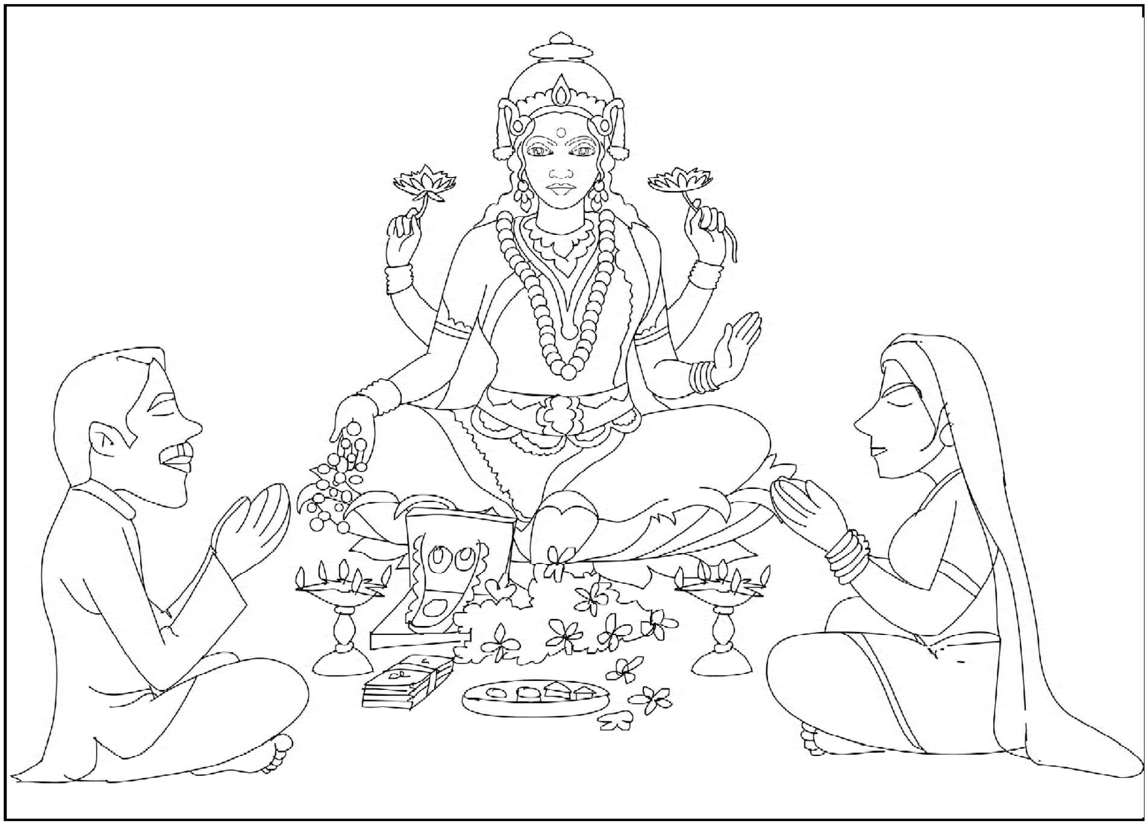
DEEPAWALI ASSIGNMENT

CLASS 12 & DROPPER FOR TARGET IIT JEE



Wishing You & Your Family A Very Happy & Prosperous Deepawali

QUESTION BANK ON

COMPOUND ANGLES,

QUADRATIC EQUATION

SOLUTIONS OF TRIANGLE

SEQUENCE & PROGRESSION

TRIGONOMETRIC EQUATIONS & INEQUATIONS

Time Limit : 4 Sitting Each of 75 Minutes duration approx.

NOTE: This assignment will be discussed on the very first day after Deepawali Vacation, hence come prepared.

Q. B. on Compound angles, QE, Sol^n of triangle, Seq. & Prog. & trigo. equations and inequations

Select the correct alternative ***: (Only one is correct)***

Q.1 A regular decagon $A_0, A_1, A_2......A_9$ is given in the xy plane. Measure of the $\angle A_0A_3A_7$ in degrees is
(A) 108° (B) 96°
(C) 72° (D) 54°

Q.2 If $a^2 + b^2 + c^2 = 1$ then $ab + bc + ca$ lies in the interval :
(A) $\left[\frac{1}{2}, 2\right]$ (B) $[-1, 2]$ (C) $\left[-\frac{1}{2}, 1\right]$ (D) $\left[-1, \frac{1}{2}\right]$

Q.3 If the roots of the cubic $x^3 - px^2 + qx - r = 0$ are in G.P. then
(A) $q^3 = p^3r$ (B) $p^3 = q^3r$ (C) $pq = r$ (D) $pr = q$

