kd education academy (9582701166

Time : 10 Hour | **STD 11 Maths** | **Total Marks : 630**

kd90+ ch-3 Trigonometry

*** Choose the right answer from the given options. [1 Marks Each]** **[85]**

1. If $\sin x + \sin y = \sqrt{3}(\cos y - \cos x)$, than $\sin 3x + \sin 3y =$

   (A) $2\sin 3x$ (B) 0 (C) 1 (D) None of these

2. The value of $\frac{2(\sin 2x + 2\cos^2 x - 1)}{\cos x - \sin x - \cos 3x + \sin 3x}$ is:

   (A) $\cos x$ (B) $\sec x$ (C) $\operatorname{cosec} x$ (D) $\sin x$

3. Choose the correct answer.

   If $\tan\theta = \frac{1}{2}$ and $\tan\phi = \frac{1}{3}$, then the value of $\theta + \phi$ is:

   (A) $\frac{\pi}{6}$ (B) π (C) 0 (D) $\frac{\pi}{4}$

4. If $\tan 20^\circ + \tan 40^\circ + \sqrt{3}\tan 20 \circ \tan 40^\circ$ is equal to:

   (A) $\frac{\sqrt{3}}{4}$ (B) $\frac{\sqrt{3}}{2}$ (C) $\sqrt{3}$ (D) 1

5. The value of $\sin^2 \frac{5\pi}{12} - \sin^2 \frac{\pi}{12}$ is:

   (A) $\frac{1}{2}$ (B) $\frac{\sqrt{3}}{2}$ (C) 1 (D) 0

6. If n = 1,2,3, ..., then $\cos\alpha \cos 4\alpha \ldots \cos 2^{n-1}\alpha$ is equal to:

   (A) $\frac{\sin 2n\alpha}{2n \sin\alpha}$ (B) $\frac{\sin 2^n\alpha}{2^n \sin 2^{n-1}\alpha}$ (C) $\frac{\sin 4^{n-1}\alpha}{4^{n-1}\sin\alpha}$ (D) $\frac{\sin 4^{n-1}\alpha}{4^{n-1}\sin\alpha}$

7. Choose the correct answer.

   The value of $\sin\frac{\pi}{10}\sin\frac{13\pi}{10}$ is:

   (A) $\frac{1}{2}$ (B) $-\frac{1}{2}$ (C) $-\frac{1}{4}$ (D) 1

8. $2(1 - 2\sin^2 7x)\sin 3x$ is equal to:

   (A) $\sin 17x - \sin 11x$

   (B) $\sin 11x - \sin 17x$

   (C) $\cos 17x - \cos 11x$

   (D) $\cos 17x + \cos 11x$

9. If α and β are acute angles satisfying $\cos 2\alpha = \frac{3\cos 2\beta - 1}{3 - \cos 2\beta}$, then $\tan\alpha =$

   (A) $\sqrt{2}\tan\beta$ (B) $\frac{1}{\sqrt{2}}\tan\beta$ (C) $\sqrt{2}\cot\beta$ (D) $\frac{1}{\sqrt{2}}\cot\beta$

10. If D, G and R denote respectively the number of degrees, grades and radians in an angle, then:

    (A) $\frac{D}{100} = \frac{G}{90} = \frac{2R}{\pi}$ (B) $\frac{D}{90} = \frac{G}{100} = \frac{R}{\pi}$

    (C) $\frac{D}{100} = \frac{G}{100} = \frac{2R}{\pi}$ (D) $\frac{D}{90} = \frac{G}{100} = \frac{R}{\pi}$

11. If $x = r\sin\theta\cos\theta, y = r\sin\theta$ and $z = r\cos\theta$, then $x^2 + x^2 + z^2$ is idepandent of

(A) θ, ϕ (B) r, θ (C) r, ϕ (D) r.

12. If $5\sin\alpha = 3\sin(\alpha + 2\beta) \neq 0$, then $\tan(\alpha + \beta)$ is equal to:

(A) $2\tan\beta$ (B) $3\tan\beta$ (C) $4\tan\beta$ (D) $6\tan\beta$

13. If $\cot(\alpha + \beta) = 0$, then $\sin(\alpha + 2\beta)$ is equal to:

(A) $\sin\alpha$ (B) $\cos 2\beta$ (C) $\cos\alpha$ (D) $\sin 2\alpha$

14. If $\sec x + \tan x = k, \cos x =$

(A) $\frac{x^2+1}{2k}$ (B) $\frac{2k}{x^2+1}$ (C) $\frac{k}{x^2+1}$ (D) $\frac{k}{x^2-1}$

15. The value of $\cos^4 x + \sin^4 x - 6\cos^2\sin^2$ is:

(A) $\cos 2x$ (B) $\sin 2x$ (C) $\cos 4x$ (D) None of these

16. The radius of the circle whose arc of length 15π makes an angle of $\frac{3\pi}{4}$ radian at the centre is:

(A) 10cm (B) 20cm (C) $11\frac{1}{4}\text{ cm}$ (D) $22\frac{1}{2}\text{ cm}$

17. In the sides of a triangle are in the ratio $1 : \sqrt{3} : 2$, then the measure of its greatest angle is:

(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{3}$ (C) $\frac{\pi}{2}$ (D) $\frac{2\pi}{3}$

18. Choose the correct answer.

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

(A) 1 (B) $\sqrt{3}$ (C) $\frac{\sqrt{3}}{2}$ (D) 2

19. If $\tan\alpha = \frac{1-\cos\beta}{\sin\beta}$, then:

(A) $\tan 3\alpha = \tan 2\beta$ (B) $\tan 2\alpha = \tan\beta$

(C) $\tan 2\beta = \tan\alpha$ (D) None of these

20. If $\cos x + \sqrt{3}\sin x = 2, \text{then } x =$

(A) $\frac{\pi}{3}$ (B) $\frac{2\pi}{3}$ (C) $\frac{4\pi}{3}$ (D) $\frac{5\pi}{3}$

