Hall Ticket Number

Q.B.No. 3 5 3 2 1 4

Booklet Code : D

Marks : 100
Time : 120 minutes

3PM2

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

3PM2 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. The remainder obtained when $3x^7 - x^6 + 31x^4 + 21x + 5$ is divided by $(x + 2)$ as well as $(x + 1)$ is 11 then the remainder when it is divided by $(x + 1)(x + 2)$ is

(1) 121 (2) 11 (3) 0 (4) 21

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2. Suppose $y^2 + z^2 = ayz$, $z^2 + x^2 = bzx$, $x^2 + y^2 = cxy$. The equation obtained by eliminating x, y and z from the above equations is

(1) $a^2 + b^2 + c^2 = abc$ (2) $a^2 + b^2 + c^2 + 4 = abc$

(3) $a^2 + b^2 + c^2 - 4 = abc$ (4) $a^2 + b^2 + c^2 = 4abc$

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3. If the solution region of the system of inequalities $x + y \geq 5$, $x - y \leq 7$ and $y \leq 3$ contains a point (α, β), where $\beta \leq 0$, then

(1) $-7 \leq \beta \leq 5$ (2) $-1 \leq \beta \leq 0$

(3) $-7 \leq \beta \leq 0$ (4) No such point exist

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4. If $\text{Log}\left[\dfrac{\left(x^2 + \dfrac{3}{x}\right)}{\left(\displaystyle\sum_{i=-15}^{30} a_i x^i\right)^{1/15}}\right] = 0$, then $3a_9 - a_6 =$

(1) $^{15}C_3$ (2) $^{15}C_6$

(3) $^{15}C_{14}$ (4) $C_0 - C_1 + C_2 + \ldots - C_{15}$

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5. Suppose the sequence of real numbers, $\{x_n\}$, satisfies $x_1 = 1$ and $x_{n+1} = \sqrt{1 + 2x_n}$ for $n \geq 1$. Then the assertion that one may make using the induction hypothesis is

(1) $x_n > 4 \quad \forall\, n \geq 1$ (2) $x_n < 4 \quad \forall\, n \geq 1$

(3) $1 < x_n < 2,\ n \geq 1$ (4) $x_n < 2 \quad \forall\, n \geq 1$

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6. If a, b, c are the roots of the equation $x^3 + p_1x^2 + p_2x + p_3 = 0$, then the equation with the roots a^2, b^2, c^2 is

(1) $y^3 + \left(2p_2 - p_1^2\right)y^2 + \left(p_2^2 - 2p_1p_3\right)y - p_3^2 = 0$

(2) $y^3 + \left(2p_2 - p_1^2\right)y^2 + \left(p_2 - 2p_1p_3\right) + p_3^2 = 0$

(3) $y^3 - \left(2p_2 - p_1^2\right)y^2 + \left(p_2^2 - 2p_1p_2\right)y - p_3^2 = 0$

(4) $y^3 - \left(2p_2 - p_1^2\right)y^2 + \left(p_2^2 - 2p_1p_2\right)y + p_3^2 = 0$

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7. The maximum value of $5x + 6y$ subject to the conditions $x + y \le 10$, $x - y \ge 3$, $5x + 4y \le 35$, $x, y \ge 0$ is

(1) $\frac{107}{2}$ (2) 65 (3) 60 (4) $\frac{355}{9}$

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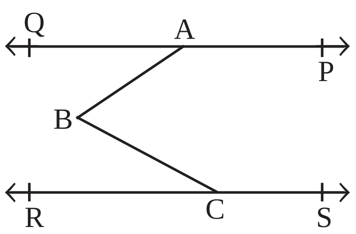
8. In the adjacent figure if PQ//RS, $\underline{|PAB} = 135°$ and $\underline{|BCR} = 40°$, then $\underline{|ABC} =$



(1) 70° (2) 85° (3) 90° (4) 45°

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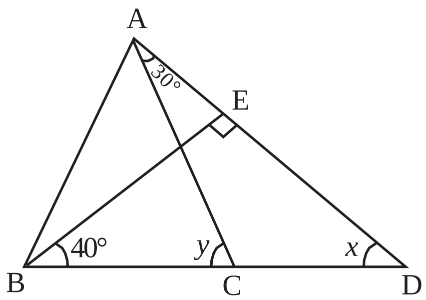
9. From the adjacent figure $\underline{|x} + \underline{|y} =$



(1) 225° (2) 70° (3) 130° (4) 180°

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10. Consider the following statement :

S : Two distinct intersecting lines cannot be parallel to the same line.

