

1. $(\sin \theta + \operatorname{cosec} \theta)^2 + (\cos \theta + \sec \theta)^2$ is

- (a) ≥ 9
- (b) ≤ 9
- (c) $= 9$
- (d) None of the above

2. If $1 + \sin x + \sin^2 x + \dots = 4 + 2\sqrt{3}$, $0 < x < \pi$, then x is equal to

- (a) $\frac{\pi}{6}$
- (b) $\frac{\pi}{4}$
- (c) $\frac{\pi}{3}$ or $\frac{\pi}{6}$
- (d) $\frac{\pi}{3}$ or $\frac{2\pi}{3}$

3. If $(\sec A - \tan A)(\sec B - \tan B)(\sec C - \tan C) = (\sec A + \tan A)(\sec B + \tan B)(\sec C + \tan C)$ then each side is equal to

- (a) 0
- (b) 1
- (c) -1
- (d) None of these

4. $\cos 18^\circ - \sin 18^\circ$ is equal to

- (a) $\sqrt{2} \sin 27^\circ$
- (b) $\sin 27^\circ$
- (c) $\sqrt{2} \cos 27^\circ$
- (d) None of these

5. If $\tan \alpha = \frac{p}{q}$, where $\alpha = 6\beta$ and α being an acute angle, then $\frac{1}{2}[p \operatorname{cosec} 2\beta - q \sec 2\beta]$ is equal to

- (a) $\sqrt{p^2 + q^2}$
- (b) $\sqrt{p^2 - q^2}$
- (c) $\sqrt{2p^2 + q^2}$
- (d) None of these

6. The value of $\cos 12^\circ + \cos 84^\circ + \cos 156^\circ + \cos 132^\circ$ is

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

7. The maximum and minimum values of $7\cos \theta + 24\sin \theta$ are

- (a) 25 and -25
- (b) 24 and -24
- (c) 5 and -5
- (d) None of these

8. If $\frac{\sin(x+y)}{\sin(x-y)} = \frac{a+b}{a-b}$, then $\frac{\tan x}{\tan y}$ is equal to

- (a) $\frac{b}{a}$
- (b) $\frac{a}{b}$

(c) ab

(d) None of these

9. If $\sin A = \frac{1}{\sqrt{10}}$ and $\sin B = \frac{1}{\sqrt{5}}$, where A, B are acute angles, then $A + B$ equals

- (a) $\frac{\pi}{4}$
- (b) $\frac{\pi}{2}$
- (c) $\frac{\pi}{3}$
- (d) π

10. If $x \cos \alpha + y \sin \alpha = 2a$, $x \cos \beta + y \sin \beta = 2a$ and $2 \sin \frac{\alpha}{2} \sin \frac{\beta}{2} = 1$, then

- (a) $\cos \alpha + \cos \beta = \frac{2ax}{x^2 + y^2}$
- (b) $\cos \alpha \cos \beta = \frac{2a^2 - y^2}{x^2 + y^2}$
- (c) $y^2 = 4a(\alpha - x)$
- (d) $\cos \alpha + \cos \beta = 2 \cos \alpha \cos \beta$

11. If $0 \leq x \leq \frac{\pi}{2}$ and $81^{\sin^2 x} + 81^{\cos^2 x} = 30$, then x is equal to

- (a) $\frac{\pi}{6}$
- (b) $\frac{\pi}{2}$
- (c) $\frac{\pi}{4}$
- (d) 0

12. The equation $\sqrt{3} \sin x + \cos x = 4$ has

- (a) only one solution
- (b) two solutions
- (c) infinitely many solutions
- (d) no solution

13. If $3 \sin^2 \theta + 2 \sin^2 \phi = 1$ and $3 \sin 2\theta = 2 \sin 2\phi$, $0 < \theta < \frac{\pi}{2}$ and $0 < \phi < \frac{\pi}{2}$, then the value of $\theta + 2\phi$ is

- (a) $\frac{\pi}{2}$
- (b) $\frac{\pi}{4}$
- (c) 0
- (d) None of these

14. The maximum value of $4 \sin^2 x + 3 \cos^2 x + \sin \frac{x}{2} + \cos \frac{x}{2}$ is

- (a) $4 + \sqrt{2}$
- (b) $3 + \sqrt{2}$
- (c) 9
- (d) 4

15. If $\sin \theta = 3 \sin(\theta + 2\alpha)$, then the value of $\tan(\theta + \alpha) + 2 \tan \alpha$ is

- (a) 3

- (b) 2
(c) 1
(d) 0

16. The value of $\cos \frac{2\pi}{15} \cos \frac{4\pi}{15} \cos \frac{8\pi}{15} \cos \frac{16\pi}{15}$ is

- (a) $\frac{1}{16}$
(b) $\frac{1}{32}$
(c) $\frac{1}{64}$
(d) $\frac{1}{8}$

17. Let $\cos A + \cos B + \cos C = \frac{3}{2}$ in a $\triangle ABC$. Then, the triangle is

- (a) isosceles
(b) right angled
(c) equilateral
(d) None of these

18. If $3\sin \theta + 5\cos \theta = 5$, then the value of $5\sin \theta - 3\cos \theta$ is

- (a) 5
(b) 3
(c) 4
(d) None of these

19. $\sin \frac{2\pi}{7} + \sin \frac{4\pi}{7} + \sin \frac{8\pi}{7}$ is equal to

