10

CHAPTER

TRIGONOMETRY

EXERCISE

TYPE A (MAXIMA AND MINIMA)

1. The minimum value of $2\sin^2\theta + 3\cos^2\theta$ is
(a) 0 (b) 3
(c) 2 (d) 1

2. If $0° < \theta < 90°$, the value of $\sin\theta + \cos\theta$ is
(a) equal to 1 (b) greater than 1
(c) less than 1 (d) equal to 2

3. Maximum value of $(2\sin\theta + 3\cos\theta)$ is
(a) 2 (b) $\sqrt{13}$
(c) $\sqrt{15}$ (d) 1

4. The equation $\cos^2\theta = \frac{(x+y)^2}{4xy}$ is only possible when
(a) $x = -y$ (b) $x > y$
(c) $x = y$ (d) $x < y$
(SSC CHSL 20.10.2013)

5. The minimum value of $4\tan^2\theta + 9\cot^2\theta$ is equal to
(a) 1 (b) 2
(c) 12 (d) 13
(SSC CHSL 10.11.2013)

6. The greatest value of $\sin^4\theta + \cos^4\theta$ is
(a) 2 (b) 3
(c) $\frac{1}{2}$ (d) 1
(SSC CHSL 10.11.2013)

7. Which one of the following is true for $0° < \theta < 90°$?
(a) $\cos\theta \le \cos^2\theta$ (b) $\cos\theta < \cos^2\theta$
(c) $\cos\theta > \cos^2\theta$ (d) $\cos\theta \ge \cos^2\theta$
(SSC CGL Tier I 20.07.2014)

8. If $\cos\pi x = x^2 - x + \frac{5}{4}$, the value of x will be
(a) 0
(b) 1
(c) –1
(d) None of the above
(SSC CGL Tier I 27.04.2014)

9. If $\sin\frac{\pi x}{2} = x^2 - 2x + 2$, then the value of x is
(a) 0 (b) 1
(c) –1 (d) N.O.T.
(SSC CGL Tier I 27.04.2014)

TYPE B (BASIC)

10. The measure of the angles of a triangle are in the ratio 2 : 7 : 11. Measures of angles are
(a) 16°,56°,88°
(b) 18°,63°,99°
(c) 20°,70°,90°
(c) 25°,175°,105°

11. If θ be an acute angle and $7\sin^2\theta + 3\cos^2\theta = 4$, then the value of $\tan\theta$ is
(a) $\sqrt{3}$ (b) $\frac{1}{\sqrt{3}}$
(c) 1 (d) 0

12. If $\tan\theta = 1$, then the value of $\frac{8\sin\theta + 5\cos\theta}{\sin^3\theta - 2\cos^3\theta + 7\cos\theta}$ is
(a) 2 (b) $2\frac{1}{2}$
(c) 3 (d) $\frac{4}{5}$

13. If θ be a positive acute angle satisfying $\cos^2\theta + \cos^4\theta = 1$, then the value of $\tan^2\theta + \tan^4\theta$ is
(a) $\frac{3}{2}$ (b) 1
(c) $\frac{1}{2}$ (d) 0

14. If $\tan\theta = \frac{4}{3}$, then the value of $\frac{3\sin\theta + 2\cos\theta}{3\sin\theta - 2\cos\theta}$ is
(a) 0.5 (b) – 0.5
(c) 3.0 (d) – 3.0

15. The simplified value of $(\sec A - \cos A)^2 + (\operatorname{cosec} A - \sin A)^2 - (\cot A - \tan A)^2$
(a) 0 (b) $\frac{1}{2}$
(c) 1 (d) 2

16. The angles of a triangle are $(x+5)°$, $(2x-3)°$ and $(3x+4)°$. The value of x is
(a) 30 (b) 31
(c) 29 (d) 28
(FCI Grade III 25.02.2012)

17. The expression $\frac{\tan 57° + \cot 37°}{\tan 33° + \cot 53°}$ is equal to
(a) tan30°cot57°
(b) tan57°cot37°
(c) tan33°cot53°
(d) tan33° cot37°
(SSC CGL Tier II 16.09.2012)

18. The value of $\frac{\cot 30° - \cot 75°}{\tan 15° - \tan 60°}$ is
(a) 0 (b) 1
(c) $\sqrt{3} - 1$ (d) –1
(SSC CHSL 21.10.2012)

19. If $\sec^2\theta + \tan^2\theta = \frac{7}{12}$, then $\sec^4\theta - \tan^4\theta =$
(a) $\frac{7}{12}$ (b) $\frac{1}{2}$
(c) $\frac{1}{2}$ (d) 1
(SSC Assistant Grade III 25.02.2012)

20. The numerical value of $\frac{5}{\sec^2\theta} + \frac{2}{1+\cot^2\theta} + 3\sin^2\theta$ is;
(a) 5 (b) 2
(c) 3 (d) 4
(SSC CHSL 21.10.2012)

21. The numerical value of $\left(\frac{1}{\cos\theta} + \frac{1}{\cot\theta}\right)\left(\frac{1}{\cos\theta} - \frac{1}{\cot\theta}\right)$ is
(a) 0 (b) – 1
(c) +1 (d) 2
(SSC CHSL 28.10.2012)

22. The value of $(2\cos^2\theta-1)$ $\left(\frac{1+\tan\theta}{1-\tan\theta}+\frac{1-\tan\theta}{1+\tan\theta}\right)$ is-

(a) 4 (b) 1
(c) 3 (d) 2

(SSC Assistant Grade III 11.11.2012)

23. The value of cos 1° cos 2° cos 3°........ cos 177° cos 178° cos 179° is;

(a) 0 (b) $\frac{1}{2}$
(c) 1 (d) $\frac{1}{\sqrt{2}}$

(SSC CGL Tier I 21.04.2013)

24. 2 cosec² 23° cot²67°– sin²23°– sin²67–cot²67° is equal to

(a) 1 (b) sec²23°
(c) tan²23° (d) 0

(SSC CHSL 20.10.2013)

25. $\frac{\tan\theta}{1-\cot\theta}+\frac{\cot\theta}{1-\tan\theta}$ is equal to

(a) $1-\tan\theta-\cot\theta$
(b) $1+\tan\theta-\cot\theta$
(c) $1-\tan\theta+\cot\theta$
(d) $1+\tan\theta+\cot\theta$

(SSC FCI Grade III 07.04.2013)

26. The value of $(1+\cot\theta-\text{cosec}\,\theta)$ $(1+\tan\theta+\sec\theta)$ is equal to

(a) 1 (b) 2
(d) 0 (d) – 1

(SSC CGL Tier I 21.04.2013)

27. If $\frac{\sin\theta}{x}=\frac{\cos\theta}{y}$, then $\sin\theta-\cos\theta$ is equal to

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

(SSC CGL Tier I 21.04.2013)

28. If $x = a\sec\theta\cos\phi$, $y = b\sec\theta\sin\phi$, $z = c\tan\theta$, then the value of $\frac{x^2}{a^2}+\frac{y^2}{b^2}-\frac{z^2}{c^2}$ is;

(a) 1 (b) 4
(c) 9 (d) 0

(SSC CGL Tier I 21.04.2013)

29. If $\frac{\sec\theta+\tan\theta}{\sec\theta-\tan\theta}=\frac{5}{3}$, then $\sin\theta$ is equal to ;

(a) $\frac{1}{4}$ (b) $\frac{1}{3}$
(c) $\frac{2}{3}$ (d) $\frac{3}{4}$

(SSC CGL Tier I 21.04.2013)

30. If $(1+\sin\alpha)(1+\sin\beta)(1+\sin\gamma) = (1-\sin\alpha)(1-\sin\beta)(1-\sin\gamma)$ =?

(a) $\pm\cos\alpha\cos\beta\cos\gamma$
(b) $\pm\sin\alpha\sin\beta\sin\gamma$
(c) $\pm\sin\alpha\cos\beta\sec\gamma$
(d) $\pm\sin\alpha\sin\beta\cos\gamma$

(SSC CGL Tier I 21.04.2013)

31. The numerical value of $\frac{1}{1+\cot^2\theta}$ + $\frac{3}{1+\tan^2\theta}$ + $2\sin^2\theta$ will be

(a) 2 (b) 5
(c) 6 (d) 3

(SSC CGL Tier I 19.05.2013)

32. The elimination of θ from $x\cos\theta-y\sin\theta = 2$ and $x\sin\theta+y\cos\theta = 4$ will give

(a) $x^2+y^2 = 20$ (b) $3x^2+y^2 = 20$
(c) $x^2-y^2 = 20$ (d) $3x^2-y^2 = 10$

(SSC CGL Tier I 19.05.2013)

33. The value of

$$\left[\frac{\cos^2 A(\sin A+\cos A)}{\text{cosec}^2 A(\sin A-\cos A)}+\frac{\sin^2 A(\sin A-\cos A)}{\sec^2 A(\sin A+\cos A)}\right](\sec^2A-\text{cosec}^2A)$$

(a) 1 (b) 3
(c) 2 (d) 4

(SSC CGL Tier I 19.05.2013)

34. The value of $\frac{1}{\text{cosec}\,\theta-\cot\theta}-\frac{1}{\sin\theta}$ is

(a) 1 (b) $\cot\theta$
(b) $\text{cosec}\,\theta$ (d) $\tan\theta$

(SSC CGL Tier I 19.05.2013)

35. If $\cos^4\theta-\sin^4\theta=\frac{2}{3}$, then the value of $1-2\sin^2\theta$ is

(a) $\frac{4}{3}$ (b) 0
(c) $\frac{2}{3}$ (d) $\frac{1}{3}$

(SSC CGL Tier I 19.05.2013)

36. The value of $\frac{\sin A}{1+\cos A}$ + $\frac{\sin A}{1-\cos A}$ is (0°<A<90°)

(a) 2 cosec A (b) 2 sec A
(c) 2 sin A (d) 2 cos A

(SSC CGL Tier II 29.09.2013)

37. If $r\sin\theta = 1$, $r\cos\theta = \sqrt{3}$, then the value of $(\sqrt{3}\tan\theta+1)$ is

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

(SSC CGL Tier II 29.09.2013)

38. If $\tan\theta = \frac{\sin\alpha-\cos\alpha}{\sin\alpha+\cos\alpha}$, then $\sin\alpha+\cos\alpha$ is

(a) $\pm\sqrt{2}\sin\theta$ (b) $\pm\sqrt{2}\cos\theta$
(c) $\pm\frac{1}{\sqrt{2}}\sin\theta$ (d) $\pm\frac{1}{\sqrt{2}}\cos\theta$

(SSC CGL Tier I 20.07.2014)

39. If $\tan^2\theta = 1-e^2$, then the value of $\sec\theta+\tan^3\theta\,\text{cosec}\,\theta$ is

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

(SSC CGL Tier I 20.07.2014)

40. If $\frac{\cos\alpha}{\cos\beta}=a$ and $\frac{\sin\alpha}{\sin\beta}=b$, then the value of $\sin^2\beta$ in terms of a and b is

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

(SSC CGL Tier I 20.07.2014)
(SSC CGL Tier I 27.04.2014)

41. $\sin\theta = 0.7$, then $\cos\theta$, $0\leq\theta<90°$ is

(a) 0.3 (b) $\sqrt{0.49}$
(c) $\sqrt{0.51}$ (d) $\sqrt{0.9}$

(SSC CGL Tier I 27.04.2014)

42. If $2\sin\theta+\cos\theta = \frac{7}{3}$, then the value of $(\tan^2\theta-\sec^2\theta)$ is

(a) 0 (b) – 1
(c) $\frac{3}{7}$ (d) $\frac{7}{3}$

(SSC CGL Tier I 26.10.2014)

43. For any real value of $\sqrt{\frac{\sec\theta-1}{\sec\theta+1}}$ = ?

(a) $\cot\theta-\text{cosec}\theta$ (b) $\sec\theta-\tan\theta$
(c) $\text{cosec}\theta-\cot\theta$ (d) $\tan\theta-\sec\theta$

(SSC CGL Tier I 21.09.2014)

44. The value of $\sec^2\theta-\frac{\sin^2\theta-2\sin^4\theta}{2\cos^4\theta-\cos^2\theta}$ is

(a) 1 (b) 2 (c) – 1 (d) 0

(SSC CGL Tier II 21.09.2014)

45. $\sqrt{\frac{1+\sin\theta}{1-\sin\theta}}+\sqrt{\frac{1-\sin\theta}{1+\sin\theta}}$ is equal to

(a) $2\cos\theta$ (b) $2\sin\theta$
(c) $2\cot\theta$ (d) $2\sec\theta$

(SSC CAPF 22.06.2014)

46. If $(r\cos\theta-\sqrt{3})^2+(r\sin\theta-1)^2=0$, then the value of

$\frac{r\tan\theta+\sec\theta}{r\sec\theta+\tan\theta}$ is equal to

(a) $\frac{4}{5}$ (b) $\frac{3}{5}$

(c) $\frac{\sqrt{3}}{4}$ (d) $\frac{\sqrt{5}}{4}$

(SSC CHSL 09.11.2014)

47. Let A, B, C, D be the angles of a quadrilateral. If they are concyclic, then the value of cosA + cosB+cosC +cosD is

(a) 0 (b) 1
(c) –1 (d) 2

48 If $r\sin\theta=\frac{7}{2}$ and $r\cos\theta=\frac{7\sqrt{3}}{2}$, then value of r is

(a) 4 (b) 3
(c) 5 (d) 7

49. If $\frac{\sec\theta+\tan\theta}{\sec\theta-\tan\theta}=2\frac{51}{79}$ then the value of $\sin\theta$ is

(a) $\frac{91}{144}$ (b) $\frac{39}{72}$ (c) $\frac{65}{144}$ (d) $\frac{35}{72}$

(SSC CGL 16–08–2015 Evening)

50. If $1+\cos^2\theta=3\sin\theta\cos\theta$, then the integral value of $\cot\theta$ is $\left(0<\theta<\frac{\pi}{2}\right)$

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

(SSC CGL 16–08–2015 Evening)

51. $\frac{\cos\alpha}{\sin\beta}=n$ and $\frac{\cos\alpha}{\cos\beta}=m$, then the value of $\cos^2\beta$ is:

(a) $\frac{m^2-1}{n^2-1}$ (b) $\frac{m^2-3}{n^2-4}$

(c) $\frac{m^2+3}{n^2+3}$ (d) $\frac{n^2}{m^2+n^2}$

(SSC CGL 09–08–2015 Evening)

52. If $\tan\theta+\cot\theta=5$, then $\tan^2\theta+\cot^2\theta$ is:

(a) 23 (b) 24
(c) 25 (d) 26

(SSC CGL 09–08–2015 Evening)

53. If tan A = n tan B and sin A = m sin B, then the value of $\cos^2 A$ is

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

(c) $\frac{m^2-1}{n^2-1}$ (d) $\frac{m^2-1}{n^2+1}$

(CGL mains 25–10–2015)

54. The numerical value of

$\frac{9}{\text{cosec}^2\theta}+4\cos^2\theta+\frac{5}{1+\tan^2\theta}$:

(a) 7 (b) 9 (c) 4 (d) 5

(LDC 15–11–2015 Evening)

55. If $\cos\theta+\sin\theta=m$ and $\sec\theta+\text{cosec}\,\theta=n$ then the value of $n(m^2-1)$ is equal to:

(a) mn (b) 4mn (c) 2n (d) 2m

(LDC 06–12–2015 Morning)

TYPE C (COMPLEMENTORY)

56. The value of tan4°. tan 43°.tan47°. tan 86°is

(a) 2 (b) 3 (c) 1 (d) 4

(SSC CPO, LDC 28, 04.08.2011)

57. The value of tan1° tan2° tan3°........tan89° is

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

58. The value of cot 10°. cot 20° .cot 60°. cot 70°.cot 80° is

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

59. The value of $\sin^2 1°+\sin^2 5°+\sin^2 9°+.........+\sin^2 89°$ is

(a) $11\frac{1}{2}$ (b) $11\sqrt{2}$ (c) 11 (d) $\frac{11}{\sqrt{2}}$

60. The value of

$\cot 18°\left(\cot 72°\cos^2 22°+\frac{1}{\tan 72°\sec^2 68°}\right)$ is

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

61. If x, y are acute angles, $0<x+y<90°$ and $\sin(2x-20°)=\cos(2y+20°)$, then the value of $\tan(x+y)$ is :

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

62. $\sin^2 5°+\sin^2 6°+........+\sin^2 84°+\sin^2 85°$ = ?

(a) $30\frac{1}{2}$ (b) $40\frac{1}{2}$

(c) 40 (d) $39\frac{1}{2}$

63. $\sin^2 5°+\sin^2 10°+\sin^2 15°+.........+\sin^2 85°+\sin^2 90°$ is equal to

(a) $7\frac{1}{2}$ (b) $8\frac{1}{2}$ (c) 9 (d) $9\frac{1}{2}$

64. The value of $\frac{\sin 39°}{\cos 51°}$ + 2 (tan 11° tan 31° tan 45° tan 59° tan 79°) – 3 $(\sin^2 21°+\sin^2 69°)$ is ;

(a) 2 (b) – 1 (c) 1 (d) 0

65. If $\sin\alpha\sec(30°+\alpha)=1$, $(0<\alpha<60°)$, then the value of $\sin\alpha+\cos 2\alpha$ is

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

(c) 0 (d) $\sqrt{2}$

66. If $\angle A$ and $\angle B$ are complementary to each other, then the value of $\sec^2 A+\sec^2 B-\sec^2 A.\sec^2 B$ is

(a) 1 (b) –1 (c) 2 (d) 0

(SSC Assistant Grade III 11.11.2012)

67. The value of $\cot\theta.\tan(90°-\theta)-\sec(90°-\theta)\text{cosec}\,\theta+(\sin^2 25+\sin^2 65°)+\sqrt{3}$ (tan5° tan15°. tan30°.tan75° .tan85°)

(a) 1 (b) –1 (c) 2 (d) 0

(SSC CHSL 21.10.2012)

68. If $\cos\theta\,\text{cosec}\,23°=1$, the value of θ is

(a) 23° (b) 37° (c) 63° (d) 67°

(SSC CHSL 04.11.2012)

69. If A, B and C be the angles of a triangle, the incorrect relation is:

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

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

(c) $\tan\left(\frac{A+B}{2}\right)=\sec\frac{C}{2}$

(d) $\cot\left(\frac{A+B}{2}\right)=\tan\frac{C}{2}$

(SSC Assistant Grade III 16.09.2012)

70. If θ is a positive acute angle and $\tan 2\theta.\tan 3\theta=1$, then the value of $\left(2\cos^2\frac{5\theta}{2}-1\right)$ is

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

(c) 0 (d) $\frac{1}{2}$

(SSC CGL Tier II 16.09.2012)

71. If $\tan 7\theta\tan 2\theta=1$, then the value of $\tan 3\theta$ is

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

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

(SSC CGL Tier I 11.11.2012)

72. If $\sin(60°-\theta)=\cos(\psi-30°)$, then the value of $\tan(\psi-\theta)$ is (assume that θ and ψ are both positive acute angles with $\theta<60°$ and $\psi>30°$).

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

(SSC CGL Tier I 21.04.2013)

73. Evaluate : 3 cos 80° cosec 10° + 2 cos 59° cosec 31°

(a) 1 (b) 3 (c) 2 (d) 5

(SSC CGL Tier I 19.05.2013)

74. $\frac{2\sin 68°}{\cos 22°} - \frac{2\cot 15°}{5\tan 75°} - \frac{3\tan 45°.\tan 20°.\tan 40°.\tan 50°.\tan 70°}{5}$ is equal to

(a) –1 (b) 0 (c) 1 (d) 2

(SSC CHSL 27.10.2013)

75. The value of tan 10° tan 15° tan75° tan80° is

(a) 0 (b) 1 (c) –1 (d) 2

(SSC CHSL 10.11.2013)

76. If sin7x = cos11x, then the value of tan9x+cot9x is

(a) 1 (b) 2 (c) 3 (d) 4

(SSC CHSL 10.11.2013)

77. The value of $\left(\sin^2 7\frac{1°}{2} + \sin^2 82\frac{1°}{2}\right)$ is

(a) 1 (b) 2 (c) 0 (d) 4

(SSC CGL Tier I 27.04.2014)

78. The simplest value of cot 9° cot 27° cot63° cot81° is

(a) 0 (b) 1 (c) –1 (d) $\sqrt{3}$

(SSC CGL Tier I 27.04.2014)

79. The value of $\sin^2 65° + \sin^2 25° + \cos^2 35° + \cos^2 55°$ is

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

(SSC CGL Tier I 27.04.2014)

80. ABCD is a rectangle of which AC is a diagonal. The value of $(\tan^2\angle CAD+1)\sin^2\angle BAC$ is

(a) 2 (b) $\frac{1}{4}$ (c) 1 (d) 0

(SSC CGL Tier I 21.09.2014)

81. If sin 3A = cos(A – 26°), where 3A is an acute angle then the value of A is

(a) 29° (b) 26° (c) 23° (d) 28°

(SSC CGL Tier II 21.09.2014)

82. If sin(θ+18°) = cos60° (0° < θ < 90°), then the value of cos 5θ is

(a) $\frac{1}{2}$ (b) 0 (c) $\frac{1}{\sqrt{2}}$ (d) 1

83. If $\tan 2\theta . \tan 3\theta = 1$, where 0° < θ < 90°, then the value of θ is

(a) $22\frac{1}{2}°$ (b) 18°

(c) 24° (d) 30°

84. If θ be acute angle and tan (4θ – 50°) = cot(50° – θ), then the value of θ in degrees is:

(a) 30 (b) 40 (c) 50 (d) 20

(SSC CGL 16–08–2015 Morning)

85. The value of $\sin^2 22° + \sin^2 68° + \cot^2 30°$ is:

(a) 5/4 (b) 3/4 (c) 3 (d) 4

(SSC CGL 16–08–2015 Morning)

86. Find the value of tan4° tan43° tan47° tan86°

(a) 1 (b) 1/2 (c) 2 (d) 2/3

(SSC CGL 09–08–2015 Morning)

87. The value of cot41° . cot42 . cot43° . cot44° . cot45° . cot46° . cot47° . cot48° . cot49°

(a) $\frac{\sqrt{3}}{2}$ (b) 1

(c) 0 (d) $\frac{1}{\sqrt{2}}$

(CGL mains 25–10–2015)

88. The value of the following is:

$\frac{(\tan 20°)^2}{(\text{cosec}70°)^2} + \frac{(\cot 20°)^2}{(\sec 70°)^2}$ + 2tan 15°. tan45° . tan75.

(a) 1 (b) 2 (c) 4 (d) 3

(LDC 01–11–2015 Evening)

89. The value of the following is:

$\left(\frac{\sin 47°}{\cos 43°}\right)^2 + \left(\frac{\cos 43°}{\sin 47°}\right)^2 - 4\cos^2 45°$

(a) 1 (b) $\frac{1}{2}$ (c) – 1 (d) 0

(LDC 01–11–2015 Evening)

90. The value of the expression $\text{Sin}^2 1° + \sin^2 11° + \sin^2 21° + \text{Sin}^2 31° + \text{Sin}^2 41° + \sin^2 45° + \text{Sin}^2 49° + \sin^2 59° + \text{Sin}^2 69° + \text{Sin}^2 79° + \text{Sin}^2 89°$ is:

(a) 0 (b) $5\frac{1}{2}$ (c) $4\frac{1}{2}$ (d) 5

(LDC 06–12–2015 Morning)

91. If $\alpha + \beta = 90°$ then the expression

$\frac{\tan\alpha}{\tan\beta} + \sin^2\alpha + \sin^2\beta$ is equal to :

(a) $\tan^2\alpha$ (b) $\tan^2\beta$

(c) $\sin^2\beta$ (d) $\sec^2\alpha$

(LDC 06–12–2015 Evening)

92. If cos 20° = m and cos 70° = n, then the value of $m^2 + n^2$ is

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

(c) $\frac{3}{2}$ (d) $\frac{1}{\sqrt{2}}$

(LDC 20–12–2015 Morning)

93. If sin (90° – θ) + cos θ = $\sqrt{2}$ cos (90° – θ) then the value of cosec θ is

(a) $\frac{1}{\sqrt{3}}$ (b) $\frac{2}{3}$

(c) $\sqrt{\frac{3}{2}}$ (d) $\frac{1}{\sqrt{2}}$

(LDC 20–12–2015 Morning)

94. If $\sin A - \cos A = \frac{\sqrt{3}-1}{2}$, then the value of sinA . cosA is

(a) $\frac{1}{\sqrt{3}}$ (b) $\frac{\sqrt{3}}{2}$

(c) $\frac{1}{4}$ (d) $\frac{\sqrt{3}}{4}$

(LDC 20–12–2015 Morning)

95. If $\frac{\sec^2 70° - \cot^2 20°}{2(\text{Cosec}^2 59° - \tan^2 31°)} = \frac{2}{m}$, then m is equal to:

(a) 2 (b) 3 (c) 4 (d) 1

(LDC 20–12–2015 Evening)

TYPE D (COMPONANDO)

96. $\frac{\tan\theta+\cot\theta}{\tan\theta-\cot\theta} = 2$, $(0 \le \theta \le 90°)$, then the value of sinθ is

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

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

(SSC CPO 28.08.2011)

97. If $\frac{\sin\theta+\cos\theta}{\sin\theta-\cos\theta} = 3$ then the value of $\sin^4\theta - \cos^4\theta$ is

(a) $\frac{1}{5}$ (b) $\frac{3}{5}$ (c) $\frac{2}{5}$ (d) $\frac{4}{5}$

TYPE E (QUADRANT)

98. If tan 15° = 2 – $\sqrt{3}$, the value of tan 15° cot 75°+ tan 75°cot15°is

(a) 14 (b) 12 (c) 10 (d) 8

99. If A = tan 11° tan 29°, B = 2 cot 61° cot 79°, then ;

(a) A = 2B (b) A = – 2B

(c) 2A = B (d) 2A= – B

100. If $\tan\left(\frac{\pi}{2} - \frac{\theta}{2}\right) = \sqrt{3}$ the value of cos θ is:

(a) 0 (b) $\frac{1}{\sqrt{2}}$ (c) $\frac{1}{2}$ (d) 1

(SSC CHSL 04.11.2012)

101. The value of $\text{cosec}^2 18° - \frac{1}{\cot^2 72°}$ is

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

(SSC CHSL 27.10.2013)

102. If $\alpha + \beta = 90°$, then the value of $(1-\sin^2\alpha)(1-\cos^2\alpha) \times (1+\cot^2\beta)(1+\tan^2\beta)$ is:

(a) 1 (b) – 1 (c) 0 (d) 2

(SSC CHSL 27.10.2013)

103. If $\tan 9° = \frac{p}{q}$, then the value of $\frac{\sec^2 81°}{1+\cot^2 81°}$ is

(a) $\frac{q}{p}$ (b) 1 (c) $\frac{p^2}{q^2}$ (d) $\frac{q^2}{p^2}$

(SSC CGL Tier I 20.07.2014)

104. The value of following is cos24° + cos55° + cos 125° + cos 204° + cos300°

(a) – 1/2 (b) 1/2
(c) 2 (d) 1

(SSC CGL 16–08–2015 Evening)

TYPE F (ANGLE FIND OUT)

105. If $2(\cos^2\theta - \sin^2\theta) = 1$, θ is a positive acute angle, then the value of θ is

(a) 60° (b) 30°
(c) 45° (d) $22\frac{1}{2}$

(SSC Assistant Grade III 11.11.2012)

106. If $7\sin^2\theta + 3\cos^2\theta = 4, (0° \le \theta \le 90°)$, then value of θ is

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

(SSC CGL Tier I 28.08.2012)

107. If $\tan(2\theta + 45°) = \cot 3\theta$, where $(2\theta+45°)$ and 3θ are acute angles, then the value of θ is

(a) 5° (b) 9° (c) 12° (d) 15°

(SSC CGL Tier I 11.11.2012)

108. If $\sin(A - B) = \frac{1}{2}$ and $\cos(A + B) = \frac{1}{2}$ where A > B > 0 and A+ B is an acute angle, then the value of B is

(a) $\frac{\pi}{6}$ (b) $\frac{\pi}{12}$ (c) $\frac{\pi}{4}$ (d) $\frac{\pi}{2}$

(SSC CGL Tier I 21.04.2013)

109. $\sin^2\theta - 3\sin\theta + 2 = 0$ will be true if

(a) $0 \le \theta < 90$ (b) $0 < \theta < 90$
(c) $\theta = 0°$ (d) $\theta = 90°$

(SSC CGL Tier I 19.05.2013)

110. If $2(\cos^2\theta - \sin^2\theta) = 1$ (θ is positive acute angle), then $\cot\theta$ is equal to

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

(SSC FCI Grade III 07.04.2013)

TYPE G (VALUE PUT)

111. If $\sin\alpha + \cos\beta = 2$; $(0° \le \beta < \alpha \le 90°)$, then $\sin\left(\frac{2\alpha+\beta}{3}\right) = ?$

(a) $\sin\frac{\alpha}{2}$ (b) $\cos\frac{\alpha}{3}$
(c) $\sin\frac{\alpha}{3}$ (d) $\cos\frac{2\alpha}{3}$

112. If $\cos^2\alpha + \cos^2\beta = 2$, then the value of $\tan^3\alpha + \sin^5\beta$ is ;

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

113. If $2\sin\left(\frac{\pi x}{2}\right) = x^2 + \frac{1}{x^2}$, then the value of $\left(x - \frac{1}{x}\right)$ is

(a) –1 (b) 2 (c) 1 (d) 0

(SSC CHSL 21.10.2012)

114. If $\cos\theta + \sec\theta = 2$, the value of $\cos^6\theta + \sec^6\theta$ is

(a) 4 (b) 8 (c) 1 (d) 2

(SSC CHSL 21.10.2012)

115. The value of 152 (sin30° + 2cos²45° + 3 sin30° + 4cos²45° + ... + 17 sin30° + 18 cos²45°) is

(a) an integer but not perfect square
(b) a rational number but not an integer
(c) a perfect square of an integer
(d) irrational

(SSC CGL Tier I 21.08.2013)