Q.4 In a triangle ABC, $a : b : c = 4 : 5 : 6$. Then $3A + B =$
(A) 4C (B) 2π (C) $\pi - C$ (D) π

Q.5 An equilateral triangle has sides 1 cm long. An ant walks around the triangle, maintaining a distance of 1 cm from the triangle at all time. Distance travelled by the ant in one round is
(A) $3+3\sqrt{3}$ (B) $3+6\sqrt{3}$ (C) $3 + 2\pi$ (D) $3 + \frac{3\pi}{2}$

Q.6 If $P(x) = ax^2 + bx + c$ & $Q(x) = -ax^2 + dx + c$, where $ac \neq 0$, then $P(x) . Q(x) = 0$ has
(A) exactly one real root (B) atleast two real roots
(C) exactly three real roots (D) all four are real roots .

Q.7 The set of all real numbers x for which $\log_{2004}(\log_{2003}(\log_{2002}(\log_{2001} x)))$ is defined as $\{x \mid x > c\}$. The value of c is
(A) 0 (B) $(2001)^{2002}$ (C) $(2003)^{2004}$ (D) $(2001)^{2002^{2003}}$

Q.8 In a triangle ABC, CD is the bisector of the angle C. If $\cos\frac{C}{2}$ has the value $\frac{1}{3}$ and $l(CD) = 6$, then $\left(\frac{1}{a}+\frac{1}{b}\right)$ has the value equal to
(A) $\frac{1}{9}$ (B) $\frac{1}{12}$ (C) $\frac{1}{6}$ (D) none

Q.9 The real values of 'a' for which the quadratic equation, $2x^2 - (a^3 + 8a - 1)x + a^2 - 4a = 0$ possesses roots of opposite signs is given by :
(A) $a > 5$ (B) $0 < a < 4$ (C) $a > 0$ (D) $a > 7$

Q.10 The arithmetic mean of the nine numbers in the given set {9, 99, 999, ... 999999999} is a 9 digit number N, all whose digits are distinct. The number N does not contain the digit
(A) 0 (B) 2 (C) 5 (D) 9

Q.11 If $x = \frac{n\pi}{2}$, satisfies the equation $\sin\frac{x}{2} - \cos\frac{x}{2} = 1 - \sin x$ & the inequality $\left|\frac{x}{2} - \frac{\pi}{2}\right| \le \frac{3\pi}{4}$, then:

(A) $n = -1, 0, 3, 5$ (B) $n = 1, 2, 4, 5$
(C) $n = 0, 2, 4$ (D) $n = -1, 1, 3, 5$

Q.12 With usual notations, in a triangle ABC, $a \cos(B - C) + b \cos(C - A) + c \cos(A - B)$ is equal to

(A) $\frac{abc}{R^2}$ (B) $\frac{abc}{4R^2}$ (C) $\frac{4abc}{R^2}$ (D) $\frac{abc}{2R^2}$

Q.13 If in a Δ ABC, $\sin^3 A + \sin^3 B + \sin^3 C = 3 \sin A \cdot \sin B \cdot \sin C$ then
(A) Δ ABC may be a scalene triangle (B) Δ ABC is a right triangle
(C) Δ ABC is an obtuse angled triangle (D) Δ ABC is an equilateral triangle

Q.14 If a, b, c are real numbers satisfying the condition $a + b + c = 0$ then the roots of the quadratic equation $3ax^2 + 5bx + 7c = 0$ are :
(A) positive (B) negative (C) real & distinct (D) imaginary

Q.15 If $\sin^3 x \cdot \cos 3x + \cos^3 x \cdot \sin 3x = \frac{3}{8}$, then the value of $\sin 4x$ is

(A) $\frac{1}{3}$ (B) $\frac{1}{4}$ (C) $\frac{1}{2}$ (D) $\frac{3}{8}$

Q.16 With usual notations in a triangle ABC, $(I I_1) \cdot (I I_2) \cdot (I I_3)$ has the value equal to
(A) R^2r (B) $2R^2r$ (C) $4R^2r$ (D) $16R^2r$

Q.17 Consider the pattern shown below

Row 1	1				
Row 2	3	5			
Row 3	7	9	11		
Row 4	13	15	17	19	etc

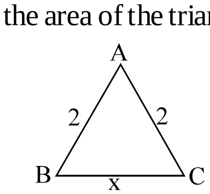
The number at the end of row 80, is
(A) 6479 (B) 6319 (C) 6481 (D) 6531

Q.18 For all positive integers n let $f(n) = \log_{2002} n^2$. Let $N = f(11) + f(13) + f(14)$
which of the following relations is true?
(A) $0 < N < 1$ (B) $N = 1$ (C) $1 < N < 2$ (D) $N = 2$