21. If $\alpha + \beta + y = 2p$, then:

(A) $\frac{\tan\alpha}{2} + \frac{\tan\beta}{2} + \frac{\tan y}{2} = \frac{\tan\alpha}{2}.\frac{\tan\beta}{2}.\frac{\tan y}{2}$

(B) $\frac{\tan\alpha}{2}.\frac{\tan\beta}{2} + \frac{\tan\beta}{2}.\frac{\tan y}{2} = \frac{\tan y}{2}.\frac{\tan\alpha}{2} = 1$

(C) $\frac{\tan\alpha}{2} + \frac{\tan\beta}{2} + \frac{\tan y}{2} = \frac{\tan\alpha}{2}.\frac{\tan\beta}{2}.\frac{\tan y}{2}$

(D) None of these

22. If the angles of a triangle are in A.P. then the measures of one of the angles in radians is:

(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{3}$ (C) $\frac{\pi}{2}$ (D) $\frac{2\pi}{3}$

23. If $\tan\frac{x}{2}=\sqrt{\frac{1-e}{1+e}}\tan\frac{\alpha}{2}$ then $\cos\alpha=$

(A) $1-e\cos(\cos x+e)$ (B) $\frac{1+e\cos x}{\cos x-e}$

(C) $\frac{1-e\cos x}{\cos x-e}$ (D) $\frac{\cos x-e}{1-e\cos x}$

24. If $\tan\alpha=\frac{1}{7},\tan\beta=-\frac{1}{3},$ then $\cos 2\alpha$ is equal to:

(A) $\sin 2\beta$ (B) $\sin 4\beta$ (C) $\sin 3\beta$ (D) $\cos^2\beta$

25. If $2\tan\alpha=3\tan\beta$ then $\tan(\alpha-\beta)=$

(A) $\frac{\sin 2\beta}{5-\cos 2\beta}$ (B) $\frac{\cos 2\beta}{5-\cos 2\beta}$ (C) $\frac{\sin 2\beta}{5+\cos 2\beta}$ (D) None of these

26. If $\frac{\pi}{2}<x<\pi$, and if $=\sqrt{\frac{1-\sin x}{1+\sin x}}+\sqrt{\frac{1+\sin x}{1-\sin x}}$, is equal to:

(A) $2\sec x$ (B) $-2\sec x$ (C) $\sec x$ (D) $-\sec x$

27. The angle between the minute and hour hands of a clock at 8 : 30 is:

(A) 80° (B) 75° (C) 60° (D) 105°

28. If $\tan\alpha=\frac{x}{x+1}$ and $\tan\beta=\frac{1}{2x+1},$ than $\alpha+\beta$ is equal to

(A) $\frac{\pi}{2}$ (B) $\frac{\pi}{3}$ (C) $\frac{\pi}{6}$ (D) $\frac{\pi}{4}$

29. Choose the correct answer.
The value of $\tan 1^\circ\tan 2^\circ\tan 3^\circ\ldots\tan 89^\circ$ is:

(A) 0 (B) 1 (C) $\frac{1}{2}$ (D) Not defined

30. The value of $\cos 1^\circ\cos 2^\circ\cos 3^\circ\ldots\ \cos 179^\circ$ is:

(A) $\frac{1}{\sqrt{2}}$ (B) 0 (C) 1 (D) -1

31. The value of $\sin^2\left(\frac{\pi}{18}\right)+\sin^2\left(\frac{\pi}{9}\right)+\sin^2\left(\frac{7\pi}{18}\right)+\sin^2\left(\frac{4\pi}{9}\right)$ is:

(A) 1 (B) 2 (C) 3 (D) None of these

32. The value of $\sin^2 5^\circ+\sin^2 10^\circ+\sin^2 15^\circ+\ \ldots\ +\sin^2 85^\circ+\sin^2 90^\circ$ is:

(A) 7 (B) 8 (C) 9.5 (D) 10

33. If $\tan X=\frac{a}{b},$ then $b\cos 2x+a\sin 2x$ is equal to:

(A) a (B) b (C) $\frac{a}{b}$ (D) $\frac{b}{a}$

34. The value of $\sin 78^\circ-\sin 66^\circ-\sin 42^\circ+\sin 6^\circ$ is

(A) $\frac{1}{2}$ (B) $-\frac{1}{2}$ (C) -1 (D) None of these

35. The value of $\cos 52^\circ+\cos 68^\circ+\cos 172^\circ$ is

(A) 0 (B) 1 (C) 2 (D) $\frac{3}{2}$

36. The value of $\left(\cot\frac{x}{2}-\tan\frac{x}{2}\right)^2(1-2\tan x\cot 2x)$ is:

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

37. Choose the correct answer.
The value of $\sin 50^\circ - \sin 70^\circ + \sin 10^\circ$ is equal to:
(A) 1 (B) 0 (C) $\frac{1}{2}$ (D) 2

38. If $\operatorname{cosec} x + \cot x = \frac{11}{2}$, then $\tan x =$
(A) $\frac{21}{22}$ (B) $\frac{15}{16}$ (C) $\frac{44}{117}$ (D) $\frac{117}{43}$

39. If $\tan\theta_1 \tan\theta_2 = k$, then $\frac{\cos(\theta_1-\theta_2)}{\cos(\theta_1+\theta_2)} =$
(A) $\frac{1+k}{1-k}$ (B) $\frac{1-k}{1+k}$ (C) $\frac{k+1}{k-1}$ (D) $\frac{k-1}{k+1}$

40. If A lies in second quadrant $3\tan A + 4 = 0$, then the value of $2\cot A - 5\cot A + \sin A$ is:
(A) $-\frac{53}{10}$ (B) $\frac{23}{10}$ (C) $\frac{37}{10}$ (D) $\frac{7}{10}$