116. If $x\sin 45° = y\,\text{cosec}\,30°$, then $\frac{x^4}{y^4}$ is equal to

(a) 4^3 (b) 6^3 (c) 2^3 (d) 8^3

(SSC CGL Tier II 29.09.2013)

117. If $\tan^2\alpha = 1 + 2\tan^2\beta$ (α,β are positive acute angles), then $\sqrt{2}\cos\alpha - \cos\beta$ is equal to

(a) 0 (b) $\sqrt{2}$ (c) 1 (d) – 1

(SSC CHSL 10.11.2013)

118. If $\tan\theta + \cot\theta = 2$, then the value of $\tan^{100}\theta + \cot^{100}\theta$ is

(a) 2 (b) 0 (c) 1 (d) $\sqrt{3}$

(SSC FCI Grade III 07.04.2013)

119. If $\sin\theta + \text{cosec}\,\theta = 2$, then the value of $\sin^9\theta + \text{cosec}^9\theta$ is ;

(a) 3 (b) 2 (c) 4 (d) 1

(SSC CGL Tier I 21.04.2013)

120. The value of $3(\sin x - \cos x)^4 + 6(\sin x + \cos x)^2 + 4(\sin^6 x + \cos^6 x)$ is

(a) 14 (b) 11 (c) 12 (d) 13

(SSC CGL Tier I 19.05.2013)

121. The value of $\sec\theta\left(\frac{1+\sin\theta}{\cos\theta} + \frac{\cos\theta}{1+\sin\theta}\right) - 2\tan^2\theta$ is

(a) 4 (b) 1 (c) 2 (d) 0

(SSC CGL Tier I 19.05.2013)

122. If $\tan\theta - \cot\theta = 0$, find the value of $\sin\theta + \cos\theta$,

(a) 0 (b) 1 (c) $\sqrt{2}$ (d) 2

(SSC CHSL 27.10.2013)

123. If x sin 60°. tan30° = sec60°. cot45°, then the value of x is

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

(SSC CGL Tier I 20.07.2014)

124. If $\theta = 60°$, then $\frac{1}{2}\sqrt{1+\sin\theta} + \frac{1}{2}\sqrt{1-\sin\theta}$ is equal to

(a) $\cot\frac{\theta}{2}$ (b) $\sec\frac{\theta}{2}$
(c) $\sin\frac{\theta}{2}$ (d) $\cos\frac{\theta}{2}$

(SSC CGL Tier I 20.07.2014)

125. If $\frac{2\tan^2 30°}{1-\tan^2 30°} + \sec^2 45° - \sec^2 0° = x\sec 60°$, then the value of x is

(a) 2 (b) 1 (c) 0 (d) – 1

(SSC CGL Tier I 20.07.2014)

126. If x sin 60° tan 30° – tan²45°= cosec 60° cot 30° – sec²45° then x =

(a) 2 (b) – 2 (c) 6 (d) – 4

(SSC CGL Tier I 20.07.2014)

127. The value of $\frac{\cos^2 60° + 4\sec^2 30° - \tan^2 45°}{\sin^2 30° + \cos^2 30°}$

(a) $\frac{64}{\sqrt{3}}$ (b) $\frac{55}{12}$
(c) $\frac{67}{12}$ (d) $\frac{67}{10}$

(SSC CGL Tier I 20.07.2014)

128. The numerical value of $1 + \frac{1}{\cot^2 63°} - \sec^2 27° + \frac{1}{\sin^2 63°} - \text{cosec}^2 27°$ is

(a) 1 (b) 2 (c) – 1 (d) 0

(SSC CGL Tier I 27.04.2014)

129. The value of $\frac{\sin 43°}{\cos 47°}+\frac{\cos 19°}{\sin 71°}-8\cos^2 60°$

(a) 0 (b) 1 (c) 2 (d) – 1

(SSC CGL Tier I 27.04.2014)

130. The value of θ, which satisfies the equation $\tan^2\theta+3 = 3\sec\theta, 0° \le \theta < 90°$ is

(a) 15° or 0° (b) 30° or 0°
(c) 45° or 0° (d) 60° or 0°

(SSC CGL Tier I 27.04.2014)

131. The value of

$\frac{1}{\sqrt{2}}\sin\frac{\pi}{6}\cos\frac{\pi}{4}-\cot\frac{\pi}{3}\sec\frac{\pi}{6}+\frac{5\tan\frac{\pi}{4}}{12\sin\frac{\pi}{2}}$ is equal to

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

(SSC CGL Tier I 19.10.2014)

132. If $(\sin\alpha+\operatorname{cosec}\alpha)^2+(\cos\alpha+\sec\alpha)^2 = k+\tan^2\alpha+\cot^2\alpha$, then the value of k is

(a) 1 (b) 7 (c) 3 (d) 5

(SSC CGL Tier I 19.10.2014)

133. If $x\sin^2 60°-\frac{3}{2}\sec 60°\tan^2 30°+\frac{4}{5}\sin^2 45°\tan^2 60° = 0$ then x is

(a) $-\frac{1}{15}$ (b) – 4 (c) $-\frac{4}{15}$ (d) – 2

(SSC CGL Tier I 26.10.2014)

134. If 0° < A < 90°, then the value of $\tan^2A+\cot^2A-\sec^2A\operatorname{cosec}^2A$ is

(a) 0 (b) 1 (c) 2 (d) –2

(SSC CAPF 22.06.2014)

135. If α and β are positive acute angles, $\sin(4\alpha-\beta) = 1$ and $\cos(2\alpha+\beta) = \frac{1}{2}$, then the value of $\sin(\alpha+2\beta)$ is

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

(SSC CHSL 02.11.2014)

136. If θ is a positive acute angle and $4\cos^2\theta-1 = 0$, then the value of $\tan(\theta-15°)$ is equal to

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

(SSC CHSL 09.11.2014)

137. The value of

$\frac{\sin 25°\cos 65°+\cos 25°\sin 65°}{\tan^2 70°-\operatorname{cosec}^2 20°}$

(a) –1 (b) 0 (c) 1 (d) 2

138. If sin(A+B) = sinA cosB + cosA sinB, then the value of sin75° is

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

(c) $\frac{\sqrt{3}+1}{2\sqrt{2}}$ (d) $\frac{\sqrt{3}+1}{2}$

139. ABC is a right angle triangle and right angle at B and $\angle A$ = 60° and AB = 20cm, then the ratio of sides BC and CA is

(a) $\sqrt{3}:1$ (b) $1:\sqrt{3}$

(c) $\sqrt{3}:\sqrt{2}$ (d) $\sqrt{3}:2$

140. If $\theta+\phi=\frac{\pi}{2}$ and $\sin\theta=\frac{1}{2}$, then the value of $\sin\phi$ is

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

141. Find value of the following $3(\sin^4\theta+\cos^4\theta)+2(\sin^6\theta+\cos^6\theta)+12\sin^2\theta\cos^2\theta$:

(a) 3 (b) 2 (c) 0 (d) 5

(SSC CGL 16–08–2015 Evening)

142. The numerical value of

$\frac{\cos^2 45°}{\sin^2 60°}+\frac{\cos^2 60°}{\sin^2 45°}-\frac{\tan^2 30°}{\cot^2 45°}-\frac{\sin^2 30°}{\cot^2 30°}$ is

(a) 3/4 (b) 1/4

(c) 1/2 (d) $1\frac{1}{4}$

(SSC CGL 09–08–2015 Morning)

143. If $x\cos\theta-\sin\theta = 1$, then $x^2-(1+x^2)\sin\theta$ equals

(a) 1 (b) – 1 (c) 0 (d) 2

(SSC CGL 09–08–2015 Morning)

144. If $\tan\theta-\cot\theta = 0$ and θ is positive acute angle, then the value of $\frac{\tan(\theta+15°)}{\tan(\theta-15°)}$ is

(a) 3 (b) $\frac{1}{3}$

(c) $\sqrt{3}$ (d) $\frac{1}{\sqrt{3}}$

(CGL mains 25–10–2015)

145. If $\sec\theta-\tan\theta=\frac{1}{\sqrt{3}}$, the value of $\sec\theta.\tan\theta$

(a) $\frac{4}{\sqrt{3}}$ (b) $\frac{2}{\sqrt{3}}$

(c) $\frac{2}{3}$ (d) $\frac{1}{\sqrt{3}}$

(CGL mains 25–10–2015)

146. The value of (cosec a – sin a) (sec a – cos a) (tan a + cot a) is:

(a) 4 (b) 6 (c) 2 (d) 1

(CGL mains 25–10–2015 Morning)

147. The value of $\theta\ (0 \le \theta \le 90°)$ satisfying $2\sin^2\theta = 3\cos\theta$ is

(a) 60° (b) 90° (c) 30° (d) 45°

(CGL mains 12–04–2015)

148. a, b, c are the lengths of three sides of a triangle ABC. If a, b, c are related by the relation $a^2+b^2+c^2 = ab+bc+ca$, then the value of $(\sin^2A+\sin^2B+\sin^2C)$ is

(a) $\frac{3}{4}$ (b) $\frac{3}{2}$

(c) $\frac{3\sqrt{3}}{2}$ (d) $\frac{9}{4}$

(CGL mains 12–04–2015)

149. If $x\cos^2 30°.\sin 60° = \frac{\tan^2 45°.\sec 60°}{\operatorname{cosec} 60°}$ then the value of x

(a) $\frac{1}{\sqrt{3}}$ (b) $2\frac{2}{3}$

(c) $\frac{1}{\sqrt{2}}$ (d) $\frac{1}{2}$

(CGL mains 12–04–2015)

150. If $\tan\alpha = 2$, then the value of $\frac{\operatorname{cosec}^2\alpha-\sec^2\alpha}{\operatorname{cosec}^2\alpha+\sec^2\alpha}$ is

(a) $-\frac{15}{9}$ (b) $\frac{3}{5}$

(c) $-\frac{3}{5}$ (d) $\frac{17}{5}$

(CGL mains 12–04–2015)

151. If $\sin(\theta+30°)=\frac{3}{\sqrt{12}}$, then find $\cos^2\theta$

(a) $\frac{1}{4}$ (b) $\frac{3}{4}$

(c) $\frac{\sqrt{3}}{2}$ (d) $\frac{1}{2}$

(CGL mains 12–04–2015)

152. If $0 \le \theta \le 90°$ and $4\cos^2\theta-4\sqrt{3}\cos\theta+3 = 0$, then the value of θ is

(a) 30° (b) 90° (c) 45° (d) 60°

(CGL mains 12–04–2015)

153. The value of $\sec^4 A(1-\sin^4 A)-2\tan^2 A$ is

(a) ½ (b) 0 (c) 2 (d) 1

(LDC 01–11–2015 Morning)

154. The value of (sin90° – cos45°+ cos60°) (cos0° + sin45° + sin30°) is

(a) $\frac{7}{4}$ (b) $\frac{5}{4}$ (c) $\frac{3}{4}$ (d) $\frac{3}{2}$

(LDC 01–11–2015 Morning)

155. If $2\sin^2\theta - 3\sin\theta + 1 = 0$, θ being positive angle, then the values of θ are

(a) 30°, 90° (b) 60°, 55°
(c) 60°, 45° (d) 45°, 50°

(LDC 01–11–2015 Morning)

156. If $4\sin^2\theta - 1 = 0$ and angle θ is less than 90°. The value of $\cos^2\theta + \tan^2\theta$ is:
(Take $0° < \theta < 90°$)

(a) $\frac{13}{12}$ (b) $\frac{12}{11}$ (c) $\frac{11}{9}$ (d) $\frac{17}{15}$

(LDC 15–11–2015 Morning)

157. If $\frac{x - x\tan^2 30°}{1+\tan^2 30°} = \sin^2 30° + 4\cot^2 45° - \sec^2 60°$ Then value of x is:

(a) $\frac{1}{4}$ (b) $\frac{1}{\sqrt{3}}$ (c) $\frac{1}{2}$ (d) $\frac{1}{5}$

(LDC 06–12–2015 Morning)

158. Value of the expression:

$$\frac{1+2\sin 60°\cos 60°}{\sin 60° + \cos 60°} + \frac{1-2\sin 60°\cos 60°}{\sin 60° - \cos 60°}$$

(a) $\sqrt{3}$ (b) $2\sqrt{3}$
(c) 0 (d) 2

(LDC 06–12–2015 Evening)

159. The value of x in the equation $\tan^2\frac{\pi}{4} - \cos^2\frac{\pi}{3} = x \sin\frac{\pi}{4}\cos\frac{\pi}{4}\tan\frac{\pi}{3}$ is:

(a) $\frac{3\sqrt{3}}{4}$ (b) $\frac{2}{\sqrt{3}}$

(c) $\frac{1}{\sqrt{3}}$ (d) $\frac{\sqrt{3}}{2}$

(LDC 06–12–2015 Evening)

TYPE H

160. If $\cos^4\theta - \sin^4\theta = \frac{2}{3}$, then the value of $2\cos^2\theta - 1$ is

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

161. If $\sin\theta - \cos\theta = \frac{7}{13}$ and $0° < \theta < 90°$, then the value of $\sin\theta + \cos\theta$ is

(a) $\frac{17}{13}$ (b) $\frac{13}{17}$ (c) $\frac{1}{13}$ (d) $\frac{1}{17}$

162. If $2\cos\theta - \sin\theta = \frac{1}{\sqrt{2}}$, $(0° < \theta < 90°)$ the value of $2\sin\theta + \cos\theta$ is

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

163. If $\sin\theta + \operatorname{cosec}\theta = 2$, then value of $\sin^{100}\theta + \operatorname{cosec}^{100}\theta$ is equal to :

(a) 1 (b) 2 (c) 3 (d) 100

Type I

164. If $\sec^2\theta + \tan^2\theta = 7$, then the value of θ when $0° \le \theta \le 90°$, is

(a) 60° (b) 30° (c) 0° (d) 90°

165. The simplified value of $(\sec x \sec y + \tan x \tan y)^2 - (\sec x \tan y + \tan x \sec y)^2$

(a) – 1 (b) 0 (c) $\sec^2 x$ (d) 1

166. If A = $\sin^2\theta + \cos^4\theta$ for any value of θ, then the value of A is

(a) $1 \le A \le 1$ (b) $\frac{3}{4} \le A \le 1$

(c) $\frac{13}{16} \le A \le 1$ (d) $\frac{3}{4} \le A \le \frac{13}{16}$

TYPE J

167. In circular measure, the value of the angle 11°15' is

(a) $\frac{\pi^c}{16}$ (b) $\frac{\pi^c}{8}$

(c) $\frac{\pi^c}{4}$ (d) $\frac{\pi^c}{12}$

(SSC CHSL 11.11.2012)

168. In a triangle ABC, $\angle ABC = 75°$ and $\angle ACB = \frac{\pi^c}{4}$, The circular measure of $\angle BAC$ is

(a) $\frac{5\pi}{12}$ radian (b) $\frac{\pi}{3}$ radian

(c) $\frac{\pi}{6}$ radian (d) $\frac{\pi}{2}$ radian

(SSC CGL Tier I 11.11.2012)

TYPE K

169. If $\sin 17° = \frac{x}{y}$, then the value of $(\sec 17° - \sin 73°)$ is

(a) $\frac{y^2}{x\sqrt{y^2-x^2}}$ (b) $\frac{x^2}{y\sqrt{y^2-x^2}}$

(c) $\frac{x^2}{y\sqrt{x^2-y^2}}$ (d) $\frac{y^2}{x\sqrt{x^2-y^2}}$

(SSC CGL Tier II 16.09.2012)

170. If θ be acute angle and $\cos\theta = \frac{15}{17}$, then the value of $\cot(90° - \theta)$ is

(a) $\frac{2\sqrt{8}}{15}$ (b) $\frac{8}{15}$ (c) $\frac{\sqrt{2}}{17}$ (d) $\frac{8\sqrt{2}}{17}$

(SSC Assistant Grade III 11.11.2012)

171. In a right-angled triangle XYZ right-angled at Y. if XY = $2\sqrt{6}$ and XZ – YZ = 2, then secX+tanX is

(a) $\frac{1}{\sqrt{6}}$ (b) $\sqrt{6}$ (c) $2\sqrt{6}$ (d) $\frac{\sqrt{6}}{2}$

(SSC CGL Tier II 16.09.2012)

172. In ΔABC, $\angle B = 90°$ and AB : BC = 2 : 1, Then value of (SinA + CotC)

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

(c) $2+\sqrt{5}$ (d) $3\sqrt{5}$

(SSC CGL Tier I 27.04.2014)

173. If $\sin 21° = \frac{x}{y}$, then sec21°– sin69° is equal to

(a) $\frac{x^2}{y\sqrt{y^2-x^2}}$ (b) $\frac{y^2}{x\sqrt{y^2-x^2}}$

(c) $\frac{x^2}{y\sqrt{x^2-y^2}}$ (d) $\frac{y^2}{x\sqrt{x^2-y^2}}$

(SSC CGL Tier I 19.10.2014)

174. If $7\sin\alpha = 24\cos\alpha$; $0 < \alpha < \frac{\pi}{2}$, then the value of $14\tan\alpha - 75\cos\alpha - 7\sec\alpha$ is equal to

(a) 3 (b) 4 (c) 1 (d) 2

(SSC CGL Tier I 26.10.2014)

175. If $\sqrt{3}\tan\theta = 3\sin\theta$, then the value of $(\sin^2\theta - \cos^2\theta)$ is

(a) 1 (b) 3

(c) $\frac{1}{3}$ (d) None of these

176. If $\sin\theta = \frac{a}{b}$, then the value of $\sec\theta - \cos\theta$ is (where $0° < \theta < 90°$)

(a) $\frac{a}{b\sqrt{b^2-a^2}}$ (b) $\frac{b^2}{a\sqrt{b^2-a^2}}$

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

(LDC 20–12–2015 Evening)

TYPE L

177. If $\sec\theta = x + \frac{1}{4x}$ $(0° < \theta < 90°)$ then $\sec\theta + \tan\theta$ is equal to

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

(SSC FCI Grade III 07.04.2013)

178. If $\sec\theta + \tan\theta = \sqrt{3}$ $(0° \le \theta \le 90°)$ then the value of $\tan 3\theta$ = ?

(a) undefined (b) $\frac{1}{\sqrt{3}}$

(c) $\frac{1}{\sqrt{2}}$ (d) $\sqrt{3}$

(SSC CGL Tier I 21.04.2013)

179. If $\operatorname{cosec}\theta - \cot\theta = \frac{7}{2}$, the value of $\operatorname{cosec}\theta$ is;

(a) $\frac{47}{28}$ (b) $\frac{51}{28}$ (c) $\frac{53}{28}$ (d) $\frac{49}{28}$

(SSC CAPF 23.06.2013)

180. If $\sec\theta + \tan\theta = 2 + \sqrt{5}$, then the value of $\sin\theta + \cos\theta$ is ;

(a) $\frac{3}{\sqrt{5}}$ (b) $\sqrt{5}$ (c) $\frac{7}{\sqrt{5}}$ (d) $\frac{1}{\sqrt{5}}$

(SSC CGL Tier I 21.04.2013)

181. If $\sec\alpha + \tan\alpha = 2$, then the value of $\sin\alpha$ is (assume that $0 < \alpha < 90°$)

(a) 0.4 (b) 0.5

(c) 0.6 (d) 0.8

(SSC CGL Tier I 19.10.2014)

182. If A is an acute angle and cotA +cosec A = 3, then the value of sin A is

(a) 1 (b) 4/5 (c) 3/5 (d) 0

(CPO 21–06–2015 Evening)

183. If θ is positive acute angle and $3(\sec^2\theta + \tan^2\theta) = 5$, then the value of $\cos 2\theta$ is

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

(CGL mains 12–04–2015)

TYPE M (RADIAN-DEGREE)

184. The circular measure of an angle of an isosceles triangle is $\frac{5\pi}{9}$, Circular measure of one of the other angles must be

(a) $\frac{5\pi}{18}$ (b) $\frac{5\pi}{9}$

(c) $\frac{2\pi}{9}$ (d) $\frac{4\pi}{9}$

(SSC FCI Grade III 07.04.2013)

185. The degree measure of 1 radian $\left(\pi = \frac{22}{7}\right)$

(a) 57°61'22''(approx.)

(b) 57°16'22''(approx.)

(c) 57°21'16''(approx.)

(d) 57°62'16''(approx.)

(SSC CGL Tier I 21.04.2013)

186. $\left(\frac{3\pi}{5}\right)$ radians is equal to

(a) 100° (b) 120°

(c) 108° (d) 180°

(SSC CGL Tier I 20.07.2013)

187. If the sum and difference of two angles are 135° and $\frac{\pi}{12}$ respectively, then the value of the angles in degree measure are

(a) 70°, 65° (b) 75°,60°

(c) 45°,90° (d) 80°,55°

(SSC CGL Tier II 21.09.2014)

188. If $\cos x + \cos^2 x = 1$, the numerical value of $(\sin^{12} + 3\sin^{10}x + 3\sin^8 x + \sin^6 x - 1)$

(a) –1 (b) 2 (c) 0 (d) 1

(SSC CGL Tier I 21.04.2013)

189. If $\cos\theta + \sin\theta = \sqrt{2}\cos\theta$, then $\cos\theta - \sin\theta$ is

(a) $\sqrt{2}\tan\theta$ (b) $-\sqrt{2}\cos\theta$

(c) $-\sqrt{2}\sin\theta$ (d) $\sqrt{2}\sin\theta$

(SSC CGL Tier I 19.05.2013)

190. If $\sin\theta - \cos\theta = \frac{1}{2}$ then value of $\sin\theta + \cos\theta$ is;

(a) –2 (b) ±2 (c) $\frac{\sqrt{7}}{2}$ (d) 2

(SSC CAPF 23.06.2013)

191. If $x\cos\theta - y\sin\theta = \sqrt{x^2+y^2}$ and $\frac{\cos^2\theta}{a^2} + \frac{\sin^2\theta}{b^2} = \frac{1}{x^2+y^2}$ then the correct relation is

(a) $\frac{x^2}{b^2} - \frac{y^2}{a^2} = 1$ (b) $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

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

(SSC CHSL 20.10.2013)

192. If $\cos^2\theta - \sin^2\theta = \frac{1}{3}$, where $0 \le \theta < \frac{\pi}{2}$, then the value of $\cos^4\theta - \sin^4\theta$ is

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

(c) $\frac{1}{9}$ (d) $\frac{2}{9}$

(SSC CGL Tier I 19.10.2014)

193. If $3\sin\theta + 5\cos\theta = 5$, then the value of $5\sin\theta - 3\cos\theta$ will be

(a) ±3 (b) ±5

(c) ±2 (d) ±1

(SSC CGL Tier I 19.10.2014)

194. If $\sin\theta + \cos\theta = \sqrt{2}\sin(90° - \theta)$ then the value of $\cot\theta$ is

(a) $-\sqrt{2}-1$ (b) $\sqrt{2}+1$

(c) $\sqrt{2}-1$ (d) $-\sqrt{2}+1$

(CGL mains 12–04–2015)

195. If $\frac{\sin\theta+\cos\theta}{\sin\theta-\cos\theta} = 3$ then the value of $\sin^4\theta$ is:

(a) $\frac{16}{25}$ (b) $\frac{2}{5}$

(c) $\frac{1}{5}$ (d) $\frac{3}{5}$

(LDC 06–12–2015 Evening)

196. If $0<\theta<90°$, $\tan\theta + \sin\theta = m$ and $\tan\theta - \sin\theta = n$, where $m \ne n$, then the value of $m^2 - n^2$ is.

(a) $2(\tan^2\theta + \sin^2\theta)$

(b) 4 mm

(c) $4\sqrt{mn}$

(d) $2(m^2+n^2)$

(SSC CPO 20–03–2016 Morning)

197. If 0< A< 90°, then the value of $\frac{1}{2}\cot A\left[\frac{1+(\sec A-\tan A)^2}{\operatorname{cosec}A\,(\sec A-\tan A)}\right]$

(a) 0 (b) 2

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

(SSC CPO 20–03–2016 Morning)

198. The value of following is:

$$\frac{\sin\theta\ \text{cosec}\theta\ \tan\theta\cot\theta}{\sin^2\theta+\cos^2\theta}$$

(a) 2 (b) 0
(c) $\tan\theta$ (d) 1

(SSC CPO 20–03–2016 Evening)

199. If $\alpha+\theta=\frac{7\pi}{12}$ and $\tan\theta=\sqrt{3}$, then the value of $\tan\alpha$ is:

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

(SSC CPO 20–03–2016 Evening)

200. If $\cos\theta+\sec\theta=\sqrt{3}$, then the value of $(\cos^3\theta+\sec^3\theta)$ is

(a) $\frac{1}{\sqrt{2}}$ (b) 1
(c) 0 (d) $\sqrt{2}$

(SSC CPO 20–03–2016 Evening)

201. The value of $\sin^2 2° + \sin^2 4 + \sin^2 6° + ...+\sin^2 90°$ is

(a) 23 (b) 0
(c) 44 (d) 22

(SSC CPO 20-03-2016, Morning)

202. The maximum value of $1+\sin\left(\frac{x}{4}+\theta\right)+2\cos\left(\frac{x}{4}-\theta\right)$ for real values of θ is:

(a) 3 (b) 4
(c) 5 (d) 6

(SSC CPO(Re Ex.) 04-06-2016, Morning)

203. If $A\times\tan(\theta+150°)=B\times\tan(\theta-60°)$, the value of $\frac{A-B}{A+B}$ is:

(a) $-\frac{\sin\theta}{2}$ (b) $\frac{\sin 2\theta}{2}$
(c) $\frac{\cos 2\theta}{2}$ (d) 0

(SSC CPO(Re Ex.) 04-06-2016, Evening)

204. Find the value of $\text{Sin}^2 25° + \sin^2 65° + \text{cosec}^2 57° - \tan^2 33°$

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

(SSC CPO(Re Ex.) 05-06-2016, Morning)

205. Find the value of $(\tan\theta)(1+\sec 2\theta)(1+\sec 4\theta)(1+\sec 8\theta)$.

(a) $\tan 10\theta$ (b) $\tan 8\theta$
(c) $\tan 12\theta$ (d) 1

(SSC CPO(Re Ex.) 06-06-2016, Evening)

206. If $6\sin^4\theta+3\cos^4\theta=2$ then the value of $[7\ \text{cosec}^6\theta+8\sec^6\theta]^{1/3}$ is:

(a) 2 (b) 4
(c) 8 (d) 6

(SSC CPO(Re Ex.) 06-06-2016, Evening)

207. If $\sin\theta=\frac{5}{13}$ and θ is acute, what is the value of $\sqrt{(\cot\theta+\tan\theta)}$?

(a) $\frac{2}{\sqrt{5}}$ (b) $13\frac{2}{\sqrt{5}}$
(c) $\frac{-2}{\sqrt{5}}$ (d) $\frac{13}{2\sqrt{15}}$

(SSC CPO(Re Ex.) 07-06-2016, Morning)

208. $\frac{2\sin\theta}{\cos\theta(1+\tan^2\theta)}$ simplifies to:

(a) $\cos\theta$ (b) $\cos 2\theta$
(c) $\sin 2\theta$ (d) $\sin\theta$

(SSC CPO(Re Ex.) 08-06-2016, Evening)

209. If $\tan\theta_1=1$, $\sin\theta_2=1/\sqrt{2}$, then the value of $\sin(\theta_1+\theta_2)$ equal to:

(a) –1 (b) 0
(c) 1 (d) 1/2

(SSC CPO(Re Ex.) 09-06-2016, Morning)

210. If $\tan\theta=\frac{3}{4}$, Find the value of $\cos 2\theta$

(a) 24/25 (b) 16/25
(c) 7/25 (d) 9/30

(SSC CPO(Re Ex.) 10-06-2016, Evening)

211. $\sin^4\theta-\cos^4\theta$ is
$\sin^4\theta-\cos^4\theta$ है

(a) $\cos 2\theta$ (b) $-\sin 2\theta$
(c) $\sin 2\theta$ (d) $-\cos 2\theta$

(SSC CPO(Re Ex.) 10-06-2016, Evening)

212. The value of $\frac{\sin 65°}{\cos 25°}$ is–

(a) 0 (b) 1
(c) 2 (d) No defined

(SSC CPO(Re Ex.) 11-06-2016, Morning)

213. If $\tan\theta-\tan^2\theta=1$, then the value of $\sec^2\theta-\sec^4\theta$ is:

(a) 1 (b) –1
(c) 2 (d) 0

(SSC CPO(Re Ex.) 11-06-2016, Evening)

214. Find the value of $8\cos 10°\cos 20°\cos 40°$

(a) $2\cot 20°$ (b) $4\tan 10°$
(c) 1 (d) $\cot 10°$

(SSC CPO(Re Ex.) 11-06-2016, Evening)

215. The value of $\sec^2 17° - \frac{1}{\tan^2 73°} - \sin 17°\sec 73°$ is

(a) 1 (b) 0
(c) –1 (d) 2

(SSC CGL Pre Exam 2016)

216. If $x=a\cos\theta\cos\phi$, $y=a\cos\theta\sin\phi$ and $z=a\sin\phi$, then the value of $x^2+y^2+z^2$ is

(a) $2a^2$ (b) $4a^2$
(c) $9a^2$ (d) a^2

(SSC CGL Pre Exam 2016)

217. The value of $\text{cosec}^2 60° + \sec^2 60 - \cot^2 60° + \tan^2 30°$ will be

(a) 5 (b) $5\frac{1}{2}$
(c) $5\frac{2}{3}$ (d) $5\frac{1}{3}$

(SSC CGL Pre Exam 2016)

218. In a ΔABC, if $4\angle A = 3\angle B = 12\angle C$, find $\angle A$

(a) 22.5° (b) 90°
(c) 67.5° (d) 112.5°

(SSC CGL Pre Exam 2016)

219. If $\sin\theta+\text{cosec}\theta=2$, the value of $\sin^n\theta+\text{cosec}^n\theta$ is

(a) 2^n (b) $2^{\frac{1}{n}}$
(c) 2 (d) 0

(SSC CGL Pre Exam 2016)