Q.19 The roots of $(x - 1)(x - 3) + K(x - 2)(x - 4) = 0$, $K > 0$ are :
(A) real (B) real & equal (C) imaginary (D) one real & one imaginary

Q.20 An isosceles triangle has sides of length 2, 2, and x. The value of x for which the area of the triangle is maximum, is

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



Q.21 If $x \sec\alpha + y \tan\alpha = x \sec\beta + y \tan\beta = a$, then $\sec \alpha \cdot \sec \beta =$

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

Q.22 Largest integral value of *m* for which the quadratic expression

$y = x^2 + (2m + 6)x + 4m + 12$ is always positive, $\forall\, x \in R$, is

(A) – 1 (B) – 2 (C) 0 (D) 2

Q.23 The general solution of the trigonometric equation

$\tan x + \tan 2x + \tan 3x = \tan x \cdot \tan 2x \cdot \tan 3x$ is

(A) $x = n\pi$ (B) $n\pi \pm \frac{\pi}{3}$ (C) $x = 2n\pi$ (D) $x = \frac{n\pi}{3}$

where $n \in I$

Q.24 With usual notation in a ΔABC $\left(\frac{1}{r_1}+\frac{1}{r_2}\right)\left(\frac{1}{r_2}+\frac{1}{r_3}\right)\left(\frac{1}{r_3}+\frac{1}{r_1}\right) = \frac{K R^3}{a^2 b^2 c^2}$ where K has the value equal to :

(A) 1 (B) 16 (C) 64 (D) 128

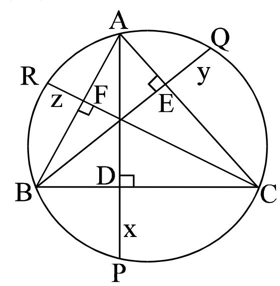
Q.25 If the sum of the roots of the quadratic equation, $ax^2 + bx + c = 0$ is equal to sum of the squares of their reciprocals, then $\frac{a}{c}, \frac{b}{a}, \frac{c}{b}$ are in :

(A) A.P. (B) G.P. (C) H.P. (D) none

Q.26 The set of values of x satisfying the inequality $\frac{1}{\log_4 \frac{x+1}{x+2}} \le \frac{1}{\log_4 (x+3)}$ is :

(A) $(-3, -2)$ (B) $(-3, -2)\cup(-1, \infty)$ (C) $(-1, \infty)$ (D) none

Q.27 As shown in the figure AD is the altitude on BC and AD produced meets the circumcircle of ΔABC at P where DP = x. Similarly EQ = y and FR = z. If a, b, c respectively denotes the sides BC, CA and AB then $\frac{a}{2x}+\frac{b}{2y}+\frac{c}{2z}$ has the value equal to



(A) tanA + tanB + tanC (B) cotA + cotB + cotC

(C) cosA + cosB + cosC (D) cosecA + cosecB + cosecC

Q.28 In a ΔABC, 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) $\frac{2r}{R}$

Q.29 If the sum of the first 11 terms of an arithmetical progression equals that of the first 19 terms, then the sum of its first 30 terms, is
(A) equal to 0 (B) equal to – 1 (C) equal to 1 (D) non unique

Q.30 The sum of all the value of m for which the roots x_1 and x_2 of the quadratic equation $x^2 - 2mx + m = 0$ satisfy the condition $x_1^3 + x_2^3 = x_1^2 + x_2^2$, is
(A) $\frac{3}{4}$ (B) 1 (C) $\frac{9}{4}$ (D) $\frac{5}{4}$

Q.31 In an A.P. with first term 'a' and the common difference d (a, $d \neq 0$), the ratio 'ρ' of the sum of the first n terms to sum of n terms succeeding them does not depend on n. Then the ratio $\frac{a}{d}$ and the ratio 'ρ', respectively are
(A) $\frac{1}{2}, \frac{1}{4}$ (B) $2, \frac{1}{3}$ (C) $\frac{1}{2}, \frac{1}{3}$ (D) $\frac{1}{2}, 2$

Q.32 AD, BE and CF are the perpendiculars from the angular points of a Δ ABC upon the opposite sides. The perimeters of the Δ DEF and Δ ABC are in the ratio :
(A) $\frac{2r}{R}$ (B) $\frac{r}{2R}$ (C) $\frac{r}{R}$ (D) $\frac{r}{3R}$
where r is the in radius and R is the circum radius of the Δ ABC

Q.33 If $\cos 25° + \sin 25° = p$, then $\cos 50°$ is
(A) $\sqrt{2-p^2}$ (B) $-\,p\sqrt{2-p^2}$ (C) $p\sqrt{2-p^2}$ (D) $-\,p\sqrt{2-p^2}$