41. If $\sin\alpha + \sin\beta = a$ and $\cos\alpha - \cos\beta = b$, than $\tan\frac{\alpha-\beta}{2} =$
(A) $-\frac{a}{b}$ (B) $-\frac{b}{a}$ (C) $\sqrt{a^2+b^2}$ (D) None of these

42. The value of $\frac{\sin 5\alpha - \sin\beta}{\cos 5\alpha + 2\cos 4\alpha + \cos 3\alpha}$ is:
(A) $\cot\frac{\alpha}{2}$ (B) $\cot\alpha$ (C) $\tan\frac{\alpha}{2}$ (D) None of these

43. The smallest value of x satisfying the equation $\sqrt{3}(\cot x + \tan x) = 4$ is:
(A) $\frac{2\pi}{3}$ (B) $\frac{\pi}{3}$ (C) $\frac{\pi}{6}$ (D) $\frac{\pi}{12}$

44. If $\operatorname{cosec} x + \cot x = \frac{11}{2}$, then $\tan x$ is equal to:
(A) $\frac{21}{22}$ (B) $\frac{15}{16}$ (C) $\frac{44}{117}$ (D) $\frac{117}{44}$

45. What is the value of cot (-870°)?
(A) 3 (B) $\frac{1}{\sqrt{3}}$ (C) $-\sqrt{3}$ (D) $\frac{-1}{\sqrt{3}}$

46. If $\tan\left(\frac{\pi}{4}+x\right) + \tan\left(\frac{\pi}{4}-x\right) = a$, then $\tan^2\left(\frac{\pi}{4}+x\right) + \tan^2\left(\frac{\pi}{4}-x\right) =$
(A) $a^2 + 1$ (B) $a^2 + 2$ (C) $a^2 - 2$ (D) none of these

47. If $\tan A + \cot A = 4$, then $\tan^4 A + \cot^4 A$ is equal to:
(A) 110 (B) 191 (C) 80 (D) 194

48. The value of $\cos(36^\circ - A)\cos(36^\circ + A) + \cos(54^\circ + A)\cos(54^\circ - A)$ is:
(A) $\sin 2A$ (B) $\cos 2A$ (C) $\cos 3A$ (D) $\sin 3A$

49. $8\sin\frac{x}{8}\cos\frac{x}{2}\cos\frac{x}{4}\cos\frac{x}{8}$ is equal to:
(A) $8\cos x$ (B) $\cos x$ (C) $8\sin x$ (D) $\sin x$

50. If x is an acute angle and $x = \frac{1}{\sqrt{7}}$, than the value of $\frac{\operatorname{cosec}^2 x - \sec^2 x}{\operatorname{cosec}^2 x + \sec^2 x}$ is:
(A) $\frac{3}{4}$ (B) $\frac{1}{2}$ (C) 2 (D) $\frac{5}{4}$

51. $\cos 40^\circ + \cos 80^\circ + \cos 160^\circ + \cos 240 =$

(A) 0 (B) 1 (C) $\frac{1}{2}$ (D) $-\frac{1}{2}$

52. A circular wire of radius 7cm is cut and bent again into an arc of a circle of radius 12cm. The angle subtended by the arc at the centre is:

(A) 50° (B) 210° (C) 100° (D) 60°

53. The solution of the equation $\cos^2 q + \sin q + 1 = 0,$ lies in the interval:

(A) $\left(\frac{\pi}{4}, \frac{\pi}{4}\right)$ (B) $\left(\frac{-\pi}{4}, \frac{3\pi}{4}\right)$ (C) $\left(\frac{-3\pi}{4}, \frac{5\pi}{4}\right)$ (D) $\left(\frac{5\pi}{4}, \frac{7\pi}{4}\right)$

54. $\frac{\cos 10^\circ + \sin 10^\circ}{\cos 10^\circ - \sin 10^\circ}$ is equal to:

(A) $\tan 55^\circ$ (B) $\cot 55^\circ$ (C) $-\tan 35^\circ$ (D) $-\cot 35^\circ$

55. The value of $\cos^2\left(\frac{\pi}{6} + x\right) - \sin^2\left(\frac{\pi}{6} - x\right)$ is:

(A) $\frac{1}{2}\cos^2 x$ (B) 0 (C) $-\frac{1}{2}\cos 2x$ (D) $\frac{1}{2}$

56. The value of $\frac{\cos 3x}{2\cos 2x - 1}$ is equal to:

(A) $\cos x$ (B) $\sin x$ (C) $\tan x$ (D) None of these

57. Choose the correct answer.

If $\sin\theta + \cos\theta = 1,$ then the value of $\sin 2\theta$ is equal to:

(A) 1 (B) $\frac{1}{2}$ (C) 0 (D) -1

58. If $\sin\alpha + \sin\beta = a$ and $\cos\alpha - \cos\beta = b$ then $\tan\frac{\alpha-\beta}{2} =$

(A) $-\frac{a}{b}$ (B) $-\frac{b}{a}$ (C) $\sqrt{a^2 + b^2}$ (D) None of these

59. The value of $\cos(36^\circ - A)\cos(36^\circ + A) + \cos(54^\circ - A)\cos(54^\circ + A)$ is:

(A) $\cos 2A$ (B) $\sin 2A$ (C) $\cos A$ (D) 0

60. If $A = 2\sin^2 x - \cos 2x,$ then A lies in the interval:

(A) $[-1, 3]$ (B) $[1, 2]$ (C) $[-2, 4]$ (D) None of these

61. If $(2^n + 1)x = \pi,$ then $2^n \cos x \cos 2x^2 x \cos^{n-1} x =$

(A) -1 (B) 1 (C) $\frac{1}{2}$ (D) None of these

62. Let a, b be such that $\pi < \alpha - \beta < 3\pi$ D

If $\sin\alpha + \sin\beta = -\frac{21}{65}$ and, $\cos\alpha + \cos\beta = -\frac{27}{65}.$ then the value is $\alpha - \frac{\beta}{2}$