Which one of the following statement is equivalent statement to S?

(1) For every line *l* and for every point P not lying on *l*, there exists a unique line *m* passing through P and parallel to *l*.

(2) For every line *l* there will be a line intersecting it.

(3) Through a point P we can draw infinite number of lines.

(4) Two distinct intersecting lines can be perpendicular to the given line.

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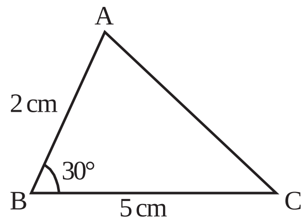
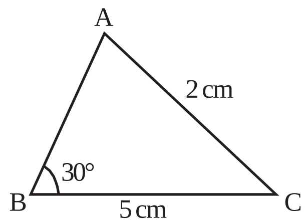
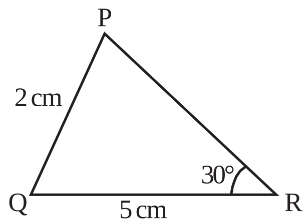
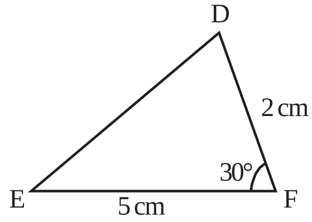
11. Consider the triangle (T) given below :

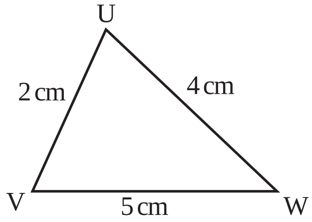
T :


Which one of the following is congruent to T?

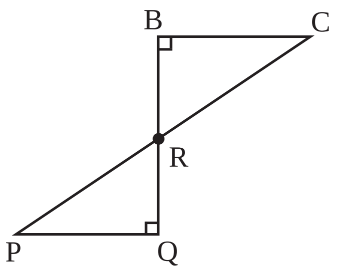
(1)


(2)


(3)


(4)


12. From the adjacent figure, the ratio of BR to RQ, when BC = PQ, $\angle CBR = \angle PQR = \frac{\pi}{2}$ is



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

13. In ΔABC, if D is a point on the side BC lying in between B & C such that AD and AC are equal, then AB – AD is

(1) Positive (2) Zero (3) Negative (4) Equal to AC

14. Consider the following statements :

A) If 3 sides of one triangle are equal to 3 sides of other triangle, then they are congruent.

B) Two circles of the same radii are congruent.

C) Sum of any two sides of a triangle is less than the third side.

D) In a triangle ABC, if AB = 5, BC = 7 and CA = x and $\angle B$ is the greatest angle, then $x < 7$

Then

(1) Only (A) and (B) are false (2) Only (B) and (C) are false

(3) Only (C) and (D) are false (4) Only (D) and (A) are false

15. If 3, 5, x ($x > 5$); y, 3, 7 ($0 < y < 3$); 1, z, 5 ($1 < z < 5$) are sides of three right angled triangles, and LCM of x^2, y^2, z^2 is $p_1^{\alpha} p_2^{\beta} p_3^{\gamma} p_4^{\delta}$, where p_1, p_2, p_3, p_4 are primes then $(p_1 + p_2 + p_3 + p_4)(\alpha + \beta + \gamma + \delta) =$

(1) 162 (2) 2040 (3) 27 (4) 6

16. The rationalising factor of $\left(\sqrt[6]{a} + \sqrt[6]{b}\right)$ is

(1) $\left(\sqrt[6]{a} - \sqrt[6]{b}\right)\left(\sqrt[3]{a} + \sqrt[3]{b}\right)$ (2) $\left(\sqrt[3]{a} - \sqrt[3]{b}\right)\left(\sqrt{a} - \sqrt{b}\right)$

