 30/1/3

Prove that : $\frac{\tan A}{1+\sec A}-\frac{\tan A}{1-\sec A}=2\,\text{cosec}\,A$

ANSWER *

$\text{LHS}=\tan A\left[\frac{(1-\sec A)-(1+\sec A)}{1-\sec^2 A}\right]=\tan A\cdot\frac{-2\sec A}{-\tan^2 A}$

$=\frac{2\sec A}{\tan A}=\frac{2}{\cos A}\times\frac{\cos A}{\sin A}$

$=\frac{2}{\sin A}=2\,\text{cosec}\,A=\text{RHS}$

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Q177 Short Answer · 3 marks — **2023** – 30/6/2; **2024** – 30/4/2

If $\sin\theta + \cos\theta = p$ and $\sec\theta + \operatorname{cosec}\theta = q$, then prove that $q(p^2 - 1) = 2p$.

ANSWER *

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

$q = \dfrac{1}{\cos\theta} + \dfrac{1}{\sin\theta} = \dfrac{\sin\theta + \cos\theta}{\sin\theta\cos\theta}$

$q(p^2 - 1) = \dfrac{\sin\theta + \cos\theta}{\sin\theta\cos\theta} \times 2\sin\theta\cos\theta = 2(\sin\theta + \cos\theta) = 2p$

Q178 Short Answer · 3 marks — **2023** – 30/6/3

Prove that $(\sin\theta + \cos\theta)(\tan\theta + \cot\theta) = \sec\theta + \operatorname{cosec}\theta$.

ANSWER *

$\tan\theta + \cot\theta = \dfrac{\sin^2\theta + \cos^2\theta}{\sin\theta\cos\theta} = \dfrac{1}{\sin\theta\cos\theta}$

$\text{LHS} = \dfrac{\sin\theta + \cos\theta}{\sin\theta\cos\theta} = \dfrac{1}{\cos\theta} + \dfrac{1}{\sin\theta}$

$= \sec\theta + \operatorname{cosec}\theta = \text{RHS}$

Q179 Short Answer · 3 marks — Internal choice (OR) part — **2024** – 30/S/2; **2026 (II)** – 30/7/3

Prove that : $(\sin\theta + \operatorname{cosec}\theta)^2 + (\cos\theta + \sec\theta)^2 = 7 + \tan^2\theta + \cot^2\theta$

ANSWER

$\text{LHS} = \sin^2\theta + \operatorname{cosec}^2\theta + 2\sin\theta\operatorname{cosec}\theta + \cos^2\theta + \sec^2\theta + 2\cos\theta\sec\theta$ — 1

$= (\sin^2\theta + \cos^2\theta) + (1 + \cot^2\theta) + 2\sin\theta \times \dfrac{1}{\sin\theta} + (1 + \tan^2\theta) + 2\cos\theta \times \dfrac{1}{\cos\theta}$ — 1

$= 3 + 2 + 2 + \tan^2\theta + \cot^2\theta$ — ½

$= 7 + \tan^2\theta + \cot^2\theta = \text{RHS}$ — ½

Q180 Short Answer · 3 marks — Internal choice (OR) part — **2024** – 30/4/1; **2025** – 30(B)/S

Prove that : $\dfrac{\sin\theta - \cos\theta + 1}{\cos\theta + \sin\theta - 1} = \dfrac{1}{\sec\theta - \tan\theta}$

ANSWER

LHS: dividing numerator and denominator by $\cos\theta$, $= \dfrac{\tan\theta - 1 + \sec\theta}{1 + \tan\theta - \sec\theta}$ — ½

$= \dfrac{(\tan\theta + \sec\theta) - (\sec^2\theta - \tan^2\theta)}{1 + \tan\theta - \sec\theta}$ — ½

$= \dfrac{(\tan\theta + \sec\theta)(1 - \sec\theta + \tan\theta)}{1 + \tan\theta - \sec\theta} = \tan\theta + \sec\theta$ — 1

Multiplying and dividing by $(\sec\theta - \tan\theta)$: $= (\tan\theta + \sec\theta) \times \dfrac{\sec\theta - \tan\theta}{\sec\theta - \tan\theta}$ — ½

