TOPICS COVERED

TRIGONOMETRIC RATIOS AND IDENTITIES, TRIGONOMETRIC EQUATIONS INVERSE TRIGONOMETRIC FUNCTIONS, PROPERTIES & SOLUTIONS OF TRIANGLE HEIGHTS AND DISTANCES

1. Let n be a positive integer such that $\sin\frac{\pi}{2n}+\cos\frac{\pi}{2n}=\frac{\sqrt{n}}{2}$. Then

(1) $6\le n\le 8$ (2) $4<n\le 8$

(3) $4\le n<8$ (4) $4<n<8$

2. For $0<\phi<\pi/2$, if $x=\sum_{n=0}^{\infty}\cos^{2n}\phi$, $y=\sum_{n=0}^{\infty}\sin^{2n}\phi$, $z=\sum_{n=0}^{\infty}\cos^{2n}\phi\,\sin^{2n}\phi$, then

(1) xyz = xz + y (2) xyz = xy + z

(3) xyz = yz + x (4) None of these

3. In a triangle $PQR, \angle R=\frac{\pi}{2}$ If $\tan\left(\frac{P}{2}\right)$ and $\tan\left(\frac{Q}{2}\right)$ are the roots of the equation $ax^2+bx+c=0\ (a\neq 0)$, then

(1) a + b = c (2) b + c = a

(3) a + c = b (4) b = c

4. If $\alpha\in\left(0,\frac{\pi}{2}\right)$, then $\sqrt{x^2+x}+\frac{\tan^2\alpha}{\sqrt{x^2+x}}$ is always greater than or equal to

(1) $2\tan\alpha$ (2) 1

(3) 2 (4) $\sec^2\alpha$

5. The lengths of the sides of a triangle are $\alpha-\beta,\alpha+\beta$ and $\sqrt{3\alpha^2+\beta^2},(\alpha>\beta>0)$. Its largest angle is

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

(3) $\frac{2\pi}{3}$ (4) $\frac{5\pi}{6}$

6. The solution set of $(2cis\,x-1)(3+2\cos x)=0$ in the interval $0\le x\le 2\pi$ is

(1) $\{\pi/3\}$ (2) $\{\pi/3, 5\pi/3\}$

(3) $\{\pi/3, 5\pi/3, \cos^{-1}(-3/2)\}$

(4) None of these

7. The roots of the equation $\cos^7 x+\sin^4 x=1$ in the interval $(-\pi,\pi)$

(1) $\left\{-\frac{\pi}{2},0,\frac{\pi}{2}\right\}$ (2) $\left\{-\frac{\pi}{2},\frac{\pi}{2}\right\}$

(3) $\left\{\frac{\pi}{2}\right\}$ (4) None of these

8. The solution set of the system of equation : $x+y=\frac{2\pi}{3}, \cos x+\cos y=\frac{3}{2}$, where x and y are real in

(1) a finite non-empty set

(2) nullset

(3) ∞ (4) None of these

9. $\sin^{-1}(\sin x)$ is a periodic function period

(1) π (2) 2π

(3) 4π (4) None of these

10. $\sin^{-1}x>\cos^{-1}x$ hold for

(1) all values of x (2) $x\in\left(0,\frac{1}{\sqrt{2}}\right)$

(3) $x\in\left(\frac{1}{\sqrt{2}},1\right)$ (4) $x=0.25$

11. $\cos^{-1}\left[\cos\left(-\frac{17}{15}\pi\right)\right]$ is equal to

(1) $-\frac{17\pi}{15}$ (2) $\frac{17\pi}{15}$

(3) $\frac{2\pi}{15}$ (4) $\frac{13\pi}{15}$

12. If $\tan^{-1}x+\cos^{-1}\frac{y}{\sqrt{(1+y^2)}}=\sin^{-1}\frac{3}{\sqrt{10}}$ and both x and y are positive and integral, then x and y =

(1) (1, 2) and (2, 7) (2) (1, 2) and (1, 7)
(3) (1, 7) and (2, 7) (4) (1, 7) and (2, 1)

13. Value of $\cos^{-1}\left(\cos\frac{5\pi}{3}\right)+\sin^{-1}\left(\sin\frac{5\pi}{3}\right)$ is

(1) 0 (2) $\frac{\pi}{2}$
(3) $\frac{2\pi}{3}$ (4) $\frac{10\pi}{3}$

14. If $\sin^{-1}\left(x-\frac{x^2}{2}+\frac{x^3}{4}-.....\right)+\cos^{-1}\left(x^2-\frac{x^4}{2}+\frac{x^6}{4}-.....\right)$ $=\frac{\pi}{2}, 0<|x|<\sqrt{2}$, then x is equal to