- (a) $\frac{\sqrt{7}}{2}$
(b) $\sqrt{7}$
(c) 2
(d) $\frac{\sqrt{7}}{4}$

20. If $\exp[(\sin^2 x + \sin^4 x + \sin^6 x + \dots) \ln 2]$ satisfies the equation $y^2 - 9y + 8 = 0$, then the value of

$\frac{\cos x}{\cos x + \sin x}, 0 < x < \frac{\pi}{2}$, is

- (a) $\sqrt{3} + 1$
(b) $\frac{\sqrt{3}-1}{2}$
(c) $\sqrt{3} - 1$
(d) None of these

21. $\log(\sin 1^\circ) \log(\sin 2^\circ) \log(\sin 3^\circ) \dots \log(\sin 179^\circ)$

is equal to

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

22. $\cos^2 \frac{3\pi}{5} + \cos^2 \frac{4\pi}{5}$ is equal to

- (a) $\frac{4}{5}$

- (b) $\frac{5}{2}$
(c) $\frac{5}{4}$
(d) $\frac{3}{4}$

23. The value of $\sin 600^\circ \cos 330^\circ + \cos 120^\circ \sin 150^\circ$ is

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

24. The value of expression $\frac{1-4\sin 10^\circ \sin 70^\circ}{2\sin 10^\circ}$ is

- (a) $\frac{1}{2}$
(b) 1
(c) 2
(d) None of these

25. The value of the expression $(\sqrt{3}\sin 75^\circ - \cos 75^\circ)$ is

- (a) $2\sin 15^\circ$
(b) $1 + \sqrt{3}$
(c) $2\sin 105^\circ$
(d) $\sqrt{2}$

26. $\sin 47^\circ + \sin 61^\circ - \sin 11^\circ - \sin 25^\circ$ is equal to

- (a) $\sin 36^\circ$
(b) $\cos 36^\circ$
(c) $\sin 7^\circ$
(d) $\cos 7^\circ$

27. If $A + B = \frac{\pi}{4}$, where $A, B \in R^+$, then the minimum value of $(1 + \tan A)(1 + \tan B)$ is

- (a) 2
(b) 4
(c) 1
(d) None of these

28. If $\frac{\sin x}{\sin y} = \frac{1}{2}, \frac{\cos x}{\cos y} = \frac{3}{2}$, where $x, y \in (0, \frac{\pi}{2})$, then the value of $\tan(x + y)$ is

- (a) $\sqrt{13}$
(b) $\sqrt{14}$
(c) $\sqrt{17}$
(d) $\sqrt{15}$

29. If $\sin x + \cos x = \frac{\sqrt{7}}{2}$, where $x \in [0, \frac{\pi}{4}]$, then $\tan \frac{x}{2}$ is equal to

- (a) $\frac{3-\sqrt{7}}{3}$

(b) $\frac{\sqrt{7}-2}{3}$

(c) $\frac{7-\sqrt{7}}{4}$

(d) None of these

30. In a $\triangle PQR$, if $3\sin P + 4\cos Q = 6$ and $4\sin Q + 3\cos P = 1$, then $\angle R$ is equal to

(a) $\frac{5\pi}{6}$

(b) $\frac{\pi}{6}$

(c) $\frac{\pi}{4}$

(d) $\frac{3\pi}{4}$

31. Let $\cos(\alpha + \beta) = \frac{4}{5}$ and $\sin(\alpha - \beta) = \frac{5}{13}$, where $0 \leq \alpha, \beta \leq \frac{\pi}{4}$. Then, $\tan 2\alpha$ is equal to

(a) $\frac{25}{16}$

(b) $\frac{56}{33}$

(c) $\frac{19}{12}$

(d) $\frac{20}{7}$

32. The value of $\frac{1-\tan^2 15^\circ}{1+\tan^2 15^\circ}$ is

(a) 1

(b) $\sqrt{3}$

(c) $\sqrt{3}/2$

(d) 2

33. If $\sin A + \cos A = \sqrt{2}$, then the value of $\cos^2 A$ is

(a) $\sqrt{2}$

(b) $1/2$

(c) 4

(d) -1

34. If $\tan \frac{\alpha}{2}$ and $\tan \frac{\beta}{2}$ are the roots of $8x^2 - 26x + 15 = 0$, then $\cos(\alpha + \beta)$ is equal to