220. If θ is acute angle and $\sin(\theta+18°)=1/2$, then the value of θ in circular measure is

(a) $\pi/12$ Radians
(b) $\pi/15$ Radians
(c) $2\pi/5$ Radians
(d) $3\pi/13$ Radians

(SSC CGL Pre Exam 2016)

221. If θ is positive acute angle and $4\sin^2\theta=3$, then the value of $\tan\theta-\cot\theta/2$ is

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

(SSC CGL Pre Exam 2016)

222. If $\sin 31°=\frac{x}{y}$ The value of $\sec 31° - \sin 59°$ is

(a) $\frac{x^2}{y\sqrt{y^2-x^2}}$ (b) $-\frac{x^2}{y\sqrt{y^2-x^2}}$
(c) $-\frac{y^2}{\sqrt{y^2-x^2}}$ (d) $-\frac{x^2}{\sqrt{y^2-x^2}}$

(SSC CGL Pre Exam 2016)

223. If $\theta>0$, be an acute, then the value of θ in degrees satisfying $\frac{\text{Cos}^2\theta-3\text{Cos}\,\theta+2}{\text{Sin}^2\theta}=1$ is

(a) 90° (b) 30°
(c) 45° (d) 60°

(SSC CGL Pre Exam 2016)

224. The value of cot17° (Cot73° Cos^2 22° + $\frac{1}{\text{Cot}17°\text{Sec}^2 68°}$)is

(a) 0 (b) 1

(c) 27 (d) $\sqrt{3}$

(SSC CGL Pre Exam 2016)

225. θ is the positive acute angle and $\sin\theta - \cos\theta = 0$, then the value of $\sec\theta + \text{cosec}\,\theta$ is

(a) 2 (b) $\sqrt{2}$

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

(SSC CGL Pre Exam 2016)

226. The value of $\frac{2\tan 53°}{\text{Cot}37°} - \frac{\text{Cot}80°}{\tan 10°}$ is

(a) 3 (b) 2

(c) 1 (d) 0

(SSC CGL Pre Exam 2016)

227. If $\alpha + \beta = 90°$ and $\alpha : \beta = 2 : 1$, then the ratio of $\cos\alpha$ to $\cos\beta$ is

(a) $1 : \sqrt{3}$ (b) 1:3

(c) $1 : \sqrt{2}$ (d) 1 : 2

(SSC CGL Pre Exam 2016)

228. If θ is positive acute angle and $7\cos^2\theta + 3\sin^2\theta = 4$, then value of θ is

(a) 60° (b) 30°

(c) 45° (d) 90

(SSC CGL Pre Exam 2016)

229. If tan (5x – 10°) = cot (5y + 20°), then the value of x + y is

(a) 15° (b) 16°

(c) $22\frac{1}{2}°$ (d) 24°

(SSC CGL Pre Exam 2016)

230. The least value of $\tan^2 x + \cot^2 x$ is

(a) 3 (b) 2

(c) 0 (d) 1

(SSC CGL Pre Exam 2016)

231. If cos 27° = x, the value of tan 63° is

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

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

(SSC CGL Pre Exam 2016)

232. If $\cos^2 x + \cos^4 x = 1$, then $\tan^2 x + \tan^4 x$ = ?

(a) 0 (b) 1

(c) $2\tan^2 x$ (d) $2\tan^4 x$

(SSC CGL Pre Exam 2016)

233. Value of (cos53°–sin 37°) is (cos 53°–sin37°)

(a) 0 (b) 1

(c) 2 sin 37° (d) 2 cos 53°

(SSC CGL Pre Exam 2016)

234. If $\text{cosec}\,\theta + \sin\theta = 5/2$ then the value of $\text{cosec}\,\theta - \sin\theta$ is

(a) –3/2 (b) 3/2

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

(SSC CGL Pre Exam 2016)

235. If $\tan\theta = \frac{4}{3}$, then the value of $\frac{3\sin\theta + 2\cos\theta}{3\sin\theta - 2\cos\theta}$ is

(a) 1/2 (b) $1\frac{2}{3}$

(c) 3 (d) – 3

(SSC CGL Pre Exam 2016)

236. If sec $(4x - 50°)$ = cosec $(50° - x)$, then the value of x is

(a) 45° (b) 90°

(c) 30° (d) 60°

(SSC CGL Pre Exam 2016)

237. If $\sec^2\theta + \tan^2\theta = \sqrt{3}$, then the value of $\sec^4\theta - \tan^4\theta$ is

(a) $\frac{1}{\sqrt{3}}$ (b) 1

(c) $\sqrt{3}$ (d) 0

(SSC CGL Pre Exam 2016)

238. If $\pi\sin\theta = 1$, $\pi\cos\theta = 1$, then the value of $\left\{\sqrt{3}\tan\left(\frac{2}{3}\theta\right)+1\right\}$ is

(a) 1 (b) $\sqrt{3}$

(c) 2 (d) $\frac{1}{\sqrt{3}}$

(SSC CGL Pre Exam 2016)

239. If in a triangle ABC, sinA = cosB then the value of cosC is

(a) $\frac{\sqrt{3}}{2}$ (b) 0

(c) 1 (d) $\frac{1}{\sqrt{2}}$

(SSC CGL Pre Exam 2016)

240. If $\sin\theta \times \cos\theta = \frac{1}{2}$. The value of $\sin\theta - \cos\theta$ is where $0° < \theta < 90°$

(a) 0 (b) $\sqrt{2}$

(c) 2 (d) 1

(SSC CGL Pre Exam 2016)

241. The value of $\cos^2 20° + \cos^2 70°$

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

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

(SSC CGL Pre Exam 2016)

242. The value of $\frac{\sin\theta}{1+\cos\theta}$ + $\frac{\sin\theta}{1-\cos\theta}$ is

(a) $2\sin\theta$ (b) $2\cos\theta$

(c) $2\sec\theta$ (d) $2\text{cosec}\,\theta$

(SSC CGL Pre Exam 2016)

243. If $\tan\theta = \frac{8}{15}$, the value of $\frac{\sqrt{1-\sin\theta}}{\sqrt{1+\sin\theta}}$ is

(a) 1/5 (b) 2/5

(c) 3/5 (d) 0

(SSC CGL Pre Exam 2016)

244. If $\frac{\cos\theta}{1-\sin\theta} + \frac{\cos\theta}{1+\sin\theta} = 4$ then the value of θ $(0 < \theta < 90°)$ is

(a) 60° (b) 45°

(c) 30° (d) 35°

(SSC CGL Pre Exam 2016)

245. If $\sec 15\theta = \text{cosec}\,15\theta$ $(0° < \theta < 10°)$ then the value of θ is

(a) 9° (b) 5°

(c) 8° (d) 3°

(SSC CGL Pre Exam 2016)

246. If $\tan\theta$ = tan30°. tan60° and θ is an acute angle, then 2θ is equal to

(a) 30° (b) 45°

(c) 90° (d) 0°

(SSC CGL Pre Exam 2016)

247. If $x^2 = \sin^2 30° + 4\cot^2 45° - \sec^2 60°$, then the value of x $(x > 0)$ is

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

(c) 0 (d) $\frac{1}{2}$

(SSC CGL Pre Exam 2016)

248. If $7\sin^2\theta + 3\cos^2\theta = 4$ then the value of $\sec\theta + \text{cosec}\,\theta$ is

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

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

(d) None of these

(SSC CGL Pre Exam 2016)

249. The value of

$$\left(\frac{\sin\theta+\sin\phi}{\cos\theta+\cos\phi}+\frac{\cos\theta-\cos\phi}{\sin\theta-\sin\phi}\right) \text{ is}$$

$$\left(\frac{\sin\theta+\sin\phi}{\cos\theta+\cos\phi}+\frac{\cos\theta-\cos\phi}{\sin\theta-\sin\phi}\right)$$

(a) 1 (b) 2
(c) $^1/_2$ (d) 0

(SSC CGL Pre Exam 2016)

250. If $\cot\theta = 4$, then the value of $\frac{5\sin\theta+3\cos\theta}{5\sin\theta-3\cos\theta}$ is

(a) $\frac{-17}{7}$ (b) $\frac{1}{3}$
(c) 3 (d) 9

(SSC CGL Pre Exam 2016)

251. The value of $\cos^2 20^\circ + \cos^2 70^\circ$ is $\cos^2 20^\circ + \cos^2 70^\circ$

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

(SSC CGL Pre Exam 2016)

252. The value of $(1 + \tan^2\theta)(1-\sin^2\theta)$ is

(a) 2 (b) 1
(c) −1 (d) −2

(SSC CGL Pre Exam 2016)

253. If $r\sin\theta = 1$, $r\cos\theta = \sqrt{3}$ then the value of $r^2\tan\theta$ is

(a) 4 (b) $\frac{1}{\sqrt{3}}$
(c) $\frac{4}{\sqrt{3}}$ (d) $4\sqrt{3}$

(SSC CGL Pre Exam 2016)

254. The value of the expression $(1 + \sec 22^\circ + \cot 68^\circ)(1 - \operatorname{cosec} 22^\circ + \tan 68^\circ)$ is

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

(SSC CGL Mains Exam- 2016)

255. If $x\sin^3\theta + y\cos^3\theta = \sin\theta\cos\theta$ and $x\sin\theta - y\cos\theta = 0$, then the value of $x^2 + y^2$ equals

(a) 1 (b) 2
(c) 1/2 (d) 3/2

(SSC CGL Mains Exam- 2016)

256. If $\sec\theta + \tan\theta = m(>1)$, then the value of $\sin\theta$ is $(0^\circ < \theta < 90^\circ)$

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

(SSC CGL Mains Exam- 2016)

257. If $(a^2 - b^2)\sin\theta + 2ab\cos\theta = a^2 + b^2$, then $\tan\theta$

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

(SSC CGL Mains Exam- 2016)

258. If $2y\cos\theta = x\sin\theta$ and $2x\sec\theta - y\operatorname{cosec}\theta = 3$, then the value of $x^2 + 4y^2$ is

(a) 1 (b) 3
(c) 2 (d) 4

(SSC CGL Mains Exam- 2016)

259. The expression of $\frac{Cot\theta+Co\sec\theta-1}{Cot\theta+Cosec\theta+1}$ is equal to

(a) $\frac{1+Cos\theta}{Sin\theta}$ (b) $\frac{1-Cos\theta}{Sin\theta}$
(c) $\frac{Cot\theta+1}{Coses\theta}$ (d) $\frac{Cot\theta-1}{Sin\theta}$

(SSC CGL Mains Exam- 2016)

260. If secA + tanA = a, then the value of cosA is

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

(SSC CGL Mains Exam- 2016)

261. If sin P + cosec P = 2, then the value of $\sin^7 P + \operatorname{cosec}^7 P$ is

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

(SSC CGL Mains Exam- 2016)

262. If cosx. cosy + sinx.siny = −1 then cosx + cosy is

(a) −2 (b) 1
(c) 0 (d) 2

(SSC CGL Mains Exam- 2016)

263. The value of the expression $2(\sin^6\theta + \cos^6\theta) - 3(\sin^4\theta + \cos^4\theta) + 1$ is

(a) −1 (b) 0
(c) 1 (d) 2

(SSC CGL Mains Exam- 2016)

264. If $\cos\theta = \frac{x^2-y^2}{x^2+y^2}$ then the value of $\cot\theta$ is equal to [if $0 \le \theta \le 90^\circ$]

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

(SSC CGL Mains Exam- 2016)

265. If $x = \operatorname{cosec}\theta - \sin\theta$ and $y = \sec\theta - \cos\theta$, then the relation between x and y is

(a) $x^2 + y^2 + 3 = 1$
(b) $x^2y^2(x^2+y^2+3) = 1$
(c) $x^2(x^2+y^2-5) = 1$
(d) $y^2(x^2 + y^2 - 5) = 1$

(SSC CGL Mains Exam- 2016)

266. If $x\tan 60^\circ + \cos 45^\circ = \sec 45^\circ$ then the value of $x^2 + 1$ is

(a) $\frac{6}{7}$ (b) $\frac{7}{6}$
(c) $\frac{5}{6}$ (d) $\frac{6}{5}$

(SSC CGL Mains Exam- 2016)

267. x, y be two acute angles, $x + y < 90^\circ$ and $\sin(2x - 20^\circ) = \cos(2y + 20^\circ)$, the value of $\tan(x + y)$ is

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

(SSC CGL Mains Exam- 2016)

268. If $a^2\sec^2 x - b^2\tan^2 x = c^2$ then the value of $\sec^2 x + \tan^2 x$ is equal to (assume $b^2 \neq a^2$)

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

(SSC CGL Mains Exam- 2016)

269. $(1 + \sec 20^\circ + \cot 70^\circ)(1 - \operatorname{cosec} 20^\circ + \tan 70^\circ)$ is equal to

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

(SSC CGL Mains Exam- 2016)

270. If $\tan^4\theta + \tan^2\theta = 1$ then the value of $\cos^4\theta + \cos^2\theta$ is

(a) 2 (b) 0
(c) 1 (d) −1

(SSC CGL Mains Exam- 2016)

271. The value of $8(\sin^6\theta + \cos^6\theta) - 12(\sin^4\theta + \cos^4\theta)$ is equal to

(a) 20 (b) −20
(c) −4 (d) 4

(SSC CGL Mains Exam- 2016)

ANSWER KEY

1. (c)	29. (a)	57. (a)	84. (a)	111. (b)	138. (c)	165. (d)	192. (a)	219. (c)	246. (c)
2. (b)	30. (a)	58. (d)	85. (d)	112. (b)	139. (d)	166. (b)	193. (a)	220. (b)	247. (d)
3. (b)	31. (d)	59. (a)	86. (a)	113. (d)	140. (d)	167. (a)	194. (b)	221. (b)	248. (b)
4. (c)	32. (a)	60. (a)	87. (b)	114. (d)	141. (d)	168. (b)	195. (a)	222. (a)	249. (d)
5. (c)	33. (c)	61. (d)	88. (d)	115. (c)	142. (a)	169. (b)	196. (c)	223. (d)	250. (a)
6. (d)	34. (b)	62. (b)	89. (d)	116. (a)	143. (a)	170. (b)	197. (c)	224. (b)	251. (d)
7. (c)	35. (c)	63. (d)	90. (b)	117. (a)	144. (a)	171. (b)	198. (d)	225. (c)	252. (b)
8. (d)	36. (a)	64. (d)	91. (d)	118. (a)	145. (c)	172. (b)	199. (d)	226. (c)	253. (c)
9. (b)	37. (d)	65. (a)	92. (b)	119. (b)	146. (d)	173. (a)	200. (c)	227. (a)	253. (c)
10. (b)	38. (b)	66. (d)	93. (c)	120. (d)	147. (a)	174. (d)	201. (a)	228. (a)	254. (d)
11. (b)	39. (d)	67. (a)	94. (d)	121. (c)	148. (d)	175. (c)	202. (a)	229. (b)	255. (a)
12. (a)	40. (c)	68. (d)	95. (c)	122. (c)	149. (b)	176. (c)	203. (a)	230. (b)	256. (b)
13. (b)	41. (c)	69. (c)	96. (b)	123. (c)	150. (c)	177. (b)	204. (b)	231. (a)	257. (b)
14. (c)	42. (b)	70. (c)	97. (b)	124. (d)	151. (b)	178. (a)	205. (b)	232. (b)	258. (d)
15. (c)	43. (c)	71. (c)	98. (a)	125. (b)	152. (a)	179. (c)	206. (d)	233. (a)	259. (b)
16. (c)	44. (a)	72. (c)	99. (c)	126. (a)	153. (d)	180. (a)	207. (d)	234. (b)	260. (b)
17. (b)	45. (d)	73. (d)	100. (c)	127. (b)	154. (a)	181. (c)	208. (c)	235. (c)	261. (b)
18. (d)	46. (a)	74. (c)	101. (d)	128. (d)	155. (a)	182. (c)	209. (c)	236. (c)	262. (c)
19. (a)	47. (a)	75. (b)	102. (a)	129. (a)	156. (a)	183. (a)	210. (c)	237. (c)	263. (b)
20. (a)	48. (d)	76. (b)	103. (d)	130. (d)	157. (c)	184. (c)	211. (d)	238. (c)	264. (d)
21. (c)	49. (c)	77. (a)	104. (b)	131. (a)	158. (a)	185. (b)	212. (b)	239. (b)	265. (b)
22. (d)	50. (b)	78. (b)	105. (b)	132. (b)	159. (d)	186. (c)	213. (a)	240. (a)	266. (b)
23. (a)	51. (d)	79. (c)	106. (c)	133. (c)	160. (c)	187. (b)	214. (d)	241. (b)	267. (c)
24. (b)	52. (a)	80. (c)	107. (b)	134. (d)	161. (a)	188. (c)	215. (b)	242. (d)	268. (b)
25. (d)	53. (c)	81. (a)	108. (b)	135. (d)	162. (c)	189. (d)	216. (d)	243. (c)	269. (c)
26. (b)	54. (b)	82. (a)	109. (d)	136. (b)	163. (b)	190. (c)	217. (d)	244. (a)	270. (c)
27. (c)	55. (d)	83. (b)	110. (d)	137. (a)	164. (a)	191. (b)	218. (c)	245. (d)	271. (c)
28. (a)	56. (c)								

EXPLANATION

1. (c) $2\sin^2\theta + 3\cos^2\theta$
Minimum Value is 2
[If $x\sin^2\theta + y\cos^2\theta$, If $x > y$, then x will be always maximum value and y is minimum if $y > x$, vice versa will happen]

2. (b) For greater value, take $\theta = 45°$
$\Rightarrow \sin\theta + \cos\theta$
$= \sin 45° + \cos 45°$
$= \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{2}} = \frac{1+1}{\sqrt{2}}$
$= \frac{2}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \sqrt{2}$
$\sqrt{2} = 1.414 > \Rightarrow$ greater than 1

3. (b) $(2\sin\theta + 3\cos\theta)$
$\Rightarrow$ Max. value of $a\sin\theta + b\cos\theta = + \sqrt{a^2+b^2}$
$\Rightarrow \sqrt{2^2+3^2} \Rightarrow \sqrt{4+9} \Rightarrow \sqrt{\mathbf{13}}$

4. (c) $\cos^2\theta = \frac{(x+y)^2}{4xy}$
max. value of $\cos^2\theta = 1$
$\Rightarrow 1 = \frac{(x+y)^2}{4xy}$
$\Rightarrow 4xy = (x+y)^2$
$\Rightarrow 4xy = x^2 + y^2 + 2xy$
$\Rightarrow 0 = x^2 + y^2 - 2xy$
$\Rightarrow 0 = (x-y)^2$
$\Rightarrow 0 = x - y \Rightarrow \boldsymbol{x = y}$

5. (c) $4\tan^2\theta + 9\cot^2\theta$
$\Rightarrow$ minimum value $= 2\sqrt{ab}$
a = 4
b = 9
$\Rightarrow 2\sqrt{9 \times 4}$
$\Rightarrow 2 \times 6 = \mathbf{12}$

6. (d) $\sin^2\theta + \cos^2\theta = 1$
Squaring both sides
$= \sin^4\theta + \cos^4\theta$
$= 1 - 2\sin^2\theta.\cos^2\theta$
Put $\theta = 90°$
$= 1 - 2\sin^2 90°.\cos^2 90° = 1 - 0 = \mathbf{1}$

7. (c) Put, $\theta = 60°$
$\Rightarrow \cos\theta > \cos^2\theta$
$\Rightarrow \cos 60° > \cos^2 60°$
$\Rightarrow \frac{1}{2} > \frac{1}{4}$
$\cos\theta > \cos^2\theta$

8. (d) $\cos\pi x = x^2 - x + \frac{5}{4}$
$= x^2 - 2 \times x \times \frac{1}{2} + \frac{1}{4} - \frac{1}{4} + \frac{5}{4}$
$= \left(x - \frac{1}{2}\right)^2 + 1 > 1$
$= -1 \le \cos x \le 1$
$\therefore$ so value of x is none of the above

9. (b) $\sin\frac{\pi x}{2} = x^2 - 2x + 2$
put value of x from options
$x = 1$
$\sin\frac{\pi}{2} \times 1 = 1^2 - 2 \times 1 + 2$
$\sin 90° = 1 - 2 + 2$
$1 = 1$

10. (b) Angles of triangle are in ratio 2 : 7 : 11
According to question
$2x + 7x + 11x = 180$
$20x = 180$
$x = 9$
Angles of triangle is 18°,63°,99°

11. (b) $7\sin^2\theta + 3\cos^2\theta = 4$
$7\sin^2\theta + 3(1 - \sin^2\theta) = 4$
$7\sin^2\theta + 3 - 3\sin^2\theta = 4$
$4\sin^2\theta = 1$
$\sin^2\theta = \frac{1}{4} \Rightarrow \sin\theta = \frac{1}{2}$
$\sin\theta = \sin 30°$
$\theta = 30°$
$\tan 30° = \frac{1}{\sqrt{3}}$

Alternate

Put $\theta = 30^0$
$7 \times \sin^2 30^0 + 3\cos^2 30^0 = 4$
$7 \times \frac{1}{4} + 3 \times \frac{3}{4} = 4$
$\frac{7}{4} + \frac{9}{4} = 4$
$\frac{16}{4} = 4$
4 = 4 (satisfied)
$\therefore \tan 30^0 = \frac{1}{\sqrt{3}}$

12. (a) If, $\tan\theta = 1$
It means $\theta = 45°$
$= \frac{8\sin\theta + 5\cos\theta}{\sin^3\theta - 2\cos^3\theta + 7\cos\theta}$
$= \frac{8\sin 45° + 5\cos 45°}{\sin^3 45° - 2\cos^3 45° + 7\cos 45°}$
$= \frac{8 \times \frac{1}{\sqrt{2}} + 5 \times \frac{1}{\sqrt{2}}}{\left(\frac{1}{\sqrt{2}}\right)^3 - 2\left(\frac{1}{\sqrt{2}}\right)^3 + 7\left(\frac{1}{\sqrt{2}}\right)} = 2$

13. (b) $\cos^2\theta + \cos^4\theta = 1$
$\cos^4\theta = 1 - \cos^2\theta$
$\cos^4\theta = \sin^2\theta$
$\cos^2\theta.\cos^2\theta = \sin^2\theta$
$\cos^2\theta = \frac{\sin^2\theta}{\cos^2\theta}$
$\cos^2\theta = \tan^2\theta$
$= \tan^2\theta + \tan^4\theta$
$= \cos^2\theta + \cos^4\theta = 1$

14. (c) $\frac{3\sin\theta + 2\cos\theta}{3\sin\theta - 2\cos\theta}$
divide numerator & denominator by $\cos\theta$
$= \frac{3\frac{\sin\theta}{\cos\theta} + \frac{2\cos\theta}{\cos\theta}}{\frac{3\sin\theta}{\cos\theta} - \frac{2\cos\theta}{\cos\theta}} \quad \left[\frac{\sin\theta}{\cos\theta} = \tan\theta\right]$
$= \frac{3\tan\theta + 2}{3\tan\theta - 2}$
put value of $\tan\theta$
$= \frac{3 \times \frac{4}{3} + 2}{3 \times \frac{4}{3} - 2} = \frac{6}{2} = 3$

15. (c) $(\sec A - \cos A)^2 + (\operatorname{cosec} A - \sin A)^2 - (\cot A - \tan A)^2$

$= (\sec^2 A + \cos^2 A - 2\sec A \cos A) + (\operatorname{cosec}^2 A + \sin^2 A - 2\operatorname{cosec} A \sin A) - (\cot^2 A + \tan^2 A - 2\cot A \tan A)$

$= \sec^2 A - \tan^2 A + \cos^2 A + \sin^2 A + \operatorname{cosec}^2 A - \cot^2 A - 2$

$= 3 - 2 = 1$

Alternate shortcut method

$(\sec A - \cos A)^2 + (\operatorname{cosec} A - \sin A)^2 - (\cot A - \tan A)^2$

put $\theta = 45°$

$= (\sec 45° - \cos 45°)^2 + (\operatorname{cosec} 45° - \sin 45°)^2 - (\cot 45° - \tan 45°)^2$

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

$$= \frac{1}{2} + \frac{1}{2} - 0 = 1$$

16. (c) $(x + 5)° + (2x - 3)° + (3x + 4)° = 180°$

(Sum of all angles in triangle is 180°)

$6x + 6° = 180°$

$(x + 1) = 30°$

$x = 29°$

17. (b) $\dfrac{\tan 57° + \cot 37°}{\tan 33° + \cot 53°}$

$$= \frac{\cot 33° + \tan 53°}{\tan 33° + \cot 53°}$$

$$= \frac{\frac{1}{\tan 33°} + \tan 53°}{\tan 33° + \frac{1}{\tan 53°}}$$

$$= \frac{1 + \tan 53°.\tan 33°}{\tan 33°.\tan 53° + 1} \times \frac{\tan 53°}{\tan 33°}$$

$= \tan 53°.\cot 33° = \cot 37°.\tan 57°$

18. (d) $\dfrac{\cot 30° - \cot 75°}{\tan 15° - \tan 60°}$

$$= \frac{\tan 60° - \tan 15°}{\tan 15° - \tan 60°}$$

$$= \frac{-(\tan 15° - \tan 60°)}{\tan 15° - \tan 60°} = -1$$

19. (a) $(\sec^4\theta - \tan^4\theta)$

$\Rightarrow (\sec^2\theta - \tan^2\theta)(\sec^2\theta + \tan^2\theta)$

$\Rightarrow 1 \times (\sec^2\theta + \tan^2\theta)\ [1 + \tan^2\theta = \sec^2\theta]$

$\Rightarrow 1 \times \dfrac{7}{12} = \mathbf{\dfrac{7}{12}}$

20. (a) $\dfrac{5}{\sec^2\theta} + \dfrac{2}{1 + \cot^2\theta} + 3\sin^2\theta$

$$= 5\cos^2\theta + \frac{2}{\operatorname{cosec}^2\theta} + 3\sin^2\theta$$

$= 5\cos^2\theta + 2\sin^2\theta + 3\sin^2\theta$

$= 5(\cos^2\theta + \sin^2\theta)$,

$(\because \sin^2\theta + \cos^2\theta = 1)$

$= 5$

21. (c) $\left[\dfrac{1}{\cos\theta} + \dfrac{1}{\cot\theta}\right]\left[\dfrac{1}{\cos\theta} - \dfrac{1}{\cot\theta}\right]$

$= (\sec\theta + \tan\theta)(\sec\theta - \tan\theta)$

$= \sec^2\theta - \tan^2\theta\ [1 + \tan^2\theta = \sec^2\theta]$

$= 1$

22. (d) $(2\cos^2\theta - 1)\left[\dfrac{1 + \tan\theta}{1 - \tan\theta} + \dfrac{1 - \tan\theta}{1 + \tan\theta}\right]$

Shortcut Method:

Put $\theta = 0°$

$$(2 \times 1 - 1)\left[\frac{1 + 0}{1 - 0} + \frac{1 - 0}{1 + 0}\right]$$

$1 \times 2 = \mathbf{2}$

23. (a) $\cos 1°.\cos 2°........\cos 178°.\cos 179°$

$\Rightarrow \cos 90° = 0$

$\Rightarrow 0$ [0 will make whole series 0]

24. (b) According to question,

$\Rightarrow 2\operatorname{cosec}^2 23° \cot^2 67° - \sin^2 23° - \sin^2 67° - \cot^2 67°$

$\Rightarrow 2\operatorname{cosec}^2 23° \cot^2(90° - 23°) - \sin^2 23° - \sin^2(90° - 23°) - \cot^2 67°$

$\Rightarrow 2\operatorname{cosec}^2 23° \tan^2 23° - (\sin^2 23° + \cos^2 23°) - \cot^2 67°$

$\Rightarrow \dfrac{2}{\cos^2 23°} - 1 - \cot^2 67°$

$\Rightarrow 2\sec^2 23° - 1 - \cot^2(90 - 23°)$

$\Rightarrow 2\sec^2 23° - 1 - \tan^2 23°$

$\Rightarrow 2\sec^2 23° - (1 + \tan^2 23°)$

$\Rightarrow 2\sec^2 23° - \sec^2 23°$

$\Rightarrow \mathbf{\sec^2 23°}$

25. (d) $\dfrac{\tan\theta}{1 - \cot\theta} + \dfrac{\cot\theta}{1 - \tan\theta}$

$$\Rightarrow \frac{\tan\theta}{1 - \frac{1}{\tan\theta}} + \frac{\frac{1}{\tan\theta}}{1 - \tan\theta}$$

$$\Rightarrow \frac{\tan^2\theta}{\tan\theta - 1} + \frac{1}{\tan\theta(1 - \tan\theta)}$$

$$\Rightarrow \frac{\tan^2\theta}{\tan\theta - 1} - \frac{1}{\tan\theta(\tan\theta - 1)}$$

$$\Rightarrow \frac{\tan^3\theta - 1}{\tan\theta(\tan\theta - 1)}$$

$$\Rightarrow \frac{(\tan\theta - 1)(\tan^2\theta + \tan\theta + 1)}{\tan\theta(\tan\theta - 1)}$$

$$\Rightarrow \frac{\tan^2\theta + \tan\theta + 1}{\tan\theta}$$

$\Rightarrow \mathbf{\tan\theta + \cot\theta + 1}$

26. (b) **Shortcut Method**

$= (1 + \cot\theta - \operatorname{cosec}\theta)(1 + \tan\theta + \sec\theta)$

Put, $\theta = 45°$

$= (1 + \cot 45° - \operatorname{cosec} 45°)(1 + \tan 45° + \sec 45°)$

$= (1 + 1 - \sqrt{2})(1 + 1 + \sqrt{2})$

$= (2 - \sqrt{2})(2 + \sqrt{2})$

$= [2^2 - (\sqrt{2})^2]$ $[(a - b)(a + b) = a^2 - b^2]$

$= 4 - 2 = \mathbf{2}$

27. (c) $\dfrac{\sin\theta}{x} = \dfrac{\cos\theta}{y} = \dfrac{1}{k}$

$\Rightarrow x = k\sin\theta$

$\Rightarrow y = k\cos\theta$

$\Rightarrow x^2 + y^2 = k^2(\sin^2\theta + \cos^2\theta) = k^2$

$\Rightarrow k = \sqrt{x^2 + y^2}$

$\therefore \sin\theta - \cos\theta$

$$\frac{x}{k} - \frac{y}{k} = \frac{x - y}{k} \Rightarrow \frac{x - y}{\sqrt{x^2 + y^2}}$$

