TRIGONOMETRIC RATIOS

SYNOPSIS

Radian:- A radian is the angle subtended at the centre of a circle by an arc equal in length to the radius of the circle.

Circular system of angles
1 revolution = 2π radians = 360^0
π radians = 180^0
1 degree $(1^0) = \frac{\pi}{180}$ radians = 0.0172 radians
1 radian $(1^c) = \frac{180}{\pi}$ degrees = $57^0\ 17'\ 44.8''$

Sexagesimal system of angles		
1rt angle	=	90 degrees (90^0)
1 degree	=	60 minutes (60')
1 minute	=	60 seconds (60'')

Centesimal system of angles		
1rt angle	=	100 grades (100^g)
1 grade	=	100 minutes (100')
1 minute	=	100 seconds (100'')

Degrees	0^0	30^0	45^0	60^0	90^0	120^0	135^0	150^0	180^0	210^0	225^0	240^0	270^0	300^0	315^0	330^0	360^0
Radian	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{3\pi}{4}$	$\frac{5\pi}{6}$	π	$\frac{7\pi}{6}$	$\frac{5\pi}{4}$	$\frac{4\pi}{3}$	$\frac{3\pi}{2}$	$\frac{5\pi}{3}$	$\frac{7\pi}{4}$	$\frac{11\pi}{6}$	2π

Some standard angles:-

Trig.Ratio	0^0	30^0	45^0	60^0	90^0	180^0	270^0	360^0
$\sin\theta$	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1	0	– 1	0
$\cos\theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0	– 1	0	1
$\tan\theta$	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	n.d	0	n.d	0
$\operatorname{cosec}\theta$	n.d	2	$\sqrt{2}$	$\frac{2}{\sqrt{3}}$	1	n.d	– 1	n.d
$\sec\theta$	1	$\frac{2}{\sqrt{3}}$	$\sqrt{2}$	2	n.d	– 1	n.d	1
$\cot\theta$	n.d	$\sqrt{3}$	1	$\frac{1}{\sqrt{3}}$	0	n.d	0	n.d

Note:- n . d $\rightarrow$ not defined

FUNDAMENTAL IDENTITIES:-

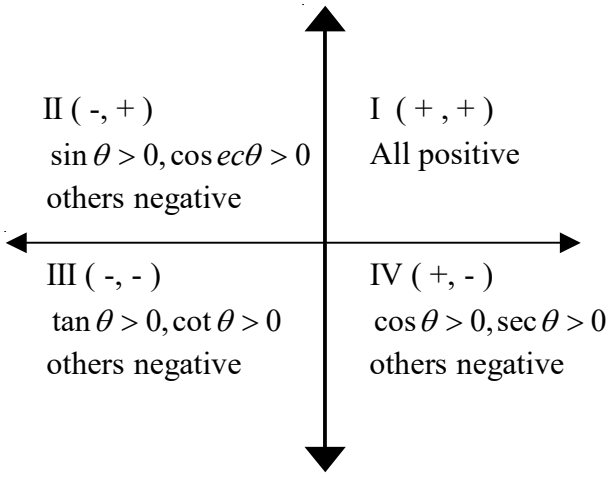
i) $\tan\theta = \frac{\sin\theta}{\cos\theta}, \cot\theta = \frac{\cos\theta}{\sin\theta}, \quad \cos ec\theta = \frac{1}{\sin\theta}, \sec\theta = \frac{1}{\cos\theta}, \cot\theta = \frac{1}{\tan\theta}$

ii) $\sin^2\theta + \cos^2\theta = 1 \rightarrow \sin^2\theta = 1 - \cos^2\theta, \cos^2\theta = 1 - \sin^2\theta$

iii) $1 + \tan^2\theta = \sec^2\theta \rightarrow \sec^2\theta - \tan^2\theta = 1, (\sec\theta + \tan\theta)(\sec\theta - \tan\theta) = 1$

iv) $1 + \cot^2\theta = \cos ec^2\theta \rightarrow \cos ec^2\theta - \cot^2\theta = 1, (\cos ec\theta + \cot\theta)(\cos ec\theta - \cot\theta) = 1$

The signs of Trigonometric functions:-



1. $\sec\theta + \tan\theta = \frac{p}{q} \Rightarrow \begin{cases} \sec\theta = \frac{1}{2}\left(\frac{p}{q} + \frac{q}{p}\right) \\ \tan\theta = \frac{1}{2}\left(\frac{p}{q} - \frac{q}{p}\right) \\ \sin\theta = \frac{p^2 - q^2}{p^2 + q^2} \end{cases}$

2. $\cos ec\theta + \cot\theta = \frac{p}{q} \Rightarrow \begin{cases} \cos ec\theta = \frac{1}{2}\left(\frac{p}{q} + \frac{q}{p}\right) \\ \cot\theta = \frac{1}{2}\left(\frac{p}{q} - \frac{q}{p}\right) \\ \cos\theta = \frac{p^2 - q^2}{p^2 + q^2} \end{cases}$

3. $-1 \le \sin\theta \le 1$ (or) $\sin\theta \in [-1, 1]$ (or) $|\sin\theta| \le 1$
4. $-1 \le \cos\theta \le 1$ (or) $\cos\theta \in [-1, 1]$ (or) $|\cos\theta| \le 1$
5. $|\cos ec\theta| \ge 1$ (or) $\cos ec\theta \ge 1, \cos ec\theta \le -1$ (or) $\cos ec\theta \in R - (-1, 1)$ (or) $\cos ec\theta \in (-\infty, -1] \cup [1, \infty)$

6. $|\sec\theta| \geq 1$ (or) $\sec\theta \geq 1, \sec\theta \leq -1$ (or) $\sec\theta \in R - (-1,1)$ (or) $\sec\theta \in (-\infty, -1] \cup [1, \infty)$

7. $A + B = 90^0 \Rightarrow \sin^2 A + \sin^2 B = 1$, $\cos^2 A + \cos^2 B = 1$, $\tan A \tan B = 1$, $\cot A \cot B = 1$

8. If $a\cos\theta + b\sin\theta = c$ then $a\sin\theta - b\cos\theta = \pm\sqrt{a^2 + b^2 - c^2}$.

9 $\sqrt{x^2} = |x| \quad \forall x \in R$.

LEVEL-I

1. $\sec A + \tan A = 3 \Rightarrow \sec A =$

1) $\frac{10}{3}$ 2) $\frac{5}{3}$ 3) $\frac{2}{3}$ 4) $\frac{4}{3}$

2. $\sec A - \tan A = 4 \Rightarrow \tan A =$

1) $\frac{15}{8}$ 2) $-\frac{15}{8}$ 3) $\frac{17}{8}$ 4) $-\frac{17}{8}$

3. $\sec A - \tan A = 5 \Rightarrow \sin A =$

1) $\frac{6}{13}$ 2) $-\frac{6}{13}$ 3) $\frac{12}{13}$ 4) $-\frac{12}{13}$

4. $\operatorname{cosec} A - \cot A = 5 \Rightarrow \operatorname{cosec} A =$

1) $\frac{5}{13}$ 2) $\frac{13}{5}$ 3) $-\frac{5}{13}$ 4) $-\frac{13}{5}$

5. $\operatorname{cosec} A - \cot A = 6 \Rightarrow \cot A =$

1) $\frac{12}{35}$ 2) $-\frac{12}{35}$ 3) $\frac{35}{12}$ 4) $-\frac{35}{12}$

6. $\operatorname{cosec} A + \cot A = \frac{2}{3} \Rightarrow \cos A =$

1) $\frac{5}{13}$ 2) $\frac{13}{5}$ 3) $-\frac{5}{13}$ 4) $-\frac{13}{5}$

7. $\sec\theta - \tan\theta = 3 \Rightarrow \theta$ lies in the quadrant

1) I 2) II 3) III 4) IV

8. $\operatorname{cosec}\theta - \cot\theta = 5 \Rightarrow \theta$ lies in the quadrant

