Hall Ticket Number

Q.B.No. **3 7 3 2 1 4**

Booklet Code : D

Marks : 100
Time : 120 minutes

3TM2

Signature of the Candidate **Signature of the Invigilator**

INSTRUCTIONS TO THE CANDIDATE

(Read the Instructions carefully before Answering)

1. Separate Optical Mark Reader (OMR) Answer Sheet is supplied to you along with Question Paper Booklet. Please read and follow the instructions on the OMR Answer Sheet for marking the responses and the required data.
2. The candidate should ensure that the Booklet Code printed on OMR Answer Sheet and Booklet Code supplied are same.
3. **Immediately on opening the Question Paper Booklet by tearing off the paper seal, please check for (i) The same booklet code (A/B/C/D) on each page, (ii) Serial Number of the questions (1-100), (iii) The number of pages and (iv) Correct Printing.** In case of any defect, please report to the invigilator and ask for replacement of booklet with same code within five minutes from the commencement of the test.
4. Electronic gadgets like Cell Phone, Calculator, Watches and Mathematical/Log Tables are not permitted into the examination hall.
5. **There will be ¼ negative mark for every wrong answer.** If the response to the question is left blank without answering, there will be no penalty of negative mark for that question.
6. Using Blue/Black ball point pen to darken the appropriate circles of (1), (2), (3) or (4) in the OMR Answer Sheet corresponding to correct or the most appropriate answer to the concerned question number in the sheet. Darkening of more than one circle against any question automatically gets invalidated and will be treated as wrong answer.
7. Change of an answer is NOT allowed.
8. Rough work should be done only in the space provided in the Question Paper Booklet.
9. Return the OMR Answer Sheet and Question Paper Booklet to the invigilator before leaving the examination hall. Failure to return the OMR sheet and Question Paper Booklet is liable for criminal action.

This Booklet consists of 20 Pages for 100 Questions + 3 Pages of Rough Work + 1 Title Page i.e. Total 24 Pages.

SPACE FOR ROUGH WORK

3TM2

Booklet Code **D**

Time : 2 Hours **Marks : 100**

Instructions :

i) Each question carries ***one*** mark and ¼ negative mark for every wrong answer.

ii) Choose the correct or most appropriate answer from the given options to the following questions and darken, with Blue/Black Ball Point Pen, the corresponding digit **1, 2, 3** or **4** in the circle pertaining to the question number concerned in the OMR Answer Sheet, separately supplied to you.

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1. If $(1+i)^{24} = 2^k$, then the number of non real roots of $Z^k - 1 = 0$ is

   (1) 6 (2) 8 (3) 10 (4) 12

2. Let a, b be complex numbers and $|z| = 1$. Then the value of $\left|\frac{az+b}{\bar{b}z+\bar{a}}\right|$ is

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

3. The number of subsets of a five element set having exactly 3 elements is

   (1) 64 (2) 10 (3) 31 (4) 32

4. Using 5 distinct letters, the number of 5-letter words formed in which atleast one letter repeats is

   (1) 3400 (2) 3004
   (3) 5003 (4) 3005

5. The number of ways of forming a club with one leader and with atleast one other member out of 100 persons, is

   (1) 2^{99} (2) $2^{99} - 1$
   (3) 100×2^{99} (4) $100\,(2^{99} - 1)$

6. 12 girls and 8 boys are seated around a table such that no two boys sit together. The number of such arrangements is

   (1) ${}^{20}C_8 \times 11!$ (2) ${}^{12}P_4 \times 11!$
   (3) ${}^{12}C_4 \times 11!$ (4) ${}^{12}P_8\ 11!$

7. The number of natural numbers x that satisfy $\left(\frac{2}{7}\right)^{6x+10-x^2} < \frac{8}{343}$ is

(1) 5 (2) 6

(3) 7 (4) ∞

---

8. If the three consecutive coefficients in the expansion of $(1 + x)^n$ are respectively 165, 330 and 462, then the sum of the coefficients of all odd terms is

