

Question Bank (MATHEMATICS)

Chapter-8 TRIGONOMETRY

1 marks:

1. If $2 \tan A = 3$, then the value of $\frac{4 \sin A + 3 \cos A}{4 \sin A - 3 \cos A}$ is **[BOARD 2023]**
- a) $\frac{7}{\sqrt{13}}$ b) $\frac{1}{\sqrt{13}}$ c) 3 d) doesn't exist
2. If $\tan \theta = \frac{5}{12}$ then the value of $\frac{\sin \theta + \cos \theta}{\sin \theta - \cos \theta}$ is **[BOARD 2023]**
- a) $\frac{-17}{7}$ b) $\frac{17}{7}$ c) $\frac{17}{13}$ d) $\frac{-7}{13}$
3. If $\tan \theta = \frac{x}{y}$ then $\cos \theta$ is **[BOARD 2023]**
- a) $\frac{x}{\sqrt{x^2 + y^2}}$ b) $\frac{x}{\sqrt{x^2 - y^2}}$ c) $\frac{y}{\sqrt{x^2 + y^2}}$ d) $\frac{y}{\sqrt{x^2 - y^2}}$
4. If $\sin A = \frac{2}{3}$ then value of $\cot A$ is **[BOARD 2024]**
- a) $\frac{\sqrt{5}}{2}$ b) $\frac{3}{2}$ c) $\frac{5}{4}$ d) $\frac{2}{3}$
5. If $\sin \theta = \cos \theta$, ($0^\circ < \theta < 90^\circ$) then the value of $\sec \theta \sin \theta$ is **[BOARD 2024]**
- a) $\frac{1}{\sqrt{2}}$ b) $\sqrt{2}$ c) 1 d) 0
6. If $\sec \theta - \tan \theta = \frac{1}{3}$, then the value of $(\sec \theta + \tan \theta)$ is **[BOARD 2023]**
- a) $\frac{4}{3}$ b) $\frac{2}{3}$ c) $\frac{1}{3}$ d) 3
7. If $\sec \theta - \tan \theta = m$, then the value of $(\sec \theta + \tan \theta)$ is **[BOARD 2024]**
- a) $1 - \frac{1}{m}$ b) $m^2 - 1$ c) $\frac{1}{m}$ d) $-m$
8. If $\cos(\alpha + \beta) = 0$ then the value of $\cos\left(\frac{\alpha + \beta}{2}\right)$ is **[BOARD 2024]**
- a) $\frac{1}{\sqrt{2}}$ b) $\frac{1}{2}$ c) 0 d) $\sqrt{2}$
9. If ΔABC is a right triangle at C, then the value of $\cos(A + B)$ is
- a) 0 b) 1 c) $\frac{1}{2}$ d) $\frac{\sqrt{3}}{2}$
10. If $\cos \theta = \frac{\sqrt{3}}{2}$ and $\sin \varphi = \frac{1}{2}$ then $\tan(\theta + \varphi)$ is **[BOARD 2024]**
- a) $\sqrt{3}$ b) $\frac{1}{\sqrt{3}}$ c) 1 d) not defined
11. If $\sin \theta + \cos \theta = \sqrt{2}$ then $\tan \theta + \cot \theta =$
- a) 1 b) 2 c) 3 d) 4

