MCQ & ASSERTION-REASON BASED WORKSHEET
INTRODUCTION TO TRIGONOMETRY
Class X (CBSE)

SECTION A
Multiple Choice Questions:

1. If $\sin\theta = a / \sqrt{(a^2 + b^2)}$, then $\tan\theta$ equals:
(A) b/a
(B) a/b
(C) $a / \sqrt{(a^2 + b^2)}$
(D) $b / \sqrt{(a^2 + b^2)}$

2. The value of $(\tan 60° - \tan 30°) / (1 + \tan 60° \tan 30°)$ is:
(A) $\sqrt{3}$
(B) $1/\sqrt{3}$
(C) 1
(D) 0

3. If $x = \sin\theta + \cos\theta$ and $y = \sin\theta - \cos\theta$, then $x^2 + y^2$ equals:
(A) 2
(B) 1
(C) $2 \sin\theta \cos\theta$
(D) $4 \sin\theta \cos\theta$

4. Which of the following is always true for any acute angle θ?
(A) $\sin^2\theta + \text{cosec}^2\theta \geq 2$
(B) $\cos^2\theta + \sec^2\theta \leq 2$
(C) $\tan\theta + \cot\theta \leq 2$
(D) $\sin\theta + \cos\theta \geq 2$

5. If $\tan\theta + \cot\theta = 2$, then $\tan^{100}\theta + \cot^{100}\theta$ equals:
(A) 2^{100}
(B) 2
(C) 1
(D) 0

6. $(\cos^4 A - \sin^4 A) / (\cos^2 A - \sin^2 A)$ simplifies to:
(A) 0
(B) 1
(C) $\cos^2 A + \sin^2 A$
(D) $\cos^2 A - \sin^2 A$

7. If $\operatorname{cosec}\theta - \cot\theta = 1/3$, then $\operatorname{cosec}\theta + \cot\theta$ is:
(A) 3
(B) 1/3
(C) 2/3
(D) 1

8. The expression $\sqrt{[(1 - \cos\theta) / (1 + \cos\theta)]}$ is equivalent to:
(A) $\cot\theta - \operatorname{cosec}\theta$
(B) $\operatorname{cosec}\theta - \cot\theta$
(C) $\tan\theta$
(D) $\sec\theta - \tan\theta$

9. If $\sin\theta = 12/13$, then $(\sec\theta + \tan\theta) / (\sec\theta - \tan\theta)$ equals:
(A) 25
(B) 1/25
(C) 13/5
(D) 5/13

10. $1/(1 + \tan^2\theta) + 1/(1 + \cot^2\theta)$ is equal to:
(A) 0
(B) 1
(C) $\sin^2\theta \cos^2\theta$
(D) −1

11. If $3\tan\theta = 4$, then $(3\sin\theta + 2\cos\theta) / (3\sin\theta - 2\cos\theta)$ equals:
(A) 2
(B) 3
(C) 4
(D) 5

12. Which of the following is NOT a valid trigonometric identity?
(A) $\sin^2\theta - \cos^2\theta = 2\sin^2\theta - 1$
(B) $\sec^4\theta - \tan^4\theta = 1 + 2\tan^2\theta$
(C) $\operatorname{cosec}^4\theta - \cot^4\theta = \operatorname{cosec}^2\theta + \cot^2\theta$
(D) $\sin^4\theta + \cos^4\theta = 1 + 2\sin^2\theta\cos^2\theta$

13. If $\sin\theta - \cos\theta = 0$, then $\sin^4\theta + \cos^4\theta$ is:
(A) 1
(B) 1/2
(C) 1/4
(D) 3/4

14. $(\sin 30° \cos 60° + \cos 30° \sin 60°) / (\tan 45° \cot 45°)$ is equal to:
(A) 1/2
(B) 1
(C) $\sqrt{3}/2$
(D) 2

15. If $\sec \theta + \tan \theta = p$, then $\sec \theta$ equals:
(A) $p + 1/p$
(B) $(1/2)(p + 1/p)$
(C) $(1/2)(p - 1/p)$
(D) $p - 1/p$

16. If $\sin A + \sin^2 A = 1$, then $\cos^2 A + \cos^4 A$ equals:
(A) 1
(B) 2
(C) 0
(D) 1/2

17. If $\sin \theta + \cos \theta = 7/5$, then $\tan \theta$ is:
(A) 3/4 or 4/3
(B) 4/3 only
(C) 3/4 only
(D) 1

18. If $a \cos \theta - b \sin \theta = c$, then $a \sin \theta + b \cos \theta$ is equal to:
(A) $\pm \sqrt{(a^2 + b^2 - c^2)}$
(B) $\pm \sqrt{(a^2 + b^2 + c^2)}$
(C) $\sqrt{(a^2 - b^2 + c^2)}$
(D) $\sqrt{(c^2 - a^2 - b^2)}$