(1) 0 (2) 2^{10}

(3) 2^{11} (4) 2^{12}

---

9. If the second, the third and the fourth terms of the binomial expansion $(x + a)^n$ are 240, 720 and 1080 respectively then the numerically greatest term in that expansion is its

(1) second term (2) third term

(3) fourth term (4) fifth term

---

10. If the coefficients of x^7 and x^8 are equal in the expansion of $\left(2+\frac{x}{2}\right)^n$, then n is

(1) 38 (2) 39

(3) 40 (4) 41

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11. Let $f : A \to B$ and $n(A) = m$, $n(B) = p$. If number of one-one functions and onto functions that exist from A to B are equal then $m^p + p^m$ is divisible by

(1) 7 (2) 5

(3) 4 (4) 2

---

12. If $\begin{vmatrix} a^2+1 & a^2 & a \\ b^2+1 & b^2 & b \\ c^2+1 & c^2 & c \end{vmatrix} = 0$, then a, b, c are

(1) the sides of any right angled triangle

(2) the sides of any isosceles triangle

(3) the sides of any triangle

(4) two sides and one diagonal of any rectangle

---

13. If $f : \mathbb{R} \to \mathbb{R}$ is defined by $f(x) = 2x + |x|$ and $f(3x) - f(-x) - 4x = k\ f(x)$, then $k =$

(1) –1 (2) –2

(3) 2 (4) 3

---

14. If $f : \mathbb{R} \to \mathbb{R}$ is defined by $f(x + y) = f(x) + f(y)$ for all $x, y \in \mathbb{R}$ and $f(1) = 7$, then $\sum_{r=1}^{16} f(r) =$

(1) 826 (2) 952

(3) 972 (4) 1052

---

15. The system of equations

$2x + 5y + 6z = 0$

$x - 3y - 8z = 0$

$3x + y - 4z = 0$

has a non trivial solution if

(1) $x = -k, y = 2k, z = -k$ (2) $x = 2k, y = -k, z = k$

(3) $x = k, y = -k, z = 2k$ (4) $x = 2k, y = -2k, z = k$

(where k is a non zero real number.)

---

16. If $\begin{vmatrix} x & 2 & 5 \\ 3 & x+2 & 1 \\ 4 & -1 & 3x+5 \end{vmatrix} = Ax^3 + Bx^2 + Cx + D$

then A – D =

(1) 65 (2) 72 (3) 80 (4) 85

---

17. If $\begin{pmatrix} x+y & 2x+z \\ x-y & 2z+w \end{pmatrix} = \begin{pmatrix} 4 & 7 \\ 0 & 10 \end{pmatrix}$, then $x - 2y - z + 3w =$

(1) –4 (2) 3 (3) 6 (4) 7

---

18. If $m_r = \begin{pmatrix} r & r-1 \\ r-1 & r \end{pmatrix}$, then $\sum_{r=1}^{20} \det m_r =$

(1) 325 (2) 360

(3) 400 (4) 480

---

19. If A is an idempotent matrix and $n \in \mathbb{N}$ then the value of $(I + A)^n - (2^n - 1)A$ is

(1) I (2) O (3) A (4) 2^nA

---

20. If $x(t) = t$ and $y(t) = \frac{k - 3t}{5}$, $t \in \mathbb{R}$ represents a line passing through (1, 1), then $k =$

(1) 6 (2) 7 (3) 8 (4) 9

---

21. If the side of a rhombus is mean proportional of its diagonals, then the ratio of its diagonals is

(1) $2+\sqrt{3} : 2-\sqrt{3}$ (2) $2+\sqrt{3} : 1$

(3) 2:3 (4) 1:1

---

22. Which one of the following is false?

(1) If a side of a triangle is produced, then the exterior angle is more than the maximum of the other two interior angles.

(2) Sum of interior angles of a polygon of n sides is $(n - 2)\pi$.

(3) The join of the neighbouring mid points of the sides of a quadrilateral form a parallelogram.

(4) A median of a triangle divides it into two triangles of equal areas and they are congruent.