Q.34 Let r_1, r_2 and r_3 be the solutions of the equation $x^3 - 2x^2 + 4x + 5074 = 0$ then the value of $(r_1 + 2)(r_2 + 2)(r_3 + 2)$ is
(A) 5050 (B) 5066 (C) – 5050 (D) – 5066

Q.35 If p , q, r in H.P. and p & r be different having same sign then the roots of the equation $px^2 + qx + r = 0$ are
(A) real & equal (B) real & distinct (C) irrational (D) imaginary

Q.36 In a Δ ABC if $b + c = 3a$ then $\cot\frac{B}{2} \cdot \cot\frac{C}{2}$ has the value equal to :
(A) 4 (B) 3 (C) 2 (D) 1

Q.37 Indicate the correct choice : If $\log_{0.3}(x-1) < \log_{0.09}(x-1)$, then x lies in the interval ;
(A) $(2, \infty)$ (B) (1 , 2) (C) (-2 , -1) (D) none of these

Q.38 Number of roots of the equation, $\sin(\cos x) = \cos(\sin x)$ in $[0, 2\pi]$ is
(A) 0 (B) 1 (C) 2 (D) 4

Q.39 The sum of the roots of the equation $(x + 1) = 2\log_2(2^x + 3) - 2\log_4(1980 - 2^{-x})$ is
(A) 3954 (B) $\log_2 11$ (C) $\log_2 3954$ (D) indeterminate

Q.40 Let *n* be a positive integer such that $\sin\frac{\pi}{2n} + \cos\frac{\pi}{2n} = \frac{\sqrt{n}}{2}$. Then

(A) $6 \le n \le 8$ (B) $4 \le n \le 8$ (C) $4 \le n < 8$ (D) $4 < n < 8$

Q.41 Let f, g, h be the lengths of the perpendiculars from the circumcentre of the ΔABC on the sides a, b and c respectively . If $\frac{a}{f} + \frac{b}{g} + \frac{c}{h} = \lambda \frac{a\,b\,c}{f\,g\,h}$ then the value of λ is :

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

Q.42 The equation whose roots are $\sec^2\alpha$ & $\text{cosec}^2\alpha$ can be :

(A) $2x^2 - x - 1 = 0$ (B) $x^2 - 3x + 3 = 0$ (C) $x^2 - 9x + 9 = 0$ (D) none

Q.43 Minimum vertical distance between the graphs of $y = 2 + \sin x$ and $y = \cos x$ is

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

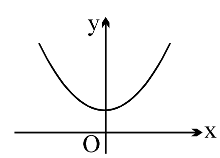
Q.44 Let C be a circle with centre P_0 and AB be a diameter of C. Suppose P_1 is the mid point of the line segment P_0B, P_2 is the mid point of the line segment P_1B and so on. Let C_1, C_2, C_3, ... be circles with diameters P_0P_1, P_1P_2, P_2P_3 ...... respectively. Suppose the circles C_1, C_2, C_3, ... are all shaded. The ratio of the area of the unshaded portion of C to that of the original circle C is

(A) 8 : 9 (B) 9 : 10 (C) 10 : 11 (D) 11 : 12

Q.45 If the orthocentre and circumcentre of a triangle ABC be at equal distances from the side BC and lie on the same side of BC then tanB tanC has the value equal to :

(A) 3 (B) $\frac{1}{3}$ (C) – 3 (D) $-\frac{1}{3}$

Q.46 The graph of a quadratic polynomial $y = ax^2 + bx + c$ $(a, b, c \in R)$ with vertex on y-axis is as shown in the figure. Then which one of the following statement is INCORRECT?



(A) Product of the roots of the corresponding quadratic equation is positive.
(B) Discriminant of the quadratic equation is negative.
(C) Nothing definite can be said about the sum of the roots, whether positive, negative or zero.
(D) Both roots of the quadratic equation are purely imaginary.

Q.47 If in a triangle ABC $\frac{2\cos A}{a} + \frac{\cos B}{b} + \frac{2\cos C}{c} = \frac{a}{bc} + \frac{b}{ca}$ then the value of the angle A is:

(A) $\frac{\pi}{8}$ (B) $\frac{\pi}{4}$ (C) $\frac{\pi}{3}$ (D) $\frac{\pi}{2}$

Q.48 If $\sin(\theta + \alpha) = a$ & $\sin(\theta + \beta) = b$ $(0 < \alpha, \beta, \theta < \pi/2)$ then $\cos 2(\alpha - \beta) - 4ab\cos(\alpha - \beta) =$

(A) $1 - a^2 - b^2$ (B) $1 - 2a^2 - 2b^2$ (C) $2 + a^2 + b^2$ (D) $2 - a^2 - b^2$

