ST

LEVEL-I

1. If the bisector of angle A of ΔABC makes an angle θ with BC, then sinθ is equal to

(A) $\cos\left(\frac{B-C}{2}\right)$ (B) $\sin\left(\frac{B-C}{2}\right)$

(C) $\sin\left(B-\frac{A}{2}\right)$ (D) $\sin\left(C-\frac{A}{2}\right)$

2. If the radius of the circumcircle of an isosceles triangle ABC is equal to AB = AC then the angle A is

(A) $\pi/6$ (B) $\pi/3$

(C) $\pi/2$ (D) $2\pi/3$

3. In a triangle ABC, if $\frac{2\cos A}{a}+\frac{\cos B}{b}+\frac{2\cos C}{c}=\frac{a}{bc}+\frac{b}{ca}$, then the value of the angle A is

(A) 30^0 (B) 45^0

(C) 60^0 (D) 90^0

4. If A = 45^0, B = 75^0 then a + c$\sqrt{2}$ is equal to

(A) 2b (B) 3b

(C) $\sqrt{2}$ b (D) b

5. The sides of a triangle inscribed in a given circle subtend angle α,β and γ at the centre. The minimum value of the arithmetic mean of $\cos(\alpha + \pi/2)$, $\cos(\beta + \pi/2)$ and $\cos(\gamma + \pi/2)$ is equal to

(A) 0 (B) $1/\sqrt{2}$

(C) –1 (D) $-\sqrt{3}/2$

6. A regular polygon of nine sides, each of length 2, is inscribed in a circle. The radius of the circle is

(A) $\sec\frac{\pi}{9}$ (B) $\sin\frac{\pi}{9}$

(C) $\operatorname{cosec}\frac{\pi}{9}$ (D) $\tan\frac{\pi}{9}$

7. In an acute angled triangle ABC, the least value of secA + secB + secC is

(A) 6 (B)3

(B) 9 (D) 4

8. A circle is inscribed in an equilateral triangle of side a. The area of any square inscribed in the circle is

(A) $a^2/4$ (B) $a^2/6$

(C) $a^2/9$ (D) $2a^2/3$

9. If $3\sin^2A + 2\sin^2B = 1$ and $3\sin 2A - 2\sin 2B = 0$, where A and B are acute angles, then A + 2B is equal to
(A) $\pi/3$ (B) $\pi/4$
(C) $\pi/2$ (D) none of these.

10. If in a ΔABC, $\cos(A - C)\cos B + \cos 2B = 0$, then a^2, b^2, c^2 are in
(A) A.P. (B) G.P.
(C) H. P. (D) none of these

11. If tan(A+B), tanB, tan(B+C) are in A.P., then tanA, cotB, tanC are in
(A) A.P. (B) G.P.
(C) H.P. (D) none of these

12. If twice the square of the diameter of a circle is equal to the sum of the squares of the sides of the inscribed triangle ABC, then $\sin^2A + \sin^2B + \sin^2C$ is equal to
(A) 2 (B) 3
(C) 4 (D) 1

13. Consider a triangle ABC, with given $\angle A$ and side 'a'. If $bc = x^2$, then such a triangle would exist if, (x is a given positive real number) .
(A) $a < x \sin\frac{A}{2}$ (B) $a > 2x \sin\frac{A}{2}$
(C) $a < 2x \sin\frac{A}{2}$ (D) None of these .

14. If in ΔABC a, b, c are in geometric progression then,
(A) $\cot^2A$, $\cot^2B$, $\cot^2C$ are in G.P.
(B) cosec^2A, cosec^2B, cosec^2C are in A.P.
(C) cosec^2A, cosec^2B, cosec^2C are in G.P.
(D) none of these.