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23. If the circle $x^2 + y^2 + 10x - 6y + k = 0$ touches Y-axis and cuts the X-axis, then the length of the intercept made by that circle on X-axis and the value of k are respectively

(1) 8, 9 (2) 7, 9

(3) 6, 25 (4) 9, 12

---

24. The equation of the chord of contact of the point (0, 5) with the circle $x^2 + y^2 - 6x + 4y = 12$ is

(1) $2x - 7y + 2 = 0$ (2) $3x - 5y + 2 = 0$

(3) $3x - 7y + 5 = 0$ (4) $3x - 7y + 2 = 0$

---

25. Which one of the following is false?

(1) If the length of a chord of a circle which is at a distance of 4 units from its centre is 10 units, then any other chord of same length will be at a distance of same 4 units from the centre.

(2) If a line segment AB subtends equal angles at points C and D on the same side of line AB, then A, B, C, D lie on a circle.

(3) Through three non collinear points, many circles can be drawn.

(4) A cyclic parallelogram is a rectangle.

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26. The radius of the circle that touches the coordinate axes and passes through (2, 1) can be

(1) 4 (2) 3

(3) 2 (4) 1

---

27. The nearest integer to the mean proportional of 40,000 and 90,000 which when divided with each of 8, 15, 21 leaves the GCD of these numbers as remainder, is

(1) 59641 (2) 60480

(3) 60,001 (4) 59941

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28. Which one of the following is not a similar surd to the others?

(1) $7\sqrt[2]{243}$ (2) $4\sqrt[2]{27}$

(3) $7\sqrt[2]{87}$ (4) $5\sqrt[2]{75}$

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29. If 102 and 2602 are two members of a Pythagorean triplet, then the other member is

(1) 2601 (2) 408

(3) 2604 (4) 2600

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30. The sum of the digits of a given two digit number is 11. The number obtained by interchanging digits of the given number is 27 more than the given number. Then the sum of twice the original number and the number with its digits interchanged is

(1) 168 (2) 159

(3) 177 (4) 195

---

31. If the 4 digited even number $x54y$ is divisible by 11, then the number of possible ordered pairs (x, y) is

(1) 10 (2) 12 (3) 5 (4) 72

---

32. If $k = p_1^{\alpha_1} p_2^{\alpha_2}$, ($p_2$, p_1 are primes) is such that $k^2 \leq 3025$,

and $k^2 + 2k - 3100 > 0$, then $(p_2 - p_1)(\alpha_1 + \alpha_2) - 1 =$

(1) 5 (2) 13 (3) 7 (4) 11

---

33. If x and y are real numbers such that $x < -1$ and $y > 1$, then which one of the following is true?

(1) $y + x^2 > 1$ (2) $y - x^3 < 1$

(3) $\frac{1}{x^2} > \frac{1}{y^2}$ (4) $|x|^2 > |y|$

---

34. If x and y are two positive integers related by $3x = 4y - 2$, then the set of all such x's and y's can be represented as

(1) $x = l + 1, y = l - 1 \ (l \in \mathbb{N})$

(2) $x = 2l - 1, y = 2l, \ (l \in \mathbb{N})$

(3) $x = 2l, y = 2l - 1 \ (l \in \mathbb{N})$

(4) $y = 3l - 1, x = 4l - 2, \ (l \in \mathbb{N})$

---

35. Three schools with a strength of participants 92, 76 and 36 respectively are participating in a marching parade. If the three groups are to march one behind the other with the same number of columns, then the maximum number of columns in which they can march, is

(1) 3 (2) 4 (3) 2 (4) 6

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36. If $\frac{2\sqrt{5}}{5\sqrt{3}-4\sqrt{5}}+\frac{2\sqrt{3}}{4\sqrt{3}-3\sqrt{5}}$ is $a+\sqrt{b}$, then $\left(a+\sqrt{b}\right)\left(a-\sqrt{b}\right)+4=$

