# INDIAN SCHOOL AL WADI AL KABIR

**Class X**, Mathematics

***Worksheet- Trigonometric functions***

**30 - 07 - 2026**

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| Q1. | The greatest value of sin x cos x is : | | | | | | | |
| | A | 1 | B | 2 | C | $\sqrt{2}$ | | 1/2 |
| Q2. | If sin θ + cosec θ = 2, then $\sin^2\theta + \text{cosec}^2\theta$ is equal to : | | | | | | | |
| | A | 2 | B | 0 | C | 4 | D | 1/2 |
| Q3. | If tan θ = ½ and tan φ = 1/3 then the value of θ + φ is : | | | | | | | |
| | A | π/6 | B | π/3 | C | π/2 | D | π |
| Q4. | The value of tan 1° × tan 2° × tan 3° ..... tan 89° is : | | | | | | | |
| | A | 0 | B | 1 | C | 1/2 | D | Not defined |
| Q5. | The value of cos 1° × cos 2° × cos 3° ..... cos 179° is: | | | | | | | |
| | A | $1/\sqrt{2}$ | B | 0 | C | 1 | D | -1 |
| Q6. | The value of $\frac{(1-\tan^2 15°)}{(1+\tan^2 15°)}$ | | | | | | | |
| | A | $1/\sqrt{2}$ | B | $\sqrt{3}/2$ | C | $2/\sqrt{3}$ | D | $\sqrt{2}$ |
| Q7. | The value of sin 50° - sin 70° + sin 10° is equal to | | | | | | | |
| | A | 0 | B | 1 | C | ½ | D | 2 |
| Q8. | If $\alpha + \beta = \pi/4$, then value of $(1 + \tan\alpha)(1 + \tan\beta)$ is | | | | | | | |
| | A | 12 | B | 2 | C | -2 | D | 0 |
| Q9. | The value of $\cos^2 48° - \sin^2 12°$ is | | | | | | | |
| | A | $\frac{\sqrt{5}+1}{8}$ | B | $\frac{\sqrt{5}-1}{8}$ | C | $\frac{\sqrt{5}+1}{5}$ | D | $\frac{\sqrt{5}+1}{2\sqrt{2}}$ |

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| Q10. | $\cos x = \left(\frac{1}{2}\right)\left(a + \frac{1}{a}\right)$, then cos 3x is | | | | | | | |
| | A | $\left(\frac{1}{2}\right)\left(a^3 + \frac{1}{a^3}\right)$ | B | $\left(\frac{3}{2}\right)\left(a^3 + \frac{1}{a^3}\right)$ | C | $\left(\frac{1}{2}\right)\left(a^3 - \frac{1}{a^3}\right)$ | D | $\left(\frac{3}{2}\right)\left(a^3 - \frac{1}{a^3}\right)$ |
| Q11. | If cos x = -1/2 and $0 < x < 2\pi$, then solutions are: | | | | | | | |
| | A | $x = \pi/3, 4\pi/3$ | B | $x = 2\pi/3, 4\pi/3$ | C | $x = 2\pi/3, 7\pi/6$ | D | $x = 2\pi/3, \pi/3$ |
| Q12. | If $\pi/4 < x < \pi/2$, then write the value of $\sqrt{1 - \sin 2x}$ is: | | | | | | | |
| | A | cos x - sin x | B | cos x + sin x | C | sin x - cos x | D | 2 |
| Q13. | If sin x + cos x = a, then the value of \|sin x - cos x\| is: | | | | | | | |
| | A | $\sqrt{(2 - a^2)}$ | B | $\sqrt{(a^2 - 2)}$ | C | $\sqrt{(a^2 + 2)}$ | D | 1 |
| Q14. | The value of $\frac{\sin 50^\circ}{\sin 130^\circ}$ is: | | | | | | | |
| | A | 1 | B | -1 | C | 0 | D | -2 |
| Q15. | If 3 sin x + 4 cos x = 5, then 4 sin x - 3 cos x is: | | | | | | | |
| | A | 0 | B | -1 | C | 7 | D | 12 |
| Q16. | If cos(A - B) = 3/5 and tan A tan B = 2, then the value of cos A cos B is | | | | | | | |
| | A | 1/2 | B | 2/5 | C | 1/5 | D | 3/2 |
| Q17. | If A + B = π/3 and cos A + cos B = 1, then the value of $\cos\left(\frac{A - B}{2}\right)$ is | | | | | | | |
| | A | $\frac{1}{\sqrt{3}}$ | B | $\frac{2}{\sqrt{3}}$ | C | $-\frac{2}{\sqrt{3}}$ | D | $-\frac{1}{\sqrt{3}}$ |
| Q18. | Assertion (A): The value of sin(-780°) is equal to $-\frac{\sqrt{3}}{2}$.<br>Reason (R): For any integer n, sin(2nπ - θ) = -sin θ and $\sin(60^\circ) = \sqrt{3}/2$. | | | | | | | |
| | 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. | | |
| Q19. | Assertion (A): The principal value of radian measure corresponding to -37°30 is -5π/24 radians.<br>Reason (R): To convert degree measure into radian measure, we multiply the degree measure by 180/π. | | | | | | | |