Q.49 Concentric circles of radii 1, 2, 3......100 cms are drawn. The interior of the smallest circle is coloured red and the angular regions are coloured alternately green and red, so that no two adjacent regions are of the same colour. The total area of the green regions in sq. cm is equal to

(A) 1000π (B) 5050π (C) 4950π (D) 5151π

Q.50 In a ΔABC if $b = a\left(\sqrt{3}-1\right)$ and $\angle C = 30^0$ then the measure of the angle A is
(A) 15^0 (B) 45^0 (C) 75^0 (D) 105^0

Q.51 The number of solution of the equation $e^{2x} + e^x + e^{-2x} + e^{-x} = 3(e^{-2x} + e^x)$ is
(A) 0 (B) 2 (C) 1 (D) more than 2

Q.52 If in a triangle $\sin A : \sin C = \sin (A - B) : \sin (B - C)$ then $a^2 : b^2 : c^2$
(A) are in A.P. (B) are in G.P.
(C) are in H.P. (D) none of these

Q.53 The number of natural numbers less than 400 that are not divisible by 17 or 23 is
(A) 382 (B) 359 (C) 360 (D) 376

Q.54 The minimum value of the expression $\dfrac{9x^2 \sin^2 x + 4}{x \sin x}$ for $x \in (0, \pi)$ is

(A) $\dfrac{16}{3}$ (B) 6 (C) 12 (D) $\dfrac{8}{3}$

Q.55 In a ΔABC, $a = a_1 = 2$, $b = a_2$, $c = a_3$ such that $a_{p+1} = \dfrac{5^p}{3^{2-p}} a_p \left(2^{2-p} - \dfrac{4p-2}{5^p} a_p\right)$

where p = 1,2 then
(A) $r_1 = r_2$ (B) $r_3 = 2r_1$ (C) $r_2 = 2r_1$ (D) $r_2 = 3r_1$

Q.56 The sum $\sum_{n=1}^{\infty} \dfrac{1}{n^2 + 2n}$ equals

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

Q.57 The product of the arithmetic mean of the lengths of the sides of a triangle and harmonic mean of the lengths of the altitudes of the triangle is equal to :
(A) Δ (B) 2Δ (C) 3Δ (D) 4Δ
[where Δ is the area of the triangle ABC]

Q.58 The set of real value(s) of p for which the equation, $|2x + 3| + |2x - 3| = px + 6$ has more than two solutions is :
(A) (0, 4] (B) (– 4, 4) (C) R – {4, - 4, 0} (D) {0}

Q.59 If 'O' is the circumcentre of the Δ ABC and R_1, R_2 and R_3 are the radii of the circumcircles of triangles OBC, OCA and OAB respectively then $\dfrac{a}{R_1} + \dfrac{b}{R_2} + \dfrac{c}{R_3}$ has the value equal to:

(A) $\dfrac{abc}{2R^3}$ (B) $\dfrac{R^3}{abc}$ (C) $\dfrac{4\Delta}{R^2}$ (D) $\dfrac{\Delta}{4R^2}$

Q.60 If for an A.P. $a_1, a_2, a_3, \ldots, a_n, \ldots$
$a_1 + a_3 + a_5 = -12$ and $a_1 a_2 a_3 = 8$
then the value of $a_2 + a_4 + a_6$ equals
(A) – 12 (B) – 16 (C) – 18 (D) – 21

Q.61 If in a Δ ABC, $\cos A \cdot \cos B + \sin A \sin B \sin 2C = 1$ then, the statement which is incorrect, is
(A) Δ ABC is isosceles but not right angled (B) Δ ABC is acute angled
(C) Δ ABC is right angled (D) least angle of the triangle is $\frac{\pi}{4}$

Q.62 The absolute term in the quadratic expression $\sum_{k=1}^{n}\left(x-\frac{1}{k+1}\right)\left(x-\frac{1}{k}\right)$ as $n \to \infty$ is
(A) 1 (B) –1 (C) 0 (D) 1/2

Q.63 The number of roots of the equation, $\sin x + 2\sin 2x = 3 + \sin 3x$ is :
(A) 0 (B) 1 (C) 2 (D) infinite

Q.64 In a triangle the expression $\frac{a^2b^2c^2(\sin 2A + \sin 2B + \sin 2C)}{\Delta^3}$ simplifies to
(A) 8 (B) 16 (C) 32 (D) 64

Q.65 Number of real values of x satisfying the equation
$$\sqrt{x^2-6x+9} + \sqrt{x^2-6x+6} = 1 \text{ is}$$
(A) 0 (B) 1 (C) 2 (D) more than 2