28. (a) $x = a\sec\theta\cos\phi$

$y = b\sec\theta\sin\phi$

$z = c\tan\theta$

$\dfrac{x}{a} = \sec\theta.\cos\phi$

$\dfrac{y}{b} = \sec\theta.\sin\phi$

$\dfrac{z}{c} = \tan\theta$

$\therefore \dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} - \dfrac{z^2}{c^2}$

$\Rightarrow \sec^2\theta.\cos^2\phi + \sec^2\theta.\sin^2\phi - \tan^2\theta$

$\Rightarrow \sec^2\theta(\cos^2\phi + \sin^2\phi) - \tan^2\theta$

$\Rightarrow \sec^2\theta - \tan^2\theta = \mathbf{1}$

29. (a) $\frac{\sec\theta+\tan\theta}{\sec\theta-\tan\theta} = \frac{5}{3}$

$\Rightarrow 3\sec\theta + 3\tan\theta = 5\sec\theta - 5\tan\theta$

$\Rightarrow 8\tan\theta = 2\sec\theta$

$\Rightarrow \frac{\sec\theta}{\tan\theta} = 4$

$\Rightarrow \frac{1}{\cos\theta}\times\frac{\cos\theta}{\sin\theta} = 4$

$\Rightarrow \sin\theta = \frac{1}{4}$

30. (a) $(1+\sin\alpha)(1+\sin\beta)(1+\sin\gamma)$

$= (1-\sin\alpha)(1-\sin\beta)(1-\sin\gamma) = x$

$\therefore\ x.x = (1+\sin\alpha)(1-\sin\alpha)(1+\sin\beta)(1-\sin\beta)(1+\sin\gamma)(1-\sin\gamma)$

$x^2 \Rightarrow (1-\sin^2\alpha)(1-\sin^2\beta)(1-\sin^2\gamma)$

$x^2 \Rightarrow \cos^2\alpha\,.\,\cos^2\beta\,.\,\cos^2\gamma$

$x \Rightarrow \pm\cos\alpha\,.\cos\beta\,.\cos\gamma$

31. (d) $\frac{1}{1+\cot^2\theta}+\frac{3}{1+\tan^2\theta}+2\sin^2\theta$

$\Rightarrow \frac{1}{\text{cosec}^2\theta}+\frac{3}{\sec^2\theta}+2\sin^2\theta$

$\Rightarrow \sin^2\theta + 3\cos^2\theta + 2\sin^2\theta$

$\Rightarrow 3(\sin^2\theta+\cos^2\theta)$

$\Rightarrow 3\,(1) \Rightarrow$ **3**

32. (a) $x\sin\theta + y\cos\theta = 4$

$x\cos\theta - y\sin\theta = 2$ [Formula]

$(x^2+y^2)(\cos^2\theta+\sin^2\theta) = 4^2+2^2$

$x^2+y^2 = a^2+b^2$

$(x^2+y^2)\,(1) = 16+4$

$x^2+y^2 = 20$

33. (c) $\left[\frac{\cos^2 A.\sin^2 A(\sin A+\cos A)}{(\sin A-\cos A)} + \frac{\sin^2 A.\cos^2 A(\sin A-\cos A)}{(\sin A+\cos A)}\right]\left[\frac{1}{\cos^2 A}-\frac{1}{\sin^2 A}\right]$

$\Rightarrow \left[\frac{(\sin A+\cos A)^2+(\sin A-\cos A)^2}{(\sin A-\cos A)\,(\sin A+\cos A)}\right]$

$[\sin^2 A - \cos^2 A]$

$\Rightarrow 2(\sin^2 A+\cos^2 A) \Rightarrow 2$

34. (b) $\frac{1}{\text{cosec}\theta-\cot\theta} - \frac{1}{\sin\theta}$

$\Rightarrow \frac{\text{cosec}^2\theta-\cot^2\theta}{\text{cosec}\theta-\cot\theta} - \text{cosec}\theta$,

$[1 = \text{cosec}^2\theta - \cot^2\theta]$

$\Rightarrow \text{cosec}\theta + \cot\theta - \text{cosec}\theta = \cot\theta$

35. (c) $\cos^4\theta - \sin^4\theta = \frac{2}{3}$

$\Rightarrow (\cos^2\theta-\sin^2\theta)(\cos^2\theta+\sin^2\theta) = \frac{2}{3}$

$\Rightarrow \cos^2\theta - \sin^2\theta = \frac{2}{3}$

$\Rightarrow 1-\sin^2\theta-\sin^2\theta = \frac{2}{3}$

$\Rightarrow 1-2\sin^2\theta = \frac{2}{3}$

36. (a) $\frac{\sin A}{1+\cos A} + \frac{\sin A}{1-\cos A}$

$\Rightarrow \frac{\sin A(1-\cos A)+\sin A(1+\cos A)}{(1+\cos A)(1-\cos A)}$

$\Rightarrow \frac{\sin A-\sin A\cos A+\sin A+\sin A\cos A}{1-\cos^2 A}$

$\Rightarrow \frac{2\sin A}{\sin^2 A} = 2\,\text{cosec}A$

37. (d) $r\sin\theta = 1$

$r\cos\theta = \sqrt{3}$

$\Rightarrow \frac{r\sin\theta}{r\cos\theta} = \frac{1}{\sqrt{3}} \Rightarrow \tan\theta = \frac{1}{\sqrt{3}}$

$\Rightarrow \sqrt{3}\tan\theta = 1$

(Add 1 both sides)

$\Rightarrow \sqrt{3}\tan\theta+1 = 1+1 \Rightarrow 2$

38. (b) $\tan\theta = \frac{\sin\alpha-\cos\alpha}{\sin\alpha+\cos\alpha}$

$\therefore$ Squaring both sides and after that add 1 both sides

$1+\tan^2\theta = 1+\frac{(\sin\alpha-\cos\alpha)^2}{(\sin\alpha+\cos\alpha)^2}$

$\sec^2\theta = \frac{(\sin\alpha+\cos\alpha)^2+(\sin\alpha-\cos\alpha)^2}{(\sin\alpha+\cos\alpha)^2}$

$\sec^2\theta = \frac{2(\sin^2\alpha+\cos^2\alpha)}{(\sin\alpha+\cos\alpha)^2}$

$\frac{1}{\cos^2\theta} = \frac{2}{(\sin\alpha+\cos\alpha)^2}$

$\frac{1}{\cos\theta} = \frac{\pm\sqrt{2}}{\sin\alpha+\cos\alpha}$

$\sin\alpha+\cos\alpha = \pm\sqrt{2}\cos\theta$

39. (d) $\tan^2\theta = 1-e^2$

$\therefore \sec\theta + \tan^3\theta\,.\,\text{cosec}\theta$

$\Rightarrow \sec\theta + \tan^2\theta\,.\,\tan\theta\,.\text{cosec}\theta$

$\Rightarrow \sec\theta + \tan^2\theta\,.\,\frac{\sin\theta}{\cos\theta}.\frac{1}{\sin\theta}$

$\Rightarrow \sec\theta + \tan^2\theta\,.\,\sec\theta$

$\Rightarrow \sec\theta(1+\tan^2\theta) = \sqrt{1+\tan^2\theta}\,(1+\tan^2\theta)$

$\Rightarrow (1+\tan^2\theta)^{3/2} = (1+1-e^2)^{3/2}$

$\Rightarrow (2-e^2)^{3/2}$

40. (c) $\frac{\cos\alpha}{\cos\beta} = a \Rightarrow \cos\alpha = a\cos\beta$

On squaring both sides

$\cos^2\alpha = a^2\cos^2\beta$

$\Rightarrow 1-\sin^2\alpha = a^2(1-\sin^2\beta)$ ....(i)

Again, $\sin\alpha = b\sin\beta$

Squaring both sides

$\Rightarrow \sin^2\alpha = b^2\sin^2\beta$

put the value of $\sin^2\alpha$ in equation (i)

$1-b^2\sin^2\beta = a^2-a^2\sin^2\beta$

$a^2-1 = a^2\sin^2\beta-b^2\sin^2\beta$

$a^2-1 = \sin^2\beta\,(a^2-b^2)$

$\Rightarrow \sin^2\beta = \frac{a^2-1}{a^2-b^2}$

41. (c) $\sin\theta = 0.7$

$\sin^2\theta+\cos^2\theta = 1$

$(0.7)^2+\cos^2\theta = 1$

$0.49+\cos^2\theta = 1$

$\cos^2\theta = 1-0.49$

$\cos\theta = \sqrt{0.51}$

42. (b) $2\sin\theta + \cos\theta = \frac{7}{3}$

$\Rightarrow (\tan^2\theta - \sec^2\theta)$

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

$= -1$

43. (c) $\sqrt{\frac{\sec\theta-1}{\sec\theta+1}} = \sqrt{\frac{\frac{1}{\cos\theta}-1}{\frac{1}{\cos\theta}+1}}$

$\Rightarrow \sqrt{\frac{1-\cos\theta}{1+\cos\theta}} = \sqrt{\frac{1-\cos\theta}{1+\cos\theta}\times\frac{1-\cos\theta}{1-\cos\theta}}$

$\Rightarrow \sqrt{\frac{(1-\cos\theta)^2}{\sin^2\theta}}$

$\Rightarrow \frac{1-\cos\theta}{\sin\theta} = \frac{1}{\sin\theta}-\frac{\cos\theta}{\sin\theta}$

$\Rightarrow \text{cosec}\theta - \cot\theta$

44. (a) $\sec^2\theta - \frac{\sin^2\theta-2\sin^4\theta}{2\cos^4\theta-\cos^2\theta}$

$= \sec^2\theta - \frac{\sin^2\theta(1-2\sin^2\theta)}{\cos^2\theta(2\cos^2\theta-1)}$

$[\cos^2\theta-\sin^2\theta = 2\cos^2\theta-1 = 1-2\sin^2\theta]$

$= \sec^2\theta - \tan^2\theta = 1$

45. (d) $\sqrt{\frac{1+\sin\theta}{1-\sin\theta}}+\sqrt{\frac{1-\sin\theta}{1+\sin\theta}}$

$= \frac{\left(\sqrt{1+\sin\theta}\right)^2+\left(\sqrt{1-\sin\theta}\right)^2}{\sqrt{1-\sin^2\theta}}$

$= \frac{1+\sin\theta+1-\sin\theta}{\cos\theta}$

$= \frac{2}{\cos\theta} = 2\sec\theta$

Alternate

Shortcut method

put $\theta = 30°$

$\sqrt{\frac{1+\sin 30°}{1-\sin 30°}} + \sqrt{\frac{1-\sin 30°}{1+\sin 30°}}$

$\Rightarrow \sqrt{\frac{1+\frac{1}{2}}{1-\frac{1}{2}}}+\sqrt{\frac{1-\frac{1}{2}}{1+\frac{1}{2}}}$

$\Rightarrow \sqrt{\frac{3}{1}}+\sqrt{\frac{1}{3}} \Rightarrow \frac{4}{\sqrt{3}}$

Now check with options by puting $\theta = 30°$

$2\sec 30° = \frac{2\times 2}{\sqrt{3}} = \frac{4}{\sqrt{3}}$

46. (a) $(r\cos\theta - \sqrt{3})^2 + (r\sin\theta - 1)^2 = 0$

$(r\cos\theta - \sqrt{3})^2 = 0, (r\sin\theta - 1)^2$

$=0$ $r\cos\theta = \sqrt{3}$ ......(i)

$r\sin\theta = 1$ ......(ii)

Squaring and adding equation (i) and (ii)

$r^2\cos^2\theta + r^2\sin^2\theta = 3 + 1$

$r^2(\cos^2\theta + \sin^2\theta) = 4$

$r^2 = 4$

$r = 2$

$\tan\theta = \frac{r\sin\theta}{r\cos\theta} = \frac{1}{\sqrt{3}}$ and $r\cos\theta = \sqrt{3}$

$\cos\theta = \frac{\sqrt{3}}{r}$, $\sec\theta = \frac{r}{\sqrt{3}}$

$\frac{r\tan\theta+\sec\theta}{r\sec\theta+\tan\theta} = \frac{\frac{r}{\sqrt{3}}+\frac{r}{\sqrt{3}}}{\frac{r^2}{\sqrt{3}}+\frac{1}{\sqrt{3}}}$

$= \frac{r\left(\frac{2}{\sqrt{3}}\right)}{\frac{r^2+1}{\sqrt{3}}} = \frac{2r}{r^2+1} = \frac{2\times 2}{2^2+1} = \mathbf{\frac{4}{5}}$

Alternate

$r = 2$

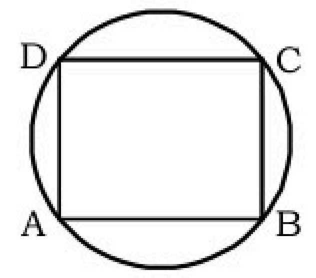
$\tan\theta = \frac{r\sin\theta}{r\cos\theta} = \frac{1}{\sqrt{3}}$

$\theta = 30°$

$= \frac{2\tan 30° + \sec 30°}{2\sec 30° + \tan 30°}$

$= \frac{2\times\frac{1}{\sqrt{3}}+\frac{2}{\sqrt{3}}}{2\times\frac{2}{\sqrt{3}}+\frac{1}{\sqrt{3}}} = \frac{4}{5}$

47. (a) ABCD is concyclic quadrilateral



$\angle A + \angle C = \angle B + \angle D = 180°$

$\therefore \angle A = 180° - \angle C$

$\cos A = \cos(180° - C) \Rightarrow -\cos C$

Similarly

$\cos B = -\cos D$

$\Rightarrow \cos A + \cos B + \cos C + \cos D$

$\Rightarrow \cos A + \cos B - \cos A - \cos B = 0$

Alternate

put, A = B = C = D = 90°

$= \cos A + \cos B + \cos C + \cos D$

$= \cos 90° + \cos 90° + \cos 90° + \cos 90°$

$= 0 + 0 + 0 + 0 = 0$

48. (d) $r\sin\theta = \frac{7}{2}$ ......(i)

$r\cos\theta = \frac{7\sqrt{3}}{2}$ .....(ii)

On squaring and adding both equations

$r^2\sin^2\theta + r^2\cos^2\theta = \left(\frac{7}{2}\right)^2 + \left(\frac{7\sqrt{3}}{2}\right)^2$

$r^2(\sin^2\theta + \cos^2\theta) = \frac{49}{4}+\frac{147}{4}$

$r^2 = \frac{196}{4} = 49$

$r = \sqrt{49} = 7$

49. (c) Given, $\frac{\sec\theta+\tan\theta}{\sec\theta-\tan\theta} = 2\frac{51}{79}$

$\Rightarrow \frac{\sec\theta+\tan\theta}{\sec\theta-\tan\theta} = \frac{209}{79}$

$\left[\begin{array}{l}\text{by componendo-dividendo} \\ \frac{a}{b}=\frac{c}{d},\ \frac{a+b}{a-b}=\frac{c+d}{c-d}\end{array}\right]$

$\frac{\sec\theta+\tan\theta+\sec\theta-\tan\theta}{\sec\theta+\tan\theta-\sec\theta+\tan\theta} = \frac{209+79}{209-79}$

$\frac{2\sec\theta}{2\tan\theta} = \frac{288}{130}$

$\Rightarrow \frac{\sec\theta}{\tan\theta} = \frac{288}{130}$

$\Rightarrow \frac{\frac{1}{\cos\theta}}{\frac{\sin\theta}{\cos\theta}} = \frac{288}{130}$

$\Rightarrow \frac{1}{\sin\theta} = \frac{288}{130}$

$\Rightarrow$ Therefore, $\sin\theta = \frac{130}{288}$

$\Rightarrow \sin\theta = \frac{65}{144}$

50. (b) Given, $1+\cos^2\theta = 3\sin\theta \cdot \cos\theta$ $[0<\theta<\pi/2]$

$1+\cos^2\theta = 3\sin\theta \cdot \cos\theta$

Dividing by $\sin^2\theta$ in both sides

$\Rightarrow \frac{1+\cos^2\theta}{\sin^2\theta} = \frac{3\sin\theta\cos\theta}{\sin^2\theta}$

$\Rightarrow \mathrm{cosec}^2\theta + \cot^2\theta = 3\cot\theta$

$\Rightarrow 1+\cot^2\theta + \cot^2\theta = 3\cot\theta$

$\because [1+\cot^2\theta = \mathrm{cosec}^2\theta]$

$\Rightarrow 1+2\cot^2\theta = 3\cot\theta$

$\Rightarrow 2\cot^2\theta = 3\cot\theta - 1$

Let $\theta = 45°$

$\because \cot 45° = 1$

$2\cot^2 45° - 3\cot 45° + 1 = 0$

$2 - 3 + 1 = 0$

$0 = 0$

Therefore $\cot\theta = \cot 45° = 1$

51. (d) Given:-

$n = \frac{\cos\alpha}{\sin\beta}$ $m = \frac{\cos\alpha}{\cos\beta}$

$\Rightarrow \cos\alpha = n\sin\beta$, and $\cos\alpha = m\cos\beta$

$\cos^2\alpha = n^2\sin^2\beta$ ....(i)

$\cos^2\alpha = m^2\cos^2\beta$ ....(ii)

equation (i) = (ii)

$\Rightarrow n^2\sin^2\beta = m^2\cos^2\beta$

$\Rightarrow n^2(1-\cos^2\beta) = m^2\cos^2\beta$

$\Rightarrow n^2 - n^2\cos^2\beta = m^2\cos^2\beta$

$\Rightarrow n^2 = m^2\cos^2\beta + n^2\cos^2\beta$

$\Rightarrow n^2 = \cos^2\beta\,(m^2+n^2)$

$\cos^2\beta = \frac{n^2}{m^2+n^2}$

52. (a) **Given**

$\tan\theta + \cot\theta = 5$

$\Rightarrow \tan\theta + \cot\theta = 5$

$\Rightarrow (\tan\theta + \cot\theta)^2 = 5^2$

(squaring both sides)

$\Rightarrow \tan^2\theta + \cot^2\theta + 2\tan\theta\cot\theta = 25$

$\Rightarrow \tan^2\theta + \cot^2\theta = 25 - 2$ $[\because \tan\theta \cdot \cot\theta = 1]$

$\Rightarrow \tan^2\theta + \cot^2\theta = 23$

53. (c) sinA = m sinB

$\sin^2A = m^2\sin^2B$ ..... (i)

Now, $\tan^2A = n^2\tan^2B$

$$\frac{\sin^2 A}{\cos^2 A} = n^2\frac{\sin^2 B}{\cos^2 B}$$

from equation (i)

$$\frac{1-\cos^2 A}{n^2\cos^2 A} = \frac{\sin^2 B}{\cos^2 B}$$

$$\frac{1-\cos^2 A}{n^2\cos^2 A} = \frac{\dfrac{(1-\cos^2 A)}{m^2}}{1-\dfrac{\sin^2 A}{m^2}}$$

$$\frac{1-\cos^2 A}{n^2\cos^2 A} = \frac{1-\cos^2 A}{m^2-1+\cos^2 A}$$

$\Rightarrow m^2 - 1 + \cos^2A = n^2\cos^2A$

$m^2 - 1 = \cos^2\theta\,(n^2 - 1)$

$$\cos^2A = \frac{m^2-1}{n^2-1}$$

54. (b) $\dfrac{9}{\operatorname{cosec}^2\theta} + 4\cos^2\theta + \dfrac{5}{1+\tan^2\theta}$

$= 9\sin^2\theta + 4\cos^2\theta + \dfrac{5}{1+\tan^2\theta}$

$\because (1+\tan^2\theta = \sec^2\theta)$

$= 9\sin^2\theta + 4\cos^2\theta + 5\cos^2\theta$

$= 9(\sin^2\theta + \cos^2\theta)$

$= 9(\sin^2\theta + \cos^2\theta = 1)$

$= 9$

55. (d) According to question

$\cos\theta + \sin\theta = m$

$\sec\theta + \operatorname{cosec}\theta = n$

put $\theta = 45°$

$\cos45° + \sin45° = m$,

$\sec45° + \operatorname{cosec}45° = n$

$\frac{1}{\sqrt{2}} + \frac{1}{\sqrt{2}} = m$, $\sqrt{2} + \sqrt{2} = n$

$m = \sqrt{2}$, $n = 2\sqrt{2}$

$\therefore n(m^2 - 1)$

$= 2\sqrt{2}\left((\sqrt{2})^2 - 1\right)$

$= 2\sqrt{2}\,(2 - 1)$

$= 2\sqrt{2}$

Now check from option only one option satisfy

$2m = 2 \times \sqrt{2}$

$= 2\sqrt{2}$

56. (c) tan4° tan43° tan47° tan86°

Here,

tan86° = tan (90° – 4°) = cot 4°

tan47° = tan(90° – 43°) = cot43°

tan4°.cot4°.tan43°.cot43° = 1

57. (a) tan1°. tan2°.tan3°.....tan89° If A + B = 90°

(tan1°.tan89°).(tan2°.tan88°).......(tan44°. tan46°). tan45°

1 × 1 × 1 ....1 × 1 = 1

58. (d) cot 10°.cot20°.cot60°.cot70°. cot80°

[In cot A. cot B if A + B = 90° then cot A. cot B = 1]

$\underbrace{\cot10°.\cot80°}.\underbrace{\cot20°.\cot70°}.\underbrace{\cot60}_{\frac{1}{\sqrt{3}}}$

$= 1 \times 1 \times \dfrac{1}{\sqrt{3}}$

59. (a) $\sin^21° + \sin^25° + \sin^29° + \ldots + \sin^289$

first identify the number of term:-

1+5+9.........89]

Formula:- No. of term

$= \dfrac{\text{Last term-first term}}{\text{difference}} + 1$

$'N' = \dfrac{89-1}{4} + 1 = 22 + 1 = 23$

Now $(\sin^21° + \sin89°) + (\sin^25° + \sin^285°)$ ....upto 11 pairs + 1 middle term

$= 11 + \sin^2 45 \leftarrow$ middle term

$= 11 + \dfrac{1}{2} = \mathbf{11\frac{1}{2}}$

Alternate

In such type of questions we count total terms (who makes pair) and answer will be half of total terms

$$\text{Ans} = \frac{\text{Total No. of Term}}{2} = \frac{23}{2} = 11\frac{1}{2}$$

Logic = each of two terms we makes one pair

60. (a) cot18° [$\cot72°.\cos^222°$

$+ \dfrac{1}{\tan72°.\sec^2 68°}$]

$= \underbrace{\cot18°.\cot72°}\,\underbrace{(\cos^222° + \cos^268°)}$

$= 1 \times 1$ [If A + B = 90° Then CotA.CotB= 1 $\cos^2A+\cos^2B = 1$]

$= 1$

61. (d) $\sin(2x-20^0) = \cos(2y+20^0)$

$(2x-20^0)+(2y+20^0) = 90^0$

[*if* sinA = cos B then A + B = 90^0]

$2(x+y) = 90^0$

$x+y = 45^0$

$\tan(x+y) = \tan45^0 = \mathbf{1}$

62. (b) $\sin^25° + \sin^26° + \ldots + \sin^2 84° + \sin^2 85°$

No. of terms $= \dfrac{85-5}{1} + 1 = 80 + 1 = 81$

$= (\sin^25° + \sin^285°) + (\sin^26° + \sin^284°) + \ldots$ upto 40 pairs + middle term

$= 40 + \sin^245°$

$= 40 + \dfrac{1}{2}$

$= 40\dfrac{1}{2}$

Alternate

In case, when series is in the form of $\sin^2\theta$ or $\cos^2\theta$, then sum of series will always be half of no. of terms.

$= \dfrac{81}{2} = \mathbf{40\frac{1}{2}}$

63. (d) $(\sin^25° + \sin^210° + \ldots + \sin^2 85°) + \sin^290°$

No. of terms $= \left\{\left(\dfrac{85-5}{5}\right)+1\right\} + 1$

$= \dfrac{17}{2} + 1$

sum of series $= \mathbf{9\frac{1}{2}}$

[*use* this approach in exam]

64. (d) $\dfrac{\sin 39^0}{\cos 51^0}$ + 2(tan11° tan31° tan45° tan59° tan79°) – 3 ($\sin^2 21° + \sin^2 69°$)

If A + B = 90°

then

tanA.tanB = 1

$\sin^2A + \sin^2B = 1$

1 + 2(tan11.tan79)(tan31.tan59). tan45° – 3 × 1

1 + 2 – 3 = 0

65. (a) $\sin\alpha \sec(30°+\alpha) = 1$

Shortcut Method

put α value between 0° to 60°

if $\alpha = 30°$

$\sin 30^0 \sec(30°+30°)=1$

$\sin 30° \sec 60° = 1$

$\frac{1}{2} \times 2 = 1$

1 = 1 (Satisfy)

so $\alpha = 30°$

$\sin\alpha + \cos 2\alpha$

$= \sin 30° + \cos 2 \times 30° = \sin 30° + \cos 60°$

$= \frac{1}{2} + \frac{1}{2} = 1$

Alternate

If, $\sin\alpha \sec\beta = 1$

then, $\alpha + \beta = 90°$

$\sin\alpha \sec(30° + \alpha) = 1$

$\alpha + 30 + \alpha = 90°$

$2\alpha = 60°$

$\alpha = 30°$

$\sin\alpha + \cos 2\alpha$

$\sin 30 + \cos 2 \times 30 = 1$

66. (d) A + B = 90°

B = 90 – A

$\sec^2A + \sec^2B - \sec^2A.\sec^2B$

$\sec^2A + \sec^2(90-A) - \sec^2A.\sec^2(90-A)$

$\sec^2A + \text{cosec}^2A - \sec^2A.\text{cosec}^2A$

$\frac{1}{\cos^2A} + \frac{1}{\sin^2A} - \frac{1}{\cos^2A} \times \frac{1}{\sin^2A}$

$\frac{\sin^2A + \cos^2A}{\cos^2A \sin^2A} - \frac{1}{\cos^2A.\sin^2A}$

$\frac{1}{\cos^2A \sin^2A} - \frac{1}{\cos^2A.\sin^2A} = 0$

67. (a) $\cot\theta.\tan(90°-\theta) - \sec(90°-\theta)\,\text{cosec}\,\theta + (\sin^2 25° + \sin^2 65°) + \sqrt{3}(\tan 5°.\tan 15°.\tan 30°.\tan 75°\ \tan 85^0)$

$= \cot\theta.\cot\theta - \text{cosec}\,\theta.\text{cosec}\,\theta + (\sin^2 25° + \cos^2 25°) + \sqrt{3}[(\tan 5°.\tan 85°).(\tan 15°.\tan^2 75°).\tan 30°]$

$= (\cot^2\theta - \text{cosec}^2\theta) + (1) + \sqrt{3}\ (1.1.\frac{1}{\sqrt{3}}) \begin{bmatrix} \text{tanA.tanB} = 1 \\ \text{If A+B} = 90° \end{bmatrix}$

$= (-1) + (1) + \sqrt{3} \times \frac{1}{\sqrt{3}} = -1 + 1 + 1$

= **1**

68. (d) $\cos\theta\ \text{cosec}23° = 1$

If cosA. cosecB = 1

then A + B = 90°

So,

$\theta + 23° = 90°$

$\theta = 67°$

69. (c) $A + B + C = \pi = 180°$

$\Rightarrow \frac{A+B}{2} = \frac{180}{2} - \frac{C}{2}$

$\Rightarrow \sin\left(\frac{A+B}{2}\right)$

$= \sin\left(\frac{\pi}{2} - \frac{c}{2}\right) = \cos\frac{c}{2}$

Similarly

$\cos\left(\frac{A+B}{2}\right) = \sin\frac{c}{2}$

$\cot\left(\frac{A+B}{2}\right) = \tan\frac{c}{2}$

$\tan\left(\frac{A+B}{2}\right) = \cot\frac{c}{2}$

So, option (C) is incorrect

70. (c) $\tan 2\theta\ \tan 3\theta = 1$

$(2\theta + 3\theta) = 90^0$

$5\theta = 90^0$

(If tanA . tanB = 1, then A + B = 90°)

$\Rightarrow \left[2\cos^2\frac{5\theta}{2} - 1\right]$

$\Rightarrow 2\cos^2\frac{90^0}{2} - 1$

$\Rightarrow 2\cos^2 45^0 - 1$

$\Rightarrow \frac{2}{2} - 1$

$\Rightarrow 1 - 1 = 0$

71. (C) $\tan 7\theta.\tan 2\theta = 1$

[If, tanA.tanB= 1 then, A + B = 90°]

$7\theta + 2\theta = 90°$

$9\theta = 90°$

$\theta = 10°$

$\Rightarrow \tan 3\theta$

$\Rightarrow \tan 30^0 \Rightarrow \frac{1}{\sqrt{3}}$

72. (c) $\sin(60^0 - \theta) = \cos(\psi - 30^0)$

$(60^0 - \theta) + (\psi - 30^0) = 90^0$

[*if* sinA = cosB then A + B = 90°]

$(\psi - \theta) = 90^0 - 30^0$

$(\psi - \theta) = 60^0$

$\tan(\psi - \theta) = \tan 60^0$

$\tan 60° = \sqrt{3}$

73. (d) 3cos80° cosec10° + 2cos59° cosec31°

[If A + B = 90°

then

CosA.CosecB =1

3 ×1 + 2 ×1 = 5]

(the value of Sinθ is always between –1 to +1)

$\Rightarrow 3\cos 80°\frac{1}{\sin 10°} + 2\cos 59°\frac{1}{\sin 31°}$

$\Rightarrow 3\cos 80°\frac{1}{\sin(90°-80°)} + 2\cos 59°\frac{1}{\sin(90°-59°)}$

⇒ 3 + 2 = **5**

74. (c) $\frac{2\sin 68°}{\cos 22°} - \frac{2\cot 15°}{5\tan 75°} - \frac{3\tan 45°.\tan 20°.\tan 40°.\tan 50°.\tan 70°}{5}$