(3) $\left(\sqrt[6]{a} - \sqrt[6]{b}\right)\left(\sqrt{a} + \sqrt{b}\right)$ (4) $\left(\sqrt[6]{a} - \sqrt[6]{b}\right)\left(\sqrt[3]{a^2} + \sqrt[3]{ab} + \sqrt[3]{b^2}\right)$

17. $1.\overline{27} + 0.\overline{94} =$

(1) $2.\overline{21}$ (2) $2.\overline{2}$ (3) $1.\overline{2794}$ (4) $\frac{219}{33}$

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18. For three numbers *a*, *b*, *c* if

a) LCM of *a*, *b*, *c* is 45

b) HCF of *a*, *b*, *c* is 3

c) LCMs of two different numbers selected out of the three given numbers are 9, 15 and 45

d) Product of the numbers *b* and *c* is 27.

Then $a =$

(1) 5 (2) 45 (3) 15 (4) 30

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19. *a* and *b* are two positive integers and $a > b$. If these exist positive integers *c*, *d*, *e*, *f* and *g* such that

$a = bc + d$, $(d < b)$, $b = de + f$, $(f < d)$ and $d = fg$, then the HCF of *a*, *b* is

(1) *e* (2) *d* (3) *g* (4) *f*

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20. A number obtained after subtracting *x* from 2035, when divided by 9, 10 and 15 gives the remainder 5 in each case. Then the smallest possible *x* is

(1) 50 (2) 55 (3) 150 (4) 220

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21. If $x = \sqrt{7} - \sqrt{5},\ y = \sqrt{5} - \sqrt{3}$

$z = \sqrt{11} - \sqrt{9}$ and $t = \sqrt{13} - \sqrt{11}$

then

(1) $y > t > x$ (2) $z > t > x$

(3) $x > z > t$ (4) $t > z > y > x$

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22. The first non zero digit in the number 12 × 18 × 55 × 40 × 105 appears at the

(1) Tens place (2) Hundreds place

(3) Thousands place (4) Ten thousands place

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23. A company manufactures two types of cube shapped tins with side 4 and 18. In a carton, $10n(n \in N)$ number of similar size tins are packed. The smallest size of the carton that can hold either of the type of the tins without leaving any gap is

(1) $120 \times 210 \times 320$ (2) $30 \times 210 \times 1280$

(3) $360 \times 360 \times 360$ (4) $360 \times 720 \times 1080$

24. Match the following

List - A		List - B	
a)	$2.45\overline{12}$	I)	Their HCF need not be equal to 1
b)	Co-prime numbers	II)	LCM is the product of those numbers
c)	Composite numbers	III)	Conjugate surds
d)	$\left(\sqrt[3]{3}+2\sqrt{5}\right)\left(\sqrt[3]{3}-2\sqrt{5}\right)$	IV)	is a Rational number
		V)	is an Irrational number

Then the correct match is

	(a)	(b)	(c)	(d)
(1)	V	I	II	III
(2)	V	I	II	IV
(3)	IV	II	V	III
(4)	IV	II	I	V

25. If the area bounded by the graph of $y = \sin x$ over $[0, \pi]$ and x-axis is approximated by 4 equally spaced rectangles such that the middle most rectangles have $y = 1$ as a common side, then the best estimate of the area containing actual area among the following is