1 I 2) II 3) III 4) IV

9. $\sin\theta = \frac{2ab}{a^2 + b^2} \Rightarrow \sec\theta + \tan\theta =$

1) $\frac{a-b}{a+b}$ 2) $\frac{a+b}{a-b}$ 3) $\frac{ab}{a^2+b^2}$ 4) $\frac{ab}{a+b}$

10. $\sin\alpha = \frac{2xy}{x^2 + y^2} \Rightarrow \sec\alpha - \tan\alpha =$

1) $\frac{x-y}{x+y}$ 2) $\frac{x+y}{x-y}$ 3) $\frac{xy}{x^2+y^2}$ 4) $\frac{xy}{x+y}$

11. $\sin x = \frac{2pq}{p^2 + q^2} \Rightarrow \operatorname{cosec} x + \cot x =$

1) $\frac{p}{q}$ 2) $\frac{q}{p}$ 3) $\frac{2p}{q}$ 4) $\frac{2q}{p}$

12. $\sin\beta = \frac{2mn}{m^2 + n^2} \Rightarrow \operatorname{cosec}\beta - \cot\beta =$

1) $\frac{m}{n}$ 2) $\frac{n}{m}$ 3) $\frac{2m}{n}$ 4) $\frac{2n}{m}$

13. $\tan 20^0 + \tan 40^0 + \tan 60^0 + ... + \tan 180^0 =$

1) 0 2) 1 3) 2 4) 3

14. $3[\sin x - \cos x]^4 + 6[\sin x + \cos x]^2 + 4[\sin^6 x + \cos^6 x] =$

1) 3 2) 6 3) 4 4) 13

15. $\frac{\cos^3 A + \sin^3 A}{\cos A + \sin A} + \frac{\cos^3 A - \sin^3 A}{\cos A - \sin A} = k \Rightarrow k =$

1) 0 2) 1 3) 2 4) –1

16. $\frac{\sin^2\alpha}{1 + \cot^2\alpha} + \frac{\tan^2\alpha}{(1 + \tan^2\alpha)^2} + \cos^2\alpha =$

1) – 1 2) 0 3) 1 4) 2

17. $\frac{1}{(1 + \cot^2\alpha)^2} + \frac{\tan^2\alpha}{(1 + \tan^2\alpha)^2} + \frac{1}{1 + \tan^2\alpha} =$

1) –1 2) 0 3) 1 4) 2

18. $\frac{\left(\sqrt{3} + 2\cos A\right)^3}{(1 - 2\sin A)^3} + \frac{(1 + 2\sin A)^3}{\left(\sqrt{3} - 2\cos A\right)^3} =$

1) 1 2) $\sqrt{3}$ 3) 0 4) – 1

19. $\frac{\left(\sqrt{3} + 2\sin A\right)^3}{(1 - 2\cos A)^3} + \frac{(1 + 2\cos A)^3}{\left(\sqrt{3} - 2\sin A\right)^3} =$

1) 1 2) $\sqrt{3}$ 3) 0 4) – 1

20. $\cos(40^0+\theta)+\cos(120^0+\theta)+\cos(220^0+\theta)+\cos(300^0+\theta)=$

1) 3 2) 2 3) 1 4) 0

21. $\tan\theta=\frac{\sin\alpha-\cos\alpha}{\sin\alpha+\cos\alpha}$, $\sin\alpha-\cos\alpha=k\sin\theta$ then k =

1) 1 2) $\sqrt{3}$ 3) $\sqrt{2}$ 4) 1/2

22. $\tan\theta=\frac{\sin\alpha-\cos\alpha}{\sin\alpha+\cos\alpha}$, $\sin\alpha+\cos\alpha=k\cos\theta$ then k =

1) –1 2) 1 3) $\sqrt{2}$ 4) $\sqrt{3}$

23. A, B, C are the angles of a triangle ABC $\Rightarrow$ $\cos\left(\frac{3A+2B+C}{2}\right)+\cos\left(\frac{A-C}{2}\right)=$

1) 0 2) 1 3) cosA 4) cosC

24. $\frac{\cot\theta+\operatorname{cosec}\theta-1}{\cot\theta-\operatorname{cosec}\theta+1}=$

I. 1) $\frac{1-\cos\theta}{\sin\theta}$ 2) $\frac{\sin\theta}{1+\cos\theta}$ 3) $\frac{1+\cos\theta}{\sin\theta}$ 4) $\frac{1-\sin\theta}{\cos\theta}$

II. 1) $\frac{\sin\theta}{1+\cos\theta}$ 2) $\frac{\sin\theta}{1-\cos\theta}$ 3) $\frac{1-\cos\theta}{\sin\theta}$ 4) $\frac{\cos\theta}{1-\sin\theta}$

25. $\frac{1+\cot\alpha+\operatorname{cosec}\alpha}{1-\cot\alpha+\operatorname{cosec}\alpha}=$

I. 1) $\frac{1-\cos\alpha}{\sin\alpha}$ 2) $\frac{\cos\alpha}{1-\sin\alpha}$ 3) $\frac{1+\cos\alpha}{\sin\alpha}$ 4) $\frac{\sin\alpha}{1+\cos\alpha}$

II. 1) $\frac{\sin\alpha}{1+\cos\alpha}$ 2) $\frac{\sin\alpha}{1-\cos\alpha}$ 3) $\frac{1-\cos\alpha}{\sin\alpha}$ 4) $\frac{1-\sin\alpha}{\cos\alpha}$

III. 1) $\operatorname{cosec}\alpha+\cot\alpha$ 2) $\operatorname{cosec}\alpha-\cot\alpha$ 3) $\cot\alpha-\operatorname{cosec}\alpha$ 4) $1+\operatorname{cosec}\alpha$

26. $\frac{\tan\alpha+\sec\alpha-1}{\tan\alpha-\sec\alpha+1}=$

I. 1) $\frac{1-\sin\alpha}{\cos\alpha}$ 2) $\frac{1+\sin\alpha}{\cos\alpha}$ 3) $\frac{1-\cos\alpha}{\sin\alpha}$ 4) $\frac{1+\cos\alpha}{\sin\alpha}$

II. 1) $\frac{\cos\alpha}{1+\sin\alpha}$ 2) $\frac{\cos\alpha}{1-\sin\alpha}$ 3) $\frac{\sin\alpha}{1+\cos\alpha}$ 4) $\frac{\sin\alpha}{1-\cos\alpha}$

III. 1) $\sec\alpha+\tan\alpha$ 2) $\sec\alpha-\tan\alpha$ 3) $\tan\alpha-\sec\alpha$ 4) $1+\sec\alpha$

27. $\frac{1+\tan\alpha+\sec\alpha}{1-\tan\alpha+\sec\alpha}=$

I. 1) $\frac{1-\sin\alpha}{\cos\alpha}$ 2) $\frac{1+\sin\alpha}{\cos\alpha}$ 3) $\frac{1-\cos\alpha}{\sin\alpha}$ 4) $\frac{1+\cos\alpha}{\sin\alpha}$

II. 1) $\frac{\cos\alpha}{1+\sin\alpha}$ 2) $\frac{\cos\alpha}{1-\sin\alpha}$ 3) $\frac{\sin\alpha}{1+\cos\alpha}$ 4) $\frac{\sin\alpha}{1-\cos\alpha}$

