Multiple Choice Questions

[This Topic was introduced in MHT-CET from May – 2013]

[MHT-CET 2022] (online shift)

1. The number of values of x in the interval $[0, 3\pi]$ satisfying $2\sin^2 x + 5\sin x - 3 = 0$ is

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

2. The value of $\cos^{-1}\left(\tan\left(\frac{7\pi}{4}\right)\right)$ is

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

3. $2\tan^{-1}\left(\frac{1}{3}\right) + \cos^{-1}\left(\frac{3}{5}\right) =$

a) $\frac{\pi}{2}$ b) $\tan^{-1}\left(\frac{5}{4}\right)$ c) 0 d) $\frac{\pi}{4}$

4. With reference to the principal values

If $\sin^{-1}x + \sin^{-1}y + \sin^{-1}z = \frac{3\pi}{2}$, then $x^{100} + y^{100} + z^{100} = ...$

a) 3 b) 2 c) 1 d) 6

5. The principal solutions of $\tan 3\theta = -1$ are

a) $\left\{\frac{\pi}{4}, \frac{\pi}{12}\right\}$ b) $\left(\frac{\pi}{4}, \frac{7\pi}{12}, \frac{11\pi}{12}, \frac{5\pi}{4}, \frac{19\pi}{12}, \frac{23\pi}{12}\right)$

c) $\left(\frac{\pi}{4}, \frac{\pi}{12}, \frac{13\pi}{12}, \frac{7\pi}{4}, \frac{19\pi}{4}, \frac{23\pi}{12}\right)$ d) $\left(\frac{\pi}{4}, \frac{7\pi}{12}, \frac{11\pi}{12}, \frac{\pi}{16}, \frac{19\pi}{4}, \frac{23\pi}{24}\right)$

6. In a triangle ABC, with usual notations $\angle A = 60°$. Then $\left(1+\frac{a}{c}+\frac{b}{c}\right)\left(1+\frac{c}{a}-\frac{a}{b}\right) = ..$

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

7. With usual notations in ΔABC, if $a^2 + b^2 - c^2 = ab$, then measurement of angle C is

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

8. The value of $\tan^{-1}\left(\frac{1}{3}\right) + \tan^{-1}\left(\frac{1}{5}\right) + \tan^{-1}\left(\frac{1}{7}\right) + \tan^{-1}\left(\frac{1}{8}\right)$ is

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

9. If the cartesian co-ordinates of a point are $\left(\frac{-5\sqrt{3}}{2}, \frac{5}{2}\right)$ then its polar co-ordinates are,

a) $\left(5, \frac{13\pi}{18}\right)$ b) $\left(5, \frac{11\pi}{18}\right)$ c) $\left(5, \frac{2\pi}{3}\right)$ d) $\left(5, \frac{5\pi}{6}\right)$

10. The principal value of $\sin^{-1}\left(\sin\left(\frac{2\pi}{3}\right)\right)$ is

a) $\frac{5\pi}{3}$ b) $\frac{\pi}{3}$ c) $\frac{-2\pi}{3}$ d) $\frac{2\pi}{3}$

[MHT-CET 2021] (online shift)

11. With usual notations if the angles of a triangle are in the ratio 1 : 2 : 3 then their corresponding sides are in the ratio.

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

12. If $4\sin^{-1}x + 6\cos^{-1}x = 3\pi$, where $-1 \leq x \leq 1$ then $x =$

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

13. $\sin^{-1}[\sin(-600°)] + \cot^{-1}(-\sqrt{3}) =$

a) $\frac{\pi}{6}$ b) $\frac{\pi}{4}$ c) $\frac{\pi}{3}$ d) $\frac{7\pi}{6}$

14. $\cos^{-1}\left(\frac{4}{5}\right) + \cos^{-1}\left(\frac{12}{13}\right) =$

a) $\cos^{-1}\left(\frac{24}{25}\right)$ b) $\cos^{-1}\left(\frac{33}{65}\right)$ c) $\cos^{-1}\left(\frac{5}{13}\right)$ d) $\cos^{-1}\left(\frac{3}{5}\right)$