(A) $\frac{-6}{65}$ (B) $\frac{3}{\sqrt{130}}$ (C) $\frac{6}{65}$ (D) $\frac{-3}{130}$

63. Choose the correct answer.

If $\alpha + \beta = \frac{\pi}{4},$ then the value of $(1 + \tan\alpha)(1 + \tan\beta)$ is:

(A) 1 (B) 2 (C) -2 (D) Not defined

64. Choose the correct answer.

If $\tan\alpha = \frac{m}{m+1}, \tan\beta = \frac{1}{2m+1},$ then $\alpha + \beta$ is equal to:

(A) $\frac{\pi}{2}$ (B) $\frac{\pi}{3}$ (C) $\frac{\pi}{6}$ (D) $\frac{\pi}{4}$

65. If $\cos A = m\cos B$, than $\cot\frac{A+B}{2}\cot\frac{B-A}{2} =$

(A) $\frac{m-1}{m+1}$ (B) $\frac{m+2}{m-2}$ (C) $\frac{m+1}{m-1}$ (D) None of these

66. If $\tan\alpha = \frac{x}{x+1}$ and $\tan\beta = \frac{1}{2x+1}$, then $\alpha+\beta$ is equal to:

(A) $\frac{\pi}{2}$ (B) $\frac{\pi}{3}$ (C) $\frac{\pi}{6}$ (D) $\frac{\pi}{4}$

67. At 3 : 40, the hour and minute hands of a clock are inclined at:

(A) $\frac{2\pi^c}{3}$ (B) $\frac{7\pi^c}{12}$ (C) $\frac{13\pi^c}{18}$ (D) $\frac{13\pi^c}{4}$

68. If $\sin 2\theta + \sin 2\phi = \frac{1}{2}$ and $\cos 2\theta + \cos 2\phi = \frac{3}{2}$, then $\cos^2(\theta-\phi) =$

(A) $\frac{3}{8}$ (B) $\frac{5}{8}$ (C) $\frac{3}{4}$ (D) $\frac{5}{4}$

69. If $\sec x = x + \frac{1}{4x}$, then $\sec x + \tan x =$

(A) $x, \frac{1}{x}$ (B) $2x, \frac{1}{2x}$ (C) $-2x, \frac{1}{2x}$ (D) $-\frac{1}{x}, x$

70. For all real values of $x, \cot x - 2\cot$ is equal to:

(A) $\tan 2x$ (B) $\tan x$ (C) $-\cot 3x$ (D) None of these

71. If $\tan x = t$ then $\tan 2x + \sec 2x$ is equal to:

(A) $\frac{1+t}{1-t}$ (B) $\frac{1-t}{1+t}$ (C) $\frac{2t}{1-t}$ (D) $\frac{2t}{1+t}$

72. Choose the correct answer.
The minimum value of $3\cos x + 4\sin x + 8$ is:

(A) 5 (B) 9 (C) 7 (D) 3

73. A solution of the equation $\cos^2 x + \sin x + 1 = 0$, lies in the interval:

(A) $\left(\frac{-\pi}{4}, \frac{\pi}{4}\right)$ (B) $\left(\frac{\pi}{4}, \frac{3\pi}{4}\right)$ (C) $\left(\frac{3\pi}{4}, \frac{5\pi}{4}\right)$ (D) $\left(\frac{5\pi}{4}, \frac{7\pi}{4}\right)$

74. The value of $\cos^2 48^\circ - \sin^2 48^\circ$ is:

(A) $\sqrt{5} + \frac{1}{8}$ (B) $\sqrt{5} - \frac{1}{8}$ (C) $\sqrt{5} + \frac{1}{5}$ (D) $\sqrt{5} + \frac{1}{2\sqrt{2}}$

75. If $\tan px - \tan qx = 0$, then the values of θ form a series in:

(A) AP (B) GP (C) HP (D) None of these

76. If $\tan\alpha = \frac{1}{7}, \tan\beta = \frac{1}{3}$, then $\cos 2\alpha$ is equal to:

a. $\sin 2\beta$
b. $\sin 4\beta$
c. $\sin 3\beta$
d. $\cos 2\beta$

77. If $f(x) = \cos^2 x + \sec^2 x$, then:

a. $f(x) < 1$
b. $f(x) = 1$
c. $2 < f(x) < 1$

d. $f(x) \geq 2$

[**Hint:** $A.M \geq G.M.$]