III. 1) $\sec\alpha+\tan\alpha$ 2) $\sec\alpha-\tan\alpha$ 3) $\tan\alpha-\sec\alpha$ 4) $1+\sec\alpha$

28. If α and β are complementary angles then $\sin^2(90^0-\alpha)+\sin^2(90^0-\beta)$

1) 0 2) 1 3) –1 4) 2

29. $\sin^2(51^0-x)+\sin^2(39^0+x)=$

1) –1 2) 0 3) 1 4) 2

30. $\cos^2\frac{\pi}{18}+\cos^2\frac{\pi}{9}+\cos^2\frac{7\pi}{18}+\cos^2\frac{4\pi}{9}=$

1) 1 2) 2 3) 3 4) 4

31. $\frac{\sin^2\frac{\pi}{18}+\sin^2\frac{\pi}{9}+\sin^2\frac{7\pi}{18}+\sin^2\frac{4\pi}{9}}{\cos^2\frac{\pi}{18}+\cos^2\frac{\pi}{9}+\cos^2\frac{7\pi}{18}+\cos^2\frac{4\pi}{9}}=$

1) 1 2) 2 3) 3 4) 4

32. $1+\cos\frac{\pi}{7}+\cos\frac{2\pi}{7}+\cos\frac{3\pi}{7}+\cos\frac{4\pi}{7}+\cos\frac{5\pi}{7}+\cos\frac{6\pi}{7}=$

1) 0 2) 1 3) 2 4) 3

33. $\cos 24^0+\cos 55^0+\cos 125^0+\cos 204^0=$

1) –1 2) 0 3) 1 4) 2

34. $\cos 5^0+\cos 24^0+\cos 175^0+\cos 204^0+\cos 300^0$ =

1) 1/2 2) 1 3) 3/2 4) 2

35. $\tan\frac{\pi}{24}.\tan\frac{3\pi}{24}.\tan\frac{5\pi}{24}.\tan\frac{7\pi}{24}.\tan\frac{9\pi}{24}.\tan\frac{11\pi}{24}.\tan\frac{16\pi}{24}=$

1) 1 2) –1 3) $\sqrt{3}$ 4) $-\sqrt{3}$

36. $\cot\frac{\pi}{20}.\cot\frac{3\pi}{20}.\cot\frac{5\pi}{20}.\cot\frac{7\pi}{20}.\cot\frac{9\pi}{20}.\cot\frac{15\pi}{20}=$

1) 1 2) –1 3) $\sqrt{3}$ 4) $-\sqrt{3}$

37. $(\sin\alpha+\operatorname{cosec}\alpha)^2+(\sec\alpha+\cos\alpha)^2=$

$k+\tan^2\alpha+\cot^2\alpha\Rightarrow k=$

1) 9 2) 7 3) 5 4) 3

38. $\tan^2\theta-\sin^2\theta-\tan^2\theta\sin^2\theta=$

1) 1 2) 0 3) 2 4) –1

39. If θ is not in 4th quadrant

$\tan\theta=-4/3\Rightarrow 5\sin\theta+$

$10\cos\theta+9\sec\theta+16\operatorname{cosec}\theta+4\cot\theta$ =

1) –1 2) 2/5 3) 4/5 4) 0

40. $A=495^0\Rightarrow\cos^2 A+\sec^2 A-\sin^2 A-2\tan A=$

1) 0 2) 1 3) 4 4) –1

41. $\frac{\sin 150^0-5\cos 300^0+7\tan 225^0}{\tan 135^0+3\sin 210^0}=$

1) 10 2) –5 3) –2 4) –3/2

42. $\frac{\sin(-660^0)\tan(1050^0)\sec(-420^0)}{\cos(225^0)\operatorname{cosec}(315^0)\cos(510^0)}=$

1) $\frac{\sqrt{3}}{4}$ 2) $\frac{\sqrt{3}}{2}$ 3) $\frac{2}{\sqrt{3}}$ 4) $\frac{4}{\sqrt{3}}$

43. $x\tan^2 120^0+4\cos^2 150^0=9\Rightarrow x=$

1) 3 2) 1 3) 2 4) 4

44. $\sin 160^0\cos 110^0+\sin 250^0\cos 340^0+$

$\tan 110^0\tan 340^0=$

1) –1 2) 1 3) 3 4) 0

45. $\cos 255^0+\sin 165^0=$

1) 2 2) 0 3) 1 4) $\sqrt{\frac{3}{2}}$

46. If θ is acute,

$\tan\theta=\frac{1}{\sqrt{7}}\Rightarrow\frac{\operatorname{cosec}^2\theta-\sec^2\theta}{\operatorname{cosec}^2\theta+\sec^2\theta}=$

1) $\frac{3}{4}$ 2) $\frac{1}{2}$ 3) 2 4) $\frac{5}{4}$

47. $\tan 25^0=p\Rightarrow\frac{\tan 245^0+\tan 335^0}{\tan 205^0-\tan 115^0}=$

1) $\frac{p^2-1}{p^2+1}$ 2) $\frac{p^2+1}{p^2-1}$ 3) $\frac{1-p^2}{1+p^2}$ 4) $\frac{1+p^2}{1-p^2}$

48. $(2p+1)\sin\alpha=2p(p+1)\cos\alpha\Rightarrow\sin\alpha=$

1) $\frac{2p+1}{2p^2+2p+1}$ 2) $\frac{2p+3}{2p^2+2p+1}$

3) $\frac{2p(p+1)}{2p^2+2p+1}$ 4) 1

49. $a\cos\theta=b\sin\theta,\ a\cos^3\theta+b\sin^3\theta=$

$\sin\theta.\cos\theta\Rightarrow a^2+b^2=$

1) $\frac{1}{2}$ 2) 1 3) $\frac{3}{2}$ 4) 2

50. $\log\sin 1^0.\log\sin 2^0.....\log\sin 179^0$

1) 1 2) 0 3) – 1 4) 2

51. $\sin x+\operatorname{cosec} x=2\Rightarrow\sin^8 x+\operatorname{cosec}^8 x=$

1) 1 2) 2 3) 3 4) 4

52. $\cos x+\sec x=2\Rightarrow\cos^m x+\sec^m x=$

1) –1 2) 0 3) 1 4) 2

53. $a_n=\cos^n\alpha+\sin^n\alpha\Rightarrow 2a_6-3a_4=$

1) 0 2) –1 3) 3 4) 4

54. If $\frac{\sin\theta-\cos\theta+1}{\sin\theta+\cos\theta-1}=\frac{x}{\tan\theta-\sec\theta+1}$ then

1) 0 2) 2

3) $\tan\theta-\sec\theta+1$ 4) $\tan\theta+\sec\theta-1$

55. $\sin 10^0+\sin 20^0+\sin 30^0+.....+\sin 360^0$

1) 0 2) 1 3) – 1 4) 2

56. $\sin\theta_1+\sin\theta_2+\sin\theta_3=3\Rightarrow$
$\cos\theta_1+\cos\theta_2+\cos\theta_3=$
1) 0 2) 1 3) 2 4) 3

57. $\cos\theta_1+\cos\theta_2+\cos\theta_3=3\Rightarrow$
$\sin\theta_1+\sin\theta_2+\sin\theta_3=$
1) 3 2) 2 3) 1 4) 0

58. $5\sin x+4\cos x=3\Rightarrow 4\sin x-5\cos x=$
1) 4 2) $4\sqrt{2}$ 3) $3\sqrt{2}$ 4) $\sqrt{2}$

59. $\cot\frac{\pi}{6},\cot\frac{\pi}{4},\cot\frac{\pi}{3}$ are in
1) AP 2) GP 3) HP 4) AGP