Q.66 If the roots of the equation $x^3 - px^2 - r = 0$ are $\tan\alpha$, $\tan\beta$ and $\tan\gamma$ then the value of $\sec^2\alpha \cdot \sec^2\beta \cdot \sec^2\gamma$ is
(A) $p^2 + r^2 + 2rp + 1$ (B) $p^2 + r^2 - 2rp + 1$ (C) $p^2 - r^2 - 2rp + 1$ (D) None

Q.67 If r_1, r_2, r_3 be the radii of excircles of the triangle ABC, then $\frac{\sum r_1}{\sqrt{\sum r_1 r_2}}$ is equal to :
(A) $\sum \cot\frac{A}{2}$ (B) $\sum \cot\frac{A}{2}\cot\frac{B}{2}$ (C) $\sum \tan\frac{A}{2}$ (D) $\prod \tan\frac{A}{2}$

Q.68 There is a certain sequence of positive real numbers. Beginning from the third term, each term of the sequence is the sum of all the previous terms. The seventh term is equal to 1000 and the first term is equal to 1. The second term of this sequence is equal to
(A) 246 (B) $\frac{123}{2}$ (C) $\frac{123}{4}$ (D) 124

Q.69 If x, y and z are the distances of incentre from the vertices of the triangle ABC respectively then $\frac{a\,b\,c}{x\,y\,z}$ is equal to
(A) $\prod \tan\frac{A}{2}$ (B) $\sum \cot\frac{A}{2}$ (C) $\sum \tan\frac{A}{2}$ (D) $\sum \sin\frac{A}{2}$

Q.70 If the equation $a(x-1)^2 + b(x^2 - 3x + 2) + x - a^2 = 0$ is satisfied for all $x \in R$ then the number of ordered pairs of (a, b) can be
(A) 0 (B) 1 (C) 2 (D) infinite

Q.71 In a ΔABC, a semicircle is inscribed, whose diameter lies on the side c. Then the radius of the semicircle is
(A) $\frac{2\Delta}{a+b}$ (B) $\frac{2\Delta}{a+b-c}$ (C) $\frac{2\Delta}{s}$ (D) $\frac{c}{2}$
Where Δ is the area of the triangle ABC.

Q.72 Number of quadratic equations with real roots which remain unchanged even after squaring their roots, is
(A) 1 (B) 2 (C) 3 (D) 4

Q.73 Along a road lies an odd number of stones placed at intervals of 10 m. These stones have to be assembled around the middle stone. A person can carry only one stone at a time. A man carried out the job starting with the stone in the middle, carrying stones in succession, thereby covering a distance of 4.8 km. Then the number of stones is
(A) 15 (B) 29 (C) 31 (D) 35

Q.74 If in a ΔABC, $\frac{\cos A}{a} = \frac{\cos B}{b} = \frac{\cos C}{c}$ then the triangle is
(A) right angled (B) isosceles (C) equilateral (D) obtuse

Q.75 The quadratic equation $ax^2 + bx + c = 0$ has imaginary roots if :
(A) $a < -1,\ 0 < c < 1,\ b > 0$ (B) $a < -1,\ -1 < c < 0,\ 0 < b < 1$
(C) $a < -1,\ c < 0,\ b > 1$ (D) none

Q.76 The equations $x^3 + 5x^2 + px + q = 0$ and $x^3 + 7x^2 + px + r = 0$ have two roots in common. If the third root of each equation is represented by x_1 and x_2 respectively, then the ordered pair (x_1, x_2) is :
(A) $(-5, -7)$ (B) $(1, -1)$ (C) $(-1, 1)$ (D) $(5, 7)$

Q.77 If cos A + cosB + 2cosC = 2 then the sides of the ΔABC are in
(A) A.P. (B) G.P (C) H.P. (D) none

<u>Select the correct alternatives</u> : (More than one are correct)

Q.78 If $\sin\theta = \sin\alpha$ then $\sin\frac{\theta}{3}$ equal to
(A) $\sin\frac{\alpha}{3}$ (B) $\sin\left(\frac{\pi}{3} - \frac{\alpha}{3}\right)$ (C) $\sin\left(\frac{\pi}{3} + \frac{\alpha}{3}\right)$ (D) $-\sin\left(\frac{\pi}{3} + \frac{\alpha}{3}\right)$

Q.79 $\cos\alpha$ is a root of the equation $25x^2 + 5x - 12 = 0$, $-1 < x < 0$, then the value of $\sin 2\alpha$ is :
(A) 24/25 (B) $-12/25$ (C) $-24/25$ (D) 20/25

Q.80 If $\sin(x-y)$, $\sin x$ and $\sin(x+y)$ are in H.P., then $\sin x . \sec\frac{y}{2} =$
(A) 2 (B) $\sqrt{2}$ (C) $-\sqrt{2}$ (D) -2