$\Rightarrow \frac{2\sin 68°}{\cos(90°-68^0)} - \frac{2\cot 15°}{5\tan(90°-15°)} - \frac{3\times 1.(\tan 20°.\tan 70°)(\tan 40°.\tan 50°)}{5}$

$\Rightarrow \frac{2\sin 68°}{\sin 68°} - \frac{2\cot 15°}{5\cot 15°} - \frac{3\times1\times1\times1}{5}$

(tanA.tanB = 1 if A + B = 90°)

$\Rightarrow 2 - \frac{2}{5} - \frac{3}{5}$ = **1**

75. (b) tan10° tan15° tan75° tan80°

⇒ (tan10° tan80°) (tan15° tan75°)

⇒ 1 × 1

⇒ (tanA.tanB = 1, if A + B = 90°)

⇒ **1**

76. (b) $\sin 7x = \cos 11x$

$7x + 11x = 90°$

$18x = 90°$

$x = 5°$

$\Rightarrow \tan 9x + \cot 9x$

⇒ tan45° + cot45°

⇒ 1 + 1 ⇒ **2**

77. (a) If A + B = 90°

Then

$\sin^2 A + \sin^2 B = 1$

$\Rightarrow 7\frac{1°}{2} + 82\frac{1°}{2} = 90°$

78. (b) cot9° cot27° cot63° cot81°

$\Rightarrow$ cot9° cot81° cot27° cot63°

$\Rightarrow$ cot9° cot(90° − 9°)cot27°cot(90°−27°)

$\Rightarrow$ cot9° tan9° cot27° tan27°

$\Rightarrow \cot 9° \frac{1}{\cot 9°} \cot 27° \frac{1}{\cot 27°}$

= 1

Alternate

cotA. cotB = 1

If A + B = 90°

So,

$\Rightarrow$ cot9° cot81° cot27° cot63° = 1

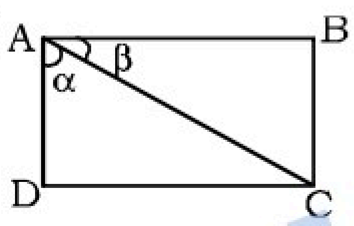
79. (c) $\sin^2 65° + \sin^2 25° + \cos^2 35° + \cos^2 55°$

$= \sin^2 65° + \sin^2(90° - 65°) + [\cos^2 35° + \cos^2(90° - 35°)]$

$= (\sin^2 65° + \cos^2 65°) + (\cos^2 35° + \sin^2 35°)$

= 1 + 1 = 2

80. (c)



$= (\tan^2\alpha + 1)\sin^2\beta$

$= (\tan^2 45° + 1)\sin^2 45°$

$= (1+1)\left(\frac{1}{\sqrt{2}}\right)^2$

$= 2 \times \frac{1}{2} = 1$

81. (a) sin3A = cos(A − 26°)

3A + A −26° = 90°

(If sin A = CosB then A + B = 90°)

4A = 116°

A = 29°

82. (a) $\sin(\theta + 18°) = \cos 60°$

$\theta + 18° + 60° = 90°$

$\theta = 12°$

$\Rightarrow \cos 5\theta = \cos 60° = \frac{1}{2}$

83. (b) $\tan 2\theta \cdot \tan 3\theta = 1$

$2\theta + 3\theta = 90°$

$5\theta = 90°$

(If tanA. tanB = 1 then A + B = 90°)

$\theta = 18°$

84. (a) We know that

$\tan(90° - \theta) = \cot\theta$

and $\cot(90° - \theta) = \tan\theta$

$\Rightarrow \tan(4\theta - 50°) = \cot(50° - \theta)$

$\Rightarrow \cot[90° - (4\theta - 50°)] = \cot(50° - \theta)$

$\Rightarrow 90° - (4\theta - 50°) = 50° - \theta$

$\Rightarrow 90° - 4\theta + 50° = 50° - \theta$

$\Rightarrow 90° = 3\theta$

then $\theta = 30°$

85. (d) Given

$\Rightarrow \sin^2 22° + \sin^2 68° + \cot^2 30°$

$\Rightarrow \cos^2 68° + \sin^2 68° + \cot^2 30°$

$\left\{\begin{matrix}\sin(90-\theta) = \cos\theta \\ \cos(90-\theta) = \sin\theta\end{matrix}\right\}$

$\Rightarrow 1 + \cot^2 30°$

$\Rightarrow 1 + (\sqrt{3})^2 \quad [\because \cot 30° = \sqrt{3}]$

$\Rightarrow 4$

86. (a) tan 4° tan 43°. tan 47°. tan 86°

= tan 4°. tan43°. tan (90° − 43°). tan (90° − 4°)

= tan 4°. tan 43° cot 43°. cot 4°

= 1

87. (b) cot41°. cot42°. cot43°. cot44°. cot45°. cot46° cot47°. cot48°. cot49°

$\Rightarrow$ (cot41°. cot49°). (cot42°.cot48°) (cot43°.cot47°) (cot44°.cot46°) cot45° [cotA. cotB = 1][If A + B = 90°]

= 1

88. (d) Value of

$\Rightarrow \frac{(\tan 20°)^2}{(\text{cosec}70°)^2} + \left(\frac{\cot 20°}{\sec 70°}\right)^2$

+ 2 tan15°tan45°tan75°

$\Rightarrow \frac{(\tan 20°)^2}{\sec^2 20°} + \frac{(\cot 20°)^2}{\text{cosec}^2 20°}$

+ 2 tan15°.tan75°

$\begin{bmatrix}\tan 15°.\tan 75° = 1 \\ \text{if } A+B = 90°\end{bmatrix}$

$\Rightarrow (\sin^2 20° + \cos^2 20°) + 2$

1 + 2 = 3

89. (d) $\left(\frac{\sin 47°}{\cos 43°}\right)^2 + \left(\frac{\cos 43°}{\sin 47°}\right)^2$

$-\,4\cos^2 45°$

$= \left(\frac{\cos 43°}{\cos 43°}\right)^2 + \left(\frac{\sin 47°}{\sin 47°}\right)^2 - 4 \times \frac{1}{2}$

= 1 + 1 − 2

= 0

Note:

$(\sin(90° - \theta) = \cos\theta$

90. (b) $\sin^2 1 + \sin^2 11° + \sin^2 21° + \sin^2 31° + \sin^2 41° + \sin^2 45° + \sin^2 49 + \sin^2 59° + \sin^2 69° + \sin^2 79° + \sin^2 89°$

$\Rightarrow (\sin^2 1° + \sin^2 89°) + (\sin^2 11° + \sin^2 79°) + (\sin^2 21° + \sin^2 69°) + (\sin^2 31° + \sin^2 59°) + (\sin^2 41° + \sin^2 49°) + \sin^2 45°$

$\Rightarrow 1 + 1 + 1 + 1 + 1 + \frac{1}{2}$

$(\sin^2 A + \sin^2 B = 1$

If A + B = 90°) $\Rightarrow 5\frac{1}{2}$

91. (d) **Given:-**

$\alpha + \beta = 90°$

to find $\frac{\tan\alpha}{\tan\beta} + \sin^2\alpha + \sin^2\beta = ?$

$\because \alpha + \beta = 90°$

$\Rightarrow \alpha = 90 - \beta$

$\Rightarrow \alpha, \beta$ are complementary angles

$\Rightarrow \frac{\tan\alpha}{\tan(90 - \alpha)} + \sin^2\alpha + \sin^2(90 - \alpha)$

$\Rightarrow \frac{\tan\alpha}{\cot\alpha} + \sin^2\alpha + \cos^2\alpha$

$\Rightarrow \tan^2\alpha + 1$

$(\because \sin^2\alpha + \cos^2\alpha = 1)$

$\Rightarrow \sec^2\alpha \quad (\because 1 + \tan^2\alpha = \sec^2\alpha)$

92. (b) cos20° = m

cos70° = n

So, $m^2 + n^2 = \cos^2 20° + \cos^2 70°$

= 1

$\begin{bmatrix}\cos^2 A + \cos^2 B = 1 \\ \text{if } A + B = 90°\end{bmatrix}$

93. (c) $\sin(90° - \theta) + \cos\theta = \sqrt{2}\cos(90° - \theta)$

$\cos\theta + \cos\theta = \sqrt{2}\sin\theta$

$\frac{2\cos\theta}{\sin\theta} = \sqrt{2}$

$\cot\theta = \frac{1}{\sqrt{2}} \begin{matrix}\to B \\ \to P\end{matrix}$

So, H $\to$

$\therefore \text{cosec}\,\theta = \frac{H}{P} = \frac{\sqrt{3}}{\sqrt{2}}$

94. (d) $\sin A - \cos A = \frac{\sqrt{3}-1}{2}$

Shortcut Method:-

Put $\theta = 60^\circ$

$\Rightarrow \sin 60^\circ - \cos 60^\circ = \frac{\sqrt{3}-1}{2}$

$\Rightarrow \frac{\sqrt{3}}{2} - \frac{1}{2} = \frac{\sqrt{3}-1}{2}$

$\Rightarrow \frac{\sqrt{3}-1}{2} = \frac{\sqrt{3}-1}{2}$

(Matched)

Hence, sinA . cosA

sin60° . cos60°

$\Rightarrow \frac{\sqrt{3}}{2} \times \frac{1}{2} = \frac{\sqrt{3}}{4}$

Alternate

$\sin A - \cos A = \frac{\sqrt{3}-1}{2}$

Squaring both side,

$\Rightarrow \sin^2 A + \cos^2 A - 2\sin A\cos A$

$= \left(\frac{\sqrt{3}-1}{2}\right)^2$

$\Rightarrow 1 - 2\sin A\cos A = \frac{3+1-2\sqrt{3}}{4}$

$\Rightarrow 2\sin A\cos A = 1 - 2\frac{(2-\sqrt{3})}{4}$

$\Rightarrow 2\sin A . \cos A = \frac{2-2+\sqrt{3}}{2}$

$\sin A. \cos A = \frac{\sqrt{3}}{4}$

95. (c) $\frac{\sec^2 70^\circ - \cot^2 20^\circ}{2(\operatorname{cosec}^2 59^\circ - \tan^2 31^\circ)} = \frac{2}{m}$

$\frac{\sec^2 70^\circ - \cot^2(90^\circ - 70^\circ)}{2(\operatorname{cosec}^2 59^\circ - \tan^2(90^\circ - 59^\circ))} = \frac{2}{m}$

$\frac{\sec^2 70^\circ - \tan^2 70^\circ}{2(\operatorname{cosec}^2 59^\circ - \cot^2 59^\circ)} = \frac{2}{m}$

$= \frac{1}{2} = \frac{2}{m} \left[\begin{array}{l}\sec^2\theta - \tan^2\theta = 1 \\ \operatorname{cosec}^2\theta - \cot^2\theta = 1\end{array}\right]$

m = 2 × 2 = 4

96. (b) $\frac{\tan\theta + \cot\theta}{\tan\theta - \cot\theta} = 2$

By componendo and dividendo,

$\frac{2\tan\theta}{2\cot\theta} = \frac{3}{1}$

$\frac{\sin\theta}{\cos\theta} \times \frac{\sin\theta}{\cos\theta} = 3$

$\sin^2\theta = 3\cos^2\theta$

$\sin^2\theta = 3(1 - \sin^2\theta)$

$4\sin^2\theta = 3$

$\sin^2\theta = \frac{3}{4} \Rightarrow \sin\theta = \frac{\sqrt{3}}{2}$

Alternate

$\frac{\tan\theta + \cot\theta}{\tan\theta - \cot\theta} = 2$

By C and D

$\frac{\tan\theta}{\cot\theta} = \frac{3}{1}$

$\tan^2\theta = 3$

$\tan\theta = \sqrt{3}$

$\theta = 60^\circ$

$\therefore \sin\theta = \sin 60^\circ = \frac{\sqrt{3}}{2}$

97. (b) If in the any question Componendo dividendo already used as

$\frac{a+b}{a-b} = \frac{m}{n}$

If second time you also want to apply componendo dividendo rule then result will be

$\frac{a}{b} = \frac{m+n}{m-n}$

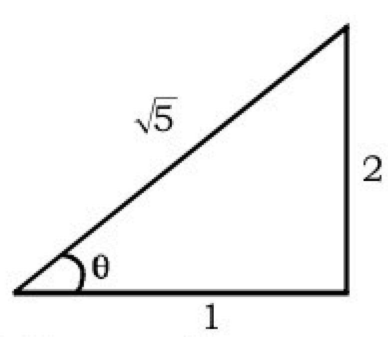
$\frac{\sin\theta + \cos\theta}{\sin\theta - \cos\theta} = 3$

$\sin\theta + \cos\theta = 3\sin\theta - 3\cos\theta$

$2\sin\theta = 4\cos\theta \Rightarrow \frac{\sin\theta}{\cos\theta} = \frac{2}{1}$

$\Rightarrow \tan\theta = \frac{2}{1} = \frac{P}{B}$

$\left[\therefore \sin\theta = \frac{P}{H} = \frac{2}{\sqrt{5}} \text{ and } \cos\theta = \frac{B}{H} = \frac{1}{\sqrt{5}}\right]$



$\Rightarrow \sin^4\theta - \cos^4\theta$

$\Rightarrow (\sin^2\theta + \cos^2\theta)(\sin^2\theta - \cos^2\theta)$

$\Rightarrow 1(\sin^2\theta - \cos^2\theta)$

$\Rightarrow \left(\frac{2}{\sqrt{5}}\right)^2 - \left(\frac{1}{\sqrt{5}}\right)^2 = \frac{4}{5} - \frac{1}{5} = \frac{3}{5}$

98. (a) tan15° cot75° + tan75° cot15°

= tan15°.cot (90° – 15°) + tan (90° – 15°). cot15°

= tan²15° + cot²15° = tan²15° + cot²15°.....(i)

[Formula]

$\cot(90^\circ - \theta) = \tan\theta$

$\tan(90^\circ - \theta) = \cot\theta$

Put value of tan 15°

$\left[\begin{array}{l}\cot 15^\circ = \frac{1}{\tan 15^\circ} \\ \cot 15^\circ = \frac{1}{(2-\sqrt{3})} \Rightarrow \frac{1}{(2-\sqrt{3})} \times \frac{(2+\sqrt{3})}{(2+\sqrt{3})}\end{array}\right]$

$\mathbf{\cot 15^\circ = 2 + \sqrt{3}}$

Now put value in eq (i)

tan²15°+cot²15°

$= (2-\sqrt{3})^2 + (2+\sqrt{3})^2$

$= 4 + 3 - 4\sqrt{3} + 4 + 3 + 4\sqrt{3}$

= 14

99. (c) $\frac{A}{B} = \frac{\tan 11^\circ \tan 29^\circ}{2\cot 61^\circ \cot 79^\circ}$

$\frac{A}{B} = \frac{\tan 11^\circ \tan 29^\circ}{2[\cot(90^\circ - 29^\circ)\cot(90^\circ - 11^\circ)]}$

$\frac{A}{B} = \frac{\tan 11^\circ \tan 29^\circ}{2\tan 11^\circ \tan 29^\circ}$

$\frac{A}{B} = \frac{1}{2}$

2A=B

100. (c) $\tan\left[\frac{\pi}{2} - \frac{\theta}{2}\right] = \sqrt{3}$

$\Rightarrow \tan\left[90 - \frac{\theta}{2}\right] = \sqrt{3}$

$[\pi = 180^\circ]$

$\Rightarrow \cot\frac{\theta}{2} = \sqrt{3} = \cot 30^\circ$

$\Rightarrow \frac{\theta}{2} = 30^\circ$

$\Rightarrow \theta = 60^\circ$

$\Rightarrow \cos 60^\circ = \frac{1}{2}$

101. (d) $\operatorname{cosec}^2 18^\circ - \frac{1}{\cot^2 72^\circ}$

$\Rightarrow \operatorname{cosec}^2 18^\circ - \tan^2 72^\circ$

$\Rightarrow \operatorname{cosec}^2 18^\circ - \tan^2(90^\circ - 18^\circ)$

$\Rightarrow \operatorname{cosec}^2 18^\circ - \cot^2 18^\circ$

$\Rightarrow$ **1**

102. (a) **Shortcut Method**

$(1 - \sin^2\alpha)(1 - \cos^2\alpha) \times (1 + \cot^2\beta)(1 + \tan^2\beta)$

$\Rightarrow (\cos^2\alpha)(\sin^2\alpha)(\operatorname{cosec}^2\beta)(\sec^2\beta)$

$\Rightarrow$ put $\alpha = \beta = 45^\circ$

$\Rightarrow \cos^2 45^\circ. \sin^2 45^\circ. \operatorname{cosec}^2 45^\circ. \sec^2 45^\circ$

$\Rightarrow \frac{1}{2} . \frac{1}{2} . 2 . 2 =$ **1**

Alternate

$\Rightarrow (1-\sin^2\alpha)(1-\cos^2\alpha) \times (1+\cot^2\beta)(1+\tan^2\beta)$

$\Rightarrow (\cos^2\alpha)(\sin^2\alpha)(\text{cosec}^2\beta)(\sec^2\beta)$

$\Rightarrow \cos^2(90-\beta).\ \sin^2\alpha.\ \text{cosec}^2\beta.\ \sec^2(90-\alpha)$

$\Rightarrow \sin^2\beta.\text{cosec}^2\beta.\sin^2\alpha.\text{cosec}^2\alpha = 1$

103. (d) $\tan 9^\circ = \frac{p}{q}$

$\frac{\sec^2 81^\circ}{1+\cot^2 81^\circ} \Rightarrow \frac{\sec^2 81^\circ}{\text{cosec}^2 81^\circ}$

$\Rightarrow \frac{1}{\cos^2 81^\circ} \times \sin^2 81^0$

$\Rightarrow \tan^2 81^\circ = \tan^2(90^\circ - 9^\circ)$

$\Rightarrow \cot^2 9^\circ = \frac{q^2}{p^2}$

104. (b) The value of cos 24° + cos 55° + cos 125° + cos 204° + cos 300°

We know that, $\cos(180^\circ \pm \theta) = -\cos\theta$

$\Rightarrow \cos 24^\circ + \cos 55^\circ + \cos(180^\circ - 55^\circ) + \cos(180^\circ + 24^\circ) + \cos(360^\circ - 60^\circ)$

$\Rightarrow \cos 24^\circ + \cos 55^\circ - \cos 55^\circ - \cos 24^\circ + \cos 60^\circ$

$= \cos 60^\circ = \frac{1}{2}$

105. (b) $2(\cos^2\theta - \sin^2\theta) = 1$

$\Rightarrow \cos^2\theta - \sin^2\theta = \frac{1}{2}$

$\Rightarrow 2\sin^2\theta = 1 - \frac{1}{2}$

$\Rightarrow \sin^2\theta = \frac{1}{4}$

$\Rightarrow \sin\theta = \frac{1}{2} = \sin 30^\circ$

$\theta = 30^\circ$

Alternate

Take help from option

Let $\theta = 30^\circ$

$\Rightarrow 2(\cos^2\theta - \sin^2\theta) = 1$

$\Rightarrow 2(\cos^2 30^\circ - \sin^2 30^\circ) = 1$

$\Rightarrow 2\left[\left(\frac{\sqrt{3}}{2}\right)^2 - \left(\frac{1}{2}\right)^2\right] = 1$

$\Rightarrow 2\left[\frac{3}{4} - \frac{1}{4}\right] = 1$

$\Rightarrow 2 \times \frac{2}{4} = 1$

$\Rightarrow$ **1 = 1** LHS = RHS

106. (c) $7\sin^2\theta + 3\cos^2\theta = 4$

$\Rightarrow 7\sin^2\theta + 3(1-\sin^2\theta) = 4$

$\Rightarrow 7\sin^2\theta + 3 - 3\sin^2\theta = 4$

$\Rightarrow 4\sin^2\theta = 1$

$\Rightarrow \sin^2\theta = \frac{1}{4} \Rightarrow \sin\theta = \frac{1}{2} = \sin 30^\circ$

$\theta = 30^\circ = \frac{\pi}{6}$ $[\because \pi^c = 180^\circ]$

107. (b) $\tan(2\theta + 45^0) = \cot 3\theta$

[if tanA = cotB then $A + B = 90^0$]

$(2\theta + 45^\circ) + 3\theta = 90^\circ$

$5\theta + 45^0 = 90^0$

$\theta = \frac{45}{5} = 9^0$

108. (b) $\sin(A-B) = \frac{1}{2}$ $(A - B = 30^0)$

$\cos(A+B) = \frac{1}{2}$ $(A + B = 60^0)$

Adding both side

$\Rightarrow (A-B)+(A+B) = 30^0 + 60^0$

$\Rightarrow 2A = 90^0$

$\Rightarrow A = 45^0$

$\because$ A-B=30^0

B=A-30^0=45^0-30^0=15^0

$\Rightarrow \frac{15\times\pi}{180} = \frac{\pi}{12}\,radian$

109. (d) $\sin^2\theta - 3\sin\theta + 2 = 0$

$\Rightarrow \sin^2\theta - 2\sin\theta - \sin\theta + 2 = 0$

$\Rightarrow \sin\theta(\sin\theta - 2) - 1(\sin\theta - 2) = 0$

$\Rightarrow (\sin\theta - 1)(\sin\theta - 2) = 0$

$[\sin\theta \neq 2]$

$\Rightarrow \sin\theta = 1 \Rightarrow \sin 90^\circ$

$\Rightarrow \theta = 90^\circ$

Alternate

Put value of $\theta = 90^\circ$

[take help from options]

$\sin^2\theta - 3\sin\theta + 2 = 0$

$\sin^2 90^\circ - 3\sin 90^\circ + 2 = 0$

$1 - 3 \times 1 + 2 = 0$

$[\sin 90^\circ = 1]$ $0 = 0$

[matched]

So, this is answer.

110. (d) $2(\cos^2\theta - \sin^2\theta) = 1$

$\Rightarrow \cos^2\theta - (1-\cos^2\theta) = \frac{1}{2}$

$\Rightarrow 2\cos^2\theta = 1 + \frac{1}{2} \Rightarrow \frac{3}{2}$

$\Rightarrow \cos^2\theta = \frac{3}{4}$

$\Rightarrow \sec^2\theta = \frac{4}{3}$

$\Rightarrow 1 + \tan^2\theta = \frac{4}{3}$

$\Rightarrow \tan^2\theta = \frac{4}{3} - 1 = \frac{1}{3}$

$\Rightarrow \tan\theta = \frac{1}{\sqrt{3}} \Rightarrow$ **$\cot\theta = \sqrt{3}$**

Alternate

$2(\cos^2\theta - \sin^2\theta) = 1$

$\Rightarrow \cos^2\theta - (1-\cos^2\theta) = \frac{1}{2}$

$\Rightarrow 2\cos^2\theta = 1 + \frac{1}{2} \Rightarrow \frac{3}{2}$

$\Rightarrow \cos^2\theta = \frac{3}{4}$

$\Rightarrow \cos\theta = \frac{\sqrt{3}}{2}$

$\theta = 30^\circ$

Hence,

$\cot\theta = \cot 30^\circ = \sqrt{3}$

111. (b) $\sin\alpha + \cos\beta = 2$

Shortcut method

put, $\alpha = 90^\circ, \beta = 0^\circ$

$\sin 90^\circ + \cos 0^\circ = 2$

$1 + 1 = 2$

2 = 2 matched

So, $\alpha = 90^\circ$, $\beta = 0^\circ$

$\Rightarrow \sin\left(\frac{2\alpha+\beta}{3}\right)^\circ$

$= \sin\left(\frac{2\times 90 + 0}{3}\right)^\circ$

$= \sin\left(\frac{180}{3}\right)^\circ$

$= \sin 60^\circ = \cos 30^\circ = \frac{\sqrt{3}}{2}$

Take $\cos\frac{\alpha}{3} = \cos\frac{90^\circ}{3}$

$= \cos 30^\circ$

So, this is answer.

112. (b) $\cos^2\alpha + \cos^2\beta = 2$

put value of $\alpha = \beta = 0°$

$\Rightarrow \cos^2 0° + \cos^2 0° = 2$

$\Rightarrow (1)^2 + (1)^2 = 2$

$\Rightarrow 2 = 2$ [It satisfies the equation]

$= \tan^3\alpha + \sin^5\beta$

$= \tan^3 0° + \sin^5 0°$

$= 0 + 0 = 0$

113. (d) $2\sin\left[\frac{\pi x}{2}\right]$

$= x^2 + \frac{1}{x^2}$

Let $x = 1$

$2\sin 90. = 1^2 + \frac{1}{1^2}$

$2 \times 1 = 1 + 1$

$2 = 2$ matched,

so $x = 1$

so, $x - \frac{1}{x}$

$\Rightarrow 1 - \frac{1}{1} =$ **0**

114. (d) $\cos\theta + \sec\theta = 2$

Put $\theta = 0°$

$\cos 0^0 + \sec 0^0 = 2$

$\Rightarrow 1 + 1 = 2 \Rightarrow 2 = 2$

(matched, so $\theta = 0°$)

$= \cos^6\theta + \sec^6\theta$

$= \cos^6 0^0 + \sec^6 0^0$

$= (1)^6 + (1)^6 = 1 + 1 = 2$

Alternate

If $x + \frac{1}{x} = 2$

then, $x = 1$

So, $\cos\theta + \sec\theta = 2$

$\cos\theta + \frac{1}{\cos\theta} = 2$

Hence, $\cos\theta = 1$

We have to find the value of

$\cos^6\theta + \sec^6\theta$

$\Rightarrow \cos^6\theta + \frac{1}{\cos^6\theta}$

$\Rightarrow 1 + 1 = 2$

115. (c) 152 $(\sin 30° + 2\cos^2 45° + 3\sin 30° \ldots\ldots + 17\sin 30° + 18\cos^2 45°)$

$= 152\left(\frac{1}{2} + 2\left(\frac{1}{\sqrt{2}}\right)^2 + 3\times\frac{1}{2}\ldots.17\times\frac{1}{2} + 18\left(\frac{1}{\sqrt{2}}\right)^2\right)$

$\Rightarrow 152\left[\frac{1}{2} + 1 + 1\frac{1}{2} + \ldots\ldots\ldots\ldots + 8\frac{1}{2} + 9\right]$

$\Rightarrow$ This is in A.P. where $a = \frac{1}{2}$, d

$= \frac{1}{2}$, $n = 18$

$\Rightarrow 152\left[\frac{18}{2}\left(2\times\frac{1}{2} + (18-1)\frac{1}{2}\right)\right]$

$\Rightarrow 152\left[\frac{18}{2}\left(1 + \frac{17}{2}\right)\right]$

$\Rightarrow 152 \times 9 \times \frac{19}{2} \Rightarrow 12996$

$\Rightarrow \sqrt{12996}$

$=$ **114**

116. (a) $x\sin 45° = y\,\text{cosec}\,30°$

$\Rightarrow \frac{x}{y} = \frac{\text{cosec}\,30°}{\sin 45°} \Rightarrow \frac{2}{1/\sqrt{2}} \Rightarrow \frac{2\sqrt{2}}{1}$

$\Rightarrow \frac{x^4}{y^4} = \left(\frac{2\sqrt{2}}{1}\right)^4 \Rightarrow \frac{64}{1}$

$=$ $\mathbf{4^3}$

117. (a) $\tan^2\alpha = 1 + 2\tan^2\beta$

$\Rightarrow \sec^2\alpha - 1 = 1 + 2(\sec^2\beta - 1)$

$\Rightarrow \sec^2\alpha - 1 = 2\sec^2\beta - 1$

$\Rightarrow \frac{1}{\cos^2\alpha} = \frac{2}{\cos^2\beta}$

$\Rightarrow \sqrt{2}\cos\alpha = \cos\beta$

$\therefore \sqrt{2}\cos\alpha - \cos\beta = 0$

Alternate

$\tan^2\alpha = 1 + 2\tan^2\beta$

Put $\beta = 45°$

$\tan^2\alpha = 1 + 2.\tan^2 45°$

$\tan^2\alpha = 3$

$\tan\alpha = \sqrt{3}$

$\alpha = 60°$

Put $\alpha = 60°$, $\beta = 45°$

$= \sqrt{2}\cos\alpha - \cos\beta = \sqrt{2}\cos 60° - \cos 45°$

$= \sqrt{2} \times \frac{1}{2} - \frac{1}{\sqrt{2}} = \frac{1}{\sqrt{2}} - \frac{1}{\sqrt{2}} = 0$

118. (a) $\tan\theta + \cot\theta = 2$

Put $\theta = 45°$

$1 + 1 = 2$ (matched)

So, $\theta = 45°$

$\Rightarrow \tan^{100}45° + \cot^{100}45°$

$\Rightarrow 1^{100} + 1^{100} =$ **2**

119. (b) **Shortcut Method**

$\sin\theta + \text{cosec}\,\theta = 2$

Put, $\theta = 90°$

$1 + 1 = 2$ (matched)

So, $\theta = 90°$

$\Rightarrow \sin^9\theta + \text{cosec}^9\theta$

$\Rightarrow \sin^9 90° + \text{cosec}^9 90°$

$\Rightarrow 1^9 + 1^9$

$\Rightarrow$ **2**

120. (d) $3(\sin x - \cos x)^4 + 6(\sin x + \cos x)^2 + 4(\sin^6 x + \cos^6 x)$

Put, $x = 90°$

$3(\sin 90° - \cos 90°)^4 + 6(\sin 90° + \cos 90°)^2 + 4(\sin^6 90° + \cos^6 90°)$

$= 3(1-0)^4 + 6(1+0)^2 + 4(1^6 + 0)$

$\Rightarrow 3 + 6 + 4 =$ **13**

121. (c)

$\sec\theta\left(\frac{1+\sin\theta}{\cos\theta} + \frac{\cos\theta}{1+\sin\theta}\right) - 2\tan^2\theta$

Shortcut method

Take, $\theta = 0°$

$\Rightarrow \sec 0°\left(\frac{1+\sin 0°}{\cos 0°} + \frac{\cos 0°}{1+\sin 0°}\right) - 2\tan^2 0°$