$= \dfrac{\sec^2\theta - \tan^2\theta}{\sec\theta - \tan\theta} = \dfrac{1}{\sec\theta - \tan\theta} = \text{RHS}$ — ½

Q181 Short Answer · 3 marks — **2024** – 30/S/1

Prove that : $\left(\frac{1+\tan^2 A}{1+\cot^2 A}\right) = \frac{(1-\tan A)^2}{(1-\cot A)^2}$

ANSWER

$\text{LHS} = \frac{1+\tan^2 A}{1+\frac{1}{\tan^2 A}}$ — 1

$= \tan^2 A$ — ½

$\text{RHS} = \frac{(1-\tan A)^2}{\left(1-\frac{1}{\tan A}\right)^2}$ — 1

$= \tan^2 A; \therefore \text{LHS} = \text{RHS}$ — ½

Q182 Short Answer · 3 marks — **2024** – 30/S/3

Prove that : $\left(\tan\alpha + \frac{1}{\cos\alpha}\right)^2 + \left(\tan\alpha - \frac{1}{\cos\alpha}\right)^2 = 2\left(\frac{1+\sin^2\alpha}{1-\sin^2\alpha}\right)$

ANSWER

$\text{LHS} = \left(\frac{\sin\alpha}{\cos\alpha} + \frac{1}{\cos\alpha}\right)^2 + \left(\frac{\sin\alpha}{\cos\alpha} - \frac{1}{\cos\alpha}\right)^2$ — 1

$= \left(\frac{\sin\alpha+1}{\cos\alpha}\right)^2 + \left(\frac{\sin\alpha-1}{\cos\alpha}\right)^2$ — ½

$= \frac{\sin^2\alpha + 2\sin\alpha + 1 + \sin^2\alpha - 2\sin\alpha + 1}{1-\sin^2\alpha}$ — 1

$= \frac{2(1+\sin^2\alpha)}{1-\sin^2\alpha} = \text{RHS}$ — ½

Q183 Short Answer · 3 marks — **2024** – 30(B)/S, 30/4/3; **2025** – 30/2/3

Prove that $\sqrt{\sec^2 A + \text{cosec}^2 A} = \tan A + \cot A$.

ANSWER

$\text{LHS} = \sqrt{(1+\tan^2 A) + (1+\cot^2 A)}$ — 1

$= \sqrt{\tan^2 A + \cot^2 A + 2}$ — ½

$= \sqrt{(\tan A + \cot A)^2}$ (as $\tan A \cot A = 1$) — 1

$= \tan A + \cot A = \text{RHS}$ — ½

Q184 Short Answer · 3 marks — **2024** – 30(B); **2026 (I)** – 30/5/1, 30/5/3

Prove that : $\frac{\tan\theta}{1-\cot\theta} + \frac{\cot\theta}{1-\tan\theta} = 1 + \tan\theta + \cot\theta$

ANSWER *

$\text{LHS} = \frac{\sin^2\theta}{\cos\theta(\sin\theta-\cos\theta)} - \frac{\cos^2\theta}{\sin\theta(\sin\theta-\cos\theta)} = \frac{\sin^3\theta - \cos^3\theta}{\sin\theta\cos\theta(\sin\theta-\cos\theta)}$

$= \frac{\sin^2\theta + \cos^2\theta + \sin\theta\cos\theta}{\sin\theta\cos\theta} = 1 + \frac{\sin^2\theta+\cos^2\theta}{\sin\theta\cos\theta}$

$= 1 + \frac{\sin\theta}{\cos\theta} + \frac{\cos\theta}{\sin\theta} = 1 + \tan\theta + \cot\theta = \text{RHS}$

Q185 Short Answer · 3 marks — **2024** – 30/2/2

Prove that $\sin^6\theta + \cos^6\theta = 1 - 3\sin^2\theta\cos^2\theta$.