12. $\left[\frac{3}{4}\tan^2 30^\circ - \sec^2 45^\circ + \sin^2 60^\circ\right]$ is equal to **[BOARD 2023]**
 a) -1 b) $\frac{5}{6}$ c) $\frac{-3}{2}$ d) $\frac{1}{6}$
13. $\left[\frac{5}{8}\sec^2 60^\circ - \tan^2 60^\circ + \cos^2 45^\circ\right]$ is equal to **[BOARD 2023]**
 a) 0 b) $\frac{-5}{3}$ c) $\frac{-1}{2}$ d) $\frac{-1}{4}$
14. $\left(\frac{2\tan 30^\circ}{1+\tan^2 30^\circ}\right)$ is equal to **[BOARD 2023]**
 a) $\sin 60^\circ$ b) $\cos 60^\circ$ c) $\tan 60^\circ$ d) $\sin 30^\circ$
15. $\left(\frac{1-\tan^2 30^\circ}{1+\tan^2 30^\circ}\right)$ is equal to **[BOARD 2023]**
 a) $\sin 60^\circ$ b) $\cos 60^\circ$ c) $\tan 60^\circ$ d) $\cos 30^\circ$
16. If $x \tan 60^\circ \cos 60^\circ = \sin 60^\circ \cot 60^\circ$, then x is
 a) $\cos 30^\circ$ b) $\tan 30^\circ$ c) $\sin 30^\circ$ d) $\cot 30^\circ$
17. Simplified form of $\frac{\cos^2 \theta}{\sin^2 \theta} - \frac{1}{\sin^2 \theta}$ is **[BOARD 2023]**
 a) $\tan^2 \theta$ b) $\sec^2 \theta$ c) 1 d) -1
18. Simplified form of $(\cos^4 A - \sin^4 A)$ is **[BOARD 2023]**
 a) $2 \sin^2 A - 1$ b) $2 \sin^2 A + 1$ c) $2 \cos^2 A + 1$ d) $2 \cos^2 A - 1$
19. $\sec \theta$ when expressed in terms of $\cot \theta$ is equal to **[BOARD 2023]**
 a) $\frac{1+\cot^2 \theta}{\cot \theta}$ b) $\frac{\sqrt{1+\cot^2 \theta}}{\cot \theta}$ c) $\sqrt{1+\cot^2 \theta}$ d) $\frac{\sqrt{1-\cot^2 \theta}}{\cot \theta}$
20. Which of the following is true for all values of θ ($0^\circ \leq \theta \leq 90^\circ$)? **[BOARD 2023]**
 a) $\cos^2 \theta - \sin^2 \theta = 1$ c) $\operatorname{cosec}^2 \theta - \sec^2 \theta = 1$
 b) $\sec^2 \theta - \tan^2 \theta = 1$ d) $\cot^2 \theta - \tan^2 \theta = 1$
21. If θ is an acute angle of a right angled triangle, then which of the following equation is not true? **[BOARD 2023]**
 a) $\sin \theta \cot \theta = \cos \theta$ c) $\cos \theta \tan \theta = \sin \theta$
 b) $\operatorname{cosec}^2 \theta - \cot^2 \theta = 1$ d) $\tan^2 \theta - \sec^2 \theta = 1$
22. If $x = p \sec \theta$ and $y = q \tan \theta$ then
 a) $x^2 - y^2 = p^2 q^2$ c) $x^2 q^2 - y^2 p^2 = pq$
 b) $x^2 q^2 - y^2 p^2 = \frac{1}{p^2 q^2}$ d) $x^2 q^2 - y^2 p^2 = p^2 q^2$
23. $(\sec^2 \theta - 1)(\operatorname{cosec}^2 \theta - 1)$ is equal to **[BOARD 2023]**
 a) -1 b) 1 c) 0 d) 2

24. $2 \cos^2 \theta (1 + \tan^2 \theta)$ is equal to **[COMPARTMENT 2023]**

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

25. If $\frac{x}{3} = 2 \sin A$, $\frac{y}{3} = 2 \cos A$ then the value of $x^2 + y^2$ is **[BOARD 2024]**

- a) 36 b) 9 c) 6 d) 18

26. If $x \sin^3 \theta + y \cos^3 \theta = \sin \theta \cos \theta$ and $x \sin \theta = y \cos \theta$ then $x^2 + y^2$ is