15. The principal solutions of $\sqrt{3}\sec x + 2 = 0$ are

a) $\frac{\pi}{6}, \frac{5\pi}{6}$ b) $\frac{5\pi}{6}, \frac{7\pi}{6}$ c) $\frac{\pi}{3}, \frac{2\pi}{3}$ d) $\frac{2\pi}{3}, \frac{4\pi}{3}$

16. If $\tan^{-1}\left(\frac{x-1}{x-2}\right) + \tan^{-1}\left(\frac{x+1}{x+2}\right) = \frac{\pi}{4}$, then the values of x are

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

17. The number of solutions of $\cos 2\theta = \sin\theta$ in $(0, 2\pi)$ is

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

18. If $\sin^{-1}\left(\frac{3}{5}\right) + \cos^{-1}\left(\frac{12}{13}\right) = \sin^{-1}\alpha$, then $\alpha =$

a) $\frac{56}{65}$ b) $\frac{61}{65}$ c) $\frac{63}{65}$ d) $\frac{62}{65}$

19. With usual notations, perimeter of a triangle ABC is 6 times the arithmetic mean of sines of its angles. If a = 1, then measure of angle A = ...

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

20. In ΔABC, with usual notations $2ab \sin \frac{1}{2}(A + B - C) =$

a) $a^2 - b^2 - c^2$ b) $a^2 + b^2 - c^2$ c) $a^2 + b^2 + c^2$ d) $a^2 - b^2 + c^2$

[MHT-CET 2020] (online shift)

21. With usual notations, in ΔABC, if $a = 2$, $b = 3$, $c = 5$ and $\frac{\cos A}{a} + \frac{\cos B}{b} + \frac{\cos C}{c} = \frac{K+7}{30}$,

then K = ?

a) 6 b) 16 c) 12 d) 17

22. If $3 \sin^2 x - 8 \sin x + 4 = 0$, $x \in \left(\frac{\pi}{2}, \pi\right)$ then $\tan x =$

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

23. The principal solutions of $\cos 2x = \frac{-1}{2}$ are

a) $x = \frac{\pi}{3}, x = \frac{7\pi}{6}$ b) $x = \frac{\pi}{3}, x = \frac{2\pi}{3}$ c) $x = \frac{-\pi}{3}, x = \frac{5\pi}{6}$ d) $x = \frac{-2\pi}{3}, x = \frac{4\pi}{3}$

24. If $\tan^{-1}x + \tan^{-1}y + \tan^{-1}z = \frac{\pi}{2}$, $x, y, z < 1$, then the value of $xy + yz + zx =$

a) 1 b) $-xyz$ c) xyz d) 0

25. If A, B, C are the angles of ΔABC, then with usual notations, $\frac{c^2 - a^2 + b^2}{a^2 - b^2 + c^2} =$

a) $\frac{\sin B}{\sin A}$ b) $\frac{\cos B}{\cos A}$ c) $\frac{\cot B}{\cot A}$ d) $\frac{\tan B}{\tan A}$

26. If $2 \sin^2 x + 7\cos x = 5$, then permissible value of $\cos x$ is

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

27. With usual notation in ΔABC, if $b \cos^2 \frac{C}{2} + c \cos^2 \frac{B}{2} = \frac{3a}{2}$, then

a) a, b, c are in A. P. b) b, a, c are in A. P.

c) a, b, c are in G. P. d) b, a, c are in G. P.