(1) $\left(\frac{1+\sqrt{2}}{4}\right)\pi$ (2) $\frac{\pi}{4}$

(3) $\left(\frac{2+\sqrt{2}}{4}\right)\pi$ (4) $\frac{3}{4}\pi$

26. In a progression, n^{th} term 'f_n' follows the pattern
$f_n = f_{n-1} + f_{n-2}, \forall n \geq 2,$
$f_0 = f_1 = 1$

Then $\sum_{j=0}^{2n-1} f_j$

(1) $f_{2n} - 1$ (2) $f_{2n+1} - 1$ (3) $f_{2n-1} - 1$ (4) $f_{2n+1} - f_{2n-1}$

27. If the sum of the continued fraction

$$2+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{2+\dots}}}}$$

is denoted by e, then

(1) $e = \infty$ (2) $e = 1$

(3) $e = 1+\sqrt{2}$ (4) $e = \frac{1+\sqrt{5}}{2}$

28. Let $\alpha = 1 + \frac{1}{2^2} + \frac{1}{2^3} + \frac{1}{2^4} + \dots + \frac{1}{2^n} + \dots$ and $\beta = \alpha + \frac{1}{2} + \frac{\alpha}{9} + \frac{1}{18} + \frac{\alpha}{81} + \dots\infty$, then

(1) $\alpha = \beta$ (2) $\sqrt{\alpha} = \beta$ (3) $\left|\sqrt{\beta}\right| = \alpha$ (4) $\alpha + \beta < 1$

29. 'x' liters mixture of pure apple juice and water is made by mixing them in the ratio 3:2. 5 liters of water is added to that mixture and found that they are in the ratio 2:3. The number of liters of water to be added insted of 5 liters so as to have the ratio 1:1 is

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

30. The mean proportional of b, c and the 4^{th} proportional of a, b, c are equal to 8. If the third proportional of b, c is 4, then $(a\ b\ c) =$

(1) 2^9 (2) 2^8 (3) 2^5 (4) 2^7

31. If $x = e^{\pi} - \pi^{e}$, then

(1) $x < 0$ (2) $0 < x < 1$ (3) $x > 1$ (4) $-1 < x < 0$

32. Which one of the following is false?
(1) Sum of finite number of numbers is always finite.
(2) Every composite number can be expressed as a product of primes and this factorzation is unique.
(3) An Irrational number has non teminating non recurring (repeating) decimal expansion.
(4) Sum of infinite number of numbers is always infinite.

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33. $2-\frac{1}{3}-\frac{4}{9}-\frac{7}{27}-\ldots\infty =$

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

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34. If S_n denotes sum of first n terms of the progression $\frac{1}{2}-\frac{1}{2^2}+\frac{1}{2^3}-\frac{1}{2^4}+\ldots$ then

$\log\left|S_n-\frac{1}{3}\right|<$

(1) $(n+1)\log_e\left(\frac{1}{3}\right)$ (2) $(n+1)\log_e\left(\frac{1}{2}\right)$

(3) $(n+1)$ (4) $\log n$

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35. A shopkeeper sells an article by offering 10% discount and there by gets a profit of 5%. If he dosenot offer the discount then the percentage profit he gets is

(1) 15 (2) $15\frac{2}{3}$ (3) $15\frac{5}{3}$ (4) $16\frac{2}{3}$

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36. A certain amount of money is given to each of A and B. After 3 years, A paid it back with a simple interest of 10% and B paid it back with 10% compound interest. If the difference of amounts they both paid is Rs. 46.50 then the amount (in Rs.) given to each of them initially, is
(1) 1250 (2) 1500 (3) 1850 (4) 2000

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37. The modulus of the complex number $\frac{(2+3i)(3-i)}{6+2i}$ is

(1) $\frac{25}{4}$ (2) $\frac{\sqrt{17}}{3}$ (3) $\frac{\sqrt{13}}{2}$ (4) $\frac{14}{\sqrt{10}}$

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38. Let $A = \{4n+1 \ / \ n \in W\}$

$B = \{4n+3 \ / \ n \in W\}$

$C = \{2n \ / \ n \in W\}$

(W is set of whole numbers) and consider the following statements :

I) A, B, C are mutually disjoint.

II) $A \cup B \cup C = W$

III) $A' = C; B' = C$

Then which of the above statements is/are true

(1) I and II only
(2) I only
(3) I and III only
(4) I, II and III

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39. Consider the statements.

I) If the set of letters needed to spell the word CORRECT is A and the set of letters needed to spell the word RECTOR is B; then $n(A) = n(B)$.