$\Rightarrow 1\left(\frac{1+0}{1} + \frac{1}{1+0}\right) - 0$

$\Rightarrow$ **2**

122. (c) $\tan\theta - \cot\theta = 0$

Shortcut Method

Put $\theta = 45°$

$\tan 45° - \cot 45° = 0$

$1 - 1 = 0$

$0 = 0$ (matched)

So, $\theta = 45°$

$\Rightarrow \sin\theta + \cos\theta$

$\Rightarrow \sin 45° + \cos 45°$

$\Rightarrow \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{2}} \Rightarrow \sqrt{2}$

123. (c) $x\sin 60°.\tan 30° = \sec 60°.\cot 45°$

Put values

$x.\frac{\sqrt{3}}{2}.\frac{1}{\sqrt{3}} = 2.1$

$\Rightarrow \frac{x}{2} = 2 \Rightarrow$ $\boldsymbol{x = 4}$

124. (d) $\theta = 60°$

$\Rightarrow \frac{1}{2}\sqrt{1+\sin\theta} + \frac{1}{2}\sqrt{1-\sin\theta}$

$\Rightarrow \frac{1}{2}\sqrt{1+\sin 60°} + \frac{1}{2}\sqrt{1-\sin 60°}$

$\Rightarrow \frac{1}{2}\sqrt{1+\left(\frac{\sqrt{3}}{2}\right)} + \frac{1}{2}\sqrt{1-\left(\frac{\sqrt{3}}{2}\right)}$

$\Rightarrow \frac{1}{2\sqrt{2}}\left(\sqrt{2+\sqrt{3}}+\sqrt{2-\sqrt{3}}\right)$

$\Rightarrow \frac{1}{2\sqrt{2}}\times\frac{1}{\sqrt{2}}\left(\sqrt{4+2\sqrt{3}}+\sqrt{4-2\sqrt{3}}\right)$

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

$\Rightarrow \frac{1}{4}\left(\sqrt{3}+1+\sqrt{3}-1\right)$

$\Rightarrow 2\ \frac{\sqrt{3}}{4} = \frac{\sqrt{3}}{2} = \cos 30° = \cos\frac{\theta}{2}$

125. (b) $\frac{2\tan^2 30°}{1-\tan^2 30°} + \sec^2 45° - \sec^2$ $0° = x \sec 60°$

$\Rightarrow \frac{2\times\left(\frac{1}{\sqrt{3}}\right)^2}{1-\left(\frac{1}{\sqrt{3}}\right)^2} + \left(\sqrt{2}\right)^2 - 1 = x\times 2$

$\Rightarrow \frac{2\times\frac{1}{3}}{1-\frac{1}{3}} + 2 - 1 = 2x$

$\Rightarrow \left(\frac{2}{3}\times\frac{3}{2}\right) + 2 - 1 = 2x \Rightarrow 2 = x\times 2$

$\boldsymbol{x = 1}$

126. (a) $x \sin 60° \tan 30° - \tan^2 45° = \operatorname{cosec} 60° \cot 30° - \sec^2 45°$

$\Rightarrow x\times\frac{\sqrt{3}}{2}\times\frac{1}{\sqrt{3}} - 1 = \frac{2}{\sqrt{3}}\times\sqrt{3} - \left(\sqrt{2}\right)^2$

$\Rightarrow \frac{x}{2} - 1 = 2 - 2$

$\Rightarrow \frac{x}{2} - 1 = 0$

$\Rightarrow \frac{x}{2} = 1 \Rightarrow x = 2$

127. (b) $\frac{\cos^2 60° + 4\sec^2 30° - \tan^2 45°}{\sin^2 30° + \cos^2 30°}$

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

($\sin^2 A + \cos^2 A = 1$)

$\Rightarrow \frac{1}{4} + \frac{4\times 4}{3} - 1$

$\Rightarrow \frac{1}{4} + \frac{16}{3} - 1$

$\Rightarrow \frac{3+64-12}{12} \Rightarrow \boldsymbol{\frac{55}{12}}$

128. (d) $1+\frac{1}{\cot^2 63°} - \sec^2 27° + \frac{1}{\sin^2 63°} - \operatorname{cosec}^2 27°$

$\Rightarrow 1 + \tan^2 63° - \sec^2 27° + \operatorname{cosec}^2 63° - \operatorname{cosec}^2 27°$

$= 1 + \cot^2 27° - \sec^2 27° + \sec^2 27° - \operatorname{cosec}^2 27°$

$= 1 + \cot^2 27° - \operatorname{cosec}^2 27°$

$= 1 - 1 = 0$

129. (a) $\frac{\sin 43°}{\cos 47°} + \frac{\cos 19°}{\sin 71°} - 8\cos^2 60°$

$\Rightarrow 1 + 1 - \left(8\times\left(\frac{1}{2}\right)^2\right)$

$\sin A = \cos B$ (If $A + B = 90°$)

$\left[\frac{\sin A}{\cos B} = 1 \text{ or } \frac{\cos B}{\sin A} = 1\right]$

$\Rightarrow 2 - 2 = 0$

130. (d) $\tan^2\theta + 3 = 3\sec\theta$

take help from option to save time put $\theta = 60°$

$\tan^2 60° + 3 = 3\sec 60°$

$\left(\sqrt{3}\right)^2 + 3 = 3\times 2$

6 = 6 It satisfies

It will also satisfies on 0°

So, this is ans $\theta = 60°$ or 0°

131. (a) $\frac{1}{\sqrt{2}}\sin\frac{\pi}{6}\cos\frac{\pi}{4} - \cot\frac{\pi}{3}\sec\frac{\pi}{6} + \frac{5\tan\frac{\pi}{4}}{12\sin\frac{\pi}{2}}$

$\Rightarrow \frac{1}{\sqrt{2}}\times\frac{1}{2}\times\frac{1}{\sqrt{2}} - \frac{1}{\sqrt{3}}\times\frac{2}{\sqrt{3}} + \frac{5\times 1}{12\times 1}$

$\Rightarrow \frac{1}{4} - \frac{2}{3} + \frac{5}{12}$

$\Rightarrow \frac{3-8+5}{12} = 0$

132. (b) $(\sin\alpha + \operatorname{cosec}\alpha)^2 + (\cos\alpha + \sec\alpha)^2 = k + \tan^2\alpha + \cot^2\alpha$

put $\alpha = 45°$

$\Rightarrow (\sin 45° + \operatorname{cosec} 45°)^2 + (\cos 45° + \sec 45°)^2 = K + \tan^2 45° + \cot^2 45°$

$\Rightarrow \left(\frac{1}{\sqrt{2}}+\sqrt{2}\right)^2 + \left(\frac{1}{\sqrt{2}}+\sqrt{2}\right)^2 = k + 1 + 1$

$\frac{1}{2} + 2 + \left(2\sqrt{2}\times\frac{1}{\sqrt{2}}\right) + \frac{1}{2} + 2 + \left(2\sqrt{2}\times\frac{1}{\sqrt{2}}\right)$

$= k + 2$

$\Rightarrow 4\frac{1}{2} + 4\frac{1}{2} = k + 2$

$k = 7$

133. (c) $x\sin^2 60 - \frac{3}{2}\sec 60° \tan^2 30° + \frac{4}{5}\sin^2 45° \tan^2 60 = 0$

$\Rightarrow x\left(\frac{\sqrt{3}}{2}\right)^2 - \frac{3}{2}\times 2\times\left(\frac{1}{\sqrt{3}}\right)^2 + \frac{4}{5}\left(\frac{1}{\sqrt{2}}\right)^2 \times \left(\sqrt{3}\right)^2 = 0$

$\Rightarrow \frac{3x}{4} - \frac{3}{2}\times 2\times\frac{1}{3} + \frac{4}{5}\times\frac{1}{2}\times 3 = 0$

$\Rightarrow \frac{3x}{4} - 1 + \frac{6}{5} = 0$

$\Rightarrow \frac{3x}{4} = 1 - \frac{6}{5} \Rightarrow \frac{5-6}{5} = \frac{-1}{5}$

$x = -\frac{1}{5}\times\frac{4}{3} = \frac{-4}{15}$

134. (d) $\tan^2 A + \cot^2 A - \sec^2 A \operatorname{cosec}^2 A$

Shortcut method

Put $A = 45°$

$\Rightarrow \tan^2 45° + \cot^2 45° - \sec^2 45° \operatorname{cosec}^2 45°$

$\Rightarrow 1 + 1 - \left(\sqrt{2}\right)^2\left(\sqrt{2}\right)^2$

$\Rightarrow 2 - 4 = -2$

135. (d) $\sin(4\alpha - \beta) = 1 = \sin 90°$

$\cos(2\alpha + \beta) = \frac{1}{2} = \cos 60°$

$4\alpha - \beta = 90°$

$2\alpha + \beta = 60°$

adding $6\alpha = 150°$

$\alpha = 25°$

$\Rightarrow \beta = 10°$

$\Rightarrow \sin(\alpha + 2\beta)$

$\Rightarrow \sin(25° + 2\times 10°)$

$\Rightarrow \sin 45° = \frac{1}{\sqrt{2}}$

136. (b) $4\cos^2\theta - 1 = 0$

$4\cos^2\theta = 1$

$\cos^2\theta = \frac{1}{4}$

$\cos\theta = \frac{1}{2} = \cos 60°$

$\theta = 60°$

$\Rightarrow \tan(\theta - 15°)$

$\Rightarrow \tan(60° - 15°) \Rightarrow \tan 45° = 1$

137. (a) $\frac{\sin 25°\cos 65° + \cos 25°\sin 65°}{\tan^2 70° - \operatorname{cosec}^2 20°}$

$= \frac{\sin 25°\cos(90°-25°) + \cos 25°\sin(90°-25°)}{\tan^2 70° - \operatorname{cosec}^2(90°-70°)}$

$= \frac{\sin^2 25° + \cos^2 25°}{\tan^2 70° - \sec^2 70°}$

$= \frac{1}{-1} = -1$

138. (c) Sin(A + B) = sinA.cosB + cosA. sinB

Shortcut method

Put A = 45°

B = 30°

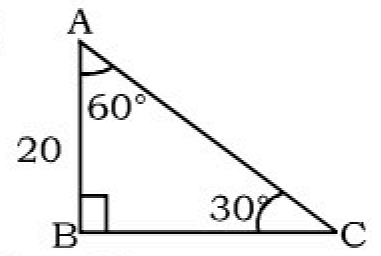
Sin(45° + 30°) = sin45° cos30° + cos45°. sin30°

$\sin 75° = \frac{1}{\sqrt{2}} \times \frac{\sqrt{3}}{2} + \frac{1}{\sqrt{2}} \times \frac{1}{2}$

$\Rightarrow \frac{\sqrt{3}}{2\sqrt{2}} + \frac{1}{2\sqrt{2}}$

$\Rightarrow \frac{\sqrt{3}+1}{2\sqrt{2}}$

139. (d)



AB = 20 cm

BC : CA = ?

$\Rightarrow \frac{BC}{CA} = \cos C$

$\Rightarrow \frac{BC}{CA} = \cos 30°$

$(\angle C = 180° - 90° - 60° \Rightarrow 30°)$

$\Rightarrow \frac{BC}{CA} = \frac{\sqrt{3}}{2}$

$\Rightarrow \sqrt{3} : 2$

140. (d) $\theta + \phi = \frac{\pi}{2}$

$\theta + \phi = 90°$ ......(i)

$\sin\theta = \frac{1}{2}$

$\sin\theta = \sin 30° = \frac{1}{2}$ ......(ii)

put θ = 30° in equation(i)

$30° + \phi = 90°$

$\phi = 60°$

$\sin\phi = \sin 60° = \frac{\sqrt{3}}{2}$

141. (d) The value of $3(\sin^4\theta + \cos^4\theta) + 2(\sin^6\theta + \cos^6\theta) + 12\sin^2\theta\cos^2\theta$

Using θ = 0°

$\because$ sin0° = 0°

cos0° = 1

$\Rightarrow 3(0+1^4) + 2(0+1^6) + 12 \times 0 \times 1$

$\Rightarrow$ 3 + 2 = 5

142. (a) $\frac{\cos^2 45°}{\sin^2 60°} + \frac{\cos^2 60°}{\sin^2 45°} - \frac{\tan^2 30}{\cot^2 45} - \frac{\sin^2 30}{\cot^2 30}$

$\Rightarrow \frac{\left(\frac{1}{\sqrt{2}}\right)^2}{\left(\frac{\sqrt{3}}{2}\right)^2} + \frac{\left(\frac{1}{2}\right)^2}{\left(\frac{1}{\sqrt{2}}\right)^2} - \frac{\left(\frac{1}{\sqrt{3}}\right)^2}{(1)^2} - \frac{\left(\frac{1}{2}\right)^2}{\left(\sqrt{3}\right)^2}$

$\Rightarrow \left(\frac{1}{2} \times \frac{4}{3}\right) + \left(\frac{1}{4} \times \frac{2}{1}\right) - \left(\frac{1}{3} \times 1\right) - \frac{1}{4} \times \frac{1}{3}$

$= \frac{2}{3} + \frac{1}{2} - \frac{1}{3} - \frac{1}{12}$

$= \frac{1}{3} + \frac{1}{2} - \frac{1}{12}$

$= \frac{4+6-1}{12} \Rightarrow \frac{9}{12} = \frac{3}{4}$

143. (a) Given let x = 1 and θ = 0°

$\Rightarrow x\cos\theta - \sin\theta = 1$ ......(i)

$\Rightarrow 1 \times 1 - (0) = 1$

$\Rightarrow 1 = 1$

putting value x = 1 and θ = 0° in following equation

$\Rightarrow x^2 - (1 + x^2)\sin\theta$

$\Rightarrow 1^2 - (1 + 1^2) \times \sin 0°$

= 1

144. (a) $\tan\theta - \cot\theta = 0$

Put θ = 45°

tan 45°– cot 45° = 0

1 – 1 = 0

0 = 0 (Satisfied)

So, θ = 45°

Now, $\frac{\tan(\theta+15°)}{\tan(\theta-15°)}$

$\Rightarrow \frac{\tan(45°+15°)}{\tan(45°-15°)}$

$\Rightarrow \frac{\tan 60°}{\tan 30°} \Rightarrow \frac{\sqrt{3}}{\frac{1}{\sqrt{3}}} = \sqrt{3} \times \sqrt{3} = 3$

145. (c) **Shortcut Method**

Put θ = 30°

$\sec\theta - \tan\theta = \frac{1}{\sqrt{3}}$

$\sec 30° - \tan 30° = \frac{1}{\sqrt{3}}$

$\frac{2}{\sqrt{3}} - \frac{1}{\sqrt{3}} = \frac{1}{\sqrt{3}}$

$\frac{1}{\sqrt{3}} = \frac{1}{\sqrt{3}}$ (satisfied)

$\sec\theta$ = 30°

$\Rightarrow \sec\theta \cdot \tan\theta$

$\Rightarrow \sec 30° \cdot \tan 30°$

$\Rightarrow \frac{2}{\sqrt{3}} \times \frac{1}{\sqrt{3}} = \frac{2}{3}$

146. (d) (cosec a – sin a) (sec a – cos a) (tan a + cot a)

Put a = 45°

(cosec 45° – sin 45°) (sec 45° – cos 45°) (tan 45° + cot 45°)

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

$\frac{1}{2} \times 2 = 1$

147. (a) Hit & Trial method

Put θ = 60° option (a)

2 sin²60° = 3 cos60°

$2\left(\frac{\sqrt{3}}{2}\right)^2 = 3\left(\frac{1}{2}\right)$

$\frac{3}{2} = \frac{3}{2}$ (LHS = RHS)

148. (d) $a^2 + b^2 + c^2 = ab + bc + ca$

or $a^2 + b^2 + c^2 - ab - bc - ca = 0$

or $2a^2 + 2b^2 + 2c^2 - 2ab - 2bc - 2ca = 0$

or $a^2 + b^2 - 2ab + b^2 + c^2 - 2bc + c^2 + a^2 - 2ca = 0$

$(a - b)^2 + (b - c)^2 + (c - a)^2 = 0$

$\therefore$ a = b = c

ΔABC = equilateral Δ

$\therefore \angle A = \angle B = \angle C = 60°$

So, $\sin^2 A + \sin^2 B + \sin^2 C$

$= \sin^2 60° + \sin^2 60° + \sin^2 60°$

$= 3\left(\frac{\sqrt{3}}{2}\right)^2$

$= \frac{9}{4}$

149. (b) $x\cos^2 30°.\sin60°$

$= \frac{\tan^2 45°.\sec60°}{\text{cosec}60°}$

$x\left(\frac{\sqrt3}{2}\right)^2\left(\frac{\sqrt3}{2}\right) = \frac{(1)^2(2)}{\left(\frac{2}{\sqrt3}\right)}$

$x = 2\frac{2}{3}$

150. (c) $\tan\alpha = 2$ (given)

$\therefore \frac{\text{cosec}^2\alpha - \sec^2\alpha}{\text{cosec}^2\alpha + \sec^2\alpha}$

(Divide by $\text{cosec}^2\,\alpha$ both in N and D)

$= \frac{1-\tan^2\alpha}{1+\tan^2\alpha} = \frac{1-(2)^2}{1+(2)^2}$

$= -\frac{3}{5}$

151. (b) $\sin(\theta+30°) = \frac{3}{\sqrt{12}} = \frac{3}{2\sqrt3}$

$= \frac{\sqrt3}{2} = \sin(\theta+30°) = \sin60°$

$\therefore \theta = 30°$

$\cos^2\theta = \cos^2 30°$

$= \left(\frac{\sqrt3}{2}\right)^2 = \frac{3}{4}$

152. (a) $4\cos^2\theta - 4\sqrt3\cos\theta + 3 = 0$

Hit & trial method

Put $\theta = 30°$ option (a)

$4\cos^2 30° - 4\sqrt3\cos30° + 3 = 0$

$4\left(\frac{3}{4}\right) - 4\sqrt3\left(\frac{\sqrt3}{2}\right) + 3 = 0$

$0 = 0$

153. (d) According to the question ,

$\Rightarrow \text{Sec}^4A\,(1-\sin^4A) - 2\tan^2A$

Put A = 45°

$\Rightarrow \text{Sec}^4 45°\,(1-\sin^4 45°) - 2\tan^2 45°$

$\Rightarrow 4\left(1-\frac{1}{4}\right) - 2$

$\Rightarrow 4\times\frac{3}{4} - 2 \Rightarrow 3 - 2 \Rightarrow 1$

154. (a) According to the question,

$\Rightarrow (\sin90° - \cos45° + \cos60°)(\cos0° + \sin45° + \sin30°)$

$\Rightarrow \left(1-\frac{1}{\sqrt2}+\frac{1}{2}\right)\left(1+\frac{1}{\sqrt2}+\frac{1}{2}\right)$

$\Rightarrow \left(\frac{3}{2}-\frac{1}{\sqrt2}\right)\left(\frac{3}{2}+\frac{1}{\sqrt2}\right)$

$\Rightarrow \frac{9}{4} - \frac{1}{2}$

$\Rightarrow \frac{7}{4}$

155. (a) According to the question,

$2\sin^2\theta - 3\sin\theta + 1 = 0$

Put $\theta = 30°$

$2\times\sin^2 30° - 3\sin30° + 1 = 0$

$2\times\frac{1}{4} - \frac{3}{2} + 1 = 0$

$\frac{1}{2} - \frac{3}{2} + 1 = 0$

$\frac{3}{2} - \frac{3}{2} = 0$ (satisfied)

put $\theta = 90°$

$2\sin^2 90° - 3\sin90° + 1 = 0$

$2 - 3 + 1 = 0$

$3 - 3 = 0$ (satisfied)

156. (a) $4\sin^2\theta - 1 = 0\ \{\theta° < 90°\}$

find $\cos^2\theta + \tan^2\theta = ?$

$\Rightarrow 4\sin^2\theta - 1 = 0$

Let $\theta = 30°$

$\Rightarrow 4\times\sin^2 30° - 1 = 0$

$\Rightarrow 4\times\frac{1}{4} - 1 = 0$

$\Rightarrow 0 = 0$ satisfied

$\Rightarrow$ In the question, putting $\theta = 30°$

$\Rightarrow \cos^2\theta + \tan^2\theta$

$\Rightarrow \cos^2 30° + \tan^2 30°$

$\Rightarrow \left(\frac{\sqrt3}{2}\right)^2 + \left(\frac{1}{\sqrt3}\right)^2$

$\Rightarrow \frac{3}{4}+\frac{1}{3} \Rightarrow \frac{13}{12}$

157. (c) $\frac{x - x\tan^2 30°}{1+\tan^2 30°}$

$= \sin^2 30° + 4\cot^2 45° - \sec^2 60°$

$\frac{x(1-\tan^2 30°)}{1+\tan^2 30°} = \left(\frac{1}{2}\right)^2 + 4\times1 - (2)^2$

$\frac{x\left[1-\left(\frac{1}{\sqrt3}\right)^2\right]}{1+\left(\frac{1}{\sqrt3}\right)^2} = \frac{1}{4} + 4 - 4$

$\frac{x\left[1-\frac{1}{3}\right]}{1+\frac{1}{3}} = \frac{1}{4}$

$x\times\frac{2}{3} = \frac{1}{4}\times\frac{4}{3}$

$x = \frac{1}{3}\times\frac{3}{2} = \frac{1}{2}$

158 (a) The value of

$\Rightarrow \frac{1+2\sin60°.\cos60°}{\sin60°+\cos60°} + \frac{1-2\sin60°\cos60°}{\sin60°-\cos60°}$

$\Rightarrow \frac{1+2\times\frac{\sqrt3}{2}\times\frac{1}{2}}{\frac{\sqrt3}{2}+\frac{1}{2}} + \frac{1-2\times\frac{\sqrt3}{2}\times\frac{1}{2}}{\frac{\sqrt3}{2}-\frac{1}{2}}$

$\Rightarrow \frac{2+\sqrt3}{\sqrt3+1} + \frac{2-\sqrt3}{\sqrt3-1}$

$\Rightarrow \frac{2\sqrt3+3-2-\sqrt3+2\sqrt3-3+2-\sqrt3}{\sqrt3^2-1^2}$

$\Rightarrow \frac{4\sqrt3-2\sqrt3}{2}$

$\Rightarrow \frac{2\sqrt3}{2} \Rightarrow \sqrt3$

159. (d) $\tan^2\frac{\pi}{4} - \cos^2\frac{\pi}{3} = x\sin\frac{\pi}{4}\cos\frac{\pi}{4}\tan\frac{\pi}{3}$

$\Rightarrow \tan^2 45° - \cos^2 60° = x\sin45°\cos45°\tan60°$

$\Rightarrow 1 - \frac{1}{4} = x\times\frac{1}{\sqrt2}\times\frac{1}{\sqrt2}\times\sqrt3$

$\Rightarrow \frac{3}{4} = \frac{x\times\sqrt3}{2}$

$\Rightarrow x = \frac{\sqrt3}{2}$

160. (c) $\cos^4\theta - \sin^4\theta = \frac{2}{3}$

$[a^4 - b^4 = (a^2-b^2)(a^2+b^2)]$

$\Rightarrow (\cos^2\theta+\sin^2\theta)(\cos^2\theta-\sin^2\theta) = \frac{2}{3}$

$\left[a^2-b^2 = (a-b)(a+b)\right]$

$\Rightarrow 1\times(\cos^2\theta - \sin^2\theta) = \frac{2}{3}$

$\Rightarrow \cos^2\theta - (1-\cos^2\theta) = \frac{2}{3}$,

$\left[\sin^2\theta = 1-\cos^2\theta\right]$

$\Rightarrow 2\cos^2\theta - 1 = \frac{2}{3}$

161. (a) $\sin\theta - \cos\theta = \frac{7}{13} = a$

When

$ax + by = m$ ……(i)

$bx - ay = n$ …….(ii)

By adding these two equations after making square on both sides we get

$(a^2+b^2)(x^2+y^2) = m^2 + n^2$

In the some process

$\text{Sin}\,\theta \pm \text{Cos}\,\theta = a$

Then

$\text{Sin}\,\theta \mp \text{Cos}\,\theta = \sqrt{2-a^2}$

$\sin\theta + \cos\theta = \sqrt{2-\left(\frac{7}{13}\right)^2}$

$= \sqrt{2-\left(\frac{49}{169}\right)} = \sqrt{\frac{289}{169}} = \frac{17}{13}$

162. (c) $2\cos\theta - \sin\theta = \frac{1}{\sqrt{2}}$

When

$ax \pm by = m$

then $bx \mp ay = \sqrt{a^2 + b^2 - m^2}$

$2\text{Cos}\,\theta - \text{Sin}\,\theta = \frac{1}{\sqrt{2}}$

$\text{Cos}\,\theta + 2\text{Sin}\,\theta = \sqrt{4+1-\frac{1}{2}}$

$= \frac{3}{\sqrt{2}}$

163. (b) $\sin\theta + \text{cosec}\,\theta = 2$

$\sin\theta + \frac{1}{\sin\theta} = 2$

Now, see the value of "$\sin\theta$" which has value"1"

$\sin\theta = \sin 90° = 1$

$\Rightarrow \sin 90° + \frac{1}{\sin 90°} = 2$

$\Rightarrow 1 + \frac{1}{1} = 2$

$\Rightarrow 2 = 2$ So, $\theta = 90°$

$\Rightarrow \sin^{100}\theta + \text{cosec}^{100}\theta$

$= \sin^{100} 90° + \frac{1}{\sin^{100} 90°} = (1)^{100} + \frac{1}{(1)^{100}}$

$= 1 + 1 = 2$

164. (a) $\sec^2\theta + \tan^2\theta = 7$

$\Rightarrow 1 + \tan^2\theta + \tan^2\theta = 7$

$\Rightarrow 2\tan^2\theta = 6$

$\Rightarrow \tan^2\theta = 3$

$\Rightarrow \tan\theta = \sqrt{3}$

$\Rightarrow \theta = 60°$

Alternate

take help from option

put $\theta = 60°$

$\sec^2 60° + \tan^2 60° = 7$

$(2)^2 + (\sqrt{3})^2 = 7$

7= 7 (matched)

So, $\theta = 60°$

165. (d) $(\sec x \sec y + \tan x \tan y)^2 - (\sec x \tan y + \tan x \sec y)^2$

$= \sec^2 x . \sec^2 y + \tan^2 x . \tan^2 y + 2\sec x . \sec y . \tan x . \tan y - \sec^2 x . \tan^2 y - \tan^2 x . \sec^2 y + 2\sec x . \tan y . \tan x . \sec y$

$= \sec^2 x [\sec^2 y - \tan^2 y] - \tan^2 x [\sec^2 y - \tan^2 y]$

$= (\sec^2 x - \tan^2 x)(\sec^2 y - \tan^2 y)$

$= 1 \times 1 = 1$

166. (b) According to question,

$A = \sin^2\theta + \cos^4\theta$

Put $\theta = 90°$ for maximum value of A

$A = \sin^2 90° + \cos^4 90°$

$A = 1 + 0$

$A = 1$

Put $\theta = 45°$ for minimum value of A

$A = \sin^2 45° + \cos^4 45°$

$A = \frac{1}{2} + \frac{1}{4}$

$A = \frac{3}{4}$

$\therefore$ A lies in $\frac{3}{4} \le A \le 1$

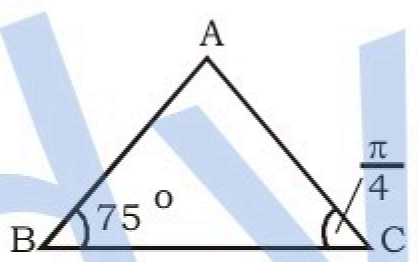
167.(a) $11° 15' = 11 + \frac{15}{60} = 11 + \frac{1}{4} = \frac{45°}{4}$

We know π radian = 180°

$1° = \left(\frac{\pi}{180}\right)$ radian,

$\frac{45°}{4} = \frac{\pi}{180°} \times \frac{45°}{4} = \frac{\pi^c}{16}$

168. (b)



$\frac{\pi^c}{4} = \frac{180°}{4} = 45°$

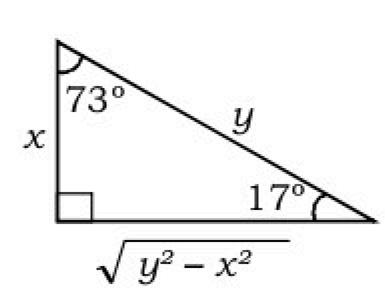
$\angle BAC = 180° - 75° - 45° = 60°$

$180° \rightarrow \pi$

$1° \rightarrow \frac{\pi}{180°}$

$60° \rightarrow \frac{\pi}{180°} \times 60° = \frac{\pi}{3}$ radian

169. (b) $\text{Sin}\,17° = \frac{x}{y} \Rightarrow \frac{P}{H}$

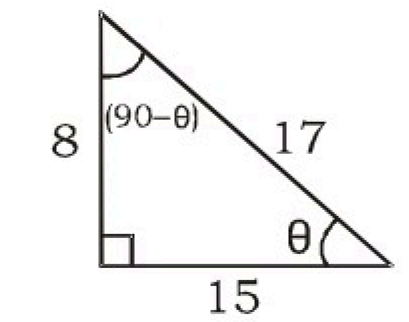


$\Rightarrow \text{Sec}\,17° - \text{Sin}\,73°$

$= \frac{y}{\sqrt{y^2 - x^2}} - \frac{\sqrt{y^2 - x^2}}{y}$

$= \frac{y^2 - (y^2 - x^2)}{(y)(\sqrt{y^2 - x^2})} = \frac{y^2 - y^2 + x^2}{y\sqrt{y^2 - x^2}} = \frac{x^2}{y\sqrt{y^2 - x^2}}$

170. (b) $\cos\theta = \frac{15 \rightarrow \text{Base}}{17 \rightarrow \text{Hypo.}}$

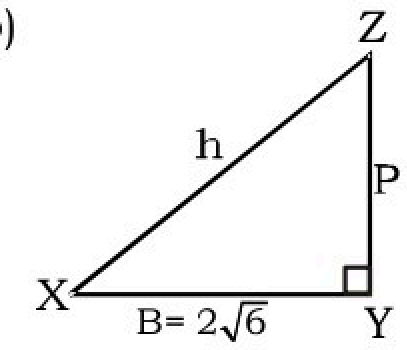


perpendicular = 8

$= \cot(90° - \theta)$

$= \tan\theta = \frac{8}{15}$ $\left[\therefore \tan\theta = \frac{P}{B}\right]$

171. (b)