(a) $\frac{627}{726}$

(b) $-\frac{627}{725}$

(c) -1

(d) None of these

35. The value of $\frac{\sin 55^\circ - \cos 55^\circ}{\sin 10^\circ}$ is

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

(b) 2

(c) 1

(d) $\sqrt{2}$

36. If $4\sin^{-1} x + \cos^{-1} x = \pi$, then x equals

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

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

(c) $-\frac{1}{2}$

(d) None of the above

37. $\cot^{-1} 9 + \operatorname{cosec}^{-1} \frac{\sqrt{41}}{4}$ is equal to

(a) $\frac{\pi}{3}$

(b) $\frac{\pi}{4}$

(c) $\frac{\pi}{6}$

(d) None of these

38. The value of $\tan \left\{ \cos^{-1} \left(-\frac{2}{7} \right) - \frac{\pi}{2} \right\}$ is

(a) $\frac{2}{3\sqrt{5}}$

(b) $\frac{2}{3}$

(c) $\frac{1}{\sqrt{5}}$

(d) $\frac{4}{\sqrt{5}}$

39. If $\cot^{-1} x + \cot^{-1} y + \cot^{-1} z = \frac{\pi}{2}$, then $x + y + z$ is equal to

(a) $\frac{1}{x} + \frac{1}{y} + \frac{1}{z}$

(b) xyz

(c) $xy + yz + zx$

(d) None of these

40. If $\sin^{-1} x - \cos^{-1} x = \frac{\pi}{6}$, then x is

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

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

(c) $-\frac{1}{2}$

(d) None of these

41. If $\sin \left(\sin^{-1} \frac{1}{5} + \cos^{-1} x \right) = 1$, then x is equal to

(a) 1

(b) 0

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

(d) $\frac{1}{5}$

42. Consider the following statements: $\tan^{-1} x + \tan^{-1} \frac{1}{x} =$

I. $\frac{\pi}{2}$ for all $x \neq 0$

II. $-\frac{\pi}{2}$ for all $x \neq 0$

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III. $\frac{\pi}{2}$ for all $x > 0$

IV. $-\frac{\pi}{2}$ for all $x < 0$

Then, correct statements are

- (a) I
- (b) II
- (c) III and IV
- (d) None of these

43. If $-1 \leq x, y, z \leq 1$ such that $\sin^{-1} x + \sin^{-1} y + \sin^{-1} z = \frac{3\pi}{2}$, then the value of $x^{2000} + y^{2001} + z^{2002} - \frac{9}{x^{2000} + y^{2001} + z^{2002}}$ is

- (a) 1
- (b) 2
- (c) 3
- (d) None of these

44. If $\sin^{-1} \left(\frac{x}{5} \right) + \operatorname{cosec}^{-1} \left(\frac{5}{4} \right) = \frac{\pi}{2}$, then a value of x is

- (a) 1
- (b) 4
- (c) 3
- (d) 5

45. $\tan^{-1}(\sqrt{3}) - \cot^{-1}(-\sqrt{3})$ is equal to

- (a) 0
- (b) $2\sqrt{3}$
- (c) $-\frac{\pi}{2}$
- (d) π

46. The value of $\sin(2\tan^{-1} x), |x| \leq 1$ is

- (a) $\frac{1}{x}$
- (b) x
- (c) $\frac{1}{x^2}$
- (d) $\frac{2x}{(1+x^2)}$

47. If $\cos^{-1} \frac{(1-x^2)}{(1+x^2)} + \tan^{-1} x = \frac{\pi}{2}$, then x is equal to

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

48. The value of $4\tan^{-1} \frac{1}{5} - \tan^{-1} \frac{1}{70} + \tan^{-1} \frac{1}{99}$ is

- (a) $\frac{\pi}{4}$
- (b) $\frac{\pi}{2}$
- (c) π
- (d) ∞

49. $\cot^{-1} \frac{xy+1}{x-y} + \cot^{-1} \frac{yz+1}{y-z} + \cot^{-1} \frac{xz+1}{z-x}$ is equal to

- (a) 1
- (b) -1
- (c) 0
- (d) None of these

50. The value of $\sin \left[\sin^{-1} \frac{\sqrt{5}}{4} + \tan^{-1} \sqrt{\frac{5}{11}} \right]$ is

- (a) $\frac{\sqrt{5}}{4\sqrt{11}}$
- (b) $\frac{4}{\sqrt{35}}$
- (c) $\frac{\sqrt{55}}{8}$
- (d) None of these