60. If $\sin\theta$ and $\cos\theta$ are the roots of $px^2+qx+r=0$ then q^2-p^2
1) 0 2) –2pr 3) 2qr 4) 2rp

61. $\sin x+\sin^2 x=1\Rightarrow\cos^2 x+\cos^4 x=$
1) 0 2) 1 3) 2 4) –1

62. $\cos x+\cos^2 x=1\Rightarrow\sin^8 x+2\sin^6 x+\sin^4 x=$
1) 0 2) 1 3) 2 4) –1

63. $a=\frac{1+\sin x}{1-\cos x+\sin x}\Rightarrow\frac{1+\cos x+\sin x}{2\sin x}=$
1) a 2) $\frac{1}{a}$ 3) a^2 4) $\frac{1}{a^2}$

64. $2\sin^2 A-\cot^2 B=1\Rightarrow\sin A\sin B=$
1) $-\frac{1}{\sqrt{2}}$ 2) $\pm\frac{1}{\sqrt{2}}$ 3) $\frac{1}{\sqrt{2}}$ 4) $\frac{-1}{2\sqrt{2}}$

65. $8\sin^2 x+3\cos^2 x=5\Rightarrow\cot x=$
1) $\pm\frac{1}{\sqrt{2}}$ 2) $\pm\frac{1}{\sqrt{3}}$ 3) $\pm\sqrt{\frac{3}{2}}$ 4) $\pm\sqrt{\frac{2}{3}}$

66. $9\cos^2 x+4\sin^2 x=5\Rightarrow\tan x=$
1) ±1 2) ±2 3) ±3 4) ±4

67. Which of the following is not possible ?
1) $\sin\theta=\frac{5}{7}$ 2) $\cos\theta=\frac{1+a^2}{1-a^2},|a|\neq1$
3) $\tan\theta=100$ 4) $\sec\theta=\frac{5}{2}$

68. If $\cot(\alpha+\beta)=0$ then $\sin(\alpha+2\beta)=$
1) $\sin\alpha$ 2) $\cos\alpha$ 3) $\sin\beta$ 4) $\cos\beta$

69. If $\tan(\alpha+\beta)=\sqrt{3},\tan(\alpha-\beta)=1$ then $\tan 6\beta=$
1) –1 2) 0 3) 1 4) 2

70. $\sin^2\frac{\pi}{18}+\sin^2\frac{2\pi}{18}+\sin^2\frac{4\pi}{18}+\sin^2\frac{8\pi}{18}$
$+\sin^2\frac{7\pi}{18}+\sin^2\frac{5\pi}{18}=$
1) 1 2) 2 3) 3 4) 4

71. If ABCD is a cyclic quadrilateral then $\cos(180^0+A)+\cos(180^0-B)+$
$\cos(180^0-C)-\sin(90^0-D)=$
1) –1 2) 0 3) 1 4) 2

72. If ABCD is a quadrilateral then $\tan\left(\frac{A+B}{4}\right)=$
1) $\cos\left(\frac{C-D}{4}\right)$ 2) $\cot\left(\frac{C-D}{4}\right)$
3) $\cos\left(\frac{C+D}{4}\right)$ 4) $\cot\left(\frac{C+D}{4}\right)$

73. If $\cos\theta=k(0<k<1)$ and θ does not lie in the first quadrant, then $\tan\theta=$
1) $-\frac{\sqrt{1-k^2}}{k}$ 2) $\frac{k}{\sqrt{1-k^2}}$
3) $-\frac{k}{\sqrt{1+k^2}}$ 4) $\frac{\sqrt{1-k^2}}{k}$

74. If $x=r\cos\theta\cos\phi,\ y=r\cos\theta\sin\phi,$
$z=r\sin\theta$ then $x^2+y^2+z^2=$
1) r^2 2) y^2 3) x^2 4) z^2

75. If $a\sec\theta+b\tan\theta=c$ then
$(a\tan\theta+b\sec\theta)^2=$
1) $a^2+b^2+c^2$ 2) $-a^2+b^2+c^2$
3) $a^2-b^2+c^2$ 4) $a^2+b^2-c^2$

76. $\sin^2 50^0+\cos^2 130^0=$
1) 0 2) 1 3) –1 4) –2

77. $\cos^2 1^0+\cos^2 2^0+\cos^2 3^0+....+\cos^2 90^0=$
1) 0 2) 1 3) 45 4) $\frac{89}{2}$

78. If $\theta = \frac{11\pi}{6}$, then $\cos\theta + \sin\theta =$

1) $\frac{\sqrt{3}+1}{\sqrt{2}}$ 2) $\frac{\sqrt{3}-1}{\sqrt{2}}$ 3) $\frac{\sqrt{3}-1}{2}$ 4) $\frac{\sqrt{3}+1}{2}$

79. If α, β are supplementary angles, then $\sin^2\alpha + \cos^2\beta =$

1) 1 2) –1 3) 2 4) 0

80. If $\cos\theta = \frac{3}{5}$ and θ is not in the first quadrant,then $\frac{5\tan(\pi+\theta) + 4\cos(\pi+\theta)}{5\sec(2\pi-\theta) - 4\cot(2\pi+\theta)} =$

1) $\frac{4}{5}$ 2) $-\frac{4}{5}$ 3) $\frac{5}{4}$ 4) $-\frac{5}{4}$

K E Y

1. 2	2. 2	3. 4	4. 2	5. 4
6. 3	7. 4	8. 2	9. 2	10. 1
11. 1	12. 2	13. 1	14. 4	15. 3
16. 3	17. 3	18. 3	19. 3	20. 4
21. 3	22. 3	23. 1		

24. I-3, II-2,
25. I-3, II-2, III-1
26. I-2, II-2, III-1
27. I-2, II-2 III-1

28. 2	29. 3	30. 2	31. 1	32. 2
33. 2	34. 1	35. 4	36. 2	37. 2
38. 2	39. 4	40. 3	41. 3	42. 3
43. 3	44. 4	45. 2	46. 1	47. 3
48. 3	49. 2	50. 2	51. 2	52. 4
53. 2	54. 4	55. 1	56. 1	57. 4
58. 2	59. 2	60. 4	61. 2	62. 2
63. 1	64. 2	65. 3	66. 2	67. 2
68. 4	69. 3	70. 3	71. 2	72. 4
73. 1	74. 1	75. 2	76. 2	77. 4
78. 3	79. 1	80. 2		

HINTS

13. $A + B = 180^0 \Rightarrow \tan A + \tan B = 0$
22. $\alpha = 90^0$
23. $A = B = C = 60^0$
24. $1 = \operatorname{cosec}^2\theta - \cot^2\theta$
29. $A + B = 90^0 \Rightarrow \sin^2 A + \sin^2 B = 1$
35. $A + B = 90^0 \Rightarrow \tan A \tan B = 1$
36. $A + B = 90^0 \Rightarrow \cot A \cot B = 1$
46. Divide Nr & Dr by $\operatorname{cosec}^2\theta$
48. Consider $\tan\alpha$ and then $\sin\alpha$
49. $\theta = 45^0$
53. $\alpha = 0^0$
58. $a\sin x + b\cos x = c \Rightarrow b\sin x - a\cos x = \pm\sqrt{a^2 + b^2 - c^2}$

LEVEL-II

1. $0 < \theta < \frac{\pi}{2} \Rightarrow$

1) $\tan\theta < \theta < \sin\theta$ 2) $\tan\theta > \theta > \sin\theta$
3) $\tan\theta > \theta < \sin\theta$ 4) $\tan\theta < \theta > \sin\theta$