(1) 4 (2) 1 (3) 2 (4) 3

---

37. For $p \in \mathbb{N}$, let $\alpha = 2^p$ and $\beta = (1 + 2 + 2^2 + ... + 2^{p-1})$ then the points (α, β) lie on

(1) $x + 1 = 2y$ (2) $y + 1 < x$

(3) $y + 1 = x$ (4) $x + 1 = y$

---

38. If x, 17, $3x - y^2 - 2$ and $3x + y^2 - 30$ are four consecutive terms of an arithmetic progression, then their sum is divisible by

(1) 2 (2) 3 (3) 5 (4) 7

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39. If the 4th and 8th terms of a geometric progression are 8 and $\frac{128}{625}$ respectively, then its 20th term is

(1) $\frac{2^{19}}{5^{16}}$ (2) $2^{19}/5^{17}$ (3) $\frac{-2^{19}}{3^{16}}$ (4) $\frac{-2^{19}}{5^{17}}$

---

40. If 27, 8, 12 are three terms of a geometric progression, then its third term can be 12, when its

(1) fifth term is 27 and first term is 8

(2) fifth term is 27 and sixth term is 8

(3) fifth term is 27 and ninth term is 8

(4) fifth term is 27 and second term is 8

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41. The ratio of available number of seats for pursuing a course in a university in Physics, Mathematics and Chemistry is 5:7:8. If these seats are increased respectively by 40%, 50% and 75%, then the ratio of the number of seats after the increase is

(1) 6:8:9 (2) 2:3:4 (3) 5:6:8 (4) 6:7:8

---

42. Which one of the following is not true?

(1) If the lengths of two sides of a right angled triangle are given and the third side is obtained using pythagorous theorem, then the lengths of the three sides form a Pythagorean triplet.

(2) If p^{th} term of an arithmetic progression is q and the q^{th} term is p, then $\left(\frac{p+q}{2}\right)^{th}$ term is $\frac{p+q}{2}$.

(3) If a line segment of length l is made into two parts of lengths m and n $(m > n)$ then m:n is the golden ratio when $\frac{l}{m} = \frac{m}{n}$.

(4) If S_n, the sum of the first n terms of a progression, is a quadratic polynomial in 'n', then that progression is an arithmetic progression.

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43. The present salaries of A, B and C are in the ratio 1:3:5. If the difference between the salaries of B and C after they obtain annual increments of 10%, 15% and 20% respectively is Rs.10,200, then A's new salary (in Rs.) is

(1) 4,400 (2) 5,200

(3) 6,400 (4) 7,800

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44. For $p \in \mathbb{N}$, if the sums of $(6p - 1)$ terms and $(2p - 1)$ terms of a progression having the r^{th} term as $\frac{4p-r}{p}$ are respectively 29 and 27, then the sum of the 20 terms of that progression starting from the 20^{th} term, is

(1) –32 (2) –38 (3) 16 (4) 40

---

45. In an arithmetic progression, for $p, q \in \mathbb{N}$, $(p > q)$ if $S_{p+q} = K[S_p - S_q]$ then K =

(1) $\frac{p+q}{p-q}$ (2) $\frac{p^2-q^2}{pq}$

(3) $\frac{p^2+q^2}{p^2-q^2}$ (4) $\frac{p-q}{p+q}$

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46. A bag contains 50 paise, 25 paise and 10 paise coins amounting to Rs. 206. If the ratio of the number of coins in the increasing order of value of each coin is 4:9:5, then the total number of coins in the bag is

(1) 360 (2) 200 (3) 160 (4) 720

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47. If a number is increased by 30% and then decreased by 30%, then the net percentage of change in that number is

(1) 7 (2) 8 (3) 9 (4) 10

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48. If the cost price of 8 bananas is equal to the selling price of 9 bananas, then the loss percentage is

(1) $11\frac{2}{9}$ (2) $11\frac{1}{9}$ (3) $10\frac{1}{9}$ (4) $10\frac{2}{9}$

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49. A sum of Rs. 5000/- is deposited in a bank at 5% interest per year. If the interest calculated is compounded in the first two years and on simple interest for next two years, then the amount the customer receives after deducting income tax at source at the rate of 5% on the total interest accumelated upto four years, is