Q.81 Which of the following functions have the maximum value unity ?
(A) $\sin^2 x - \cos^2 x$ (B) $\frac{\sin 2x - \cos 2x}{\sqrt{2}}$
(C) $-\frac{\sin 2x - \cos 2x}{\sqrt{2}}$ (D) $\sqrt{\frac{6}{5}}\left(\frac{1}{\sqrt{2}}\sin x + \frac{1}{\sqrt{3}}\cos x\right)$

Q.82 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 the third side can be :

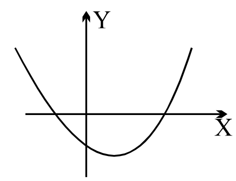
(A) $5-\sqrt{6}$ (B) $3\sqrt{3}$ (C) 5 (D) $6 \pm \sqrt{5}$

Q.83 ' ' $\left(a^{\log_b x}\right)^2 - 5\,x^{\log_b a} + 6 = 0$, where $a > 0$, $b > 0$ & $ab \neq 1$, then the value of x can be equal to

(A) $2^{\log_b a}$ (B) $3^{\log_a b}$ (C) $b^{\log_a 2}$ (D) $a^{\log_b 3}$

Q.84 If the roots of the equation, $x^3 + px^2 + qx - 1 = 0$ form an increasing G.P. where p and q are real, then
(A) $p+q = 0$
(B) $p \in (-\infty, -3)$
(C) one of the roots is one
(D) one root is smaller than 1 & one root is greater than 1.

Q.85 The graph of the quadratic polynomial ;
$y = ax^2 + bx + c$ is as shown in the figure. Then :



(A) $b^2 - 4ac > 0$ (B) $b < 0$
(C) $a > 0$ (D) $c < 0$

Q.86 If $\left(a^{\log_b x}\right)^2 - 5\,x^{\log_b a} + 6 = 0$, where $a > 0$, $b > 0$ & $ab \neq 1$, then the value of x can be equal to

(A) $2^{\log_b a}$ (B) $3^{\log_a b}$ (C) $b^{\log_a 2}$ (D) $a^{\log_b 3}$

Q.87 Let Δ^2 be the discriminant and α, β be the roots of the equation $ax^2 + bx + c = 0$. Then $2a\alpha + \Delta$ and $2a\beta - \Delta$ can be the roots of the equation :
(A) $x^2 + 2bx + b^2 = 0$ (B) $x^2 - 2bx + b^2 = 0$
(C) $x^2 + 2bx - 3b^2 + 16ac = 0$ (D) $x^2 - 2bx - 3b^2 + 16ac = 0$

Q.88 Which of the following statement(s) is/are true?

(A) $\log_{10} 2$ lies between $\frac{1}{3}$ & $\frac{1}{4}$

(B) $\log_{\text{cosec}(5\pi/6)} \cos\frac{5\pi}{3} = -1$

(C) $e^{ln\,(ln 3)}$ is smaller than 1

(D) $\log_{10} 1 + \frac{1}{2}\log_{10} 3 + \log_{10}\left(2+\sqrt{3}\right) = \log\left(1+\sqrt{3}+\left(2+\sqrt{3}\right)\right)$

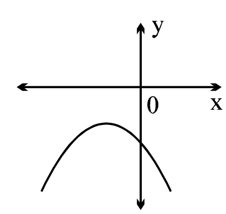
Q.89 Select the statement(s) which are true in respect of a triangle ABC, all symbols have their usual meaning.
(A) The inradius, circumradius and one of the exradii of an equilateral triangle are in the ratio of $1:2:3$.

(B) $abc = \frac{1}{4}Rrs$

(C) If r = 3 then the value of $\frac{1}{r_1} + \frac{1}{r_2} + \frac{1}{r_3} = \frac{1}{3}$

(D)If the diameter of any escribed cricle is equal to the perimeter then the triangle must be a right triangle.

Q.90 The graph of a quadratic polynomial $y = ax^2 + bx + c$ $(a, b, c \in R, a \neq 0)$ is as shown. Then the incorrect statement(s) is/are



(A) $c > 0$ (B) $b < 0$

(C) product of the roots is negative (D) sum of the roots is positive

Q.91 The points A (x_1, y_1) ; $B(x_2, y_2)$ and $C(x_3, y_3)$ lie on the parabola $y = 3x^2$. If x_1, x_2, x_3 are in A.P. and y_1, y_2, y_3 are in G.P. then the common ratio of the G.P. is

(A) $3 + 2\sqrt{2}$ (B) $3 + \sqrt{2}$ (C) $3 - \sqrt{2}$ (D) $3 - 2\sqrt{2}$

Q.92 Which of the following when simplified, vanishes ?