15. If in a Δ ABC, $8R^2 = a^2 + b^2 + c^2$, then the triangle is
(A) Equilateral (B) Right angled
(C) Isosceles (D) None of these

16. In a triangle ABC, angle B is greater than angle A, $B - A < \frac{2\pi}{3}$. If the values of A and B satisfy the equation $3\sin x - 4\sin^3 x - k = 0$ $(0 < k < 1)$, then angle C is equal to
(A) $\frac{\pi}{3}$ (B) $\frac{\pi}{6}$
(C) $\frac{2\pi}{3}$ (D) None of these

17. If in a triangle ABC, b + c = 4a. Then $\cot\frac{B}{2}\cot\frac{C}{2}$ is equal to

(A) $\frac{5}{3}$ (B) $\frac{3}{5}$

(C) $\frac{5}{8}$ (D) None of these

18. The ex-radai of a triangle r_1, r_2, r_3 are in Harmonic progression, then the sides a, b, c are in

(A) A.P (B) G.P

(C) H.P (D) none of these

19. In a ΔABC A = 30^0, B = 60^0, then a : b : c is

(A) 1 : 2 : 3 (B) 1 : $\sqrt{3}$: 2

(C) 1 : 2 : $\sqrt{3}$ (D) 1 : $\sqrt{2}$: 3

20. In a ΔABC, the value of a (cos B + cos C) + b (cos A + cos C) + c (cos A + cos B) is

(A) a + b (B) a + b + c

(C) b + c (D) b + c –a

21. In a triangle a = 13, b = 14, c = 15, r =

(A) 4 (B) 8

(C) 2 (D) 6

22. In a triangle ABC, If b + c = 3a, then the value of $\cot\frac{B}{2}\cot\frac{C}{2}$ is

(A) 1 (B) 2

(C) $\sqrt{3}$ (D) 3

23. In a triangle ABC, then 2ac sin $\frac{1}{2}$(A –B + C) is

(A) $a^2 + b^2 - c^2$ (B) $c^2 + a^2 - b^2$

(D) $b^2 - c^2 - a^2$ (D) $c^2 - a^2 - b^2$

24. The angle A of the triangle ABC, in which (a + b + c) (b + c –a) = 3bc is

(A) 30^0 (B) 45^0

(C) 60^0 (D) 120^0

25. In a triangle ABC, Let $\angle C = \frac{\pi}{2}$, if r is the inradius and R is the circumradius of the triangle, then 2 (r + R) is equal to

(A) a + b (B) b + c

(C) c + a (D) a + b + c

26. In a triangle ABC, $\frac{c+b}{c-b}.\tan\frac{A}{2}$ is equal to

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

(C) $\tan\left(A+\frac{B}{2}\right)$ (D) none of these

27. In a ΔABC, a = 2b and $|A - B| = \frac{\pi}{3}$, the measure of angle C ……………………………………..

28. In a ΔABC, the sides a, b and c are such that they are the roots of $x^3 - 11x^2 + 38x - 40 = 0$ then the value of $\frac{\cos A}{a}+\frac{\cos B}{b}+\frac{\cos C}{c}$ = ………………………………………

29. If AD, BE and CF are the medians of a ΔABC, then $(AD^2 + BE^2 + CF^2) : (BC^2 + CA^2 + AB^2)$ = ……………………………………………..

30. sin A, sin B, sin C are in A.P for the ΔABC then
(A) altitudes are in A.P (B) sides are in A.P
(C) altitudes are in H.P (D) medians are in A.P

31. In a triangle ABC, tan C< 0, then
(A) tan A . tan B < 1 (B) tan A . tan B > 1
(C) tan A + tan B + tan C < 0 (D) tan A + tan B + tan C > 0

32. If in a triangle ABC, b + c = 4a. Then $\cot\frac{B}{2}\cot\frac{C}{2}$ is equal to
(A) $\frac{5}{3}$ (B) $\frac{3}{5}$ (C) $\frac{5}{8}$ (D) None of these

33. If in a triangle ABC, $\cos A = \frac{\sin B}{\sin C}+\frac{\sin C}{\sin B}-\frac{\sin^2 A}{\sin B \sin C}$, then the triangle is
(A) right angled (B) isosceles (C) scalene (D) None of these

34. In a triangle, the lengths of the two larger sides are 10 and 9 respectively. If the angles are in A.P., then the length of third side can be
(A) $5-\sqrt{6}$ (B) 3
(C) 5 (D) $3\sqrt{3}$