(1) Rs. 6010.55 (2) Rs. 6063.75

(3) Rs. 5512.50 (4) Rs. 6500.15

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50. If $f(x) = \left|1 - |x-1| - |x-1| - |x-1| - |x-1|\right|$, then the slope of the line $y = f(x)$ when $x > 5/4$, is

(1) –4 (2) 4 (3) 5 (4) –5

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51. A solid cylinder of height 20 cm and diameter 10 cm is made into two cones whose volumes are in the proportion of 1:2, keeping the height 20 cm. Then, the ratio of the volumes of the cylinder and the bigger cone is

(1) 1:3 (2) 3:1 (3) 2:3 (4) 3:2

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52. If the area of the circumcircle of an equilateral triangle is $\frac{81}{3}\pi$ metres^2, then the radius of the incircle of that triangle is

(1) $\frac{4}{\sqrt{3}}$ m (2) $\frac{9}{\sqrt{3}}$ m

(3) $\frac{2}{\sqrt{3}}$ m (4) $\frac{9}{2\sqrt{3}}$ m

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53. The area of the curved surface of a right circular cone of height 10 cm and base diameter of 16 cm is

(1) $12\pi\sqrt{41}$ (2) $16\pi\sqrt{41}$

(3) $16\pi\sqrt{31}$ (4) $12\pi\sqrt{31}$

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54. The cost of painting the four walls and the ceiling of a room with length, breadth and height respectively 5 m, 4 m, 3.5 m, if the rate of painting is Rs. 150 per m^2, is

(1) Rs. 12540 (2) Rs. 12504

(3) Rs. 12045 (4) Rs. 12450

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55. Let μ be the mean of 'n' observations. If the first observation is increased by 1, the second observation is increased by 2 and so on, then the effective mean (after the change) is

(1) $\mu + n$ (2) $\mu + \frac{n+1}{2}$

(3) $\mu + \frac{n}{2}$ (4) $\frac{1}{2}\mu + \frac{n(n+1)}{2}$

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56. The arithmetic mean and mode of a given discrete data are 24 and 12 respectively. If every data point is multiplied with 2 and then 5 is added to it then the median of the new data is

(1) 40 (2) 20 (3) 45 (4) 80

---

57. In a Chess tournament, assume that your probability of winning a game is 0.3 against level 1 players, 0.4 against level 2 players and 0.5 against level 3 players. If 50%, 25%, 25% are the percentages of players in level 1, level 2, level 3 respectively, then the probability of you winning a game against a randomly chosen player, is

(1) 0.275 (2) 0.375

(3) 0.325 (4) 0.225

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58. A box contains 6 white, x red balls. If two balls are drawn at random and the odds in favour of the two balls being not white is 2:1, then x =

(1) 9 (2) 4 (3) 8 (4) 12

---

59. If the data $x_1, x_2 \ldots x_{2n+1}$ is such that the difference of any two consecutive data points is a positive constant, then

(1) Mean = Mode ≠ Median

(2) Median = Mode ≠ Mean

(3) Mean = Median = Mode

(4) Mean ≠ Median ≠ Mode

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60. α, β are the roots of $50x^2 - 15x + 1 = 0$ and γ, δ are roots of $50x^2 + bx + c = 0$. Let X be a random variable with the following probability distribution :

X_i	x_1	x_2	x_3	x_4
$P(X = x_i)$	α	β	γ	δ

If the two quadratic equations have one root in common, then the absolute difference of the possible values of c is

(1) 2 (2) 3 (3) 5 (4) 0

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61. If the probability mass function of a random variable X is $P_X(n) = \frac{1}{n2^n}, n = 1, 2, 3, \ldots$, then the mean of that random variable X is

(1) 0 (2) $1/2$ (3) 1 (4) 2

---

62. Let X be the event of getting a head in tossing a fair coin, then the variance of X is

(1) $\frac{1}{4}$ (2) $\frac{1}{6}$

(3) $\frac{1}{8}$ (4) $\frac{1}{2}$

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63. Statement 1 : If A and B are mutually exclusive events, then $P(A \cap B) = P(A)\ P(B)$

Statement 2 : For any two events, $P\left(\frac{A}{B}\right) \cdot P(B) = P(A \cap B)$

Which one of the following is true?