78. The value of $\cos 1^\circ \cos 2^\circ \cos 3^\circ \ldots \cos 179^\circ$ is:

a. $\frac{1}{\sqrt{2}}$

b. 0

c. 1

d. -1

79. If $\alpha + \beta = \frac{\pi}{4}$, then the value of $(1 + \tan\alpha)(1 + \tan\beta)$ is:

a. 1

b. 2

c. -2

d. Not defined

80. If $\tan\alpha = \frac{m}{m+1}, \tan\beta = \frac{1}{2m+1}$, then $\alpha + \beta$ is equal to:

a. $\frac{\pi}{2}$

b. $\frac{\pi}{3}$

c. $\frac{\pi}{6}$

d. $\frac{\pi}{4}$

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

a. $\frac{1}{2}$

b. 1

c. $-\frac{1}{2}$

d. $\frac{1}{8}$

82. If $\tan\theta = \frac{a}{b}$, then $b\cos 2\theta + a\sin 2\theta$ is equal to:

a. a

b. b

c. $\frac{a}{b}$

d. None

83. The value of $\cot\left(\frac{\pi}{4} + \theta\right)\cot\left(\frac{\pi}{4} - \theta\right)$ is:

a. -1

b. 0

c. 1

d. Not defined

84. The value of $\sin(45^\circ + \theta) - \cos(45^\circ - \theta)$ is:

a. $2\cos\theta$

b. $2\sin\theta$

c. 1

d. 0

85. The value of $\sin 50^\circ - \sin 70^\circ + \sin 10^\circ$ is equal to:

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

*** Given section consists of questions of 2 marks each.** **[4]**

86. Find the value of $\tan 22^\circ 30'$.

87. If $\tan(A+B)=p, \tan(A-B)=q,$ then show that $\tan 2A=\frac{p+q}{1-pq}$
[**Hint:** Use $2A=(A+B)+(A-B)$]

*** Given section consists of questions of 3 marks each.** **[36]**

88. Prove that: cos 6x = 32 $\cos^6$ x – 48 $\cos^4$ x + 18 $\cos^2$ x – 1

89. Find sin $\frac{x}{2}, \cos\frac{x}{2}$ and $\tan\frac{x}{2}$ in the $\sin x=\frac{1}{4}$, x in quadrant II.

90. Solve: 2 $\cos^2$ x + 3 sin x = 0

91. Prove that: $\cos^2 x+\cos^2\left(x+\frac{\pi}{3}\right)+\cos^2\left(x-\frac{\pi}{3}\right)=\frac{3}{2}$

92. Show thet:
$(\sin^6 x+\cos^6 x)-3(\sin^4 x+\cos^4 x)+1=0$

93. Prove that:
$\sin^2 42^\circ-\cos^2 78^\circ=\frac{\sqrt{15}+1}{8}$

94. If $\cos\alpha+\cos\beta=\frac{1}{3}$ and $\sin\alpha+\sin\beta=\frac{1}{4}$, prove that $\cos\frac{\alpha-\beta}{2}=\pm\frac{5}{24}$

95. If $\sin\alpha+\sin\beta=a$ and $\cos\alpha+\cos\beta=b$ prove that
$\cos(\alpha-\beta)=\frac{a^2+b^2-2}{2}$

96. Prove that:
$\cos 36^\circ\cos 42^\circ\cos 60^\circ\cos 78^\circ=\frac{1}{16}$

97. If $a\cos 2x+b\sin 2x=c$ has α and β as its roots, then prove that,
$\tan\alpha\tan\beta=\frac{c-a}{c+a}$

98. If $\tan x=\frac{b}{a}$, then find the value of $\sqrt{\frac{a+b}{a-b}}+\sqrt{\frac{a-b}{a+b}}$

99. If $\frac{\sin(x+y)}{\sin(x-y)}=\frac{a+b}{a-b}$, then show that $\frac{\tan x}{\tan y}=\frac{a}{b}$.
[**Hint:** Use Componendo and Dividendo]

*** Given section consists of questions of 5 marks each.** **[505]**

100. In a circle of diameter 40cm, the length of a chord is 20cm. Find the length of minor arc of the chord.

101. If $\alpha+\beta=\frac{\pi}{2}$, show that the maximum value of $\cos\alpha\cos\beta$ is $\frac{1}{2}$.

102. If θ lies in the first quadrant and $\cos\theta = \frac{8}{17}$, then find the value of $\cos(30^\circ + \theta) + \cos(45^\circ - \theta) + \cos(120^\circ - \theta)$.

103. Prove that $(2\sqrt{3}+3)\sin x + 2\sqrt{3}\cos x$ lies between $-(2\sqrt{3}+\sqrt{15})$ and $(2\sqrt{3}+\sqrt{15})$.

104. Prove that:

$\cos\frac{\pi}{15}\cos\frac{2\pi}{15}\cos\frac{3\pi}{15}\cos\frac{4\pi}{15}\cos\frac{5\pi}{15}\cos\frac{6\pi}{15}\cos\frac{7\pi}{15} = \cos\frac{1}{128}$

105. Prove that:

$\sin\alpha + \sin\beta + \sin\gamma - \sin(\alpha+\beta+\gamma)$
$= 4\sin\left(\frac{\alpha+\beta}{2}\right)\sin\left(\frac{\beta+\gamma}{2}\right)\sin\left(\frac{\gamma+\alpha}{2}\right)$

106. If $\cos(\alpha+\beta)\sin(\gamma+\delta) = \cos(\alpha-\beta)\sin(\gamma-\delta)$,
prove that $\cot\alpha\cot\beta\cot\gamma = \cot\delta$

107. If $T_n = \sin^n x + \cos^n x$, Prove that
$\frac{T_3 - T_5}{T_1} = \frac{T_5 - T_7}{T_3}$

108. $4\left(bc\cos^2\frac{A}{2} + ca\cos^2\frac{B}{2} + ab\cos^2\frac{C}{2}\right) = (a+b+c)^2$

109. If are two different valus of X lying between 0 and which satisfy the equation $6\cos x + 8\sin x = 9$ find the value of $\sin(\alpha+\beta)$.

110. A person observes the angle of elevation of the peak of a hill from a station to be α. He walks *c* metres along a slope inclined at an angle β and finds the angle of elevation of the peak of the hill to be γ. Show that the height of the peak above the ground is $\frac{c\sin\alpha\sin(\gamma-\beta)}{(\sin\gamma-\alpha)}$.

111. If the sides a, b, c of a $\triangle ABC$ are in H.P., prove that $\sin^2\frac{A}{2}, \sin^2\frac{B}{2}, \sin^2\frac{C}{2}$ are in H.P.