35. In a ΔABC, maximum value of $c\cos(A - \theta) + a\cos(C + \theta)$, equals
(A) a (B) b
(C) c (D) $\sqrt{a^2+c^2}$

36. In a triangle ABC, a^2 ($\cos^2 B$ - $\cos^2 C$) + b^2 ($\cos^2 C$ – $\cos^2 A$) + c^2 ($\cos^2 A$- $\cos^2 B$) equals

(A) 0 (B) 1

(C) -1 (D) none of these

37. In a ΔABC, the angles A and B are two values of θ satisfying $\sqrt{3}\ \sin\theta + \cos\theta = \lambda$, $|\lambda| < 2$. Then $\angle C$ equals

(A) 60° (B) 90°

(C) 120° (D) none of these

38. If the ex-radii of a triangle ABC are in H.P., then the sides a, b, c are in

(A) A.P. (B) G.P.

(C) H.P. (D) None of these

LEVEL-II

1. The expression $\frac{(a+b+c)(b+c-a)(c+a-b)(a+b-c)}{4b^2c^2}$ is equal to
(A) $\cos^2 A$ (B) $\sin^2 A$
(C) cosA cosB cosC (D) None of these

2. The perimeter of a triangle ABC is 6 times the arithmetic mean of the sines of its angles. If the side a is 1, then the angle A is
(A) $\pi/6$ (B) $\pi/3$
(C) $\pi/2$ (D) π

3. If a^2, b^2,c^2 are in A.P , then cotA, cotB, cotC are in
(A) A.P (B) G.P
(C) H.P (D) None of these

4. The area of the circle and the regular polygon of n sides and of equal perimeter are in the ratio of
(A) $\tan(\pi/n) : \pi/n$ (B) $\cos(\pi/n) : \pi/n$
(C) $\sin(\pi/n) : \pi/n$ (D) $\cot(\pi/n) : \pi/n$

5. In a triangle ABC, $(a+b+c)(b+c-a) = \lambda bc$ if
(A) $\lambda < 0$ (B) $\lambda > 0$
(C) $0 < \lambda < 4$ (D) $\lambda > 4$

6. In a triangle ABC, AD is the altitude from A. Given b > c, C $=23^0$ and AD $= \frac{abc}{b^2-c^2}$ then $\angle$B is equal to
(A) 23^0 (B) 113^0
(C) 67^0 (D) 90^0

7. In any triangle ABC, $a^3\cos(B-C) + b^3\cos(C-A) + c^3\cos(A-B)$ is equal to
(A) 6abc (B) 9abc
(C) 3abc (D) None

8. In a triangle ABC, $\sqrt{a}+\sqrt{b}-\sqrt{c}$ is
(A) always positive (B) always negative
(C) positive only when c is smallest (D) none of these .

9. In a triangle with sides a,b, and c, a semicircle touching the sides AC and CB is inscribed whose diameter lies on AB. Then , the radius of the semicircle is
(A) a/ 2 (B) Δ/ s
(C) $\frac{2\Delta}{a+b}$ (D) $\frac{2abc}{(s)(a+b)}\cos\frac{A}{2}\cos\frac{B}{2}\cos\frac{C}{2}$

10. A triangle is inscribed in a circle. The vertices of the triangle divide the circle in to three arcs of length 3, 4 and 5 units, then area of the triangle is equal to,

(A) $\dfrac{9\sqrt{3}\left(1+\sqrt{3}\right)}{\pi^2}$ (B) $\dfrac{9\sqrt{3}\left(\sqrt{3}-1\right)}{\pi^2}$

(C) $\dfrac{9\sqrt{3}\left(1+\sqrt{3}\right)}{2\pi^2}$ (D) $\dfrac{9\sqrt{3}\left(\sqrt{3}-1\right)}{2\pi^2}$

11. If a sinx + bcos(C + x) + bcos (C –x) = α, then the minimum value of |cosC| is

(A) $\sqrt{\dfrac{\alpha^2-a^2}{b^2}}$ (B) $\sqrt{\dfrac{\alpha^2-a^2}{4b^2}}$

(C) $\sqrt{\dfrac{\alpha^2-a^2}{16b^2}}$ (D) none of these

12. In a ΔABC, the point D divides BC in the ratio 1:2 . Also AD is perpendicular to AB. Then the value of the expression tanB(1+2tanA tanC) – 2tanC is

(A) 0 (B) 1

(C) –1 (D) none of these

13. If in ΔABC , secA , secB, secC are in Harmonic progression, then

(A) a, b, c, are in harmonic progression.