(A) $\frac{1}{\log_3 2} + \frac{2}{\log_9 4} - \frac{3}{\log_{27} 8}$

(B) $\log_2\left(\frac{2}{3}\right) + \log_4\left(\frac{9}{4}\right)$

(C) $-\log_8 \log_4 \log_2 16$

(D) $\log_{10}\cot 1^\circ + \log_{10}\cot 2^\circ + \log_{10}\cot 3^\circ + ... + \log_{10}\cot 89^\circ$

Q.93 If one root of the quadratic equation, $px^2 + qx + r = 0\ (p \neq 0)$ is a surd $\frac{\sqrt{a}}{\sqrt{a}+\sqrt{a-b}}$ where p, q, r ; a, b are all rationals then the other root is

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

SUBJECTIVE:

Q.94 Find whether the diagonals of the parallelogram formed by the lines $\frac{x}{a}+\frac{y}{b}=1$, $\frac{x}{b}+\frac{y}{a}=1$, $\frac{x}{a}+\frac{y}{b}=2$ and $\frac{x}{b}+\frac{y}{a}=2$ are perpendicular to each other or not.

Q.95 Find the area of the parallelogram formed by the lines

$4y - 3x - 1 = 0$ $3y - 4x + 1 = 0$

$4y - 3x - 3 = 0$ $3y - 4x + 2 = 0$

Q.96 Find the value of a for which the lines $2x + y - 1 = 0$, $ax + 3y - 3 = 0$, $3x + 2y - 2 = 0$ are concurrent.

Q.97 Find the coordinates of the points on the line $y = x + 1$, which are at a distance of 5 from the line $4x - 3y + 20 = 0$.

Q.98 An equilateral triangle has its centroid at the origin and one side is $x + y = 1$. Find the other two sides.

Q.99 The three lines $x + 2y + 3 = 0$, $x + 2y - 7 = 0$, $2x - y - 4 = 0$ form the three sides of two squares. Find the equation to the fourth side of each square.

Q.100 Each side of a square is of length 4. The centre of the square is (3, 7) and one of its diagonals is parallel to $y = x$. Find the coordinates of its vertices.

ANSWER KEY

***Select the correct alternative* : (Only one is correct)**

Q.1	D	Q.2	C	Q.3	A	Q.4	D	Q.5	C
Q.6	B	Q.7	B	Q.8	A	Q.9	B	Q.10	A
Q.11	B	Q.12	A	Q.13	D	Q.14	C	Q.15	C
Q.16	D	Q.17	A	Q.18	D	Q.19	A	Q.20	D
Q.21	B	Q.22	C	Q.23	D	Q.24	C	Q.25	C
Q.26	C	Q.27	A	Q.28	A	Q.29	A	Q.30	D
Q.31	C	Q.32	C	Q.33	C	Q.34	C	Q.35	D
Q.36	C	Q.37	A	Q.38	A	Q.39	B	Q.40	D
Q.41	A	Q.42	C	Q.43	D	Q.44	D	Q.45	A
Q.46	C	Q.47	D	Q.48	B	Q.49	B	Q.50	D
Q.51	C	Q.52	A	Q.53	C	Q.54	C	Q.55	D
Q.56	C	Q.57	B	Q.58	D	Q.59	C	Q.60	D
Q.61	C	Q.62	A	Q.63	A	Q.64	C	Q.65	A
Q.66	B	Q.67	C	Q.68	B	Q.69	B	Q.70	B
Q.71	A	Q.72	C	Q.73	C	Q.74	C	Q.75	D
Q.76	A	Q.77	A						

***Select the correct alternatives* : (More than one are correct)**

Q.78	A,B,D	Q.79	A,C	Q.80	B,C	Q.81	A,B,C,D
Q.82	A,D	Q.83	B,C	Q.84	A,B,C,D	Q.85	A,B,C,D
Q.86	B,C	Q.87	A,C	Q.88	A,B,D	Q.89	A,C,D
Q.90	A,C, D	Q.91	A,D	Q.92	A,B,C,D	Q.93	A,C

SUBJECTIVE:

Q.94 perpendicular to each other

Q.95 2/7

Q.96 all values of a

Q.97 (8, 9) and (– 42, – 41)

Q.98 $y + 1 = \frac{\sqrt{3}-1}{\sqrt{3}+1}(x + 1)$; $y + 1 = \frac{\sqrt{3}+1}{\sqrt{3}-1}(x + 1)$

Q.99 $2x – y – 14 = 0$; $2x – y + 6 = 0$

Q.100 (1, 5), (1, 9), (5, 9), (5, 5)