(1) Statement 1 and Statement 2 are true

(2) Statement 1 is true, Statement 2 is false

(3) Statement 1 is false, Statement 2 is true

(4) Statement 1 is false, Statement 2 is false

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64. If the probability mass function of a random variable X is $P_X(n) = \begin{cases} nk, & n = 0,1,2 \\ (n-1)k, & n = 3,4,5 \end{cases}$.

Then the mean of X is

(1) $\frac{41}{12}$ (2) $\frac{39}{12}$

(3) $\frac{43}{12}$ (4) $\frac{47}{12}$

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65. The solution of the equation

$\tan 2\theta + \tan 5\theta + \tan 7\theta = \tan 2\theta\ \tan 5\theta\ \tan 7\theta,\ \theta \in (0, \pi)$ is

(1) $\frac{\pi}{3}$ (2) $\frac{\pi}{5}$

(3) $\frac{\pi}{7}$ (4) $\frac{2\pi}{5}$

---

66. The domain and range of $\tan x$ are respectively

(1) $\mathbb{R}$, [–1, 1]

(2) $\{x \in \mathbb{R} : x \neq n\pi, n \in \mathbb{Z}\}, \mathbb{R}$

(3) $\left\{x \in \mathbb{R} : x \neq (2n+1)\frac{\pi}{2}, n \in \mathbb{Z}\right\}, \mathbb{R} - (-1,1)$

(4) $\left\{x \in \mathbb{R} : x \neq (2n+1)\frac{\pi}{2}, n \in \mathbb{Z}\right\}, \mathbb{R}$

---

67. If $\frac{7\pi}{4} < \theta < 2\pi$, then

$\sqrt{2\cot\theta + \frac{1}{\sin^2\theta}}$ is

(1) $1 + \cot\theta$ (2) $-1 - \cot\theta$

(3) $-1 + \cot\theta$ (4) $1 - \cot\theta$

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68. In ΔABC, If $\tan\frac{A}{2}, \tan\frac{B}{2}, \tan\frac{C}{2}$ are in harmonic progression, then the value of $\tan\frac{A}{2} \cdot \tan\frac{C}{2}$ is

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

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69. A quadratic equation with its roots as $4\sin^2\theta$ and $4\cos^2\theta$ is

(1) $3x^2 - 2x + 3 = 2\sin 4\theta$

(2) $x^2 - 4x + 2 = 2\cos 4\theta$

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

(4) $5x^2 - 2x + 3 = 2\cos 4\theta$

---

70. The general solution of the equation $\sqrt{3}\cot x + 1 = 0$ is

(1) $x = \left(n\pi + \frac{\pi}{3}\right)$

(2) $x = \frac{2\pi}{3}$

(3) $x = \left(n\pi + \frac{2\pi}{3}\right)$

(4) $x = \left(n\pi - \frac{2\pi}{3}\right)$

(where n = 0, 1, 2, ...)

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71. The minimum value of $3^{\sin x} + 3^{-\sin x}$ is

(1) 2

(2) 1

(3) $3^{\left(1-\frac{1}{\sqrt{2}}\right)}$

(4) $2\left(3^{\frac{-1}{2}}\right)$

---

72. If $x - y = \pi/3$ and $\tan x = 2\tan y$, then the value of $\sin x \cos y$ is

(1) $\sqrt{3}$

(2) $\sqrt{3}/2$

(3) $1/2$

(4) 1

---

73. If $\cos^6\theta + \sin^6\theta + \alpha\sin^2 2\theta = 1$ for some $\theta \in \left[0, \pi/2\right]$, then α is

(1) $3/4$

(2) $1/4$

(3) 1

(4) not unique

---

74. If $\frac{\sin(x+y)}{\sin(x-y)} = \frac{\alpha+\beta}{\alpha-\beta}$, for some α, β ∈ ℝ and $\frac{\tan x}{\alpha} = \frac{k}{\beta}$, then k =