(1) 1/2 (2) 1
(3) –1/2 (4) –1

15. Trigonometrical equation $\sin^{-1}x=2\sin^{-1}a$ has solution for

(1) $|a|\geq\frac{1}{\sqrt{2}}$ (2) $\frac{1}{2}<|a|\frac{1}{\sqrt{2}}$
(3) $a\,\forall\, a\in R$ (4) $|a|<\frac{1}{2}$

16. In $\Delta ABC, 2\left(bc\cos A+ca\cos B+ab\cos C\right)=$

(1) xy (2) $xy\sqrt{3}$
(3) $3xy$ (4) $2xy$

17. If $\cot\frac{A}{2}=\frac{b+c}{a}$, then DABC is

(1) Isosceles (2) Equilateral
(3) Right angled (4) none of these

18. The value of $\frac{1}{r_1^2}+\frac{1}{r_2^2}+\frac{1}{r_3^2}+\frac{1}{r^2}$ is

(1) 0 (2) $\frac{a^2+b^2+c^2}{\Delta^2}$
(3) $\frac{\Delta^2}{a^2+b^2+c^2}$ (4) $\frac{a^2+b^2+c^2}{\Delta}$

19. In a triangle ABC, if $\tan\frac{B-C}{2}=x\cot\frac{A}{2}$, then x is equal to

(1) $\frac{c-a}{c+a}$ (2) $\frac{a-b}{a+b}$
(3) $\frac{b-c}{b+c}$ (4) None of these

20. If the angle of a triangle are in the tario 4 : 1 : 1, then the ratio of the longest side to the perimeter is

(1) $\sqrt{3}:\left(2+\sqrt{3}\right)$ (2) 1 : 6
(3) $1:\left(2+\sqrt{3}\right)$ (4) 2 : 3

21. The sum of the radii of the incircle and circumcircle of a regular polygon of n sides of length a is equal to

(1) $\frac{a}{4}\cot\frac{\pi}{2n}$ (2) $a\cot\frac{\pi}{n}$
(3) $\frac{a}{2}\cot\frac{\pi}{2n}$ (4) $a\cot\frac{\pi}{2n}$

22. In a triangle ABC, if a $\cos^2\frac{C}{2}+c\cos^2\frac{A}{2}=\frac{3b}{2}$, then a, b,c are in

(1) AP (2) GP
(3) HP (4) None of these

23. The sides of triangle are in $\sin\alpha,\cos\alpha$ and $\sqrt{1+\sin\alpha\cos\alpha}$ for some $0<\alpha<\pi/2$. Then the greatest angle of the triangle is

(1) 120° (2) 90°
(3) 60° (4) 150°

24. In a triangle ABC, let $\angle C=\frac{\pi}{2}$. If r is the inradius and R is the circumradius of the triangle ABC, then $2\left(r+R\right)$ equals

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

25. If in a ΔABC, the altitudes from the vertices A, B, C on opposite sides are in H.P., then sin A, sin B, sin C are in

(1) H.P.
(2) Arithmetic - Geometric Progession
(3) A.P. (4) G.P.

26. Among two towers T and R, the height of T is 72 metres which is less than that of R. If the angle of depression of the top of T from the top of R is 30° and its angle of elecation from the foot of R is 45, then the height of R is

(1) $72\sqrt{3}\,m$ (2) $72\left(1+\sqrt{3}\right)m$

(3) $72\left(1+\frac{1}{\sqrt{3}}\right)m$ (4) $72\left(1-\frac{1}{\sqrt{3}}\right)m$

27. The angle of elevation of the top of a tower from a point 20m away from its base in s45°. The height of the tower is

(1) 10 m (2) 20 m

(3) 40 m (4) $20\sqrt{3}\,m$

28. The relative positions of four ships A,B,C,D in a sea are as follows : B is on line segment AC, B is north to D and D is just west to C, BD=2 km, If $\angle BDA=40^0, \angle BCD=25^0$, then distance between A and D is (here $\sin 25^0=0.423$)

(1) 3.28 km (2) 3.46 km

(3) 4.28 km (4) 4.83 km

29. The upper 3/4th partion of a vertical pole students an angle $\tan^{-1}3/5$ at point in the horizontal plane through its foot and at a distance 40 m from the foot. A possible height of the vertical pole is

(1) 80 m (2) 20 m

(3) 40 m (4) 60 m

30. A person standing on the bank of a river observes that the angle of elavation of the top of a tree on the opposite bank of the rive is 60° and when he retires 40 meters away from the tree the angle of elevation becomes 30°. The breadth of the river is

(1) 40 m (2) 30 m

(3) 20 m (4) 60 m