28. With usual notation in ΔABC, if $C = 90°$, then $\tan^{-1}\left(\frac{a}{b+c}\right) + \tan^{-1}\left(\frac{b}{c+a}\right) =$

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

39. The value of the expression $2\sec^{-1} 2 + \sin^{-1}\left(\frac{1}{2}\right)$ is

a) $\frac{7\pi}{6}$ b) $\frac{\pi}{6}$ c) 1 d) $\frac{5\pi}{6}$

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

a) 0 b) $\frac{\pi}{3}$ c) $\frac{\pi}{6}$ d) π

[MHT-CET 2018]

41. If A, B, C are the angles of ΔABC, then cot A. cot B + cot B. cot C + cot C. cot A =

a) 0 b) 1 c) 2 d) – 1

42. In ΔABC, with usual notations, if a, b, c are in A. P. Then $a\cos^2\left(\frac{C}{2}\right) + c\cos^2\left(\frac{A}{2}\right) =$

a) $\frac{3a}{2}$ b) $\frac{3c}{2}$ c) $\frac{3b}{2}$ d) $\frac{3abc}{2}$

43. The number of solutions of $\sin x + \sin 3x + \sin 5x = 0$ in the interval $\left[\frac{\pi}{2}, \frac{3\pi}{2}\right]$ is

a) 2 b) 3 c) 4 d) 5

44. If $\tan^{-1} 2x + \tan^{-1} 3x = \frac{\pi}{4}$, then $x =$

a) – 1 b) $\frac{1}{3}$ c) $\frac{1}{6}$ d) $\frac{1}{2}$

[MHT-CET 2017]

45. The number of principal solutions of $\tan 2\theta = 1$ is

a) one b) two c) three d) four

46. In ΔABC, if $\sin^2 A + \sin^2 B = \sin^2 C$ and $l(AB) = 10$, then the maximum value of the area of triangle ABC is

a) 50 b) $10\sqrt{2}$ c) 25 d) $25\sqrt{2}$

47. The value of $\cos^{-1}\left[\cos\left(\frac{\pi}{2}\right)\right] + \cos^{-1}\left[\sin\left(\frac{2\pi}{3}\right)\right]$ is

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

[MHT-CET 2013]

58. If $\frac{1}{6}\sin\theta$, $\cos\theta$, $\tan\theta$ are in G.P. then $\theta =$

a) $2n\pi \pm \frac{\pi}{3}$ b) $2n\pi \pm \frac{\pi}{6}$ c) $n\pi + (-1)^n \frac{\pi}{3}$ d) $n\pi + \frac{\pi}{3}$

59. If $a = 16$, $b = 24$, $c = 20$ then $\cos\left(\frac{B}{2}\right) =$

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

60. The value of $\cos^{-1}\left(\cos\frac{7\pi}{6}\right) =$

a) $\frac{7\pi}{6}$ b) $\frac{5\pi}{6}$ c) $\frac{\pi}{3}$ d) $\frac{\pi}{6}$

[MHT-CET 2023]

61. The solution set of $8\cos^2\theta + 14\cos\theta + 5 = 0$ in the interval $[0, 2\pi]$ is

a) $\left\{\frac{\pi}{3}, \frac{2\pi}{3}\right\}$ b) $\left\{\frac{\pi}{3}, \frac{4\pi}{3}\right\}$ c) $\left\{\frac{2\pi}{3}, \frac{4\pi}{3}\right\}$ d) $\left\{\frac{2\pi}{3}, \frac{5\pi}{3}\right\}$

62. The solutions of $\sin x + \sin 5x = \sin 3x$ in $\left(0, \frac{\pi}{2}\right)$ are

a) $\frac{\pi}{6}, \frac{\pi}{3}$ b) $\frac{\pi}{8}, \frac{\pi}{16}$ c) $\frac{\pi}{4}, \frac{\pi}{10}$ d) $\frac{\pi}{4}, \frac{\pi}{12}$