(B) $\cot\dfrac{A}{2}$, $\cot\dfrac{B}{2}$, $\cot\dfrac{C}{2}$ are in harmonic progression

(C) r_1, r_2, r_3 are in arithmetic progression

(D) $\cot\dfrac{A}{2}$, $\cot\dfrac{B}{2}$, $\cot\dfrac{C}{2}$ are in arithmetic progression .

14. In a triangle ABC a = 7, b = 8 and c= 9. Then the length of median from B to AC is given by

(A) 9 (B) 8

(C) 7 (D) 6

15. If sinA and sinB of a triangle ABC satisfy c^2x^2 – c(a+b)x + ab = 0, then the triangle is

(A) Equilateral (B) Isosceles

(C) Right angled (D) Acute angled

16. The number of triangles that can be made with the given data: b = 2cm, c = 6 cm and

$\angle$B = 30°, is

(A) 1 (B) 2

(C) zero (D) None of these

17. In ΔABC, if AB = c , AC = b, BC = a and A : B : C = 1 : 2 : 5, then

(A) b^2 = a(c + a) (B) b^2 = a(c – a)

(C) b^2 = a(a – c) (D) None of these.

18. In ΔABC, if $\dfrac{c+a}{12}=\dfrac{a+b}{14}=\dfrac{b+c}{18}$, then

(A) $r_1 = \frac{11}{7}r$ (B) $r_2 = 11r$

(C) $r_3 = \frac{2}{11}r$ (D) None of these

19. If a cos A = b cos B, the triangle is
(A) equilateral (B) right angled
(C) isosceles (D) right angled or isosceles

20. The sides of a triangle are a, b and $\sqrt{a^2 + ab + b^2}$, then the greatest angle is
(A) $\frac{\pi}{3}$ (B) $\frac{\pi}{2}$
(C) $\frac{2\pi}{3}$ (D) none of these

21. Two sides of a Δ are given by the roots of the equation $x^2 - 2\sqrt{3}x + 2 = 0$. The angle between the sides is $\frac{\pi}{3}$. The perimeter of the triangle is

22. In a triangle ABC, R = circumradius and r = inradius. The value of $\frac{a\cos A + b\cos B + c\cos C}{a + b + c}$ is equal to
(A) $\frac{R}{r}$ (B) $\frac{R}{2r}$
(C) $\frac{r}{R}$ (D) $\frac{2r}{R}$

23. In a triangle ABC, $2\cos\frac{A-C}{2} = \frac{a+c}{\sqrt{a^2 + c^2 - ac}}$, then
(A) $B = \frac{\pi}{3}$ (B) B = C
(D) A, B, C are in A.P (D) B + C = A

24. The distance of the circumcentre of the acute angled ΔABC from the sides BC, CA and AB are in the ratio
(A) a sin A : b sin B : c sin C (B) cos A : cos B : cos C
(C) a cot A : b cot B : c cot C (D) none of these

25. If twice the square of the diameter of a circle is equal to the sum of the squares of the sides of the inscribed triangle ABC, then $\sin^2 A + \sin^2 B + \sin^2 C$ is equal to
(A) 2 (B) 3 (C) 4 (D) 1

26. In ΔABC, if $\frac{c+a}{12} = \frac{a+b}{14} = \frac{b+c}{18}$, then

(A) $r_1 = \frac{11}{7}r$ (B) $r_2 = 11r$ (C) $r_3 = \frac{2}{11}r$ (D) None of these

27. In a triangle ABC, 2 sinA cosC = 1 and $\frac{\tan A}{\tan C} = \frac{1}{2}$ then triangle is
(A) right angled at A (B) right angled at B
(C) right angled at C (D) none of these

28. In a triangle ABC, $\frac{(r_1 + r_2)(r_2 + r_3)(r_3 + r_1)}{Rs^2}$ is equal to
(A) 4 (B) 4 abc (C) $\frac{4abc}{\Delta^2}$ (D) Δ