- a) 0 b) $\frac{1}{2}$ c) 1 d) $\frac{3}{2}$

27. If $x = a \cos \theta$ and $y = b \sin \theta$ then the value of $b^2 x^2 + a^2 y^2$ is **[BOARD 2024]**

- a) $a^2 b^2$ b) ab c) $a^4 b^4$ d) $a^2 + b^2$

Options for Assertion and Reasoning Questions:

- a) Both assertion(A) and reason(R) are true and reason(R) is the correct explanation of assertion(A)
- b) Both assertion(A) and reason(R) are true but reason(R) is not the correct explanation of assertion(A)
- c) Assertion (A) is true but reason (R) is false
- d) Assertion (A) is false but reason (R) is true

28. **Assertion (A):** For $0 < \theta \leq 90^\circ$, $\operatorname{cosec} \theta - \cot \theta$ and $\operatorname{cosec} \theta + \cot \theta$ are reciprocal of each other.

Reason (R): $\operatorname{cosec}^2 \theta - \cot^2 \theta = 1$. **[BOARD 2023]**

29. **Assertion (A):** If $\sin A = \frac{1}{3}$ ($0^\circ < A < 90^\circ$) then the value of $\cos A$ is $\frac{2\sqrt{2}}{3}$.

Reason (R): For every angle θ , $\sin^2 \theta + \cos^2 \theta = 1$. **[BOARD 2024]**

2 marks:

1. Find an acute angle θ when $\frac{\cos \theta - \sin \theta}{\cos \theta + \sin \theta} = \frac{1 - \sqrt{3}}{1 + \sqrt{3}}$.

2. Find the value of $\cos 2\theta$ if $2 \sin 2\theta = \sqrt{3}$.

3. If $\sqrt{3} \sin \theta - \cos \theta = 0$ and $0^\circ < \theta < 90^\circ$, find the value of θ .

4. If $\sin \theta + \cos \theta = \sqrt{3}$, then find the value of $\sin \theta \cos \theta$. **[BOARD 2023]**

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

[BOARD 2023]

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

[BOARD 2023]

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

[BOARD 2023]

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

[BOARD 2023]

9. If $\cos A + \cos^2 A = 1$, then find the value of $\sin^2 A + \sin^4 A$. [BOARD 2023]

10. If $\tan \theta = \frac{1}{\sqrt{7}}$ then show that $\frac{\operatorname{cosec}^2 \theta - \sec^2 \theta}{\operatorname{cosec}^2 \theta + \sec^2 \theta} = \frac{3}{4}$. [BOARD 2023]

11. If $4 \cot^2 45^\circ - \sec^2 60^\circ + \sin^2 60^\circ + p = \frac{3}{4}$, then find the value of p . [BOARD 2023]

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

13. Evaluate: $\frac{5 \cos^2 60^\circ + 4 \sec^2 30^\circ - \tan^2 45^\circ}{\sin^2 30^\circ + \cos^2 30^\circ}$. [BOARD 2023 & BOARD 2024]

14. Evaluate: $\frac{5}{\cot^2 30^\circ} + \frac{1}{\sin^2 60^\circ} - \cot^2 45^\circ + 2 \sin^2 90^\circ$. [BOARD 2023]

15. Evaluate: $2 \sec^2 \theta + 3 \operatorname{cosec}^2 \theta - 2 \sin \theta \cos \theta$ if $\theta = 45^\circ$. [BOARD 2023]

16. Evaluate: $2\sqrt{2} \cos 45^\circ \sin 30^\circ + 2\sqrt{3} \cos 30^\circ$. [BOARD 2024]

17. If A and B are acute angles such that $\sin(A - B) = 0$ and $2 \cos(A + B) - 1 = 0$, then find the angles A and B . [BOARD 2023]

18. If $2 \sin(A + B) = \sqrt{3}$ and $\cos(A - B) = 1$ then find A and B . [BOARD 2024]

19. If $a \cos \theta + b \sin \theta = m$ and $a \sin \theta - b \cos \theta = n$, then prove that $a^2 + b^2 = m^2 + n^2$. [BOARD 2023]