(1) cot y

(2) tan y

(3) tan x

(4) cot x

---

75. The range of $\sin^2 x + \cos^4 x$ is

(1) $\left[\frac{1}{2},1\right]$ (2) $(0, 1]$

(3) $\left[\frac{3}{4},1\right]$ (4) $\left(\frac{3}{4},1\right]$

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76. $\tan\frac{\pi}{40}\cdot\tan\frac{2\pi}{40}\cdot\ldots\cdot\tan\left(\frac{18\pi}{40}\right)\cdot\tan\left(\frac{19\pi}{40}\right) =$

(1) –1 (2) 0

(3) 1 (4) 2

---

77. A circle is passing through the points A(1, 1) and B(3, 5) such that the length of the chord AB and the distance from its centre to the chord AB are equal. Then its centre is

(1) (2, 5) (2) (6 ,1)

(3) (2, 3) (4) (6, 2)

---

78. At 9AM, on a sunny day, the lengths of the shadows of a man and a light house are 8 ft and 20 ft. If the man is 5 ft tall, then the height of the light house is

(1) 12 ft (2) $12\frac{1}{4}$ ft

(3) $12\frac{1}{2}$ ft (4) $12\frac{3}{4}$ ft

---

79. Slope of a tangent drawn to the circle $x^2 + y^2 = 9$ from the point (6, 6) is

(1) $\frac{4+\sqrt{7}}{3}$ (2) $\frac{2+\sqrt{7}}{3}$

(3) $\frac{2-\sqrt{7}}{3}$ (4) $\frac{4+\sqrt{7}}{2}$

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80. If three points (a, 0), (c, d) and (0, e) lie on a line, then which of the following is true?

(1) $\frac{c}{e}-\frac{d}{a}=1$ (2) $\frac{c}{e}+\frac{d}{a}=1$

(3) $\frac{c}{a}+\frac{d}{e}=1$ (4) $\frac{a}{c}+\frac{e}{d}=1$

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81. If points (2, 3), (–4, –3) and (–4, 3) are the vertices of a triangle Δ, then which of the following is true about triangle Δ?

A) Δ is a right angled triangle
B) Δ is a iscosceles triangle
C) Δ is a equilateral triangle
D) Δ is a acute angled triangle

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

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82. The line joining (–1, 1) and (5, 7) is divided by the line $x + y = 4$ in the ratio

(1) 1:2 (2) 2:1 (3) 1:3 (4) 2:3

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83. If the lines $y = 3x + 6$ and $2y = x + 4$ are equally inclined to the line $y = mx + 6$, then the value of m is

(1) $\frac{3\pm\sqrt{41}}{8}$

(2) $\frac{1\pm5\sqrt{2}}{7}$

(3) indeterminate (can't be determined)

(4) $\frac{1\pm7\sqrt{2}}{5}$

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84. The acute angle between the lines $7x - 4y = 0$ and $3x - 11y + 5 = 0$ is

(1) $\pi/4$ (2) $\pi/6$ (3) $\pi/8$ (4) $\pi/10$

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85. If A(–1, 3) and B(2, 5) are two given points and P is a variable point such that PA:PB = 1:3, then the locus of P is

(1) the circle of radius 45 units

(2) a straight line not containing the origin

(3) a line passing through the origin

(4) a circle with radius other than 45

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86. If the y-intercept of a straight line is three times its x-intercept and if the point (1, 1) lies on the line, then the equation of that line is

(1) $3x + y = 4$ (2) $6x - y = 5$

(3) $x + 3y = 4$ (4) $4x - y = 3$

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87. If (α, β) is the point of intersection of the lines $3x - 11y + 5 = 0$ and $7x - 4y = 0$ then $13(\beta - 2\alpha) =$

(1) 0 (2) –1 (3) 26 (4) 1

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88. O(0, 0) and P(3, 4) are two points on either side of the line $L \equiv 5x - 12y + k = 0$. If PM = 2 is the length of the perpendicular from P to the line L = 0, then a point on the line at a distance of 2 units from M is