II) If A and B are not disjoint, then (A – B), $A \cap B$ and (B – A) are also not disjoint.

III) If three sets A, B, C are such that $A \cap B = B$, $A \cap C \neq \phi$; $B \cap C = \phi$, then $n(A \cup B \cup C) = n(A) + n(C) - n(A \cap C)$.

Which of the above statements is/are false?

(1) Statement I and II
(2) Only statement II
(3) Only statement III
(4) All statements I, II and III

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40. If θ_1 and θ_2 are the amplitudes of two complex numbers z_1 and z_2 satisfying $|z_1 + z_2| = |z_1| + |z_2|$, then $\theta_1 - \theta_2 =$

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

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41. $\text{Arg}\left(-\sqrt{7} + \sqrt{21}\, i\right) + \text{Arg}\left(\sqrt{7} + \sqrt{21}\, i\right) + \text{Arg}\left(\sqrt{7} - \sqrt{21}\, i\right) =$

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

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42. A businessman marks the price of an item 30% above the cost price and allows a discount of 12%. The profit the businessman makes on selling that item is

(1) 18% (2) $14\frac{2}{5}\%$ (3) 15% (4) $15\frac{1}{3}\%$

43. A sum of Rs. x lent for interest amounts to Rs. 2,24,952 in three years. If the interest is calculated on the amount accumelated at the end of previous year at the rate of 3%, 4% and 5% for each of the 1^{st}, 2^{nd} and 3^{rd} years, then x (in Rs.) =

(1) 2,00,000 (2) 1,90,000 (3) 2,05,000 (4) 1,95,000

44. In measuring the sides of a rectangle, one side is taken 5% more and the other 4% less. The percentage error in the area of the rectangle is

(1) $\frac{7}{9}$ decrease (2) $\frac{4}{5}$ decrease

(3) $\frac{8}{9}$ increase (4) $\frac{4}{5}$ increase

45. The square root of $\frac{3}{2}(x-1)+\sqrt{2x^2-7x-4}$ is

(1) $\frac{1}{\sqrt{2}}\left[\sqrt{2x+1}+\sqrt{x-4}\right]$ (2) $\frac{1}{\sqrt{2}}\left[\sqrt{2x+1}-\sqrt{x-4}\right]$

(3) $\frac{1}{\sqrt{2}}\left[\sqrt{2x-1}+\sqrt{x-4}\right]$ (4) $\frac{1}{\sqrt{2}}\left[\sqrt{2x-1}+\sqrt{x+4}\right]$

46. By allowing complex coefficients in the factorization of a polynomial of real variable the following factorization is taken $x^3+y^3=(x+y)(x+ay)(x+by)$. Then a =

(1) $2+\sqrt{3}i$ (2) $\frac{-1\pm\sqrt{3}i}{2}$

(3) $\frac{\sqrt[2]{3}-i}{2}$ (4) $\frac{1\pm\sqrt{3}i}{2}$

47. If x_1 and x_2 are roots of $ax^2 + bx + c = 0$, then the equation possessing the roots $\frac{x_1}{x_2}, \frac{x_2}{x_1}$ is

(1) $acx^2 - (b^2 + 2ac)x + ac = 0$
(2) $acx^2 - (b^2 - 2ac)x - ac = 0$
(3) $acx^2 + (b^2 - 2ac)x + ac = 0$
(4) $acx^2 - (b^2 - 2ac)x + ac = 0$

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48. If $f(x) = \frac{\lambda x^2 - 7x + 5}{5x^2 - 7x + \lambda}$ takes real values for any real x, then the maximum of the possible values of λ is

(1) 2 (2) –12 (3) 10 (4) 7

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49. For $|x| < 1$, the series expansion of $\sqrt{1+x}$ is given by

(1) $1 - x + x^2 - x^3 + \ldots$

(2) $1 + \frac{1}{2}x - \frac{1}{2\cdot 4}x^2 + \frac{1\cdot 3}{2\cdot 4\cdot 6}x^3 - \frac{1\cdot 3\cdot 5}{2\cdot 4\cdot 6\cdot 8}x^4 + \ldots$