112. Prove that:

$\cos 20^\circ\cos 100^\circ + \cos 100^\circ\cos 140^\circ - \cos 140^\circ\cos 200^\circ = -\frac{3}{4}$

113. Prove that: $\cos^2 A + \cos^2 B - 2\cos A\cos B\cos(A-B) = \sin^2(A+B)$

114. If $\cos x = \frac{\cos\alpha + \cos\beta}{1+\cos\alpha\cos\beta}$ prove that $\tan\frac{x}{2} = \pm\tan\frac{\alpha}{2}\tan\frac{\beta}{2}$

115. Reduce each of the following expressions to the sine and cosin of a single expression:

$24\cos x + 7\sin x$

116. The angles of a triangle are in A.P. such that the greatest is 5 times the least. Find the angles in radians.

117. Prove the following identities:

$\frac{\sin^3 + \cos^3 x}{\sin x + \cos x} + \frac{\sin^3 x - \cos^3 x}{\sin x - \cos x} = 2$

118. The number of sides of two regular polygons are as 5 : 4 and the difference between their angles is 9°. Find the number of sides of the polygons.

119. Prove that:

$\sin 20^\circ \sin 40^\circ \sin 80^\circ = \frac{\sqrt{3}}{8}$

120. Solve the following equations:

$\tan x + \tan 2x + \tan 3x = 0$

121. If $\sin(\theta + \alpha) = a$ and $\sin(\theta + \beta) = b$, then prove that

$\cos 2(\alpha - \beta) - 4ab\cos(\alpha - \beta) = 1 - 2a^2 - 2b^2$

[**Hint:** Express $\cos(\alpha - \beta) = \cos((\theta + \alpha) - (\theta + \beta))$]

122. If $\cos(\alpha + \beta) = \frac{4}{5}$ and $\sin(\alpha - \beta) = \frac{5}{13}$, where α lie between 0 and $\frac{\pi}{4}$, find the value of $\tan 2\alpha$

[**Hint:** Express $\tan 2\alpha$ as $\tan(\alpha + \beta + \alpha - \beta)$]

123. If $\sin\alpha + \sin\beta = a$ and $\cos\alpha + \cos\beta = b$, show that

$\cos(\alpha + \beta) = \frac{b^2 - a^2}{b^2 + a^2}$

124. If $\sin\alpha = \frac{4}{5}$ and $\cos\beta = \frac{5}{13}$, prove that $\cos\frac{\alpha - \beta}{2} = \frac{8}{\sqrt{65}}$

125. Show thet:

$3(\sin x - \cos x) + 6(\sin x + \cos)^2 + 4(\sin^6 x + \cos^6 x) = 13$

126. If $\cos A + \sin B = m$ and $\sin A + \cos B = n$, prove that $2\sin(A + B) = m^2 + n^2 - 2$.

127. The angle of a quadrilateral are in A.P. and the greatest angle is 120°. Express the angles in radians.

128. If $\sin x + \sin\cos x = m$, then prove that $\sin^6 x + \cos^6 x = \frac{4 - 3(m^2 - 1)^2}{4}$, where $m^2 \leq 2$

129. Prove that:

$\cos^3 2x + 3\cos 2x = 4(\cos^6 x - \sin^6 x)$

130. Prove that:

$\cos 3A + \cos 5A + \cos 7A + \cos 15A = 4\cos 4A \cos 5A \cos 6A$

131. Prove the following identities:

$\frac{\tan^3 x}{1 + \tan^2 x} + \frac{\cot^3 x}{1 + \cot^2 x} = \frac{1 - 2\sin^2 x \cos^2 x}{\sin x \cos x}$

132. If $\sin 2A = \lambda \sin 2B$, prove that:

$\frac{\tan(A + B)}{\tan(A - B)} = \frac{\lambda + 1}{\lambda - 1}$

133. If $2\tan\alpha = 3\tan\beta$, prove that $\tan(\alpha - \beta) = \frac{\sin 2\beta}{5 - \cos 2\beta}$

134. Solve the following equation:

$\sin^2 x - \cos x = \frac{1}{4}$

135. If $m\sin\theta = n\sin(\theta + 2\alpha)$, then prove that $\tan(\theta + \alpha)\cot\alpha = \frac{m + n}{m - n}$

[**Hint:** Express $\frac{\sin(\theta+2\alpha)}{\sin\theta}=\frac{m}{n}$ and apply componendo and dividendo]

136. If $2\tan\frac{\alpha}{2}=\tan\frac{\beta}{2}$, prove that $\cos\alpha=\frac{3+5\cos\beta}{5+3\cos\beta}$

137. $\sin^3 x+\sin^3\left(\frac{2\pi}{3}+x\right)+\sin^3\left(\frac{4\pi}{3}+x\right)=-\frac{3}{4}\sin 3x$

138. If $\frac{2\sin\alpha}{1+\cos\alpha+\sin\alpha}=y$, then prove that $\frac{1-\cos\alpha+\sin\alpha}{1+\sin\alpha}$ is also equal to y.

$\left[\text{Hint: Express } \frac{1-\cos\alpha+\sin\alpha}{1+\sin\alpha}=\frac{1-\cos\alpha+\sin\alpha}{1+\sin\alpha}\cdot\frac{1+\cos\alpha+\sin\alpha}{1+\cos\alpha+\sin\alpha}\right]$

139. Solve the following equations:

$\sqrt{3}\cos x+\sin x=1$

140. Prove the following identities:

$(1+\tan\alpha\tan\beta)^2+(\tan\alpha-\tan\beta)^2=\sec^2\alpha\sec^2\beta$

141. Find the value of the expression

$3[\sin^4\left(\frac{3\pi}{2}-\alpha\right)+\sin^4(3\pi+\alpha)]-2[\sin^6\left(\frac{\pi}{2}+\alpha\right)+\sin^6(5\pi-\alpha)]$

142. If $\cos\theta+\tan\theta=2\text{cosec}\theta$, then find the general value of θ.

143. If $y\sin\phi=x\sin(2\theta+\phi)$, prove that $(x+y)\cot(\theta+\phi)=(y-x)\cot\theta$

144. If $\cos(\theta+\phi)=m\cos(\theta-\phi)$, then prove that $\tan\theta=\frac{1-m}{1+m}\cot\phi$.

[**Hint:** Express $\frac{\cos(\theta+\phi)}{\cos(\theta-\phi)}=\frac{m}{1}$ and apply Componendo and Dividendo]