2. $a = \sin 1^0, b = \sin 1 \Rightarrow$

1) $a = b$ 2) $a < b$
3) $a > b$ 4) $a = 2b$

3. $x = \cos 1^0, y = \cos 1 \Rightarrow$

1) $x = y$ 2) $x > y$
3) $x < y$ 4) $2x = y$

4. $p = \tan 1^0, q = \tan 1 \Rightarrow$

1) $p = q$ 2) $p < q$
3) $p > q$ 4) $2p = 3q$

5. $\left(\sqrt{1 - \sin^2 100^0}\right)\sec 100^0$

1) – 1 2) 0 3) 1 4) 2

6. $\left(\sqrt{1 - \sin^2 200^0}\right)\sec 200^0 =$

1) – 1 2) 0 3) 1 4) 2

7. $\left(\sqrt{1 - \cos^2 200^0}\right)\operatorname{cosec} 200^0 =$

1) – 1 2) 0 3) 1 4) 2

8. $a = \operatorname{cosec} 2^0, b = \operatorname{cosec} 2 \Rightarrow$

1) $a = b$ 2) $a > b$
3) $a < b$ 4) $a = 2b$

9. $a = \sec 2^0, b = \sec 2 \Rightarrow$

1) $a = b$ 2) $a < b$
3) $b < a$ 4) $2a = b$

10. $a = \cot 2^0, b = \cot 2 \Rightarrow$

1) $a = b$ 2) $a < b$
3) $b < a$ 4) $2a = 3b$

11. $\operatorname{cosec} A = 4p + \frac{1}{16p} \Rightarrow \operatorname{cosec} A + \cot A =$

1) $8p$ 2) $\frac{1}{8p}$

3) $-8p$ (or) $\frac{1}{8p}$ 4) $8p$ (or) $\frac{1}{8p}$

12. $\cos ec\beta = x + \frac{1}{4x} \Rightarrow \cos ec\beta - \cot\beta =$

1) $2x$ (or) $-\frac{1}{2x}$ 2) $-2x$ (or) $\frac{1}{2x}$

3) $-2x$ (or) $-\frac{1}{2x}$ 4) $\frac{1}{2x}$ (or) $2x$

13. $\sec\alpha = 5x + \frac{1}{20x} \Rightarrow \sec\alpha + \tan\alpha =$

1) $5x$ 2) $\frac{1}{20x}$

3) $10x$ (or) $-\frac{1}{10x}$ 4) $10x$ (or) $\frac{1}{10x}$

14. $\tan\theta = P - \frac{1}{4p} \Rightarrow \sec\theta - \tan\theta =$

1) $2p$ (or) $\frac{1}{2p}$ 2) $\frac{1}{2p}$ (or) $-2p$

3) $-\frac{1}{2p}$ (or) $2p$ 4) $-\frac{1}{2p}$ (or) $-2p$

15. $\cot\alpha = 2a - \frac{1}{8a} \Rightarrow \cos ec\alpha + \cot\alpha =$

1) $4a$ 2) $-4a$

3) $\frac{1}{4a}$ 4) $4a$ or $\frac{-1}{4a}$

16. $\cot\theta = 3x - \frac{1}{12x} \Rightarrow \cos ec\theta - \cot\theta =$

1) $6x$ 2) $-\frac{1}{6x}$

3) $\frac{1}{6x}$ or $-6x$ 4) $6x$ or $-\frac{1}{6x}$

17. If $\sqrt{\frac{1-\sin A}{1+\sin A}} = \sec A - \tan A$ then A lies in the quadrants

1) I, II 2) II, III 3) I, IV 4) I, III

18. If $\sqrt{\frac{1+\sin A}{1-\sin A}} = \sec A + \tan A$, then A lies in the quadrants

1) I, II 2) II, III 3) I, III 4) I, IV

19. If $\sqrt{\frac{1-\cos A}{1+\cos A}} = \cos ecA - \cot A$, then A lies in the quadrants

1) I, II 2) II, III 3) I, III 4) I, IV

20. If $\sqrt{\frac{1+\cos A}{1-\cos A}} = \cos ecA + \cot A$, then A lies in the quadrants

1) I, II 2) II, III 3) I, III 4) I, IV

21. If $k = (\sec A + \tan A)(\sec B + \tan B)(\sec C + \tan C) = (\sec A - \tan A)(\sec B - \tan B)(\sec C - \tan C)$ then k = ...

1) 0 2) ± 1 3) ± 3 4) ± 4

22. $\sqrt{\frac{1-\sin A}{1+\sin A}} =$

1) $\pm(\sec A - \tan A)$ 2) $\pm(\sec A + \tan A)$

3) $\pm(\cos ecA - \cot A)$

4) $\pm(\cos ecA + \cot A)$

23. $\sqrt{\frac{1+\sin A}{1-\sin A}} = k(\sec A + \tan A) \Rightarrow k =$

1) -1 2) 1 3) ± 1 4) ± 2

24. $\sqrt{\frac{1-\cos A}{1+\cos A}} =$

1) $\pm(\sec A - \tan A)$ 2) $\pm(\sec A + \tan A)$

3) $\pm(\cos ecA - \cot A)$

4) $\pm(\cos ecA + \cot A)$

25. $\sqrt{\frac{1+\cos A}{1-\cos A}} = k(\cos ecA + \cot A) \Rightarrow k =$

1) -1 2) 1 3) ± 1 4) 2

26. $p = \sec\alpha - \tan\alpha, q = \cos ec\alpha + \cot\alpha \Rightarrow q =$

1) $\frac{p+1}{p-1}$ 2) $\frac{1+p}{1-p}$ 3) $\frac{p-1}{p+1}$ 4) $\frac{1-p}{1+p}$

27. $a = \sec\theta - \tan\theta, b = \operatorname{cosec}\theta + \cot\theta \Rightarrow a =$

1) $\frac{b+1}{b-1}$ 2) $\frac{1+b}{1-b}$ 3) $\frac{b-1}{b+1}$ 4) $\frac{1-b}{1+b}$

28. $1 + \cos x + \cos^2 x + \ldots\ldots \text{ to } \infty = 4 + 2\sqrt{3} \Rightarrow x$

1) 30^0 2) 60^0 3) 45^0 4) 90^0

29. $1 + \sin x + \sin^2 x + \ldots\ldots \text{ to } \infty = 4 + 2\sqrt{3} \Rightarrow x =$

1) $30^0, 60^0$ 2) $60^0, 120^0$
3) $90^0, 120^0$ 4) $30^0, 45^0$

30. $\sin^2 5^0 + \sin^2 10^0 + \sin^2 15^0 + \ldots\ldots + \sin^2 90^0 =$

1) 17/2 2) 9 3) 19/2 4) 10

31. $\cos^2 5^0 + \cos^2 10^0 + \cos^2 15^0 + \ldots\ldots + \cos^2 360^0 =$

1) 18 2) 27 3) 36 4) 45

32. $\sin^2 6^0 + \sin^2 9^0 + \ldots\ldots + \sin^2 84^0 =$

1) 13 2) 27/2 3) 12 4) 29/2

33. $\cos^2 9^0 + \cos^2 18^0 + \cos^2 27^0 + \ldots\ldots + \cos^2 81^0 =$

1) 4 2) 9/2 3) 5 4) 11/2

34. $\sin^2 5^0 + \sin^2 10^0 + \sin^2 15^0 + \ldots\ldots + \sin^2 180^0 =$

1) 18 2) 19 3) 20 4) 21

35. $\sin^6 \frac{\pi}{49} + \cos^6 \frac{\pi}{49} - 1 + 3\sin^2 \frac{\pi}{49} \cos^2 \frac{\pi}{49}$