(1) (7, 14) (2) $\left(\frac{25}{13}, \frac{38}{13}\right)$

(3) $\left(\frac{73}{13}, \frac{18}{13}\right)$ (4) $\left(\frac{25}{13}, \frac{18}{13}\right)$

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89. If d is the distance between the parallel lines $3x - ay = 1$ and $(a + 2)x - y + 3 = 0$ and $a > 0$, then $d =$

(1) $\sqrt{\frac{16}{5}}$ (2) $\sqrt{\frac{2}{5}}$

(3) $\sqrt{\frac{4}{5}}$ (4) $\sqrt{\frac{8}{5}}$

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90. If the point (1, 1) is inside the circle $a\left(x^2+y^2\right)+4x-6y+16=0$, then

(1) $a \le -5$ (2) $a < -7$

(3) $a \le -7$ (4) $a < -5$

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91. If the circle $9x^2+9y^2-kx+78y+71=0$ passes through the intersection of the circles $x^2+y^2-8x-2y+7=0$ and $x^2+y^2-4x+10y+8=0$, then the value of k is

(1) 40 (2) 44 (3) 48 (4) 52

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92. The image of the point (–5, 1) with respect to the line $y=\sqrt{3}x$ is

(1) $\left(\frac{5-\sqrt{3}}{2},\frac{5+\sqrt{3}}{2}\right)$ (2) $\left(\frac{5+\sqrt{3}}{2},\frac{5-\sqrt{3}}{2}\right)$

(3) $\left(\frac{5+\sqrt{3}}{2},\frac{1-5\sqrt{3}}{2}\right)$ (4) $\left(\frac{1-5\sqrt{3}}{2},\frac{5+\sqrt{3}}{2}\right)$

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93. The point of intersection of the normals at the points $\left(\sqrt{2},\frac{3}{\sqrt{2}}\right)$ and $\left(-\sqrt{2},\frac{3}{\sqrt{2}}\right)$ to the ellipse $\frac{x^2}{4}+\frac{y^2}{9}=1$ is

(1) $\left(0, 5/\sqrt{2}\right)$ (2) $\left(0, 5/2\sqrt{2}\right)$

(3) $\left(0, 5/3\sqrt{2}\right)$ (4) $\left(0, 5/4\sqrt{2}\right)$

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94. The equation of the hyperbola having the foci at (±4, 0) and the latusrectum 12, is

(1) $x^2 - 3y^2 = 12$

(2) $3x^2 - 2y^2 = 12$

(3) $x^2 - 2y^2 = 12$

(4) $3x^2 - y^2 = 12$

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95. If 4, 16, 25 sq.cms are the surface areas of the three coterminous faces of a cuboid, then the volume of the cuboid is

(1) 1600 cubic cm

(2) 45 cubic cm

(3) 80 cubic cm

(4) 40 cubic cm

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96. If a cube of side 20 cm is divided into small cubes of side 5 cm, then the percentage increase in the surface area is

(1) 300% (2) 75%

(3) 4% (4) 400%

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97. The internal diameter of a spherical capsule is 0.42 cm. The amount of liquid needed to fill the capsule is

(1) 28.088 mm^3 (2) 388.078 mm^3

(3) 38.808 mm^3 (4) 37.808 mm^3

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98. The full capacity of a cuboidal water tank is 60,000 litres. If its length and depth are 3 metre and 10 metre respectively, then its width is

(1) 2 m (2) 1 m

(3) 20 m (4) 18 m

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99. A circular well with a diameter 2 meters is dug to a depth of 21 meters. The soil that is dugout is spread uniformly on a circular ring whose outer and inner diameters are 34 meters and 32 meters respectively. The height of the embarkation of this dugout soil is

(1) $\frac{3}{11}$ m (2) $\frac{4}{11}$ m

(3) $\frac{5}{11}$ m (4) $\frac{7}{11}$ m

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100. A metallic cube of edge 1 cm is drawn into a rod of diameter 4 mm. Then the length of that rod is

(1) $\frac{100}{\pi}$ cm (2) 100π cm

(3) $\frac{25}{\pi}$ cm (4) 1000 cm

SPACE FOR ROUGH WORK

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