145. Prove that:

$\sin 3A+\sin 2A-\sin A=4\sin A\cos\frac{A}{2}\cos\frac{3A}{2}$

146. If $\sec(x+\alpha)+\sec(x-\alpha)=2\sec x$, prove that $\cos x-\pm\sqrt{2}\cos\frac{\alpha}{2}$

147. $\frac{\sqrt{\sin A}-\sqrt{\sin B}}{\sqrt{\sin A}+\sqrt{\sin B}}=\frac{a+b-2\sqrt{ab}}{a-b}$

148. Prove that:

$\frac{1}{\sin(x-b)\sin(x-b)}=\frac{\cot(x-b)-\cot(x-b)}{\sin(a-b)}$

149. Solve the following equations:

$\cos x\cos 2x\cos 3x=\frac{1}{4}$

150. If $\tan\theta=\frac{\sin\alpha-\cos\alpha}{\sin\alpha+\cos\alpha}$, then show that $\sin\alpha+\cos\alpha=\sqrt{2}\cos\theta$.

[**Hint:** Express $\tan\theta=\tan(\alpha-\frac{\pi}{4})\theta=\alpha-\frac{\pi}{4}$]

151. Prove that:

$\cos 40^\circ\cos 80^\circ\cos 160=-\frac{1}{8}$

152. Prove that:

$\sin 20^\circ\sin 40^\circ\sin 60^\circ\sin 80^\circ=\frac{3}{16}$

153. Solve the following equations:

$\sin x+\cos x=1$

154. If $\tan x = \frac{\sin\alpha - \cos\alpha}{\sin\alpha + \cos\alpha}$, then show that $\sin\alpha + \cos\alpha = \sqrt{2}\cos x$.

155. In any $\triangle ABC$, if a^2, b^2, c^2 are in A.P., prove that $\cot A, \cot B$ and $\cot C$ are also in A.P.

156. If $a\cos 2\theta + b\sin 2\theta = c$ has α and β as its roots, then prove that $\tan\alpha + \tan\beta = \frac{2b}{a+b}$.

[**Hint:** Use the identities $\cos 2\theta = \frac{1-\tan^2\theta}{1+\tan^2\theta}$ and $\sin 2\theta = \frac{2\tan\theta}{1+\tan^2\theta}$].

157. Prove the following identities:

$\frac{1-\sin x\cos x}{\cos x(\sec x - \operatorname{cosec} x)} \cdot \frac{\sin^2 x - \cos^2 x}{\sin^3 x \cos^3 x} = \sin x$

158. A railway train is travelling on a circular curve of 1500 metres radius at the rate of 66km/ hr. Through what angle has it turned in 10 seconds?

159. If $m\sin\theta = n\sin(\theta + 2\alpha)$, prove that $\tan(\theta+\alpha)\cot\alpha = \frac{m+n}{m-n}$.

160. Prove that:

$\cot\frac{\pi}{8} = \sqrt{2} + 1$

161. Prove that:

$\tan 20^\circ \tan 30^\circ \tan 40^\circ \tan 80^\circ = 1$

162. Prove that:

$\cos 6^\circ \cos 42^\circ \cos 66^\circ \cos 78^\circ = \frac{1}{16}$

163. Prove that:

$\cos 10^\circ \cos 30^\circ \cos 50^\circ \cos 70^\circ = \frac{3}{16}$

164. Show that:

$\sin 25^\circ \cos 115^\circ = \frac{1}{2}(\sin 140^\circ - 1)$

165. If $\cos\alpha + \cos\beta = 0 = \sin\alpha + \sin\beta$, then prove that $\cos 2\alpha + \cos 2\beta = -2\cos(\alpha+\beta)$.

[**Hint:** $(\cos\alpha + \cos\beta)^2 - (\sin\alpha + \sin\beta)^2 = 0$]

166. Prove that

$\cos\frac{\pi}{65}\cos\frac{2\pi}{65}\cos\frac{4\pi}{65}\cos\frac{8\pi}{65}\cos\frac{16\pi}{65}\cos\frac{32\pi}{65} = \frac{1}{64}$

167. Prove that

$\cos\frac{2\pi}{15}\cos\frac{4\pi}{15}\cos\frac{8\pi}{15}\cos\frac{16\pi}{15} = \frac{1}{16}$

168. If $\cos x - \sin x = a^3, \sec x - \cos x = b^3$, than proved that $a^2b^2(a^2 + b^2) = 1$.

169. Prove that:

$\cos 20^\circ \cos 40^\circ \cos 80^\circ = \frac{1}{8}$

170. Prove that:

$\frac{1}{\cos(x-b)\cos(x-b)} = \frac{\tan(x-a) - \tan(x-b)}{\sin(a-b)}$

171. If $x = \sec\phi - \tan\phi$ and $y = \operatorname{cosec}\phi + \cot\phi$ then show that $xy + x - y + 1 = 0$

[**Hint:** Find xy + 1 and then show that x - y = -(xy + 1)]

172. Prove that:

$\sin 10^\circ \sin 50^\circ \sin 60^\circ \sin 70^\circ = \frac{\sqrt{3}}{16}$

173. Find the distance from the eye at which a coin of 2cm diameter should be held so as to conceal the full moon whose angular diameter is 31'.