1) 1 2) – 1 3) 2 4) 0

36. $f(x) = x^3 - 2x^2 + 3x - 5 \Rightarrow f\left[\sin\left(\frac{5\pi}{2}\right)\right] + f\left[\sin\left(\frac{3\pi}{2}\right)\right] =$

1) 10 2) –10 3) 14 4) –14

37. In a triangle ABC, $C = 90^0$, then the equation whose roots are tanA, tanB is

1) $ab\,x^2 + c^2 x + ab = 0$

2) $ab\,x^2 + c^2 x - ab = 0$

3) $ab\,x^2 - c^2 x - ab = 0$

4) $ab\,x^2 - c^2 x + ab = 0$

38. In a triangle ABC, $3\cos A + 2 = 0 \Rightarrow$ quadratic equation with roots are sinA, cosA is $9x^2 + 3\left(2 - \sqrt{5}\right)x + k = 0 \Rightarrow k =$

1) 5 2) $-\sqrt{5}$ 2) $2\sqrt{5}$ 4) $-2\sqrt{5}$

39. In a triangle ABC, $3\cos A + 2 = 0 \Rightarrow$ quadratic equation whose roots are sinA, tanA is

1) $6x^2 - \sqrt{5}x - 5 = 0$ 2) $6x^2 + \sqrt{5}x + 5 = 0$

3) $6x^2 - \sqrt{5}x + 5 = 0$ 4) $6x^2 + \sqrt{5}x - 5 = 0$

40. cosA, sinA, cotA are in GP

$\Rightarrow \tan^6 A - \tan^2 A =$

1) –1 2) 0 3) 1 4) 2

41. cosA, sinA, cotA are in GP

$\Rightarrow \cot^6 A + \cot^4 A =$

1) –1 2) 0 3) 1 4) 2

42. sinA, cosA, tanA are in GP

$\Rightarrow \cot^6 A - \cot^2 A =$

1) 2 2) 1 3) 0 4) –1

43. sinA, cosA, tanA are in GP

$\Rightarrow \tan^6 A + \tan^4 A =$

1) 0 2) –1 3) 2 4) 1

44. $\tan A = a + 1, \tan B = a - 1 \Rightarrow 2\cot(A - B) =$

1) –a 2) a 3) a^2 4) a^3

45. $a\sec\theta + b\tan\theta = 1, a^2\sec^2\theta - b^2\tan^2\theta = 5 \Rightarrow a^2(b^2 + 4)$

1) $3b^2$ 2) $9b^2$ 3) b^2 4) $4b^2$

46. In a Δ ABC $C = 90^0 \Rightarrow \tan A + \tan B =$

1) a^2/bc 2) b^2/ca 3) c^2/ab 4) ab/c

47. $a = x\operatorname{cosec}^2\theta + y\cot^2\theta \Rightarrow \frac{a-x}{a+y} =$

1) $\cos^2\theta$ 2) $\sin^2\theta$ 3) $\tan^2\theta$ 4) $\cot^2\theta$

48. $x = a\tan^2\alpha + b\sec^2\alpha \Rightarrow \frac{x+a}{x-b} =$

1) $\sec^2\alpha$ 2) $\operatorname{cosec}^2\alpha$
3) $\sin^2\alpha$ 4) $\cos^2\alpha$

49. $\tan A = a\tan B, \sin A = b\sin B \Rightarrow \frac{b^2-1}{a^2-1} =$

1) $\sin^2 A$ 2) $\sin^3 A$ 3) $\cos^2 A$ 4) $\cos^3 A$

50. $\cos A = a\cos B, \sin A = b\sin B \Rightarrow (b^2 - a^2)\sin^2 B =$

1) $1 + a^2$ 2) $2 + a^2$ 3) $1 - a^2$ 4) $2 - a^2$

51. $x = \tan\theta + \cot\theta, y = \cos\theta - \sin\theta \Rightarrow$

1) $x = y$ 2) $\frac{1-y^2}{2} = \frac{1}{x}$

3) $\frac{y^2-1}{2} = \frac{1}{x}$ 4) $\frac{1+y^2}{2} = \frac{1}{x}$

52. If $x = \cos 10^0 - \sin 10^0$ then

1) $x > 0$ 2) $x < 0$ 3) $x = 0$ 4) $x \geq 0$

53. If $\frac{\cos^2\theta}{a}=\frac{\sin^2\theta}{b}$ then $\frac{\cos^4\theta}{a}+\frac{\sin^4\theta}{b}=$

1) $\frac{1}{a+b}$ 2) $\frac{1}{(a+b)^2}$

3) $\frac{1}{a^2}+\frac{1}{b^2}$ 4) $a+b$

54. If $\tan\theta=\frac{-4}{3}$, then $\sin\theta=$

1) $-\frac{4}{5}$ but not $\frac{4}{5}$ 2) $-\frac{4}{5}$ (or) $\frac{4}{5}$

3) $\frac{4}{5}$ but not $-\frac{4}{5}$ 4) $\frac{3}{5}$

55. If θ is acute and

$(1-a^2)\sin\theta=(1+a^2)\cos\theta$, then $\sin\theta=$

1) $\frac{1-a^2}{\sqrt{2(1+a^4)}}$ 2) $\frac{1+a^2}{\sqrt{2(1+a^4)}}$

3) $\frac{\sqrt{2(1+a^4)}}{1-a^2}$ 4) $\frac{\sqrt{2(1+a^4)}}{1+a^2}$

56. If $\sin\theta+\cos\theta=a$, then $\sin^4\theta+\cos^4\theta=$

1) $1-\frac{1}{2}\left(a^2+1\right)^2$ 2) $1-\frac{1}{2}\left(a^2-1\right)^2$

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

57. If $\sin(\alpha+\beta)=1, \sin(\alpha-\beta)=\frac{1}{2}$, then

$\tan(\alpha+2\beta)\tan(2\alpha+\beta)=$ (α,β acute).

1) 1 2) –1 3) 0 4) 5

K E Y

01. 2	02. 2	03. 2	04. 2	05. 1
06. 1	07. 1	08. 2	09. 3	10. 3
11. 4	12. 4	13. 4	14. 2	15. 4
16. 3	17. 3	18. 4	19. 1	20. 1
21. 2	22. 1	23. 3	24. 3	25. 3
26. 2	27. 3	28. 1	29. 2	30. 3
31. 3	32. 2	33. 2	34. 1	35. 4
36. 4	37. 4	38. 4	39. 4	40. 3
41. 3	42. 2	43. 4	44. 3	45. 2
46. 3	47. 1	48. 2	49. 3	50. 3
51. 2	52. 1	53. 1	54. 2	55. 2
56. 2	57. 1			

HINTS

5. $\sqrt{1-\sin^2\theta}=-\cos\theta$ $[\theta\in Q_2, Q_3]$

10. $2=2^e=114^0$ (app)

13. $\sec\alpha=\frac{1}{2}\left(p+\frac{1}{p}\right)\Rightarrow\sec\alpha+\tan\alpha=p$

19. $\sqrt{\sin^2 A}=\sin A$, $(A\in Q_1, Q_2)$

26. Put $\alpha=45^0$

33. $A+B=90^0\Rightarrow\cos^2 A+\cos^2 B=1$

LEVEL-III

1. $\tan^2\alpha=1-p^2$ then,

$\sec\alpha+\tan^3\alpha\,\mathrm{cosec}\alpha=$

1) $(2+p^2)^{\frac{3}{2}}$ 2) $(1+p^2)^{\frac{3}{2}}$

3) $(2-p^2)^{\frac{3}{2}}$ 4) $(1-p^2)^{\frac{3}{2}}$

2. $\cot^2\alpha=1+a^2$ then

$\mathrm{cosec}\alpha+\cot^3\alpha\sec\alpha=$

1) $(1+a^2)^{\frac{2}{3}}$ 2) $(2+a^2)^{\frac{2}{3}}$

3) $(1+a^2)^{\frac{3}{2}}$ 4) $(2+a^2)^{\frac{3}{2}}$

3. $\frac{\pi}{2}<\alpha<\pi\Rightarrow\sqrt{\frac{1-\cos\alpha}{1+\cos\alpha}}+\sqrt{\frac{1+\cos\alpha}{1-\cos\alpha}}=$