ANSWER *

$\text{LHS} = (\sin^2\theta)^3 + (\cos^2\theta)^3 = (\sin^2\theta + \cos^2\theta)^3 - 3\sin^2\theta\cos^2\theta(\sin^2\theta + \cos^2\theta)$

$= 1 - 3\sin^2\theta\cos^2\theta = \text{RHS}$

Q186 Short Answer · 3 marks — **2024** – 30/3/2; **2025** – 30/1/1, 30/1/2, 30/1/3

Prove that $\dfrac{\sin A + \cos A}{\sin A - \cos A} + \dfrac{\sin A - \cos A}{\sin A + \cos A} = \dfrac{2}{2\sin^2 A - 1}$

ANSWER *

$\text{LHS} = \dfrac{(\sin A + \cos A)^2 + (\sin A - \cos A)^2}{\sin^2 A - \cos^2 A}$

$= \dfrac{2(\sin^2 A + \cos^2 A)}{\sin^2 A - (1 - \sin^2 A)}$

$= \dfrac{2}{2\sin^2 A - 1} = \text{RHS}$

Q187 Short Answer · 3 marks — **2024** – 30/3/3

Prove that : $(\text{cosec}\,\theta - \sin\theta)(\sec\theta - \cos\theta)(\tan\theta + \cot\theta) = 1$

ANSWER *

$(\text{cosec}\,\theta - \sin\theta)(\sec\theta - \cos\theta) = \dfrac{\cos^2\theta}{\sin\theta} \cdot \dfrac{\sin^2\theta}{\cos\theta} = \sin\theta\cos\theta$

$\tan\theta + \cot\theta = \dfrac{\sin^2\theta + \cos^2\theta}{\sin\theta\cos\theta} = \dfrac{1}{\sin\theta\cos\theta}$

$\text{LHS} = \sin\theta\cos\theta \times \dfrac{1}{\sin\theta\cos\theta} = 1 = \text{RHS}$

Q188 Short Answer · 3 marks — **2024** – 30/5/3

Prove that : $\dfrac{\tan\theta - \cot\theta}{\sin\theta\cos\theta} = \sec^2\theta - \text{cosec}^2\theta$

ANSWER *

$\text{LHS} = \dfrac{\frac{\sin\theta}{\cos\theta} - \frac{\cos\theta}{\sin\theta}}{\sin\theta\cos\theta} = \dfrac{\sin^2\theta - \cos^2\theta}{\sin^2\theta\cos^2\theta}$

$= \dfrac{1}{\cos^2\theta} - \dfrac{1}{\sin^2\theta}$

$= \sec^2\theta - \text{cosec}^2\theta = \text{RHS}$

Q189 Short Answer · 3 marks — **2025** – 30/S/1

Prove that : $\dfrac{1}{\cot^2 A} + \dfrac{1}{1 + \tan^2 A} = \dfrac{1}{1 - \sin^2 A} - \dfrac{1}{\text{cosec}^2 A}$

ANSWER

$\text{LHS} = \tan^2 A + \dfrac{1}{\sec^2 A} = \tan^2 A + \cos^2 A$ — 1

$\text{RHS} = \dfrac{1}{\cos^2 A} - \sin^2 A = \sec^2 A - \sin^2 A$ — 1

$= \tan^2 A + 1 - \sin^2 A = \tan^2 A + \cos^2 A; \therefore \text{LHS} = \text{RHS}$ — 1

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Q190 Short Answer · 3 marks — **2025** – 30/S/2

Prove that : $\dfrac{\cot\theta+\operatorname{cosec}\theta-1}{\cot\theta-\operatorname{cosec}\theta+1}=\dfrac{1+\cos\theta}{\sin\theta}$

ANSWER

$\text{LHS}=\dfrac{(\cot\theta+\operatorname{cosec}\theta)-(\operatorname{cosec}^2\theta-\cot^2\theta)}{\cot\theta-\operatorname{cosec}\theta+1}$ — 1

$=\dfrac{(\cot\theta+\operatorname{cosec}\theta)(\cot\theta-\operatorname{cosec}\theta+1)}{\cot\theta-\operatorname{cosec}\theta+1}$ — 1

$=\cot\theta+\operatorname{cosec}\theta$ — ½

$=\dfrac{1+\cos\theta}{\sin\theta}=\text{RHS}$ — ½

Q191 Short Answer · 3 marks — **2025** – 30/S/3

Prove that : $\dfrac{\tan^3\theta}{1+\tan^2\theta}+\dfrac{\cot^3\theta}{1+\cot^2\theta}=\sec\theta\operatorname{cosec}\theta-2\sin\theta\cos\theta$