174. Prove that:

$\tan 20^\circ \tan 40^\circ \tan 60^\circ \tan 80^\circ = 3$

175. Prove that:

$\sin A + \sin 2A + \sin 4A + \sin 5A = 4 \cos \frac{A}{2} \cos \frac{2A}{2} \cos 4A$

176. Prove that:

$(\cos x - \cos y)^2 + (\sin x - \sin y)^2 = 4 \sin^2 \frac{x-y}{2}$

177. If $\sin x + \sin \cos x = m$, then prove that $\sin^6 x + \cos^6 x = \frac{4-3(m^2-1)^2}{4}$, where $m^2 \leq 2$

178. Prove the following identities:

$(1 + \tan \alpha \tan \beta)^2 + (\tan \alpha - \tan \beta)^2 = \sec^2 \alpha \sec^2 \beta$

179. If $a = \sec x - \tan x$ and $b = \operatorname{cosec} x + \cot x$, then show that $ab + a - b + 1 = 0$.

180. If $\sin \alpha = \frac{4}{5}$ and $\cos \beta = \frac{5}{13}$, prove that $\cos \frac{\alpha - \beta}{2} = \frac{8}{\sqrt{65}}$

181. Show thet:

$3(\sin x - \cos x) + 6(\sin x + \cos)^2 + 4(\sin^6 x + \cos^6 x) = 13$

182. If $\sin \alpha + \sin \beta = a$ and $\cos \alpha + \cos \beta = b$ prove that

$\sin(\alpha + \beta) = \frac{2ab}{a^2 + b^2}$

183. If $2 \tan \alpha = 3 \tan \beta$, prove that $\tan(\alpha - \beta) = \frac{\sin 2\beta}{5 - \cos 2\beta}$

184. Prove that:

$\cos \frac{\pi}{15} \cos \frac{2\pi}{15} \cos \frac{4\pi}{15} \cos \frac{7\pi}{15} = \frac{1}{16}$

185. If $\sec(x + \alpha) + \sec(x - \alpha) = 2 \sec x$, prove that $\cos x - \pm \sqrt{2} \cos \frac{\alpha}{2}$

186. Prove that:

$\sin 6 \circ \sin 42^\circ \sin 66^\circ \sin 78^\circ = \frac{1}{16}$

187. Prove that:

$\tan 82 \frac{1^\circ}{2} = (\sqrt{3} + \sqrt{2})(\sqrt{2} + 1) = \sqrt{2} + \sqrt{3} + \sqrt{4} + \sqrt{6}$

188. Prove that:

$\cos 6^\circ \cos 42^\circ \cos 66^\circ \cos 78^\circ = \frac{1}{16}$

189. Prove that

$\cos \frac{\pi}{65} \cos \frac{2\pi}{65} \cos \frac{4\pi}{65} \cos \frac{8\pi}{65} \cos \frac{16\pi}{65} \cos \frac{32\pi}{65} = \frac{1}{64}$

190. Prove that:

$\tan 20^\circ \tan 40^\circ \tan 60^\circ \tan 80^\circ = 3$

191. If θ lies in the first quadrant and $\cos\theta = \frac{8}{17}$, then find the value of $\cos(30^\circ + \theta) + \cos(45^\circ - \theta) + \cos(120^\circ - \theta)$.

192. If $\tan\theta + \sin\theta = m$ and $\tan\theta - \sin\theta = n$, then prove that $m^2 - n^2 = 4\sin\theta\tan\theta$

193. If $\sin(\theta + \alpha) = a$ and $\sin(\theta + \beta) = b$, then prove that $\cos 2(\alpha - \beta) - 4ab\cos(\alpha - \beta) = 1 - 2a^2 - 2b^2$
[**Hint:** Express $\cos(\alpha - \beta) = \cos((\theta + \alpha) - (\theta + \beta))$]

194. If $\cos(\alpha + \beta) = \frac{4}{5}$ and $\sin(\alpha - \beta) = \frac{5}{13}$, where α lie between 0 and $\frac{\pi}{4}$, find the value of $\tan 2\alpha$
[**Hint:** Express $\tan 2\alpha$ as $\tan(\alpha + \beta + \alpha - \beta)$]

195. If $\tan x = \frac{b}{a}$, then find the value of $\sqrt{\frac{a+b}{a-b}} + \sqrt{\frac{a-b}{a+b}}$

196. If $m\sin\theta = n\sin(\theta + 2\alpha)$, then prove that $\tan(\theta + \alpha)\cot\alpha = \frac{m+n}{m-n}$
[**Hint:** Express $\frac{\sin(\theta+2\alpha)}{\sin\theta} = \frac{m}{n}$ and apply componendo and dividendo]

197. If $\frac{2\sin\alpha}{1+\cos\alpha+\sin\alpha} = y$, then prove that $\frac{1-\cos\alpha+\sin\alpha}{1+\sin\alpha}$ is also equal to y.
$\left[\text{Hint: Express } \frac{1-\cos\alpha+\sin\alpha}{1+\sin\alpha} = \frac{1-\cos\alpha+\sin\alpha}{1+\sin\alpha} \cdot \frac{1+\cos\alpha+\sin\alpha}{1+\cos\alpha+\sin\alpha}\right]$

198. Find the value of the expression
$3[\sin^4\left(\frac{3\pi}{2} - \alpha\right) + \sin^4(3\pi + \alpha)] - 2[\sin^6\left(\frac{\pi}{2} + \alpha\right) + \sin^6(5\pi - \alpha)]$

199. If $\cos(\theta + \phi) = m\cos(\theta - \phi)$, then prove that $\tan\theta = \frac{1-m}{1+m}\cot\phi$.
[**Hint:** Express $\frac{\cos(\theta+\phi)}{\cos(\theta-\phi)} = \frac{m}{1}$ and apply Componendo and Dividendo]

200. If $a\cos 2\theta + b\sin 2\theta = c$ has α and β as its roots, then prove that $\tan\alpha + \tan\beta = \frac{2b}{a+b}$.
[**Hint:** Use the identities $\cos 2\theta = \frac{1-\tan^2\theta}{1+\tan^2\theta}$ and $\sin 2\theta = \frac{2\tan\theta}{1+\tan^2\theta}$].

----- the journey of thousands miles begins with a single step -----