19. For an acute angle θ, if $(2 \sin \theta - 1)(\tan \theta - 1) = 0$, then $\sin \theta + \cos \theta$ could be:
(A) $(1 + \sqrt{3})/2$
(B) $\sqrt{2}$
(C) $(\sqrt{3} + 1)/2$
(D) Both (A) and (B)

20. If $\sec \theta = (p + q)/(p - q)$, then $\cot \theta$ equals:
(A) $2\sqrt{(pq)} / (p - q)$
(B) $(p - q) / 2\sqrt{(pq)}$
(C) $\sqrt{(pq)} / (p + q)$
(D) $(p + q) / \sqrt{(pq)}$

SECTION B
Assertion-Reason Based Questions

Instructions: In each of the following questions, two statements are given — one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer using the codes given below:

(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is NOT the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

21. **Assertion (A):** $\cos 60° \cdot \cos 0° - \sin 60° \cdot \sin 0° = 1/2$.
Reason (R): $\cos(A + B) = \cos A \cos B - \sin A \sin B$. With $A = 60°$, $B = 0°$, it yields $\cos 60° = 1/2$.

22. **Assertion (A):** If $\tan \theta = 1$, then $\sin^4 \theta - \cos^4 \theta = 0$.
Reason (R): $\sin^4 \theta - \cos^4 \theta = (\sin^2 \theta - \cos^2 \theta)(\sin^2 \theta + \cos^2 \theta)$. If $\tan \theta = 1$, then $\sin \theta = \cos \theta$, so the first factor is zero.

23. **Assertion (A):** $\sin^6 \theta + \cos^6 \theta = 1 - 3 \sin^2 \theta \cos^2 \theta$.
Reason (R): $a^3 + b^3 = (a + b)^3 - 3ab(a + b)$ with $a = \sin^2 \theta$, $b = \cos^2 \theta$, and $\sin^2 \theta + \cos^2 \theta = 1$.

24. **Assertion (A):** The value of $(\sec 30°) / (\operatorname{cosec} 60°)$ is $2/\sqrt{3}$.
Reason (R): $\sec 30° = 2/\sqrt{3}$ and $\operatorname{cosec} 60° = 2/\sqrt{3}$. Their ratio is 1.

25. **Assertion (A):** If $\cos \theta + \sec \theta = 2$, then $\cos^n \theta + \sec^n \theta = 2$ for any positive integer n.
Reason (R): From $\cos \theta + \sec \theta = 2$, we get $\cos \theta = 1$, making both terms 1.

26. **Assertion (A):** For $\theta \neq 45°$, $\sin \theta/(1 - \cot \theta) + \cos \theta/(1 - \tan \theta) = \sin \theta + \cos \theta$.
Reason (R): Expressing $\cot \theta$ and $\tan \theta$ in terms of $\sin \theta$ and $\cos \theta$, LHS simplifies to $(\sin^2 \theta - \cos^2 \theta)/(\sin \theta - \cos \theta) = \sin \theta + \cos \theta$.

27. **Assertion (A):** If $x = r \sin \alpha \cos \beta$, $y = r \sin \alpha \sin \beta$, $z = r \cos \alpha$, then $x^2 + y^2 + z^2 = r^2$.
Reason (R): $x^2 + y^2 = r^2 \sin^2 \alpha (\cos^2 \beta + \sin^2 \beta) = r^2 \sin^2 \alpha$. Adding $z^2 = r^2 \cos^2 \alpha$ gives r^2.

28. **Assertion (A):** The minimum value of $4 \tan^2 \theta + 9 \cot^2 \theta$ is 12 for acute θ.
Reason (R): By AM-GM, $(4 \tan^2 \theta + 9 \cot^2 \theta)/2 \geq \sqrt{(36)} = 6$, so the expression ≥ 12.

29. **Assertion (A):** $\sqrt{(\sec^2 \theta + \operatorname{cosec}^2 \theta)} = \tan \theta + \cot \theta$ for all acute θ.
Reason (R): $\sec^2 \theta + \operatorname{cosec}^2 \theta = 1/\cos^2 \theta + 1/\sin^2 \theta = 1/(\sin^2 \theta \cos^2 \theta)$. Its square root is $1/(\sin \theta \cos \theta) = \sec \theta \operatorname{cosec} \theta$. And $\tan \theta + \cot \theta = (\sin^2 \theta + \cos^2 \theta)/(\sin \theta \cos \theta) = 1/(\sin \theta \cos \theta)$. Hence they are equal.

30. **Assertion (A):** The equation $\sin\theta = x + 1/x$ has no real solution for any acute θ.
Reason (R): For any non-zero real x, $|x + 1/x| \geq 2$, while $0 < \sin\theta \leq 1$ for acute θ.