ANSWER

$\text{LHS}=\dfrac{\tan^3\theta}{\sec^2\theta}+\dfrac{\cot^3\theta}{\operatorname{cosec}^2\theta}=\dfrac{\sin^3\theta}{\cos\theta}+\dfrac{\cos^3\theta}{\sin\theta}$ — ½+½

$=\dfrac{\sin^4\theta+\cos^4\theta}{\sin\theta\cos\theta}=\dfrac{(\sin^2\theta+\cos^2\theta)^2-2\sin^2\theta\cos^2\theta}{\sin\theta\cos\theta}$ — 1

$=\dfrac{1-2\sin^2\theta\cos^2\theta}{\sin\theta\cos\theta}=\dfrac{1}{\sin\theta\cos\theta}-\dfrac{2\sin^2\theta\cos^2\theta}{\sin\theta\cos\theta}$ — ½

$=\operatorname{cosec}\theta\sec\theta-2\sin\theta\cos\theta=\text{RHS}$ — ½

Q192 Short Answer · 3 marks · Internal choice (OR) part — **2025** – 30(B)/S

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

> Since $\sin A+\cos A\le\sqrt{2}$ for every angle, no real A satisfies $\sin A+\cos A=\sqrt{3}$; the result above is the algebraic working given in the marking scheme.

ANSWER

Squaring both sides: $\sin^2 A+\cos^2 A+2\sin A\cos A=3$ — ½

$\Rightarrow \sin A\cos A=1$ — ½

$\Rightarrow \dfrac{1}{\sin A\cos A}=1$ — ½

$\Rightarrow \dfrac{\sin^2 A+\cos^2 A}{\sin A\cos A}=1$ — 1

$\Rightarrow \tan A+\cot A=1$ — ½

Q193 Short Answer · 3 marks · Internal choice (OR) part — **2025** – 30/2/1

Prove that : $\left(1+\dfrac{1}{\tan^2\theta}\right)\left(1+\dfrac{1}{\cot^2\theta}\right)=\dfrac{1}{\sin^2\theta-\sin^4\theta}$

ANSWER *

$\text{LHS}=(1+\cot^2\theta)(1+\tan^2\theta)=\operatorname{cosec}^2\theta\sec^2\theta$

$=\dfrac{1}{\sin^2\theta\cos^2\theta}=\dfrac{1}{\sin^2\theta(1-\sin^2\theta)}$

$=\dfrac{1}{\sin^2\theta-\sin^4\theta}=\text{RHS}$

Q194 Short Answer · 3 marks · Internal choice (OR) part — **2025** – 30/2/1

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

ANSWER *

$$\text{LHS}=\frac{(\operatorname{cosec}\theta-1)+(\operatorname{cosec}\theta+1)}{\sqrt{\operatorname{cosec}^2\theta-1}}=\frac{2\operatorname{cosec}\theta}{\sqrt{\cot^2\theta}}$$
$$=\frac{2\operatorname{cosec}\theta}{\cot\theta}\ (\theta \text{ acute})$$
$$=\frac{2}{\sin\theta}\times\frac{\sin\theta}{\cos\theta}=2\sec\theta=\text{RHS}$$

Q195 Short Answer · 3 marks · Internal choice (OR) part — **2025** – 30/2/2

Prove that : $\frac{\cot A-1}{2-\sec^2 A}=\frac{\cot A}{1+\tan A}$

ANSWER *

$$2-\sec^2 A=1-\tan^2 A=(1-\tan A)(1+\tan A);\ \cot A-1=\frac{1-\tan A}{\tan A}$$
$$\text{LHS}=\frac{1-\tan A}{\tan A(1-\tan A)(1+\tan A)}=\frac{1}{\tan A(1+\tan A)}$$
$$=\frac{\cot A}{1+\tan A}=\text{RHS}$$

Q196 Short Answer · 3 marks · Internal choice (OR) part — **2025** – 30/2/3

If $\operatorname{cosec}\theta=x+\frac{1}{4x}$, prove that $\operatorname{cosec}\theta+\cot\theta=2x$ or $\frac{1}{2x}$.