$XZ - YZ = 2$

$h - P = 2$ ....(i)

$h^2 = (2\sqrt{6})^2 + P^2$

$h^2 - P^2 = (2\sqrt{6})^2$

$(h - P)(h + P) = 4 \times 6$

$(2)(h + P) = 24$

$h + P = 12$ ....(ii)

Adding eq (i) & (ii)

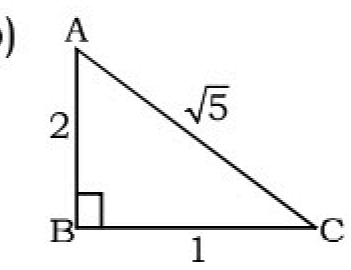
$2h = 14$

$h = 7$, $P = 5$

$\sec X + \tan X = \frac{h}{XY} + \frac{P}{XY}$

$= \frac{7}{2\sqrt{6}} + \frac{5}{2\sqrt{6}} = \frac{12}{2\sqrt{6}} = \frac{6}{\sqrt{6}} = \sqrt{6}$

172. (b)



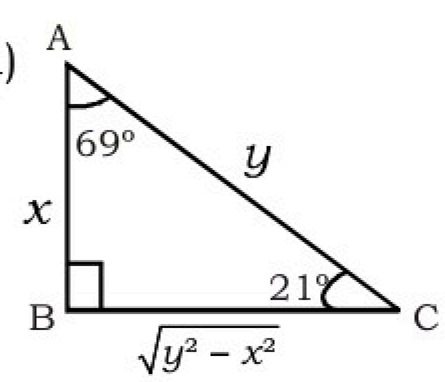
$AC = \sqrt{2^2 + 1^2} = \sqrt{5}$

$\sin A + \cot C$

$\frac{BC}{AC} + \frac{BC}{AB}$

$\frac{1}{\sqrt{5}} + \frac{1}{2} \Rightarrow \frac{2 + \sqrt{5}}{2\sqrt{5}}$

173. (a)



In $\triangle ABC$ $\sin 21° = \frac{x}{y}$

AB = x

AC = y

$BC = \sqrt{y^2 - x^2}$

$\Rightarrow \sec 21° - \sin 69°$

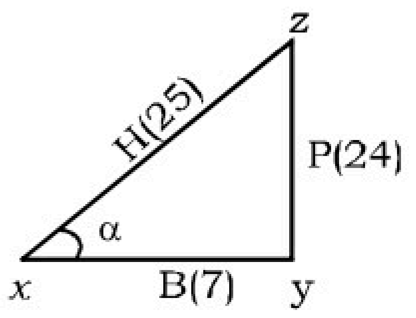
$\Rightarrow \frac{AC}{BC} - \frac{BC}{AC}$

$\Rightarrow \frac{(AC)^2 - (BC)^2}{(BC)(AC)} = \frac{y^2 - \left(\sqrt{(y^2 - x^2)}\right)^2}{y\sqrt{y^2 - x^2}}$

$\Rightarrow \frac{y^2 - y^2 + x^2}{y\sqrt{y^2 - x^2}} = \frac{x^2}{y\sqrt{y^2 - x^2}}$

174. (d) $7 \sin\alpha = 24 \cos\alpha$

$\frac{\sin\alpha}{\cos\alpha} = \frac{24}{7} = \tan\alpha = \frac{24 \to P}{7 \to B}$



$\Rightarrow 14 \tan\alpha - 75\cos\alpha - 7\sec\alpha$

$\Rightarrow 14 \times \frac{24}{7} - 75 \times \frac{7}{25} - 7 \times \frac{25}{7}$

$\Rightarrow 48 - 21 - 25$

$\Rightarrow 2$

175. (c) $\sqrt{3} \tan\theta = 3 \sin\theta$

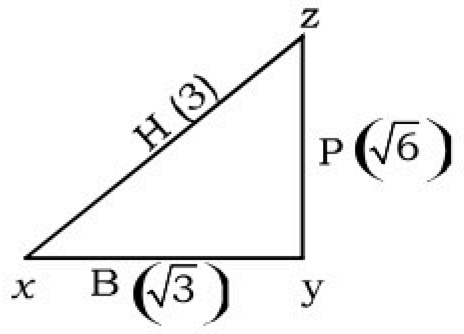
Shortcut method

$\sqrt{3} \frac{\sin\theta}{\cos\theta} = 3\sin\theta$

$\frac{\sqrt{3}}{\cos\theta} = 3$

$\cos\theta = \frac{\sqrt{3}}{3}$

then perpendicular = $\sqrt{6}$



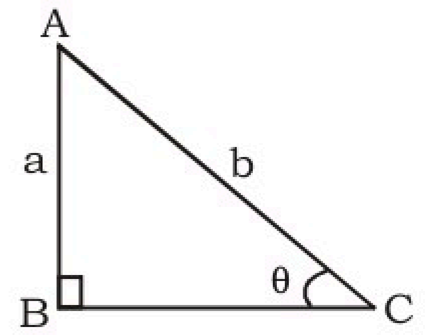
$(\sin^2\theta - \cos^2\theta)$

$\Rightarrow \left(\frac{P}{H}\right)^2 - \left(\frac{B}{H}\right)^2$

$\Rightarrow \left(\frac{\sqrt{6}}{3}\right)^2 - \left(\frac{\sqrt{3}}{3}\right)^2$

$\Rightarrow \frac{6}{9} - \frac{3}{9} = \frac{1}{3}$

176. (c) $\sin\theta = \frac{a}{b} = \frac{p}{h}$



$BC = \sqrt{b^2 - a^2}$

[using pythagoras theorem]

$\therefore \sec\theta - \cos\theta$

$= \frac{H}{B} - \frac{B}{H} = \frac{AC}{BC} - \frac{BC}{AC}$

$= \frac{b}{\sqrt{b^2 - a^2}} - \frac{\sqrt{b^2 - a^2}}{b}$

$= \frac{b^2 - \left(\sqrt{b^2 - a^2}\right)^2}{b\sqrt{b^2 - a^2}}$

$= \frac{b^2 - b^2 + a^2}{b\sqrt{b^2 - a^2}}$

$= \frac{a^2}{b\sqrt{b^2 - a^2}}$

177. (b) $\sec\theta = \frac{4x^2 + 1}{4x}$

$\tan\theta = \sqrt{\sec^2\theta - 1}$

$= \sqrt{\left[\frac{4x^2 + 1}{4x}\right]^2 - 1}$

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

$= \sqrt{\frac{16x^4 + 1 + 8x^2 - 16x^2}{(4x)^2}}$

$= \sqrt{\frac{16x^4 + 1 - 8x^2}{(4x)^2}}$

$= \sqrt{\frac{(4x^2 - 1)^2}{(4x)^2}}$

$= \frac{4x^2 - 1}{4x}$

$\therefore \sec\theta + \tan\theta = \frac{4x^2 + 1}{4x} + \frac{4x^2 - 1}{4x}$

$= \frac{4x^2 + 1 + 4x^2 - 1}{4x} = \frac{8x^2}{4x} = 2x$

Alternate

$\sec\theta = x + \frac{1}{4x}$

put $x = 1$

$\sec\theta = 1 + \frac{1}{4} = \frac{5}{4} = \frac{H}{B}$

$\tan\theta = \frac{P}{B} = \frac{3}{4}$

Now,

$\sec\theta + \tan\theta$

$= \frac{5}{4} + \frac{3}{4} = \frac{5+3}{4} = \frac{8}{4} = 2 \times 1 = 2x,$

(**$x = 1$**)

178. (a) $\sec\theta + \tan\theta = \sqrt{3}$ ....(i)

$\Rightarrow \sec^2\theta - \tan^2\theta = 1$

$[1 + \tan^2\theta = \sec^2\theta]$

$\Rightarrow (\sec\theta - \tan\theta)(\sec\theta + \tan\theta) = 1$

$\Rightarrow \sec\theta - \tan\theta = \frac{1}{\sqrt{3}}$ .....(ii)

subtract equation (ii) from (i)

$\Rightarrow 2\tan\theta = \sqrt{3} - \frac{1}{\sqrt{3}}$

$\Rightarrow 2\tan\theta = \frac{3-1}{\sqrt{3}} = \frac{2}{\sqrt{3}}$

$\Rightarrow \tan\theta = \frac{1}{\sqrt{3}} = \tan 30°$

$\Rightarrow \theta = 30° \left[\tan 30^0 = \frac{1}{\sqrt{3}}\right]$

$\Rightarrow \tan 3\theta = \tan 90°$(undefined)

179. (c) $\operatorname{cosec}\theta - \cot\theta = \frac{7}{2}$ ......(i)

$\Rightarrow \operatorname{cosec}^2\theta - \cot^2\theta = 1$

$\Rightarrow [\operatorname{cosec}\theta - \cot\theta][\operatorname{cosec}\theta + \cot\theta] = 1$

$\Rightarrow (\operatorname{cosec}\theta + \cot\theta)$

$= \frac{1}{(\operatorname{cosec}\theta - \cot\theta)}$

$\Rightarrow \operatorname{cosec}\theta + \cot\theta = \frac{2}{7}$ ..... (ii)

Adding both equations,

$\Rightarrow 2\operatorname{cosec}\theta = \frac{7}{2} + \frac{2}{7}$

$\Rightarrow \frac{49+4}{14} = \frac{53}{14}$

$\Rightarrow \operatorname{cosec}\theta = \mathbf{\frac{53}{28}}$

180. (a) $\sec\theta + \tan\theta = 2+\sqrt{5}$ .....(i)

$\sec^2\theta - \tan^2\theta = 1$

$(\sec\theta - \tan\theta)(\sec\theta + \tan\theta) = 1$

$(\sec\theta - \tan\theta) = \frac{1}{2+\sqrt{5}} = \frac{1}{\sqrt{5}+2}$

$= \sqrt{5}-2$ ....(ii)

add eq (i) + (ii)

$2\sec\theta = 2+\sqrt{5}+\sqrt{5}-2$

$\Rightarrow 2\sec\theta = 2\sqrt{5}$

$\Rightarrow \sec\theta = \sqrt{5}$

$\Rightarrow \cos\theta = \frac{1}{\sqrt{5}}$

$\Rightarrow \sin^2\theta + \cos^2\theta = 1$

$\Rightarrow \sin^2\theta = 1 - \left(\frac{1}{\sqrt{5}}\right)^2$

$\Rightarrow \sin^2\theta = \frac{4}{5}$

$\Rightarrow \sin\theta = \frac{2}{\sqrt{5}}$

$\therefore \sin\theta + \cos\theta = \frac{2}{\sqrt{5}} + \frac{1}{\sqrt{5}} = \mathbf{\frac{3}{\sqrt{5}}}$

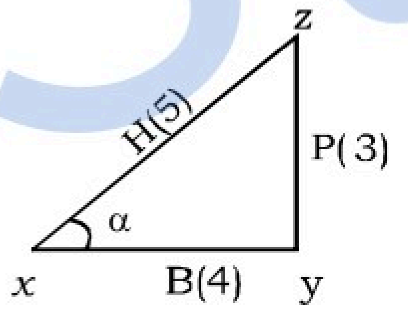
181. (c) $\sec\alpha + \tan\alpha = 2$ ....(i)

$\sec\alpha - \tan\alpha = \frac{1}{2}$ ....(ii)

Add equation (i) and (ii)

$2\sec\alpha = 2+\frac{1}{2}$

$\sec\alpha = \frac{5 \to H}{4 \to B}$



$\sin\alpha = \frac{3}{5} = 0.6$

182. (c)According to the question,

$\operatorname{cosec}A + \cot A = 3$

$\operatorname{cosec}A - \cot A = \frac{1}{3}$

$2\operatorname{cosec}A = \frac{10}{3}$

$\operatorname{cosec}A = \frac{10}{6}$

$\sin A = \frac{6}{10} = \frac{3}{5}$

183. (a) $3(\sec^2\theta + \tan^2\theta) = 5$

$\sec^2\theta + \tan^2\theta = \frac{5}{3}$ ..... (i)

$\sec^2\theta - \tan^2\theta = 1$ ......(II)

Add eqn (i) & (ii)

$2\sec^2\theta = \frac{8}{3}$

$\sec\theta = \frac{2}{\sqrt{3}}$

$\therefore \theta = 30°$

$\cos 2\theta = \cos 2(30°) = \cos 60° = \frac{1}{2}$

184. (c) $\frac{5\pi}{9} = \frac{5\times180^0}{9} \Rightarrow 100^0$

Other two angle must be 40° + 40° 40° = $40^0 = \frac{2\pi}{9}$

185. (b) $180° = \pi$ radian

$1\text{radian} = \frac{180^0}{\pi}$

$\frac{180^0}{\pi} \Rightarrow \frac{180\times7}{22} \Rightarrow \frac{630}{11} \Rightarrow 57\frac{3^0}{11}$

$= \frac{1}{c\ \ o\ \ t} = 57°\frac{180'}{11}$

$= 57°16'\frac{4'}{11}$

$= 57°16'\left(\frac{4}{11}\times60''\right) = 57°16'22''$

186.(c) $\left[\frac{3\pi}{5}\right]^c \Rightarrow \pi = 180^0$

$\left(\frac{3\pi}{5}\right)^c = \left(\frac{3\times180}{5}\right)^° = 108^0$

187. (b) $\angle A + \angle B = 135°$ ....(i)

$\angle A - \angle B = \frac{\pi}{12} = 15°$ ......(ii)

adding both equation

$2\angle A = 150° \Rightarrow \angle A = 75°$

$\angle B = 60°$

188. (c) $\sin^{12}x + 3\sin^{10}x + 3\sin^8x + \sin^6x - 1$

$\Rightarrow (\sin^4x + \sin^2x)^3 - 1$

$\Rightarrow (\cos^2x + \sin^2x)^3 - 1$

$\left[\begin{array}{l}\cos x + \cos^2x = 1\\ \cos x = 1 - \cos^2x = \sin^2x\end{array}\right]$

$\Rightarrow 1 - 1 = 0$

189. (d) $\cos\theta + \sin\theta = \sqrt{2}\cos\theta$

Squaring both sides

$\cos^2\theta + \sin^2\theta + 2\cos8\theta\sin\theta = 2\cos^2\theta$

$\Rightarrow 2\cos^2\theta - \cos^2\theta - \sin^2\theta$

$= 2\cos\theta\sin\theta$

$\Rightarrow \cos^2\theta - \sin^2\theta = 2\sin\theta.\cos\theta$

$\Rightarrow (\cos\theta - \sin\theta)(\cos\theta + \sin\theta)$

$= 2\sin\theta.\cos\theta$

$\Rightarrow (\cos\theta - \sin\theta)(\sqrt{2}\cos\theta)$

$= 2\sin\theta.\cos\theta$

$\Rightarrow \cos\theta - \sin\theta = \frac{2\sin\theta.\cos\theta}{\sqrt{2}\cos\theta}$

$= \sqrt{2}\sin\theta$

Alternate: Let $\sqrt{2}\cos\theta = a$

$\therefore \cos\theta \pm \sin\theta = a$

$\cos\theta \mp \sin\theta = \sqrt{2-a^2}$

$= \sqrt{2-a^2} = \sqrt{2-2\cos^2\theta}$

$= \sqrt{2\left(1-\cos^2\theta\right)}$

$= \sqrt{2\sin^2\theta} = \sqrt{2}\sin\theta$

190. (c) $\sin\theta - \cos\theta = \frac{1}{2}$ ....(i)

$\Rightarrow \sin\theta + \cos\theta = m$ .....(ii)

then,

$a^2 + b^2 = c^2 + d^2$

$1^2 + 1^2 = \left(\frac{1}{2}\right)^2 + m^2$

$2 = \frac{1}{4} + m^2$

$m^2 = 2 - \frac{1}{4} = \frac{7}{4}$

$\Rightarrow m = \frac{\sqrt{7}}{2}$

191. (b) In this question on the place of Negative (–) should be Positive (+) sign but in SSC Exam Question asked wrong.

$x\cos\theta - y\sin\theta = \sqrt{x^2+y^2}$ .....(i)

$\Rightarrow \frac{\cos^2\theta}{a^2} + \frac{\sin^2\theta}{b^2} = \frac{1}{x^2+y^2}$ .....(ii)

$\frac{x}{\sqrt{x^2+y^2}}\cos\theta + \frac{-y}{\sqrt{x^2+y^2}}\sin\theta = 1$

(from eq. (i))

$\Rightarrow \sin\theta = \frac{-y}{\sqrt{x^2+y^2}}$

$\Rightarrow \cos\theta = \frac{x}{\sqrt{x^2+y^2}}$

put value in eq. (ii)

$\therefore \frac{\cos^2\theta}{a^2}+\frac{\sin^2\theta}{b^2} = \frac{1}{x^2+y^2}$

$\Rightarrow \frac{x^2}{(x^2+y^2)a^2}+\frac{y^2}{(x^2+y^2)b^2} = \frac{1}{x^2+y^2}$

$\Rightarrow \frac{x^2}{a^2}+\frac{y^2}{b^2} = 1$

192. (a) $\cos^2\theta - \sin^2\theta = \frac{1}{3}$ (given)

$\cos^2\theta + \sin^2\theta = 1$ (property)

$(\cos^2\theta - \sin^2\theta)(\cos^2\theta + \sin^2\theta)$

$= \frac{1}{3}\times 1$

$\cos^4\theta - \sin^4\theta = \frac{1}{3}$

$\therefore ((a^2 - b^2)(a^2+b^2) = a^4 - b^4)$

193. (a) $3\sin\theta + 5\cos\theta = 5$

$5\sin\theta - 3\cos\theta = x$

now,

$a^2 + b^2 = P^2 + q^2$

$3^2 + 5^2 = 5^2 + x^2$

$9 + 25 = 25 + x^2$

$9 = x^2$

$x = \pm 3$

194. (b) $\sin\theta + \cos\theta = \sqrt{2}\sin(90-\theta)$

$\sin\theta + \cos\theta = \sqrt{2}\cos\theta$

Divide both sides by $\cos\theta$

$\tan\theta + 1 = \sqrt{2}$

$\cot\theta = \frac{1}{\sqrt{2}-1} = \sqrt{2}+1$

195. (a) $\frac{\sin\theta+\cos\theta}{\sin\theta-\cos\theta} = \frac{3}{1}$

find $\sin^4\theta = ?$

$\frac{\sin\theta+\cos\theta}{\sin\theta-\cos\theta} = \frac{3}{1}$(by C & D)

$\Rightarrow \frac{\sin\theta}{\cos\theta} = \frac{3+1}{3-1}$

$\Rightarrow \tan\theta = 2$

$\tan\theta = \frac{\text{Perpendicular}}{\text{Base}} = \frac{2}{1}$

$\Rightarrow \sin^4\theta = \left(\frac{2}{\sqrt{5}}\right)^4 = 16/25$

196. (c) $\tan\theta + \sin\theta = m$

squaring both sides

$\tan^2\theta + \sin^2\theta + 2\tan\theta\sin\theta = m^2$ ...(i)

$\tan\theta - \sin\theta = n$

squaring both sides

$\tan^2\theta + \sin^2\theta - 2\tan\theta\sin\theta = n^2$ ...(ii)

Subtract from (i) & (ii)

$m^2 - n^2 = \tan^2\theta + \sin^2 + 2\tan\theta \sin\theta - \tan^2\theta - \sin^2\theta + 2\tan\theta \sin\theta$

$m^2 - n^2 = 4\tan\theta\sin\theta$

$= 4\sqrt{\tan^2\theta\sin^2\theta}$

$= 4\sqrt{\tan^2\theta(1-\cos^2\theta)}$

$= 4\sqrt{\tan^2\theta-\sin^2\theta}$

$= 4\sqrt{mn}$

197. (c) According to the question.

Put A = 45°

$\Rightarrow \frac{1}{2}\times\cot 45^\circ$

$\left[\frac{1+(\sec 45^0-\tan 45^0)^2}{\operatorname{cosec}45^0(\sec 45^0-\tan 45^0)}\right]$

$\Rightarrow \frac{1}{2}\left[\frac{1+(\sqrt{2}-1)^2}{\sqrt{2}\times(\sqrt{2}-1)}\right]$

$\Rightarrow \frac{1}{2}\left[\frac{1+2+1-2\sqrt{2}}{2-\sqrt{2}}\right]$

$\Rightarrow \frac{1}{2}\left[\frac{4-2\sqrt{2}}{2-\sqrt{2}}\right]$

$\Rightarrow \frac{1}{2}\times 2\left[\frac{2-\sqrt{2}}{2-\sqrt{2}}\right]$

$\Rightarrow 1$

198. (d) $\frac{\sin\theta\ \operatorname{cosec}\theta\ \tan\theta\ \cot\theta}{\sin^2\theta+\cos^2\theta}$

$= \frac{\sin\theta\times\frac{1}{\sin\theta}\times\tan\theta\times\frac{1}{\tan\theta}}{1}$

$= 1$

199. (d) $\alpha + \theta = \frac{7\pi}{12}$ .....(i)

$\tan\theta = \sqrt{3}$

$\tan\theta = \tan 60^\circ$

$\theta = 60^\circ$

Put value in equation (i)

$\alpha + 60^\circ = \frac{7}{12}\times 180^\circ$

$\alpha = 105^\circ - 60^\circ$

$\alpha = 45^\circ$

$\tan\alpha = \tan 45^\circ = 1$

200. (c) $\cos\theta + \sec\theta = \sqrt{3}$

cubing both sides

$\cos^3\theta + \sec^3\theta + 3\cos\theta\ \sec\theta$

$(\cos\theta + \sec\theta) = 3\sqrt{3}$

$\cos^3\theta + \sec^3\theta + 3\sqrt{3} = 3\sqrt{3}$

$\cos^3\theta + \sec^3\theta = 0$

201. (a) According to the question

$\Rightarrow \sin^2 2^\circ+\sin^2 4^\circ+\sin^2 6^\circ+.......+\sin^2 90^\circ$.

Number of terms $= \frac{l-a}{d}+1$

$= \frac{90-2}{2}+1 = 45$

But $\sin^2 90^\circ = 1$

So, 22 pairs + $\sin^2 90^\circ$

22 + 1 = 23

202. (a) $1+\sin\left(\frac{x}{4}+\theta\right)+2\cos\left(\frac{x}{4}-\theta\right)$

for maximum value of this equation

Maximum value

$\sin\left(\frac{x}{4}+\theta\right) = 1,\ \cos\left(\frac{x}{4}-\theta\right) = 1$

$\frac{x}{4}+\theta=90^\circ$ ...(i)

$\frac{x}{4}-\theta=0^\circ$ ...(ii)

From Eq. (i) & (ii)

We get,

$x = 180^\circ,\ \theta = 45^\circ$

then max value = 1+1+2 = 4

203. (a)

$A\times\tan(\theta+150^\circ)=B\times\tan(\theta-60^\circ)$

$\frac{A}{B}=\frac{\tan(\theta-60^\circ)}{\tan(\theta+150^\circ)}$

Put $\theta = 90^\circ$

$\frac{A}{B}=\frac{\tan(90^\circ-60^\circ)}{\tan(90^\circ+150^\circ)}$

$=\frac{\tan30^\circ}{\tan(180^\circ+60^\circ)}=\frac{\tan30^\circ}{\tan60^\circ}$

$\frac{A}{B}=\frac{1}{3}$

then $\frac{A+B}{A-B}=-\frac{4}{2}$

$\frac{A+B}{A-B}=-2$

$=\frac{A-B}{A+B}=-\frac{1}{2}$

Put in option (a) $-\frac{\sin90^\circ}{2}=-\frac{1}{2}$

So, Option (a) is correct.

204. (b) $\sin^2 25^\circ + \sin^2 65^\circ + \text{cosec}^2 57^\circ - \tan^2 33^\circ$

$\Rightarrow (\sin^2 25^\circ + \cos^2 25^\circ) + (\sec^2 33^\circ - \tan^2 33^\circ)$

$= 1 + 1 = 2$

Note:-

$\sin^2 65^\circ=\sin^2(90^\circ-25^\circ)= \cos^2 25^\circ$

$\text{cosec}^2 57^\circ=\text{cosec}^2(90^\circ-33^\circ)= \sec^2 33^\circ$

205. (b) $\tan\theta(1+\sec2\theta)(1+\sec4\theta)(1+\sec8\theta)$

Put, $\theta = 30^\circ$

$\tan 30^\circ(1+\sec60^\circ)(1+\sec120^\circ)(1+\sec240^\circ)$

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

$\Rightarrow \frac{1}{\sqrt{3}}\times3\times(-1)(-1) = \sqrt{3}$

Now, take Option (b)

$\tan 8\theta = \tan 240^\circ$

$= \tan(180^\circ+60^\circ)$

$= \tan 60^\circ$

$= \sqrt{3}$

206. (d) $6\sin^4\theta+3\cos^4\theta = 2$

$\Rightarrow 6\sin\theta^4+3(1-\sin^2\theta)^2 = 2$

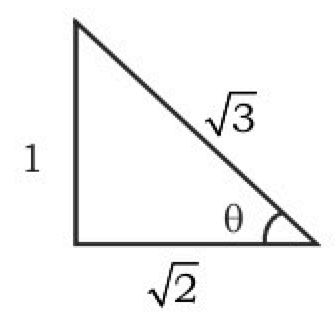
$\Rightarrow 6\sin^4\theta+3+3\sin^4\theta-6\sin^2\theta = 2$

$\Rightarrow 9\sin^4\theta-6\sin^2\theta+1 = 0$

$\Rightarrow (3\sin^2\theta-1)^2 = 0$

$\Rightarrow 3\sin^2\theta = 1$

$\Rightarrow \sin\theta = \frac{1}{\sqrt{3}}$



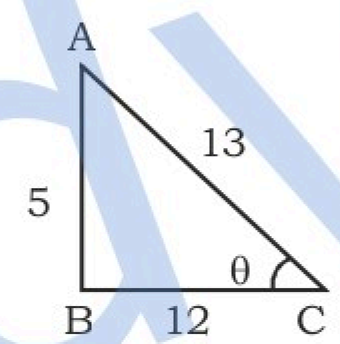
Now, $(7\,\text{cosec}^6\theta+8\sec^6\theta)^{1/3}$

$=(7\times(\sqrt{3})^6+8\left(\frac{\sqrt{3}}{\sqrt{2}}\right)^6)^{1/3}$

$=(7\times27+8\times\frac{27}{8})^{1/3}$

$=(27\times8)^{1/3} = 6$ ans.

207. (d) $\sin\theta = \frac{5}{13}$



$BC = \sqrt{169-25} = 12$

$\sqrt{\cot\theta+\tan\theta} = \sqrt{\frac{12}{5}+\frac{5}{12}}$

$=\sqrt{\frac{169}{60}}=\frac{13}{2\sqrt{15}}$

208. (c) $\frac{2\sin\theta}{\cos\theta(1+\tan^2\theta)}=\frac{2\tan\theta}{1+\tan^2\theta}$

$= \sin2\theta$

209. (c) $\tan\theta_1=1 \quad \sin\theta_2=\frac{1}{\sqrt{2}}$

$\theta_1 = 45^\circ \quad \theta_2 = 45^\circ$

$\sin(\theta_1+\theta_2) = \sin 90^\circ = 1$

210. (c) $\tan\theta = \frac{3}{4}$

$\text{Cos}2\theta = \frac{1-\tan^2\theta}{1+\tan^2\theta}$

$=\frac{1-\frac{9}{16}}{1+\frac{9}{16}}$

$=\frac{\frac{7}{16}}{\frac{25}{16}}=\frac{7}{25}$

211. (d) $\sin^4\theta - \cos^4\theta$

$= (\sin^2\theta + \cos^2\theta)(\sin^2\theta - \cos^2\theta)$

$= \sin^2\theta - \cos^2\theta$ ($\because \sin^2\theta + \cos^2\theta = 1$)

$\Rightarrow -(\cos^2\theta - \sin^2\theta) = -\cos2\theta$

($\because \cos^2\theta - \sin^2\theta = \cos2\theta$)

212. (b) $\frac{\sin65^\circ}{\cos25^\circ}=\frac{\sin(90^\circ-65^\circ)}{\cos25^\circ}$

[$\text{Sin}(90-\theta) = \text{Cos}\theta$]

$=\frac{\cos25^\circ}{\cos25^\circ}=1$

213. (a) $\tan\theta - \tan^2\theta = 1$

$\tan\theta = 1 + \tan^2\theta = \sec^2\theta$

$\tan\theta = \sec^2\theta$

Now, $\sec^2\theta - \sec^4\theta$

$= \tan\theta - \tan^2\theta = 1$

214. (d) Let $x = 8\cos10.\cos20.\cos40$

Multiply on both side by sin10 and applying formula

($2\sin\theta.\cos\theta = \sin2\theta$)

$\Rightarrow x\sin10 = 4 \times 2\sin10.\cos10.\cos20.\cos40$

$\Rightarrow x\sin10=2\times2\sin20.\cos20.\cos40$

$\Rightarrow x\sin10 = 2\times\sin40.\cos40$

$\Rightarrow x\sin10 = \sin80$

$\Rightarrow x\sin10 = \sin(90-10) = \cos10$

then $x = \frac{\cos10}{\sin10}$

$x = \cot10$

215 (b) $\sec^2 17^\circ - \frac{1}{\tan^2 73^\circ} - \sin17^\circ \sec 73$

$= \sec^2 17^\circ - \cot^2 73^\circ - \sin17^\circ \sec(90^\circ - 17^\circ)$

$= \sec^2 17^\circ - \cot^2(90^\circ - 17^\circ) - \sin17^\circ\,\text{cosec}17^\circ = \sec^2 17 - \tan^2 17 - 1$

$= 1 - 1$ [$\because \sec^2\theta - \tan^2\theta = 1$]

$=0$

216. (d) $x^2 + y^2 + z^2 = a^2 \cos^2\theta \cos^2\phi$

$+ a^2 \cos^2\theta \sin^2\phi + a^2\sin\phi$

$= a^2 \cos^2\theta (\cos^2\phi + \sin^2\phi) + a^2 \sin^2\phi$

$= a^2 \cos^2\theta + a^2\sin^2\theta$

$= a^2 (\cos^2\theta + \sin^2\theta)$

$x^2 + y^2 + z^2 = a^2$

217. (d) $\text{cosec}^2 60° + \sec^2 60° - \cot^2 60° + \tan^2 30°$

$= \left(\frac{2}{\sqrt{3}}\right)^2 + (2)^2 - \left(\frac{1}{\sqrt{3}}\right)^2 + \left(\frac{1}{\sqrt{3}}\right)^2$

$= \frac{4}{3} + 4 - \frac{1}{3} + \frac{1}{3}$

$= \frac{16}{3} = 5\frac{1}{3}$

218. (c) $4\angle A = 3\angle B = 12\angle C$

$A : B : C = \frac{1}{4} : \frac{1}{3} : \frac{1}{12}$

$A : B : C = 3 : 4 : 1$

Now

$3x + 4x + x = 180$

$8x = 180$

$x = \frac{180}{8}$

$\angle A = 3x = \frac{180}{8} \times 3 = 67.5$ Ans.