1) $2\sec\alpha$ 2) $-2\sec\alpha$

3) $2\,\mathrm{cosec}\alpha$ 4) $-2\,\mathrm{cosec}\alpha$

4. $\pi<\theta<\frac{3\pi}{2}\Rightarrow\sqrt{\frac{1-\cos\theta}{1+\cos\theta}}+\sqrt{\frac{1+\cos\theta}{1-\cos\theta}}=$

1) $-2\,\mathrm{cosec}\theta$ 2) $2\,\mathrm{cosec}\theta$

3) $-2\cot\theta$ 4) $2\cot\theta$

5. $\frac{\pi}{2}<x<\frac{3\pi}{2}\Rightarrow\frac{1}{\cos x-\sqrt{\tan^2 x-\sin^2 x}}=$

1) cosec x 2) sec x 3) sin x 4) cos x

6. $\pi<\theta<2\pi\Rightarrow\frac{1}{\sin\theta-\sqrt{\cot^2\theta-\cos^2\theta}}=$

1) $\mathrm{cosec}\,\theta$ 2) $\sec\theta$ 3) $\sin\theta$ 4) $\cos\theta$

7. $\sin x + \sin^2 x = 1 \Rightarrow \cos^{12} x + 3\cos^{10} x + 3\cos^8 x + \cos^6 x + 2\cos^4 x + \cos^2 x - 2 =$

1) 0 2) $\cos^2 x$

3) $\sin^2 x$ 4) $-\sin^2 x$

8. $\cos x + \cos^2 x = 1 \Rightarrow \sin^{12} x + 3\sin^{10} x + 3\sin^8 x + \sin^6 x + \sin^4 x + 2\sin^2 x - 2 =$

1) 0 2) sin x 3) cos x 4) 1

9. $\cos\theta + \cos^2\theta = 1$,

$a\sin^{12}\theta + b\sin^{10}\theta + c\sin^8\theta + d\sin^6\theta = 1 \Rightarrow \frac{b+c}{a+d} =$

1) 2 2) 3 3) 4 4) 6

10. $\sin x + \sin^2 x + \sin^3 x = 1 \Rightarrow \cos^6 x - 4\cos^4 x + 8\cos^2 x =$

1) 4 2) 2 3) 1 4) 0

11. $\cos x + \cos^2 x + \cos^3 x = 1$,

$a\sin^6 x + b\sin^4 x + c\sin^2 x + d = 0 \Rightarrow$

$a + b + c + d =$

1) 0 2) 1 3) –1 4) 2

12. $\operatorname{cosec}^2\alpha = \frac{4xy}{x^2 + y^2}$ $[(x, y) \neq (0, 0)]$ is

1) Possible for x = y 2) Impossible for x = y

3) Possible for x = – y 4) Not possible

13. $\operatorname{cosec}\theta = \frac{x^2 + y^2}{2xy}$ $(x \neq 0, y \neq 0)$ is

1) possible for x = y

2) possible for all real values of x and y

3) impossible for all real values of x and y

4) possible for x = 2y

14. $\sin^2\alpha = \frac{(x+y)^2}{4xy}$ is possible when

1) x > 0, y > 0, x = 3y 2) x > 0, y > 0, x = y

3) x = 2y 4) x > 0, y < 0, x = y

15. Which of the following is possible ?

1) $\cos\theta = x + \frac{1}{x}$ 2) $\sec\theta = \frac{x^2}{1+x^2}$

3) $\operatorname{cosec}\theta = \frac{x}{1+x^2}$ 4) $\tan\theta = \frac{x^2 + x + 1}{x^2 - 3x + 5}$

16. The equation $\sin x = k + \frac{1}{k}(k > 0)$ is

1) possible for real values of k

2) impossible for real values of k

3) true if k = 3 4) true if k =1

17. If $\tan\theta + \sin\theta = m, \tan\theta - \sin\theta = n$, then $(m^2 - n^2)^2 = ...$

1) 16mn 2) 4mn 3) 32mn 4) 8mn

18. If $x = a\cos^2\theta\sin\theta$ and $y = a\sin^2\theta\cos\theta$, then $\frac{(x^2 + y^2)^3}{x^2y^2} =$

1) a 2) a^3 3) a^2 4) a^5

KEY

01. 3	02. 4	03. 3	04. 1	05. 4
06. 3	07. 3	08. 3	09. 2	10. 1
11. 2	12. 1	13. 2	14. 2	15. 4
16. 2	17. 1	18. 3		

HINTS

1. $\sec\alpha\left(1 + \tan^3\alpha\frac{\operatorname{cosec}\alpha}{\sec\alpha}\right)$ and

$\sec^2\alpha = 2 - p^2$

5. Take $x = 135^0$

7. Use $(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$

17. Take $\alpha = 30^0, \beta = 150^0, \gamma = 390^0, \delta = 510^0$ verify.

LEVEL - IV

I. STATEMENT QUESTIONS

1. Statement-I:- If α, β are complementary angles, $\cos^2\alpha + \cos^2\beta = 0$.

Statement-II:- If α, β are supplementary angles, $\cos^2\alpha + \sin^2\beta = -1$.

Which of the above statements is correct ?

1) only I 2) only II

3) both I and II 4) Neither I nor II

2. Statement-I : If A, B, C, D are the angles of a cyclic quadrilateral, then cosA+cosB+cosC+cosD=0

Statement-II: If A, B, C, D are the angles of a quadrilateral then

$\cos\left(\frac{A+B}{2}\right) + \cos\left(\frac{C+D}{2}\right) = 0$

Which of the above statements is correct ?
1) only I is true 2) only II is true
3)Both I and II are true
4)Neither I nor II is true

3. Statement I : $\frac{\cos^3 A+\sin^3 A}{\cos A+\sin A}+\frac{\cos^3 A-\sin^3 A}{\cos A-\sin A}=2$.
Satement II: For all real values of θ, if $\sin\theta=\frac{a-4}{2}$ then the limits of 'a' are $2\le a\le 6$.
Which of the above statements is correct ?
1) only I is true 2) only II is true
3) Both I and II are true
4) Neither I nor II is true

4. Satement I: If $\sec\theta+\cos\theta=1$ then $\sec^3\theta+\cos^3\theta=2$.
Statement II: If $7\sin^2\alpha+3\cos^2\alpha=4$, then $\tan\alpha=\sqrt{3}$.
Which of the above statements is correct ?
1) only I is true 2) only II is true
3) Both I and II are true 4) Neither I nor II is true

II. MATCHING QUESTIONS

5. Observe the following lists. Let $\frac{\sin x}{a}=\frac{\cos x}{b}=\frac{\tan x}{c}=k$.

List - I	List-II
1) bc	a) $\frac{1}{b^2k^4}$
2) a^2+b^2	b) $\frac{1}{ak}$
3) $\frac{1}{ck}+\frac{ak}{1+bk}$	c) $\frac{a}{k}$
4) $a^2+b^2+c^2$	d) $\frac{1}{k^2}$

The correct match for List-I form List-II is
1) 1 - c, 2 - d, 3 - b, 4 - a
2) 1 - d, 2 - a, 3 - c, 4 - b
3) 1 - a, 2 - b, 3 - d, 4 - c 4) 1 - b, 2 - c, 3 - a, 4 - d