ANSWER *

$$\cot^2\theta=\operatorname{cosec}^2\theta-1=x^2+\frac{1}{2}+\frac{1}{16x^2}-1=\left(x-\frac{1}{4x}\right)^2$$
$$\Rightarrow\cot\theta=\pm\left(x-\frac{1}{4x}\right)$$
$$\operatorname{cosec}\theta+\cot\theta=x+\frac{1}{4x}+x-\frac{1}{4x}=2x \text{ or } x+\frac{1}{4x}-x+\frac{1}{4x}=\frac{1}{2x}$$

Q197 Short Answer · 3 marks · Internal choice (OR) part — **2025** – 30/3/1, 30/3/2, 30/3/3

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

ANSWER *

$$\text{LHS}=\frac{(\sec A-1)+(\sec A+1)}{\sqrt{\sec^2 A-1}}=\frac{2\sec A}{\sqrt{\tan^2 A}}=\frac{2\sec A}{\tan A}\ (\text{A acute})$$
$$=\frac{2}{\cos A}\times\frac{\cos A}{\sin A}$$
$$=\frac{2}{\sin A}=2\operatorname{cosec}A=\text{RHS}$$

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Q198 Short Answer · 3 marks Internal choice (OR) part **2025** – 30/4/1, 30/4/2, 30/4/3

Prove that $\dfrac{\cos A+\sin A-1}{\cos A-\sin A+1}=\operatorname{cosec} A-\cot A$

ANSWER *

Dividing numerator and denominator by $\sin A$: LHS $=\dfrac{\cot A+1-\operatorname{cosec} A}{\cot A-1+\operatorname{cosec} A}$

Numerator $=(\cot A-\operatorname{cosec} A)+(\operatorname{cosec}^2 A-\cot^2 A)=(\operatorname{cosec} A-\cot A)(\operatorname{cosec} A+\cot A-1)$

$\text{LHS}=\dfrac{(\operatorname{cosec} A-\cot A)(\operatorname{cosec} A+\cot A-1)}{\operatorname{cosec} A+\cot A-1}=\operatorname{cosec} A-\cot A=\text{RHS}$

Q199 Short Answer · 3 marks Internal choice (OR) part **2025** – 30/4/1, 30/4/2, 30/4/3

If $\cot\theta+\cos\theta=p$ and $\cot\theta-\cos\theta=q$, prove that $p^2-q^2=4\sqrt{pq}$

ANSWER *

$p^2-q^2=(p+q)(p-q)=2\cot\theta\times 2\cos\theta=4\cot\theta\cos\theta$

$pq=\cot^2\theta-\cos^2\theta=\cos^2\theta\left(\dfrac{1}{\sin^2\theta}-1\right)=\cos^2\theta\cot^2\theta$

$4\sqrt{pq}=4\cot\theta\cos\theta=p^2-q^2$

Q200 Short Answer · 3 marks Internal choice (OR) part **2025** – 30/5/1, 30/5/2, 30/5/3

Prove the following trigonometric identity : $\dfrac{1+\operatorname{cosec} A}{\operatorname{cosec} A}=\dfrac{\cos^2 A}{1-\sin A}$

ANSWER *

$\text{LHS}=\dfrac{1}{\operatorname{cosec} A}+1=\sin A+1$

$\text{RHS}=\dfrac{1-\sin^2 A}{1-\sin A}=\dfrac{(1-\sin A)(1+\sin A)}{1-\sin A}$

$=1+\sin A=\text{LHS}$

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Q201 Short Answer · 3 marks Internal choice (OR) part **2025** – 30/6/1, 30/6/2, 30/6/3

Prove that : $\dfrac{\cos\theta-2\cos^3\theta}{\sin\theta-2\sin^3\theta}+\cot\theta=0.$

ANSWER *

$\dfrac{\cos\theta(1-2\cos^2\theta)}{\sin\theta(1-2\sin^2\theta)}$

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

$\therefore \text{LHS}=-\cot\theta+\cot\theta=0=\text{RHS}$

Q202 Short Answer · 3 marks · Internal choice (OR) part — **2025** – 30/6/1, 30/6/2, 30/6/3

Given that $\sin\theta + \cos\theta = x$, prove that $\sin^4\theta + \cos^4\theta = \dfrac{2-(x^2-1)^2}{2}$.