63. The number of solutions in $[0, 2\pi]$ of the equation $16^{\sin^2 x} + 16^{\cos^2 x} = 10$ is

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

64. If the general solution of the equation $\frac{\tan 3x - 1}{\tan 3x + 1} = \sqrt{3}$ is $x = \frac{n\pi}{p} + \frac{7\pi}{q}$, $n, p, q \in Z$, then $\frac{p}{q}$ =

a) 3 b) 12 c) 36 d) $\frac{1}{12}$

65. If the general solution of $\cos^2 x - 2\sin x + \frac{1}{4} = 0$ is $x = \frac{n\pi}{p} + (-1)^n \frac{\pi}{q}$, $n, p, q \in Z$, then $p + q$ =

a) -7 b) 1 c) 6 d) 7

66. The general solution of $3\sec^2 x = 2\,\text{cosec}\, x$ is

a) $n\pi + (-1)^n \frac{\pi}{6}, n \in Z$

b) $n\pi + (-1)^n \frac{\pi}{3}, n \in Z$

c) $2n\pi + (-1)^n \frac{\pi}{12}, n \in Z$

d) $n\pi + \frac{\pi}{4}, n \in Z$

80. The principal solution of $\sin^{-1}\left(\sin\left(\frac{3\pi}{4}\right)\right)$ is

a) $-\frac{\pi}{4}$ b) $\frac{\pi}{4}$ c) $\frac{3\pi}{4}$ d) $\frac{5\pi}{4}$

81. $\tan^{-1}(1)+\cos^{-1}\left(-\frac{1}{2}\right)+\sin^{-1}\left(-\frac{1}{2}\right)=$

a) $\frac{\pi}{2}$ b) $\frac{2\pi}{3}$ c) $\frac{3\pi}{4}$ d) $\frac{5\pi}{6}$

82. The value of $\sec^2(\tan^{-1}2)+\text{cosec}^2(\cot^{-1}3)$ is

a) 2 b) 4 c) 9 d) 15

83. The value of $\sin(\cot^{-1}x)$ is

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

84. If $x=\text{cosec}\left(\tan^{-1}\left(\cos\left(\cot^{-1}\left(\sec\left(\sin^{-1}a\right)\right)\right)\right)\right)$, $a\in[0,1]$, then

a) $x^2-a^2=2$ b) $x^2+a^2=2$ c) $x^2-a^2=3$ d) $x^2+a^2=3$

85. If $\alpha=3\sin^{-1}\left(\frac{6}{11}\right)$ and $\beta=3\cos^{-1}\left(\frac{4}{9}\right)$, where the inverse trigonometric functions take only the principal values, then

a) $\cos\alpha>0$ b) $\cos(\alpha+\beta)<0$ c) $\sin\beta>0$ d) $\cos(\alpha+\beta)>0$

86. If $\cos^{-1}\sqrt{p}+\cos^{-1}\sqrt{1-p}+\cos^{-1}\sqrt{1-q}=\frac{3\pi}{4}$, then $q=$

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

87. If $\cos^{-1}x+\cos^{-1}y+\cos^{-1}z=3\pi$, then $x^{2025}+y^{2026}+z^{2027}=$

a) -1 b) 0 c) 1 d) 3

88. If $\sin^{-1}x+\cos^{-1}y=\frac{3\pi}{10}$, then $\cos^{-1}x+\sin^{-1}y=$

a) $\frac{\pi}{10}$ b) $\frac{3\pi}{10}$ c) $\frac{7\pi}{10}$ d) $\frac{9\pi}{10}$

89. If $(\tan^{-1}x)^2+(\cot^{-1}x)^2=\frac{5\pi^2}{8}$, then $x=$

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

90. If $\tan^{-1}a+\tan^{-1}b+\tan^{-1}c=\pi$, then which of the following is true ?]

a) $abc=1$ b) $a+b+c=1$ c) $a+b+c=abc$ d) $a+b-c=\frac{ab}{c}$

91. If $x>0$ and $\tan^{-1}\left(\frac{1-x}{1+x}\right)=\frac{1}{2}\tan^{-1}x$, then $x=$

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

92. If $\sin(\cot^{-1}x)=\cos(\tan^{-1}(1+x))$, then $x=$]

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