(3) $1 - \frac{1}{2}x + \frac{1\cdot 3}{2\cdot 4}x^2 - \frac{1\cdot 3\cdot 5}{2\cdot 4\cdot 6}x^3 + \frac{1\cdot 3\cdot 5\cdot 7}{2\cdot 4\cdot 6\cdot 8}x^4 - \ldots$

(4) $1 + \frac{1}{2}x^2 + \frac{1\cdot 3}{2\cdot 4}x^4 + \frac{1\cdot 3\cdot 5}{2\cdot 4\cdot 6}x^4 + \ldots$

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50. The value of $\begin{vmatrix} 29 & 26 & 22 \\ 25 & 31 & 27 \\ 63 & 54 & 46 \end{vmatrix}$ is

(1) 132 (2) –132 (3) 0 (4) ±1

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51. Consider the data : 1, 2, *m*, 7, 15, 10, 8, 35, 76, 9, 27
and the statements given below :

A) *m* is the median, when *m* is any value between 9 and 10.
B) 9 is the median, when *m* is any value less than 9.
C) 10 is the median, when *m* is any value greater than 10.

Which one of the following is true?

(1) Only (A) and (B)
(2) Only (B) and (C)
(3) Only (C) and (A)
(4) All the three statements (A), (B), (C)

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52. If $\sum_{i=1}^{18}(x_i-8)=9$ and $\sum_{i=1}^{18}(x_i-8)^2=45$, then the standard deviation of the observations x_i (i = 1, 2, 3, ... 18), is

(1) $\frac{9}{5}$ (2) $\frac{9}{4}$

(3) $\frac{3}{2}$ (4) $\frac{1}{5}$

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53. If $\pi < x < \frac{3\pi}{2}$ and $\tan x = \frac{3}{4}$ then $10\left(\sin\frac{x}{2}-\cos\frac{x}{2}\right)-3\cot\frac{x}{2}=$

(1) $2\sqrt{10}+3$ (2) $4\sqrt{10}+1$

(3) $3\sqrt{5}-2$ (4) $\frac{3+\sqrt{5}}{2}$

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54. The period of $f(x)=|\sin 2x|$ is

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

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55. For $x, y \in \mathbb{R}$, the solution of the equations $x+y=\frac{2\pi}{3}$ and $\cos x+\cos y=\frac{3}{2}$ is

(1) $x=\frac{\pi}{6}, y=\frac{\pi}{2}$ (2) $x=\frac{\pi}{3}, y=\frac{\pi}{3}$

(3) $x=\frac{\pi}{4}, y=\frac{5\pi}{12}$ (4) Non existent (does not exist)

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56. cos36° – sin18° =

(1) 0 (2) $\frac{\sqrt{5}}{2}$ (3) $\frac{1}{4}$ (4) $\frac{1}{2}$

---

57. If $\sin x - \sin y = a$ and $\cos x + \cos y = b$, then the value of $\sin\left(\frac{x+y}{2}\right)$, interms of a and b, is

(1) $\pm\frac{1}{2}\sqrt{4-a^2-b^2}$ (2) $\pm\sqrt{4+a^2+b^2}$

(3) $+\frac{1}{2}\sqrt{4+a^2+b^2}$ (4) $\pm\sqrt{4-a^2-b^2}$

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58. If $\mathrm{Sin}^{-1}x + \mathrm{Sin}^{-1}2x = \frac{\pi}{3}$ then $x =$

(1) $\frac{\sqrt{21}}{14}$ (2) $\frac{2\sqrt{12}}{7}$

(3) $\frac{3\sqrt{21}}{2}$ (4) $\frac{\sqrt{3}}{7\sqrt{2}}$

---

59. If $\tan\theta$ is the geometric mean between $\sin\theta$ and $\cos\theta$ then $2-4\sin^2\theta+3\sin^4\theta-\sin^6\theta =$