ANSWER *

$x^2 = 1 + 2\sin\theta\cos\theta \Rightarrow \sin\theta\cos\theta = \dfrac{x^2-1}{2}$

$\sin^4\theta + \cos^4\theta = (\sin^2\theta + \cos^2\theta)^2 - 2\sin^2\theta\cos^2\theta = 1 - \dfrac{(x^2-1)^2}{2}$

$= \dfrac{2-(x^2-1)^2}{2} = \text{RHS}$

Q203 Short Answer · 3 marks · Internal choice (OR) part — **2026 (I)** – 30/5/2; **2026 (II)** – 30(B)

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

ANSWER

$\text{LHS} = \left(\dfrac{\sin A + \cos A - 1}{\sin A}\right)\left(\dfrac{\cos A + \sin A + 1}{\cos A}\right)$ — 1

$= \dfrac{(\sin A + \cos A)^2 - 1^2}{\sin A\cos A}$ — 1

$= \dfrac{\sin^2 A + \cos^2 A + 2\sin A\cos A - 1}{\sin A\cos A} = \dfrac{2\sin A\cos A}{\sin A\cos A} = 2 = \text{RHS}$ — 1

Q204 Short Answer · 3 marks · Internal choice (OR) part — **2026 (I)** – 30/3/1, 30/3/2, 30/3/3; **2026 (II)** – 30/7/3

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

> Since $\sin\theta + \cos\theta \le \sqrt{2}$ for every θ, no real angle actually satisfies $\sin\theta + \cos\theta = \sqrt{3}$; the result above is the algebraic working given in the marking scheme.

ANSWER

$(\sin\theta + \cos\theta)^2 = 3 \Rightarrow \sin^2\theta + \cos^2\theta + 2\sin\theta\cos\theta = 3$ — 1

$\Rightarrow 2\sin\theta\cos\theta = 2 \Rightarrow \sin\theta\cos\theta = 1$ ...(i) — 1

$\text{LHS} = \tan\theta + \cot\theta = \dfrac{\sin\theta}{\cos\theta} + \dfrac{\cos\theta}{\sin\theta} = \dfrac{\sin^2\theta + \cos^2\theta}{\sin\theta\cos\theta}$ — ½

$= \dfrac{1}{1} = 1 = \text{RHS (using (i))}$ — ½

Q205 Short Answer · 3 marks — **2026 (I)** – 30(B)

If $\cos A + \sin A = \sqrt{2}\cos A$, prove that $\cos A - \sin A = \sqrt{2}\sin A$.

ANSWER *

$\sin A = (\sqrt{2} - 1)\cos A$

$\Rightarrow \cos A = \dfrac{\sin A}{\sqrt{2}-1} = (\sqrt{2}+1)\sin A$

$\Rightarrow \cos A - \sin A = \sqrt{2}\sin A$

Q206 Short Answer · 3 marks | Internal choice (OR) part | **2026 (I)** – 30/1/1, 30/1/2, 30/1/3

If $x = h + a\cos\theta$, $y = k + b\sin\theta$, then prove that : $\left(\frac{x-h}{a}\right)^2 + \left(\frac{y-k}{b}\right)^2 = 1$

ANSWER *

$\frac{x-h}{a} = \cos\theta$ and $\frac{y-k}{b} = \sin\theta$

$\text{LHS} = \cos^2\theta + \sin^2\theta$

$= 1 = \text{RHS}$

Q207 Short Answer · 3 marks | Internal choice (OR) part | **2026 (I)** – 30/2/1, 30/2/2, 30/2/3

Prove that : $\frac{\sec^3\theta}{\sec^2\theta - 1} + \frac{\text{cosec}^3\theta}{\text{cosec}^2\theta - 1} = \sec\theta \cdot \text{cosec}\,\theta(\sec\theta + \text{cosec}\,\theta)$

ANSWER *

$\text{LHS} = \frac{\sec^3\theta}{\tan^2\theta} + \frac{\text{cosec}^3\theta}{\cot^2\theta} = \frac{1}{\cos\theta\sin^2\theta} + \frac{1}{\sin\theta\cos^2\theta}$