29. In a ΔABC, $\frac{a\cos A + b\cos B + c\cos C}{\Delta^2}$ is equal to
(A) $\frac{8}{abc}$ (B) $\frac{2}{\Delta R}$ (C) $\frac{8\Delta^3}{abc}$ (D) None of these

30. If p_1, p_2 and p_3 are respectively the lengths of perpendiculars from the vertices of a triangle ABC to the opposite sides, then the value of $p_1p_2p_3$ is
(A) $\frac{a^2b^2c^2}{8R^2}$ (B) $\frac{a^2b^2c^2}{8R^3}$ (C) $\frac{a^2b^2c^2}{8R^4}$ (D) $\frac{a^2b^2c^2}{4R^2}$

31. If in a triangle $\cos^2 A + \cos^2 B - \cos^2 C = 1$, then the triangle is
(A) Right angled at A (B) Right angled at B
(C) Right angled at C (D) not a right triangle

32. If in a triangle ABC, $\frac{\text{Sin}B - \text{Sin}A}{\text{Sin}C} + \frac{\text{Cos}B - \text{Cos}A}{\text{Cos}C} = 0$ then the triangle is
(A) right angled (B) equilateral (C) isosceles (D) None of these

33. If $\sin\theta$ and $-\cos\theta$ are the roots of the equation $ax^2 - bx - c = 0$, where a, b, c are the sides of a triangle ABC then
(A) $\cos B = 1 - \frac{c}{2a}$ (B) $\cos B = 1 - \frac{b}{2a}$ (C) $\cos B = 1 + \frac{c}{2a}$ (D) $\cos B = 1 + \frac{b}{2a}$

34. In a right angled triangle ABC, with right angle at B, $\frac{1}{r^2} + \frac{1}{r_1^2} + \frac{1}{r_2^2} + \frac{1}{r_3^2} =$
(A) $\frac{8R^2}{\Delta^2}$ (B) $\frac{2R^2}{\Delta^2}$ (C) $\frac{4R^2}{\Delta}$ (D) None of these

35. If in a triangle ABC, $\angle C = 135^0$, then value of tan A + tan B + tan A tan B equals

(A) 0 (B) 1

(C) –1 (D) none of these

36. Suppose the angles of a triangle ABC are in A.P. and sides b and c satisfy b : c = $\sqrt{3} : \sqrt{2}$ then the angle A equals

(A) 45^0 (B) 60^0

(C) 75^0 (D) 90^0

37. If a^2, b^2, c^2 are the roots of the equation $x^3 - Px^2 + Qx - R = 0$ where a, b, c be the sides of a triangle ABC then the value of $\frac{\cos A}{a} + \frac{\cos B}{b} + \frac{\cos C}{c}$ equals

(A) $\frac{P}{\sqrt{R}}$ (B) $\frac{P}{2\sqrt{R}}$

(C) $\frac{P}{4\sqrt{R}}$ (D) none of these

38. In a triangle ABC, $\frac{b^2 - c^2}{a\sin(B-C)} + \frac{c^2 - a^2}{b\sin(C-A)}$ equals

(A) R (B) $\frac{1}{2R}$

(B) 2R (D) none of these

ANSWERS

LEVEL –I

1.	A	2.	D	3.	D	4.	A
5.	D	6.	C	7.	A	8.	B
9.	C	10.	A	11.	C	12.	A
13.	D	14.	C	15.	B	16.	C
17.	A	18.	A	19.	B	20.	B
21.	A	22.	B	23.	B	24.	C
25.		26.	D	27.		28.	$\frac{9}{16}$
29.		30.	B	31.	C	32.	A
33.	A	34.	A	35.	B	36.	A
37.	C	38.	A				

LEVEL –II

1.	B	2.	A	3.	A	4.	A
5.	C	6.	B	7.	C	8.	A
9.	C	10.	A	11.	B	12.	A
13.	B,C	14.	C	15.	C	16.	C
17.	A	18.	A	19.	D	20.	C
21.	$\sqrt{6}\left(1+\sqrt{2}\right)$	22.	C	23.		24.	C
25.		26.		27.			
28.	A						
29.		30.		31.		32.	
33.	C	34.	A	35.	B	36.	C
37.	B	38.	D				