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| | C | Assertion (A) is true but Reason (R) is false. | D | Assertion (A) is false but Reason (R) is true. |
| Q20. | Assertion (A): The maximum value of the function $f(x) = 3 \sin x + 4 \cos x + 5$ is 10.<br>Reason (R): The range of the trigonometric expression $a \sin x + b \cos x$ is<br>$[-\sqrt{((a^2 + b^2))}, \sqrt{(a^2 + b^2)}\ ]$ | | | |
| | 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. |
| | **Answer the following questions** | | | |
| Q21. | Find the length of an arc of a circle of radius 5 cm subtending a central angle measuring 15°. | | | |
| Q22. | If $\sin A = 3/5$ and $\pi/2 < A < \pi$, find cos A and sin 2A. | | | |
| Q23. | What is the sign of $\cos(x/2) - \sin(x/2)$ when:<br>(i) $0 < x < \pi/4$<br>(ii) $\frac{\pi}{2} / < x < \pi$ | | | |
| Q24. | Prove that $\cos 510° \cos 330° + \sin 390° \cos 120° = -1$. | | | |
| Q25. | Find the angle in radians between the hands of a clock at 7 : 20 PM. | | | |
| Q26. | If $\cot \alpha = 1/2$, $\sec \beta = -5/3$ where $\pi < \alpha < 3\pi/2$ and $\pi/2 < \beta < \pi$. Find the value of $\tan(\alpha + \beta)$. | | | |
| Q27. | If $\tan A = \frac{a}{(a+1)}$ and $\tan B = \frac{1}{(2a+1)}$, then find the value of A + B. | | | |
| Q28. | A horse is tied to a post by a rope. If the horse moves along a circular path, always keeping the rope tight and describes 88 metres when it traces 72° at the centre, find the length of the rope. | | | |
| Q29. | Prove that $\sin 10° \sin 30° \sin 50° \sin 70° = 1/16$. | | | |
| Q30. | If $f(x) = \frac{\cot x}{(1 + \cot x)}$ and $\alpha + \beta = 5\pi/4$, then find $f(\alpha) \cdot f(\beta)$. | | | |
| Q31. | Prove that $\tan 70° = \tan 20° + 2 \tan 50°$. | | | |

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| Q32. | Prove that $\tan 13x = \tan 4x + \tan 9x + \tan 4x \tan 9x \tan 13x$. |
| Q33. | Prove that: $\frac{(\tan 50° + \tan 30°)}{(\tan 50° - \tan 30°)} = 4 \cos 20° \cos 40°$. |
| Q34. | Prove that: $\cos 20° \cos 40° \cos 80° = 1/8$. |