$= \frac{\cos\theta + \sin\theta}{\sin^2\theta\cos^2\theta} = \frac{1}{\sin\theta\cos\theta}\left(\frac{1}{\sin\theta} + \frac{1}{\cos\theta}\right)$

$= \sec\theta\,\text{cosec}\,\theta(\sec\theta + \text{cosec}\,\theta) = \text{RHS}$

Q208 Short Answer · 3 marks | Internal choice (OR) part | **2026 (I)** – 30/2/1, 30/2/2, 30/2/3

If $\frac{\sec\alpha}{\text{cosec}\,\beta} = p$ and $\frac{\tan\alpha}{\text{cosec}\,\beta} = q$, then prove that $(p^2 - q^2)\sec^2\alpha = p^2$.

ANSWER *

$p^2 - q^2 = \frac{\sec^2\alpha - \tan^2\alpha}{\text{cosec}^2\beta} = \frac{1}{\text{cosec}^2\beta}$

$(p^2 - q^2)\sec^2\alpha = \frac{\sec^2\alpha}{\text{cosec}^2\beta} = p^2$

Q209 Short Answer · 3 marks | Internal choice (OR) part | **2026 (I)** – 30/3/1, 30/3/2, 30/3/3

Prove that : $(\sin A + \sec A)^2 + (\cos A + \text{cosec}\,A)^2 = (1 + \sec A\,\text{cosec}\,A)^2$

ANSWER *

$\text{LHS} = \sin^2 A + \cos^2 A + \sec^2 A + \text{cosec}^2 A + 2(\tan A + \cot A)$

$\sec^2 A + \text{cosec}^2 A = \frac{\sin^2 A + \cos^2 A}{\sin^2 A\cos^2 A} = \sec^2 A\,\text{cosec}^2 A$; $\tan A + \cot A = \frac{1}{\sin A\cos A} = \sec A\,\text{cosec}\,A$

$\text{LHS} = 1 + 2\sec A\,\text{cosec}\,A + \sec^2 A\,\text{cosec}^2 A = (1 + \sec A\,\text{cosec}\,A)^2 = \text{RHS}$

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Q210 Short Answer · 3 marks **2026 (I)** – 30/4/3

If $\sec\theta + \tan\theta = m$, show that $\dfrac{m^2-1}{m^2+1} = \sin\theta$.

ANSWER *

$$m^2 = \left(\frac{1+\sin\theta}{\cos\theta}\right)^2 = \frac{(1+\sin\theta)^2}{1-\sin^2\theta} = \frac{1+\sin\theta}{1-\sin\theta}$$

$$\frac{m^2-1}{m^2+1} = \frac{(1+\sin\theta)-(1-\sin\theta)}{(1+\sin\theta)+(1-\sin\theta)}$$

$$= \frac{2\sin\theta}{2} = \sin\theta$$

Q211 Short Answer · 3 marks Internal choice (OR) part **2026 (II)** – 30(B)

Prove that : $\dfrac{\tan\theta+\sin\theta}{\tan\theta-\sin\theta} = \dfrac{\sec\theta+1}{\sec\theta-1}$

ANSWER

$$\text{LHS} = \frac{\frac{\sin\theta}{\cos\theta}+\sin\theta}{\frac{\sin\theta}{\cos\theta}-\sin\theta}$$ 1

$$= \frac{\sin\theta\left(\frac{1}{\cos\theta}+1\right)}{\sin\theta\left(\frac{1}{\cos\theta}-1\right)}$$ 1

$$= \frac{\sec\theta+1}{\sec\theta-1} = \text{RHS}$$ 1

Q212 Short Answer · 3 marks Internal choice (OR) part **2026 (II)** – 30/7/1, 30/7/2