20. Prove that $\sqrt{\frac{\sec A - 1}{\sec A + 1}} + \sqrt{\frac{\sec A + 1}{\sec A - 1}} = 2 \operatorname{cosec} A$. [BOARD 2023]

21. If $A = 60^\circ$ and $B = 30^\circ$, verify that $\sin(A + B) = \sin A \cos B + \cos A \sin B$. [BOARD 2024]

3 marks:

1. Prove that $\frac{\tan \theta + \sec \theta - 1}{\tan \theta - \sec \theta + 1} = \frac{1 + \sin \theta}{\cos \theta}$. [BOARD 2023]

2. Prove that $\frac{1 + \sec \theta - \tan \theta}{1 + \sec \theta + \tan \theta} = \frac{1 - \sin \theta}{\cos \theta}$. [BOARD 2024]

3. Prove that $\frac{\sin \theta - \cos \theta + 1}{\sin \theta + \cos \theta - 1} = \frac{1}{\sec \theta - \tan \theta}$. [BOARD 2024]

4. Prove that $\frac{\cot \theta + \operatorname{cosec} \theta - 1}{\cot \theta - \operatorname{cosec} \theta + 1} = \frac{1 + \cos \theta}{\sin \theta}$.

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

6. Prove that $(\operatorname{cosec} A - \sin A)(\sec A - \cos A) = \frac{1}{\cot A + \tan A}$.

[BOARD 2023 & BOARD 2024]

7. Prove that $2(\sin^6 \theta + \cos^6 \theta) - 3(\sin^4 \theta + \cos^4 \theta) + 1 = 0$. [BOARD 2023]

8. Prove that $\sin^6 \theta + \cos^6 \theta = 1 - 3 \sin^2 \theta \cos^2 \theta$. [BOARD 2024]

9. Prove that $\left(\frac{1}{\cos \theta} - \cos \theta\right)\left(\frac{1}{\sin \theta} - \sin \theta\right) = \frac{1}{\tan \theta + \cot \theta}$. [BOARD 2023]