219. (c) $\sin\theta + \text{cosec}\theta = 2$

$\sin\theta + \frac{1}{\sin\theta} = 2$

$x + \frac{1}{x} = 2$ then $x = 1$ this is the same type of expression

So,

$\sin\theta = 1$

& $\text{cosec}\theta = 1$

$\sin^n\theta + \text{cosec}^n\theta = (1)^n + (1)^n = 2$

220. (b) $\text{Sin}(\theta + 18) = \frac{1}{2}$

$\sin(\theta + 18) = \sin 30$

$\theta + 18 = 30$

$\therefore\ \theta = 12$

we know that

$180° = \pi$

$12° = \frac{\pi}{180} \times 12 = \frac{\pi}{15}$

221. (b) Given $4\sin^2\theta = 3$

$\sin^2\theta = \frac{3}{4}$

$\sin\theta = \frac{\sqrt{3}}{2} = \sin 60$

$\theta = 60$

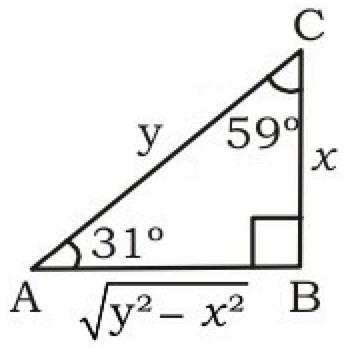
$\because\ \tan\theta - \cot\frac{\theta}{2}$

$= \tan 60 - \cot\frac{60}{2}$

$= \tan 60 - \cot 30$

$= \sqrt{3} - \sqrt{3} = 0$

222. (a)



$\text{Sin } 31° = \frac{x}{y}$

so $\sec 31 - \sin 59°$

$= \frac{y}{\sqrt{y^2 - x^2}} - \frac{\sqrt{y^2 - x^2}}{y}$

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

223. (d) $\frac{\cos^2\theta - 3\cos\theta + 2}{\sin^2\theta} = 1$

$\cos^2\theta - 3\cos\theta + 2 = \sin^2\theta$

$\Rightarrow \cos^2\theta - 3\cos\theta + 2 = 1 - \cos^2\theta$

$\Rightarrow 2\cos^2\theta - 3\cos\theta + 1 = 0$

$\Rightarrow 2\cos^2\theta - 2\cos\theta - \cos\theta + 1 = 0$

$\Rightarrow 2\cos\theta(\cos\theta - 1) - (\cos\theta - 1) = 0$

$(\cos\theta - 1)(2\cos\theta - 1) = 0$

$\cos\theta - 1 = 0 \Rightarrow \theta = 0°$ Not valid

$\cos\theta = \frac{1}{2} = \cos 60°,\ \boxed{\theta = 60°}$

224. (b) $\Rightarrow \cot 17°\ (\cot 73°\ \cos^2 22° + \frac{1}{\cot 17° \sec^2 68°})$

$= \cot 17° [\cot(90 - 17°) \cos^2(90 - 68) + \tan 17° \cos^2 68)$

$= \cot 17° [\tan 17° \sin^2 68 + \tan 17 \cos^2 68)$

$= \cot 17 \tan 17 (\sin^2 68 + \cos^2 68)$

$= 1\ [1] = 1$

225. (c) $\text{Sin}\theta - \cos\theta = 0$

$\sin\theta = \cos\theta$

$\theta = 45°$

then $\text{Sec}\theta + \text{cosec}\theta = \sqrt{2} + \sqrt{2}$

$= 2\sqrt{2}$

226. (c) $\frac{2\tan 53°}{\cot 37°} - \frac{\cot 80°}{\tan 10°}$

$\frac{2\tan(90° - 37°)}{\cot 37°} - \frac{\cot(90° - 10°)}{\tan 10°}$

$\frac{2\cot 37°}{\cot 37°} - \frac{\tan 10°}{\tan 10°}$

$[\tan(90° - \theta) = \cot\theta$

$\cot(90° - \theta) = \tan\theta]$

$2 - 1 = 1$

227. (a) $\alpha + \beta = 90$

and $\alpha : \beta = 2 : 1$

$2x + x = 90°$

$x = 30°$

$\alpha = 60°$

$\beta = 30°$

$\frac{Cos\alpha}{\cos\beta} = \frac{\cos 60°}{\cos 30°} = \frac{1/2}{\sqrt{3}/2}$

$= \frac{1}{2} \times \frac{2}{\sqrt{3}} = \frac{1}{\sqrt{3}} = 1 : \sqrt{3}$

228. (a) $7\cos^2\theta + 3\sin^2\theta = 4$

$7\cos^2\theta + 3(1 - \cos^2\theta) - 4 = 0$

$7\cos^2\theta - 3\cos^2\theta + 3 - 4 = 0$

$4\cos^2\theta = 1$

$\cos^2\theta = \frac{1}{4}$

$\cos\theta = \frac{1}{2} = \cos 60°$

$\theta = 60°$

229. (b) $\tan(5x - 10) = \cot(5y + 20)$

$\tan(5x - 10) = \tan(90 - 5y - 20)$

then,

$5x - 10 = 90 - 5y - 20$

$5(x + y) = 80°$

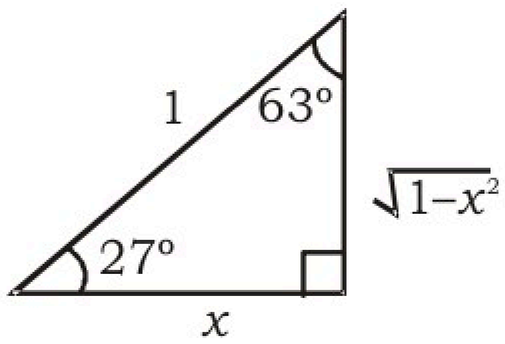
$x + y = 16°$

230. (b) $\tan^2 x + \cot^2 x$

we know that the value of $\tan^2 x$ and $\cot^2 x$ is minimum at 45°

$\therefore\ \tan^2 45° + \cot^2 45° = 1 + 1 = 2$

231. (a) $\cos 27° = x$



$\tan 63° = \dfrac{x}{\sqrt{1-x^2}}$

232. (b) $\cos^2x + \cos^4x = 1$

$\cos^4x = 1 - \cos^2x$

$\cos^4x = \sin^2x$

$\cos^2x \cos^2x = \sin^2x$

$\cos^2x = \tan^2x$ ....(i)

$\cos^4x = \tan^4x$ ....(ii)

$\tan^2x + \tan^4x$

$\cos^2x + \cos^4x = 1$

(From eq. (i) and (ii)

233. (a) $\cos 53° - \sin 37°$

$= \cos(90°-37°) - \sin 37°$

$= \sin 37° - \sin 37° = 0$

234. (b) $\operatorname{cosec}\theta + \sin\theta = \dfrac{5}{2}$

$\dfrac{1}{\sin\theta} + \sin\theta = \dfrac{5}{2}$

Squaring both sides

$\sin^2\theta + \dfrac{1}{\sin^2\theta} + 2\sin\theta.\dfrac{1}{\sin\theta} = \dfrac{25}{4}$

$\sin^2\theta + \dfrac{1}{\sin^2\theta} = \dfrac{25}{4} - 2 = \dfrac{17}{4}$ ....(i)

So, $(\operatorname{cosec}\theta - \sin\theta)^2 = \left(\frac{1}{\sin\theta} - \sin\theta\right)^2$

$= \dfrac{1}{\sin^2\theta} + \sin^2\theta - 2\sin\theta.\dfrac{1}{\sin\theta}$

$(\operatorname{cosec}\theta - \sin\theta)^2 = \dfrac{17}{4} - 2$

$\operatorname{cosec}\theta - \sin\theta = \sqrt{\dfrac{17-8}{4}}$

$= \sqrt{\dfrac{9}{4}} = \dfrac{3}{2}$

235. (c) $\operatorname{Tan}\theta = \dfrac{4}{3}$

$\dfrac{\sin\theta}{\operatorname{Cos}\theta} = \dfrac{4}{3}$

$\dfrac{3\times4+2\times3}{3\times4-2\times3} \Rightarrow \dfrac{18}{6} \Rightarrow 3$

236. (c) $\operatorname{Sec}(4x - 50°) = \operatorname{Cosec}(50° - x)$

$\operatorname{Sec}(4x - 50°) = \operatorname{cosec}[(90° - (40° + x)]$

$\operatorname{Sec}(4x - 50°) = \operatorname{Sec}[40° + x]$

$4x - 50° = 40° + x$

$3x = 90°$

$x = 30°$

237. (c) $\sec^2\theta + \tan^2\theta = \sqrt{3}$

We know that $\sec^2\theta - \tan^2\theta = 1$

then, $\sec^4\theta - \tan^4\theta$

$= (\sec^2\theta + \tan^2\theta)(\sec^2\theta - \tan^2\theta)$

$= \sqrt{3} \times 1 = \sqrt{3}$

238. (c) $\pi\sin\theta = 1$.....(i)

$\pi\cos\theta = 1$ ......(ii)

divide eq^n (i) from (ii)

$\dfrac{\pi\sin\theta}{\pi\cos\theta} = \dfrac{1}{1}$

$\tan\theta = 1 = \tan 45$

$\theta = 45$

$\therefore \sqrt{3}\tan(\dfrac{2}{3}\theta)+1$

$= \sqrt{3}\tan\left(45\times\dfrac{2}{3}\right)+1$

$= \sqrt{3}\tan 30° + 1$

$= \sqrt{3}\dfrac{1}{\sqrt{3}} + 1 = 2$

239. (b) In $\triangle$, $\angle A + \angle B + \angle C$

$= 180°$ ....(i)

$\sin A = \cos B$

$\sin A = \sin(90 - B)$

$A = 90° - B$

$A + B = 90°$ .....(ii)

from equation (i) and (ii)

$\angle C = 90°$

So, $\cos C = \cos 90° = 0$

240. (a) $\sin\theta \times \cos\theta = \dfrac{1}{2}$

Multiply by 2 both side

$2\sin\theta\cos\theta = 1$

$\sin 2\theta = 1$

$\sin 2\theta = \sin 90°$

$2\theta = 90°$

$\theta = 45°$

So, $\sin\theta - \cos\theta$

$= \sin 45° - \cos 45°$

$= \dfrac{1}{\sqrt{2}} - \dfrac{1}{\sqrt{2}} = 0$

241. (b) $\cos^2 20° + \cos^2 70° = \cos^2(90 - 70) + \cos^2 70°$

$\operatorname{Sin}^2 70° + \cos^2 70° = 1$

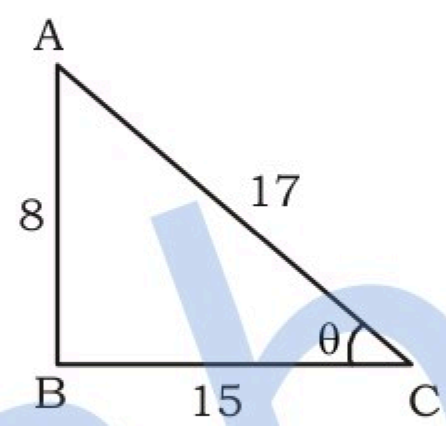
242. (d) $\dfrac{\sin\theta}{1+\cos\theta} + \dfrac{\sin\theta}{1-\cos\theta}$

$\Rightarrow \dfrac{\sin\theta(1-\cos\theta)+\sin\theta(1+\cos\theta)}{(1+\cos\theta)\times(1-\cos\theta)}$

$\Rightarrow \dfrac{\sin\theta - \sin\theta\cos\theta + \sin\theta + \sin\theta\cos\theta)}{(1-\cos^2\theta)}$

$\Rightarrow \dfrac{2\sin\theta}{\sin^2\theta} \Rightarrow \dfrac{2}{\sin\theta} \Rightarrow 2\operatorname{cosec}\theta$

243. (c) $\tan\theta = \dfrac{8}{15}$



$\Rightarrow \dfrac{\sqrt{1-\dfrac{8}{17}}}{\sqrt{1+\dfrac{8}{17}}} \Rightarrow \dfrac{\sqrt{9}}{\sqrt{25}} = \dfrac{3}{5}$

244. (a) $\dfrac{\cos\theta}{1-\sin\theta} + \dfrac{\cos\theta}{1+\sin\theta} = 4$

$\cos\theta\left(\dfrac{1+\sin\theta+1-\sin\theta}{1-\sin^2\theta}\right) = 4$

$\cos\theta\left[\dfrac{2}{\cos^2\theta}\right] = 4$

$\cos\theta = \dfrac{1}{2}$

$\theta = 60°$

245. (d) $\sec 15\theta = \operatorname{cosec} 15\theta$

$\dfrac{1}{\cos 15\theta} = \dfrac{1}{\sin 15\theta}$

$\dfrac{\sin 15\theta}{\cos 15\theta} = 1$

$\tan 15\theta = 1 = \tan 45$

$15\theta = 45$

$\theta = \dfrac{45}{15}$

$\theta = 3°$

246. (c) $\tan\theta = \tan30.\tan60$

$= \frac{1}{\sqrt{3}} \cdot \sqrt{3}$

$\tan\theta = 1 = \tan45$

$\theta = 45$

$\therefore\ 2\theta = 90^\circ$

247. (d) $x^2 = \sin^2 30^\circ + 4\cot^2 45^\circ - \sec^2 60^\circ$

$x^2 = \left(\frac{1}{2}\right)^2 + 4\,(1)^2 - (2)^2$

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

$x^2 = \frac{1}{4}$

$x = \frac{1}{2}$

248. (b) $7\sin^2\theta + 3\cos^2\theta = 4$

$7\sin^2\theta + 3(1 - \sin^2\theta) = 4$

$7\sin^2\theta + 3 - 3\sin^2\theta = 4$

$4\sin^2\theta = 1$

$\sin^2\theta = \frac{1}{4}$

$\sin\theta = \frac{1}{2} = \sin30^\circ$

$\theta = 30^\circ$

$\sec\theta + \mathrm{cosec}\,\theta = \sec30^\circ + \mathrm{cosec}30^\circ$

$= \frac{2}{\sqrt{3}} + 2$

249. (d) $\left(\frac{Sin\theta + \sin\Phi}{\cos\theta + \cos\Phi} + \frac{\cos\theta - \cos\Phi}{\sin\theta - \sin\Phi}\right)$

Put $\theta = 90^\circ$

$\Phi = 0^\circ$

$\therefore \left(\frac{\sin90 + \sin0}{\cos90 + \cos0} + \frac{\cos90 - \cos0}{\sin90 - \sin0}\right)$

$\Rightarrow \left(\frac{1+0}{0+1} + \frac{0-1}{1-0}\right)$

$\Rightarrow (1 - 1) = 0$

250. (a) $\mathrm{Cot}\,\theta = 4$ The value of

$\frac{5\sin\theta + 3\cos\theta}{5\sin\theta - 3\cos\theta} = \left[\frac{5 + 3\cot\theta}{5 - 3\cot\theta}\right]$

$\Rightarrow \frac{5 + 3\times4}{5 - 3\times4} \Rightarrow \frac{17}{-7}$

251. (d) $\cos^2 20^\circ + \cos^2 70^\circ$

$= \cos^2(90-70) + \cos^2 70^\circ$

$= \mathrm{Sin}^2 70^\circ + \mathrm{Cos}^2 70^\circ = 1$

252. (b) $(1 + \tan^2\theta)(1 - \sin^2\theta)$

$= \sec^2\theta\ .\ \cos^2\theta$

$= \sec^2\theta\ .\ \frac{1}{\sec^2\theta} = 1$

253. (c) $r\sin\theta = 1$, $r\cos\theta = \sqrt{3}$

put $\theta = 30^\circ$

$r = 2$

so $r^2\tan\theta = (2)^2 \times \tan30$

$= 4\times\frac{1}{\sqrt{3}} = \frac{4}{\sqrt{3}}$

254. (d) $(1+\sec22 + \cot68)$
$(1 - \mathrm{cosec}22 + \tan68)$

$= (1 + \sec22 + \tan22)$
$(1 - \mathrm{cosec}22 + \cot22)$

$= 1 + \sec22 + \tan22 - \mathrm{cosec}22 - \sec22\,\mathrm{cosec}22 - \mathrm{cosec}22\tan22 + \cot22 + \cot22\sec22 + \tan22\cot22$

$= 1 + \sec22 + \tan22 - \mathrm{cosec}22 - \frac{1}{\cos22}\frac{1}{\sin22} - \frac{1}{\sin22}\frac{\sin22}{\cos22} + \cot22 + \frac{\cos22}{\sin22}\times\frac{1}{\cos22} + 1$

$= 1 + \frac{1}{\cos22} + \frac{\sin22}{\cos22} - \frac{1}{\sin22} - \frac{1}{\cos22}\frac{1}{\sin22} - \frac{1}{\cos22} + \cot22 + \frac{1}{\sin222} + 1$

$= 1 + \frac{\sin22}{\cos22} + \frac{\cos22}{\sin22} - \frac{1}{\sin22}\frac{1}{\cos22} + 1$

$= 2 + \frac{\cos^2 22 + \cos^2 22}{\cos22\sin22} - \frac{1}{\sin22}\frac{1}{\cos22}$

$\Rightarrow 2 + \frac{1}{\cos22\sin22} - \frac{1}{\sin22\cos22}$

$= 2$

255. (a) $x\sin\theta - y\cos\theta = 0$

$x\sin\theta = y\cos\theta$

$\frac{\sin\theta}{\cos\theta} = \frac{y}{x}$

By comparing

$\sin\theta = y$, $\cos\theta = x$

Now,

$x\sin^3\theta + y\cos^3\theta = \sin\theta.\cos\theta$

put values of x,y

$x.y^3 + yx^3 = y.x$

$xy\,(x^2+y^2) = xy$

$x^2+y^2 = 1$

256. (b) $\sec\theta + \tan\theta = m$....(i)

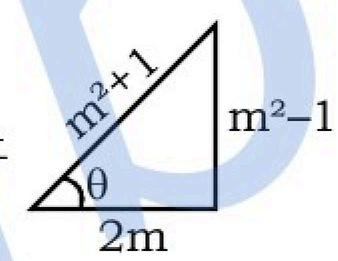
then, $\sec\theta - \tan\theta = \frac{1}{m}$ ...(ii)

because $\sec^2\theta - \tan^2\theta = 1$

from equation (i) − (ii)

$2\tan\theta = m - \frac{1}{m}$

$\tan\theta = \frac{m^2-1}{2m}$

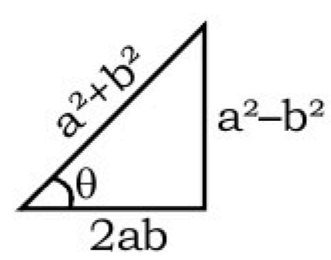


$\sin\theta = \frac{m^2-1}{m^2+1}$

257. (b) $(a^2 - b^2)\sin\theta + 2ab\cos\theta = a^2+b^2$

divide by a^2+b^2

$\frac{a^2-b^2}{a^2+b^2}\sin\theta + \frac{2ab}{a^2+b^2}\cos\theta = 1$



$\therefore \sin\theta = \frac{a^2-b^2}{a^2+b^2}$ ......(i)

$\cos\theta = \frac{2ab}{a^2+b^2}$ ......(ii)

from equation (i) and (ii)

$\tan\theta = \frac{a^2-b^2}{2ab}$

258. (d) $2y\cos\theta = x\sin\theta$ .....(i)

or $4y^2\cos^2\theta = x^2\sin^2\theta$ ...(ii)

and

$2x\sec\theta - y\,\mathrm{cosec}\,\theta = 3$ (given)

$\frac{2x}{\cos\theta} - \frac{y}{\sin\theta} = 3$

$2x\sin\theta - y\cos\theta = 3\sin\theta\cos\theta$

from eq (i) put $y\cos\theta = \frac{x\sin\theta}{2}$

$2x\sin\theta - \frac{x\sin\theta}{2} = 3\sin\theta\cos\theta$

$4x\sin\theta - x\sin\theta = 6\sin\theta\cos\theta$

$3x\sin\theta = 6\sin\theta\cos\theta$

$x = 2\cos\theta$ .....(iii)

Now,

$x^2+4y^2 = (2\cos\theta)^2 + \frac{x^2\sin^2\theta}{\cos^2\theta}$

from eq (ii))

(from eq (iii) $x = 2\cos\theta$)

$= 4\cos^2\theta + \frac{4\cos^2\theta\sin^2\theta}{\cos^2\theta}$

$= 4(\cos^2\theta + \sin^2\theta) = 4$

Alternate:

$2y\cos\theta = x\sin\theta$

put $\theta = 45°$

$2y.\frac{1}{\sqrt{2}} = x\frac{1}{\sqrt{2}}$

$2y = x$ ......(i)

$2x\sec\theta - y\,\text{cosec}\,\theta = 3$

but $-\ \theta = 45$

$2x.\sqrt{2} - y\sqrt{2} = 3$

$2x - y = \frac{3}{\sqrt{2}}$ ....(ii)

from eq (i) and (ii)

$$\begin{array}{r} 2x - 4y = 0 \\ 2x - y = 3/\sqrt{2} \\ \hline 3y = \frac{3}{\sqrt{2}} \end{array}$$

$y = \frac{1}{\sqrt{2}}$

put value of y in eq (i)

$x = 2\times\frac{1}{\sqrt{2}} = \sqrt{2}$

Now,

$x^2 + 4y^2 = \left(\sqrt{2}\right)^2 + 4\left(\frac{1}{\sqrt{2}}\right)^2$

$= 2 + 2 = 4$

259. (b) $\frac{\cot\theta+\text{cosec}\theta-1}{\cot\theta+\text{cosec}\theta+1}$

put $\theta = 45°$

$= \frac{1+\sqrt{2}-1}{1+\sqrt{2}+1} = \frac{\sqrt{2}}{2+\sqrt{2}}$

$= \frac{\sqrt{2}}{\sqrt{2}(\sqrt{2}+1)}$

$= \frac{1}{\sqrt{2}+1} = \sqrt{2}-1$

Now, option B

$\frac{1-\cos\theta}{\sin\theta} = \frac{1-\frac{1}{\sqrt{2}}}{\frac{1}{\sqrt{2}}}$

$= \sqrt{2}-1$ (satisfy)

260. (b) SecA + tanA = a

we know that

$\sec^2A - \tan^2A = 1$

(secA − tanA)(secA + tanA)= 1

(secA − tanA) a = 1

$\sec A - \tan A = \frac{1}{a}$

$\sec A + \tan A = a$

$2\sec A = a + \frac{1}{a}$

$2\sec\frac{1}{A} = \frac{a^2+1}{a}$

$\sec\theta = \frac{a^2+1}{2a}$

so, $\cos\theta = \frac{2a}{a^2+1}$

261. (b) sinP + cosecP = 2

for P = 90°

sin90 + cosec 90 = 2

1 + 1 = 2 (satisfy)

so,

$\sin^7P + \text{cosec}^7P$

$= \sin^7 90 + \text{cosec}^7 90$

$= 1^7 + 1^7 = 2$

262. (c) cosx. cosy + sinx.siny = −1

cos(x − y) = −1

cos(x − y) = cos180°

x − y = 180

$\cos x + \cos y = 2\cos\frac{x+y}{2}.\cos\frac{x-y}{2}$

$= 2\cos\frac{x+y}{2}\ .\ \cos\frac{180}{2}$

$= 2\cos\frac{x+y}{2}\ \cos 90°$

$\boxed{\cos 90° = 0}$

cosx + cosy = 0

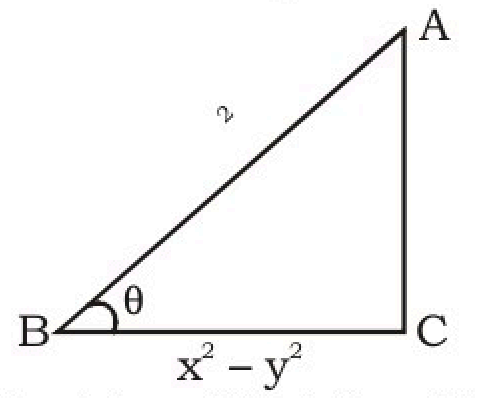
263. (b) $2(\sin^6\theta + \cos^6\theta) - 3(\sin^4\theta + \cos^4\theta)+1$

$2(1 - 3\sin^2\theta\cos^2\theta) - 3(1 - 2\sin^2\theta\cos^2\theta)+1$

$2 - 6\sin^2\theta\ .\ \cos^2\theta - 3 + 6\sin^2\theta\cos^2\theta + 1$

$= 2 - 3 + 1 = 0$

264. (d) $\cos\theta = \frac{x^2-y^2}{x^2+y^2}$



$AC^2 = (x^2 + y^2)^2 - (x^2 - y^2)^2$

$= x^4 + y^4 + 2x^2y^2 - x^4 - y^4 + 2x^2y^2$

$= 4x^2y^2$

AC = 2xy

$\cot\theta = \frac{x^2-y^2}{2xy}$

265. (b) $x = \text{cosec}\theta - \sin\theta$

$y = \sec\theta - \cos\theta$

put $\theta = 45°$

$x = \sqrt{2} - \frac{1}{\sqrt{2}} = \frac{1}{\sqrt{2}}$

$y = \sqrt{2} - \frac{1}{\sqrt{2}} = \frac{1}{\sqrt{2}}$

by options (b) $x^2y^2(x^2 + y^2 + 3)$

$= \left(\frac{1}{\sqrt{2}}\right)^2 \times \left(\frac{1}{\sqrt{2}}\right)^2$

$\left[\left(\frac{1}{\sqrt{2}}\right)^2 + \left(\frac{1}{\sqrt{2}}\right)^2 + 3\right]$

$= \frac{1}{2}\times\frac{1}{2}\left(\frac{1}{2}+\frac{1}{2}+3\right) = \frac{1}{4}(1+3)$

= 1 satisfy

266.(b) $x\tan 60° + \cos 45° = \sec 45°$

$x.\sqrt{3} + \frac{1}{\sqrt{2}} = \sqrt{2}$

$x\sqrt{6} + 1 = 2$

$x\sqrt{6} = 1$

$x = \frac{1}{\sqrt{6}}$

$x^2+1 = \left(\frac{1}{\sqrt{6}}\right)^2 + 1$

$= \frac{1}{6} + 1 = \frac{7}{6}$

267.(c) $\sin(2x-20) = \cos(2y+20)$

$\sin(2x-20) = \sin[90-(2y-20)]$

$(2x-20) = \sin[90-(2y+20)]$

$2x-20 = 90 - 2y - 20$

$2x+2y = 90$

$x+y = 45^\circ$

$\tan(x+y) = \tan45^\circ = 1$

268.(b) $a^2\sec^2x - b^2\tan^2x = c^2$

$a^2(1+\tan^2x)-b^2\tan^2x = c^2$

$a^2+a^2\tan^2x-b^2\tan^2x = c^2$

$a^2+\tan^2x(a^2-b^2)= c^2$

$a^2-c^2 = \tan^2x(b^2-a^2)$

$$\frac{a^2-c^2}{b^2-a^2} = \tan^2x$$

$\sec^2x - \tan^2x = 1$

$\sec^2x = 1 + \tan^2x$

$$= 1+ \frac{a^2-c^2}{b^2-a^2}$$

$$= \frac{b^2-a^2+a^2-c^2}{b^2-a^2}$$

$$= \frac{b^2-c^2}{b^2-a^2}$$

$\sec^2x + \tan^2x$

$$= \frac{b^2-c^2}{b^2-a^2} + \frac{a^2-c^2}{b^2-a^2}$$

$$= \frac{b^2+a^2-2c^2}{b^2-a^2}$$

269.(c) $(1+\sec20+\cot70)\ (1-\text{cosec}20^\circ + \tan70^\circ)$

$(1+\sec20+\tan20)\ (1-\text{cosec}20 + \tan20)$

put 45° in place of 20°

$(1+\sec45^\circ + \tan45)\ (1-\text{cosec}45^\circ + \cot45^\circ)$

$(1+\sqrt{2}+1)(1-\sqrt{2}+1)$

$(2+\sqrt{2})\ (2-\sqrt{2}) = 2$

270.(c) $\tan^4\theta+\tan^2\theta = 1$

$\because \sec^2\theta-\tan^2\theta = 1$

$\tan^2\theta(1+\tan^2\theta) = 1$

$\tan^2\theta\ (\sec^2\theta) = 1$

$$\tan^2\theta = \frac{1}{\sec^2\theta}$$

$\tan^2\theta = \cos^2\theta$

$\because \cos^4\theta + \cos^2\theta$

$= (\cos^2\theta)^2 + \cos^2\theta$

$= (\tan^2\theta) + \tan^2\theta$

$= \tan^4\theta + \tan^2\theta$

= 1 from equation (i)

271.(c) $8(\sin^6\theta + \cos^6\theta) - 12(\sin^4\theta+\cos^4\theta)$

put $\theta = 0^\circ$

$= 8(\sin^60^\circ+ \cos^60) - 12(\sin^40 + \cos^40)$

$= 8(0+1)- 12\ (0+1) = - 4$