6. Observe the following lists.

List-I	List-II
1) $\cos^2\frac{2\pi}{3}+\sin^2\frac{5\pi}{6}-\cot^2\frac{3\pi}{4}=$	a) 0
2) $\cos^2(51^0+\theta)+\cos^2(39^0-\theta)=$	b) $-\frac{1}{2}$
3) $\sec^2\pi+2\sin^2\frac{3\pi}{2}-\tan^2\frac{5\pi}{3}=$	c) 3
4) $\tan^2 120^0+\cos^2 150^0-\sin^2 300^0=$	d) 1

The correct match for List-I from List-II is
1) 1-c, 2-a, 3-d, 4-b
2) 1-b, 2-d, 3-a, 4-c
3) 1-a, 2-b, 3-c, 4-d
4) 1-d, 2-c, 3-b, 4-a

7. Observe the following lists. Let SecA+TanA=3

List-I	List-II
1) sec A	a) $\frac{4}{5}$
2) tan A	b) $\frac{5}{3}$
3) sin A	c) $\frac{4}{3}$

The correct match for List-I from List-II is
1) 1-b, 2-c, 3-a 2) 1-a, 2-b, 3-c
3) 1-c, 2-a, 3-b 4) 1-c, 2-b, 3-a

8. Observe the following lists.
List-I (parametric equation)
List-II (cartesian equation)

I. $x\cos\theta+y\sin\theta=a$, $x\sin\theta-y\cos\theta=b$	a) $(x^2-y^2)^2=16xy$
II. $x=\sec\theta+\tan\theta$, $y=\sec\theta-\tan\theta$	b) $xy=1$
III. $x\sec\theta+y\tan\theta=a$, $x\tan\theta+y\sec\theta=b$	c) $x^2-y^2=a^2-b^2$
IV. $x=\cot\theta+\cos\theta$, $y=\cot\theta-\cos\theta$	d) $x^2+y^2=a^2+b^2$

The correct match for List-I from List-II is
1) I-c, II-d, III-a, IV-b
2) I-d, II-b, III-c, IV-a
3) I-a, II-c, III-d, IV-b
4) I-b, II-c, III-a, IV-d

9. Observe the following lists.

List-I	List-II
I. $\sin^2\frac{2\pi}{3}+\cos^2\frac{5\pi}{6}-\tan^2\frac{3\pi}{4}$	a) $\frac{15}{2}$
II. $\sin^2\frac{11\pi}{6}+\cos^2\frac{7\pi}{6}-\tan^2\frac{5\pi}{4}$	b) $-\frac{1}{2}$
III. $\sin^2\frac{3\pi}{4}+\sec^2\frac{5\pi}{3}+\tan^2\frac{2\pi}{3}$	c) 0
IV. $\cos^2\frac{2\pi}{3}+\sin^2\frac{5\pi}{3}-\frac{3}{2}\tan^2\frac{3\pi}{4}$	d) 1/2

The correct match for List-I from List-II is

1) I-d, II-c, III-a, IV-b 2) I-a, II-b, III-c, IV-d
3) I-b, II-a, III-d, IV-c 4) I-c, II-d, III-b, IV-a

III. ASCENDING & DESCENDING ORDER QUESTIONS

10. The arrangement of the following trigonometric ratios in the descending order is

A) $\sin 150^0$ B) $\tan 135^0$ C) $\cot 225^0$ D) $\cos 270^0$

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

11. A = tan1, B = tan2, C = tan3, then the descending order of A, B, C is

1) A, B, C 2) C, B, A 3) A, C, B 4) B, C, A

12. If $A=\cos\frac{\pi}{4}+\sin\frac{\pi}{4}$, $B=\cos\frac{3\pi}{2}+\sin\frac{3\pi}{2}$, $C=\cos 2\pi+\sin 2\pi$

Then the ascending order of A, B, C is

1) B, C, A 2) B, A,C 3) A, B, C 4) C, B, A

13. If $\frac{\pi}{2}<\theta<\pi$ and $\sin\theta=\frac{3}{5}$, then the ascending order of $\sin\theta, \cos\theta, \tan\theta$ is

1) $\cos\theta, \sin\theta, \tan\theta$ 2) $\cos\theta, \tan\theta, \sin\theta$ 3) $\sin\theta, \cos\theta, \tan\theta$ 4) $\sin\theta, \tan\theta, \cos\theta$

14. If $\alpha=\cos 10^0-\sin 10^0, \beta=\cos 45^0-\sin 45^0, \gamma=\cos 70^0-\sin 70^0$ then the descending order of α, β, γ is

1) α, β, γ 2) γ, β, α 3) α, γ, β 4) β, α, γ

IV. ASSERTION & REASONING QUESTIONS

15. Assertion A:- $-\sin\theta+\sin(\pi+\theta)+\sin(2\pi+\theta)+.....+\sin(10\pi+\theta)=\sin\theta$

. Reason R:- $-\sin\theta+\sin(\pi+\theta)+\sin(2\pi+\theta)+.....+\sin(n\pi+\theta)=\sin\theta$ if n is odd

1) A , R are true and R is the correct explanation of A
2) A, R are true and R is not the correct explanation of A
3) A is true, R is false 4) A is false, R is true

16. Assertion A:- $\sqrt{1-\sin^2 100^0}\sec 100^0=-1$.

Reason R: $\sqrt{x^2}=x$ if $x>0$.

1) A , R are true and R is the correct explanation of A
2) A, R are true and R is not the correct explanation of A
3) A is true, R is false 4) A is false, R is true

17. Assertion A: $\cos 1 < \cos 2$

Reason R : In $(0, \pi)$, cosx is a decreasing function.

1) A, R are true and R is the correct explanation of A
2) A, R are true and R is not the correct explanation of A
3) A is true, R is false
4) A is false, R is true

18. Assetion A:- In a right angled triangle $\sin^2 A + \sin^2 B + \sec^2 C = 2$.

Reason R:- If α, β are complementary angles then $\sin^2 \alpha + \sin^2 \beta = 1$

1) A , R are true and R is the correct explanation of A
2) A, R are true and R is not the correct explanation of A
3) A is true, R is false
4) A is false, R is true

19. Assertion A:- $\sin 1 < \sin 1^0$.

Reason R:- sinx is a decreasing function in $\left(0, \frac{\pi}{2}\right)$.

1) A , R are true and R is the correct explanation of A
2) A, R are true and R is not the correct explanation of A
3) Both A & R are false
4) A is true, R is false

K E Y

01. 4	02. 3	03. 3	04. 4	05. 1	06. 2	07. 1	08. 2	9. 1	10. 2	11. 3
12. 1	13. 2	14. 1	15. 3	16. 2	17. 4	18. 4	19. 3			

LEVEL - V

$\sin x$ is increasing in $\left(0, \frac{\pi}{2}\right)$ and decreasing in $\left(\frac{\pi}{2}, \pi\right)$; $\cos x$ is decreasing in $(0, \pi)$; $\tan x$ is increasing function in $\left(0, \frac{\pi}{2}\right)$

1) $x = \sin 1^c, y = \cos 1^c$ then
   1) $x > y$ 2) $x < y$ 3) $x = y$ 4) cannot be compared
2) $a = \sin 1^c, b = \tan 1^c$ then
   1) $a > b$ 2) $a < b$ 3) $a = b$ 4) cannot be compared
3) $x = \sin 2^c, y = \tan 2^c$ then
   1) $x < y$ 2) $x > y$ 3) $x = y$ 4) cannot be compared

KEY

1. 1 2. 2 3. 2