10. Prove that $\frac{\sin \theta}{1+\cos \theta} + \frac{1+\cos \theta}{\sin \theta} = 2 \operatorname{cosec} \theta$. [BOARD 2023 & BOARD 2024]
11. Prove that $\frac{\cos^2 \theta}{1-\tan \theta} + \frac{\sin^3 \theta}{\sin \theta - \cos \theta} = 1 + \sin \theta \cos \theta$. [BOARD 2023]
12. Prove that $\frac{\tan^3 \theta}{1+\tan^2 \theta} + \frac{\cot^3 \theta}{1+\cot^2 \theta} = \sec \theta \operatorname{cosec} \theta - 2 \sin \theta \cos \theta$.
13. Prove that $\frac{\tan \theta - \cot \theta}{\sin \theta \cos \theta} = \sec^2 \theta - \operatorname{cosec}^2 \theta$. [BOARD 2024]
14. Prove that $\frac{\sin A - 2 \sin^3 A}{2 \cos^3 A - \cos A} = \tan A$. [BOARD 2023 & BOARD 2024]
15. Prove that $\frac{\sin A + \cos A}{\sin A - \cos A} + \frac{\sin A - \cos A}{\sin A + \cos A} = \frac{2}{2 \sin^2 A - 1}$. [BOARD 2024]
16. Prove that $\sec A (1 - \sin A)(\sec A + \tan A) = 1$. [BOARD 2023]
17. Prove that $(\sin \theta + \cos \theta)(\tan \theta + \cot \theta) = \sec \theta + \operatorname{cosec} \theta$. [BOARD 2023]
18. Prove that $(\sin \theta + \operatorname{cosec} \theta)^2 + (\cos \theta + \sec \theta)^2 = 7 + \tan^2 \theta + \cot^2 \theta$.
19. Prove that $\frac{\tan \theta}{1-\cot \theta} + \frac{\cot \theta}{1-\tan \theta} = 1 + \sec \theta \operatorname{cosec} \theta$. [BOARD 2023 & BOARD 2024]
20. Prove that $\frac{\tan A}{1+\sec A} - \frac{\tan A}{1-\sec A} = 2 \operatorname{cosec} A$. [BOARD 2023]
21. Prove that $\frac{\tan^2 A}{\tan^2 A - 1} + \frac{\operatorname{cosec}^2 A}{\sec^2 A - \operatorname{cosec}^2 A} = \frac{1}{1 - 2 \cos^2 A}$.
22. Prove that $\frac{1+\sec A}{\sec A} = \frac{\sin^2 A}{1-\cos A}$. [BOARD 2023]
23. Prove that $\frac{\operatorname{cosec}^2 \theta - \sec^2 \theta}{\operatorname{cosec}^2 \theta + \sec^2 \theta} = \frac{3}{4}$ if $\tan \theta = \frac{1}{\sqrt{7}}$. [BOARD 2024]
24. Prove that $\sqrt{\frac{1-\cos A}{1+\cos A}} = \operatorname{cosec} A - \cot A$.
25. If $\sin \theta + \cos \theta = p$ and $\sec \theta + \operatorname{cosec} \theta = q$, then prove that $q(p^2 - 1) = 2p$. [BOARD 2023]
26. If $1 + \sin^2 \theta = 3 \sin \theta \cos \theta$, then prove that $\tan \theta = 1$ or $\frac{1}{2}$.
27. If $\sin \theta + \cos \theta = \sqrt{2}$ then prove that $\tan \theta + \cot \theta = 2$.

5 marks:

1. (a) Prove that $\sqrt{\sec^2 \theta + \operatorname{cosec}^2 \theta} = \tan \theta + \cot \theta$.
 (b) Evaluate: $\frac{\cos 45^\circ}{\sec 30^\circ + \operatorname{cosec} 30^\circ}$. [COMPARTMENT 2023 & BOARD 2024]
2. If $x \sin^3 \theta + y \cos^3 \theta = \sin \theta \cos \theta$ and $x \sin \theta = y \cos \theta$ then prove that $x^2 + y^2 = 1$. [COMPARTMENT 2023]
3. Prove that $\frac{1+\sin \theta}{1-\sin \theta} - \frac{1-\sin \theta}{1+\sin \theta} = 4 \tan \theta \sec \theta$. [COMPARTMENT 2023]

4. Prove that $\frac{\sin \theta}{\cot \theta + \operatorname{cosec} \theta} = 2 + \frac{\sin \theta}{\cot \theta - \operatorname{cosec} \theta}$.

5. Evaluate: $\frac{\tan^2 60^\circ + 4 \sin^2 45^\circ + 3 \sec^2 60^\circ + 5 \cos^2 90^\circ}{\operatorname{cosec} 30^\circ + \sec 60^\circ - \cot^2 30^\circ}$.

[COMPARTMENT 2023]

6. If $\tan \theta + \sin \theta = m$ and $\tan \theta - \sin \theta = n$, then show that $(m^2 - n^2) = 4\sqrt{mn}$.

[COMPARTMENT 2023]

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

[COMPARTMENT 2023]

8. If $\sec \theta = x + \frac{1}{4x}$, $x \neq 0$ then find $(\sec \theta + \tan \theta)$.

9. If $15 \tan^2 \theta + 4 \sec^2 \theta = 23$, then find the value of $(\sec \theta + \operatorname{cosec} \theta)^2 - \sin^2 \theta$.

10. If $\sqrt{3} \cot^2 \theta - 4 \cot \theta + \sqrt{3} = 0$ then find the value of $\cot^2 \theta + \tan^2 \theta$.