Prove that : $\dfrac{\tan A-\cot A}{\sin A\cos A} = \tan^2 A - \cot^2 A$

ANSWER

$$\text{LHS} = \frac{\frac{\sin A}{\cos A}-\frac{\cos A}{\sin A}}{\sin A\cos A}$$ ½

$$= \frac{1}{\cos^2 A}-\frac{1}{\sin^2 A}$$ 1

$$= \sec^2 A - \operatorname{cosec}^2 A$$ ½

$$= (1+\tan^2 A)-(1+\cot^2 A) = \tan^2 A - \cot^2 A = \text{RHS}$$ 1

Q213 Long Answer · 5 marks Internal choice (OR) part **2023** – 30/C/1

(i) Prove that : $\sqrt{\sec^2\theta + \operatorname{cosec}^2\theta} = \tan\theta + \cot\theta$

(ii) Evaluate : $\dfrac{\cos 45^\circ}{\sec 30^\circ + \operatorname{cosec} 30^\circ}$

ANSWER

(i) LHS $= \sqrt{1+\tan^2\theta+1+\cot^2\theta}$ — 1

$= \sqrt{\tan^2\theta+\cot^2\theta+2\tan\theta\cot\theta} = \sqrt{(\tan\theta+\cot\theta)^2}$ — 1

$= \tan\theta+\cot\theta = \text{RHS}$ — ½

(ii) $= \dfrac{\frac{1}{\sqrt{2}}}{\frac{2}{\sqrt{3}}+2}$ — 1

$= \dfrac{\sqrt{3}}{2\sqrt{2}(1+\sqrt{3})} \times \dfrac{\sqrt{2}}{\sqrt{2}}$ — ½

$= \dfrac{\sqrt{6}}{4(1+\sqrt{3})} \times \dfrac{(1-\sqrt{3})}{(1-\sqrt{3})}$ — ½

$= \dfrac{3\sqrt{2}-\sqrt{6}}{8}$ — ½

(ii) $\dfrac{3\sqrt{2}-\sqrt{6}}{8}$

Q214 Long Answer · 5 marks · Internal choice (OR) part — **2023** – 30/C/1

If $x\sin^3\theta + y\cos^3\theta = \sin\theta\cos\theta$ and $x\sin\theta = y\cos\theta$, prove that $x^2+y^2=1$.

ANSWER

$x\sin\theta(\sin^2\theta) + y\cos\theta(\cos^2\theta) = \sin\theta\cos\theta \Rightarrow x\sin\theta(\sin^2\theta) + x\sin\theta(\cos^2\theta) = \sin\theta\cos\theta$ — 1

$\Rightarrow x\sin\theta(\sin^2\theta+\cos^2\theta) = \sin\theta\cos\theta$ — 1

$\Rightarrow x = \cos\theta$ — 1

Given $x\sin\theta = y\cos\theta \Rightarrow \cos\theta\sin\theta = y\cos\theta \Rightarrow y = \sin\theta$ — 1

LHS $= x^2+y^2 = \cos^2\theta+\sin^2\theta = 1 = \text{RHS}$ — 1

Q215 Long Answer · 5 marks · Internal choice (OR) part — **2023** – 30/C/3; **2025** – 30/2/2

If $\tan\theta+\sin\theta = m$ and $\tan\theta-\sin\theta = n$, then show that $(m^2-n^2) = 4\sqrt{mn}$.

ANSWER

LHS $= m^2-n^2 = (\tan\theta+\sin\theta)^2 - (\tan\theta-\sin\theta)^2$

$= (\tan^2\theta+\sin^2\theta+2\tan\theta\sin\theta) - (\tan^2\theta+\sin^2\theta-2\tan\theta\sin\theta)$ — 1

$= 4\tan\theta\sin\theta$ — 1

RHS $= 4\sqrt{mn} = 4\sqrt{(\tan\theta+\sin\theta)(\tan\theta-\sin\theta)} = 4\sqrt{\tan^2\theta-\sin^2\theta}$ — 1

$= 4\sqrt{\dfrac{\sin^2\theta}{\cos^2\theta}-\sin^2\theta} = 4\sqrt{\dfrac{\sin^2\theta(1-\cos^2\theta)}{\cos^2\theta}}$ — 1

$= 4\dfrac{\sin\theta\sin\theta}{\cos\theta} = 4\tan\theta\sin\theta; \therefore \text{LHS} = \text{RHS}$ — 1

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REFERENCES

Questions: CBSE Previous Year Question Papers – www.cbse.gov.in/cbsenew/question-paper.html

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