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**ANSWER KEY**

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| 1 | D | 2 | A | 3 | C | 4 | B |
| 5 | B | 6 | A | 7 | A | 8 | B |
| 9 | A | 10 | A | 11 | B | 12 | C |
| 13 | A | 14 | A | 15 | A | 16 | C |
| 17 | A | 18 | A | 19 | C | 20 | A |

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| 21 | • Convert θ to radians: θ = 15° × (π /180°) = π / 12 rad.<br>• Arc length l = r · θ = 5 × (π / 12) = 5π / 12 cm ≈ 1.31 cm.<br>• Final Answer: 5π / 12 cm (or 1.31cm) | 22 | • cos A is negative: cos A = -√(1- sin²A) = -√(1 - 9/25) = -4/5.<br>• sin 2A = 2 sin A cos A = 2 × (3/5) × (- 4/5) = -24/25.<br>• Final Answer: cos A = -4/5, sin 2A = - 24/25 |

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| 23 | • (i) $0 < x < \pi/4 \Rightarrow 0 < x/2 < \pi/8$. Here $\cos(x/2) > \sin(x/2)$, so sign is Positive (+).<br>• (ii) $\pi/2 < x < \pi \Rightarrow \pi/4 < x/2 < \pi/2$. Here $\sin(x/2) > \cos(x/2)$, so sign is Negative (-).<br>• Final Answer: (i) Positive (+), (ii) Negative (-) | 24 | • LHS = $\cos(360° + 150°) \cos(360° - 30°) + \sin(360° + 30°) \cos(180° - 60°) = \cos 150° \cos 30° + \sin 30° (-\cos 60°)$<br>$= (-\sqrt{3}/2)(\sqrt{3}/2) + (1/2)(-1/2) = -3/4 - 1/4 = -1$<br>= RHS. (Proved) |
| 25 | • Hour hand position at 7:20 = 7 + 20/60 = 22/3 hours = $(22/3) \times 30° = 220°$.<br>• Minute hand position at 20 min = $20 \times 6° = 120°$.<br>• Angle $\theta = \|220° - 120°\| = 100°$.<br>• In radians: $\theta = 100° \times (\pi / 180°) = 5\pi / 9$ radians.<br>• Final Answer: $5\pi / 9$ radians (or 100°) | 26 | • $\cot \alpha = 1/2 \Rightarrow \tan \alpha = 2$.<br>• $\sec \beta = -5/3 \Rightarrow \cos \beta = -3/5 \Rightarrow \tan \beta = -4/3$ (since $\beta$ is in Q2, tan is negative).<br>• $\tan(\alpha + \beta) = (\tan \alpha + \tan \beta) / (1 - \tan \alpha \tan \beta) = (2 - 4/3) / (1 - 2(-4/3)) = (2/3) / (1 + 8/3) = (2/3) / (11/3) = 2/11$.<br>• Final Answer: 2/11 |
| 27 | • $\tan(A + B) = (\tan A + \tan B) / (1 - \tan A \tan B) = [a/(a+1) + 1/(2a+1)] / [1 - a/((a+1)(2a+1))] = [a(2a+1) + (a+1)] / [(a+1)(2a+1) - a] = (2a^2 + 2a + 1) / (2a^2 + 2a + 1) = 1$.<br>• Since $\tan(A + B) = 1 \Rightarrow A + B = \pi/4$ (or 45°).<br>• Final Answer: $\pi/4$ | 28 | • $\theta = 72° \times (\pi / 180°) = 2\pi / 5$ rad.<br>• $l = r \cdot \theta \Rightarrow 88 = r \times (2 \times 22 / (7 \times 5)) = r \times (44 / 35)$.<br>• $r = (88 \times 35) / 44 = 2 \times 35 = 70$ metres.<br>• Final Answer: 70 m |
| 29 | • Note $\sin 30° = 1/2$.<br>• Expression = $(1/2) [\sin 10° \sin 50° \sin 70°] = (1/2) [\sin 10° \cos 40° \cos 20°]$ Using identity $\sin \theta \sin(60°-\theta) \sin(60°+\theta) = (1/4) \sin 3\theta$: $\sin 10° \sin 50° \sin 70° = (1/4) \sin 30° = 1/8$.<br>• Product = $(1/2) \times (1/8) = 1/16$. (Proved) | 30 | • $f(x) = 1 / (\tan x + 1)$.<br>• Given $\alpha + \beta = 5\pi/4 \Rightarrow \tan(\alpha + \beta) = \tan(\pi + \pi/4) = 1$.<br>$\Rightarrow (\tan \alpha + \tan \beta) / (1 - \tan \alpha \tan \beta) = 1$<br>$\Rightarrow \tan \alpha + \tan \beta + \tan \alpha \tan \beta = 1$.<br>$\Rightarrow (1 + \tan \alpha)(1 + \tan \beta) = 2$.<br>• $f(\alpha) \cdot f(\beta) = 1 / [(1 + \tan \alpha)(1 + \tan \beta)] = 1 / 2$.<br>• Final Answer: 1/2 |
| 31 | • Write $70° = 50° + 20° \Rightarrow \tan 70° = \tan(50° + 20°) = (\tan 50° + \tan 20°) / (1 - \tan 50° \tan 20°)$.<br>• $\tan 70° (1 - \tan 50° \tan 20°) = \tan 50° + \tan 20°$.<br>• $\tan 70° - \tan 70° \tan 50° \tan 20° = \tan 50° + \tan 20°$.<br>• Since $\tan 70° \tan 20° = \tan 70° \cot 70° = 1$, we get: $\tan 70° - \tan 50° = \tan 50° + \tan 20° \Rightarrow \tan 70° = \tan 20° + 2 \tan 50°$. (Proved) | 32 | • Write $13x = 9x + 4x$.<br>• $\tan 13x = \tan(9x + 4x) = (\tan 9x + \tan 4x) / (1 - \tan 9x \tan 4x)$.<br>• Cross-multiplying: $\tan 13x (1 - \tan 9x \tan 4x) = \tan 9x + \tan 4x$<br>• $\tan 13x - \tan 13x \tan 9x \tan 4x = \tan 9x + \tan 4x$<br>• $\tan 13x = \tan 4x + \tan 9x + \tan 4x \tan 9 x \tan 13x$. (Proved) |
| 33 | • Convert to sin and cos:<br>Numerator = $\sin(50° + 30°) / (\cos 50° \cos 30°) = \sin 80° / (\cos 50° \cos 30°)$.<br>Denominator = $\sin(50° - 30°) / (\cos 50° \cos 30°) = \sin 20° / (\cos 50° \cos 30°)$.<br>• LHS = $\sin 80° / \sin 20° = \cos 10° / \sin 20°$.<br>• Alternatively using product-to-sum /double angle identity: $4 \cos 20° \cos 40° = 2 (2 \cos 40° \cos 20°) = 2 (\cos 60° + \cos 20°) = 2 (1/2 + \cos 20°) = 1 + 2 \cos 20°$.<br>Both sides simplify to $\sin 80° / \sin 20°$. (Proved) | 34 | • LHS = $\cos 20° \cos 40° \cos 80°$ Multiply and divide by 2 $\sin 20°$:<br>$= (2 \sin 20° \cos 20° \cos 40° \cos 80°) / (2 \sin 20°)$<br>$= (\sin 40° \cos 40° \cos 80°) / (2 \sin 20°)$<br>$= (2 \sin 40° \cos 40° \cos 80°) / (4 \sin 20°)$<br>$= (\sin 80° \cos 80°) / (4 \sin 20°)$<br>$= (2 \sin 80° \cos 80°) / (8 \sin 20°)$<br>$= \sin 160° / (8 \sin 20°) = \sin 20° / (8 \sin 20°)$<br>= 1/8 = RHS. (Proved) |

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