(1) 0 (2) 1 (3) 2 (4) –1

---

60. The number of solutions of the equation $\mathrm{Sin}^{-1}x + \mathrm{Cos}^{-1}x^2 = \frac{\pi}{2}$ is

(1) 0 (2) 3

(3) 1 (4) 2

---

61. $\mathrm{Sin}^{-1}\left(\frac{12}{13}\right) + \mathrm{Cos}^{-1}\left(\frac{4}{5}\right) + \mathrm{Tan}^{-1}\left(\frac{63}{16}\right) =$

(1) π (2) 2π

(3) 0 (4) $-\pi$

---

62. In ΔABC, with the usual notation, $r_1 - r_2 + r_3 + r =$

(1) 8R cos B (2) 4R cos B

(3) $2\mathrm{R}\cos\frac{\mathrm{B}}{2}$ (4) 4R sin B

---

63. In a triangle ABC, if the lengths of the sides are $1, \sqrt{3}, 2$ and its circum radius is r, then its area is

(1) $\frac{\sqrt{3}}{2r}$ (2) $\frac{\sqrt{3}}{r}$

(3) $4\sqrt{3}\,r$ (4) $8\sqrt{3}\,r$

---

64. In ΔABC, if $\tan\frac{A}{2} = \frac{5}{6}$ and $\tan\frac{C}{2} = \frac{2}{5}$, then

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

(3) $b^2 = ac$ (4) $2(a + c) = b$

---

65. In a parallelogram ABCD, if AC is a diagonal then

(1) ΔABC and ΔABD are congruent (2) ΔABC and ΔBCD are congruent

(3) ΔABC and ΔACD are congruent (4) ΔACD and ΔABD are congruent

---

66. In a ΔABC, AB = AC. P is a point on the side AB such that AD bisects $\angle$PAC and CD is parallel to AB, then

(1) ABCD is a square

(2) ABCD is a parallelogram

(3) ABCD is a rhombus

(4) ABCD is a quadrilateral other than a square, a parallelogram and a rhombus

---

67. In a parallelogram ABCD, E and F are the midpoints of the sides AB and CD respectively. If P, Q are the points of intersection of AF and EC with the diagonal BD, then DQ:QB =

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

---

68. For $a \neq b$ and $a \neq -b$, if the points (a, b), (b, a) and $(a^2, -b^2)$ lie on a line, then the relation between a, b and the equation of that line is

(1) $a = 1 + b;\ x + y = a + b$

(2) $b = 1 + a,\ x + y = 1$

(3) $a = 1 + b,\ x + y = a^2 - b^2$

(4) $b = 1 - a,\ x - y = a + b$

---

69. The equation of one side of an equilateral triangle is $x + y - 2 = 0$. If its incentre lies at the origin, then the coordinates of the vertex opposite to this side are

(1) (–2, –3) (2) (–1, –1) (3) (–1, –2) (4) (–2, –2)

---

70. Suppose the triangle ABC has an area 12 sq.units with AC = 6 units, AB = 8 units and $\angle BAC$ being obtuse. The length of the side BC is

(1) $\sqrt{100-48\sqrt{3}}$ (2) $\sqrt{76}$

(3) $\sqrt{100+48\sqrt{3}}$ (4) $\sqrt{124}$

---

71. The distance between a moving point, from the fixed points (1, 0) and (–1, 0) are in the ratio $\sqrt{2}:1$. Then the equation of the locus of that moving point is

(1) $x^2+y^2+6x+1=0$

(2) $x^2+y^2-6x+1=0$

(3) $\left(\sqrt{2}-1\right)x^2+2\left(\sqrt{2}+1\right)x+\left(\sqrt{2}-1\right)y^2+\left(\sqrt{2}-1\right)=0$

(4) $x^2+y^2+3x+1=0$

---

72. The equation $ax^2+by^2+2gx+2fy+c=0$ (where $a \neq 0 \neq b$) represents a circle

(1) for all values of a, b, g, f, c

(2) if $g^2+f^2 \geq ac$ and $a = b$

(3) if $g^2+f^2 \geq a^2c$ and $a = b$

(4) for all values of a, b, g, f, c and $a = b$

---

73. The locus of the point which divides the line joining (5, 0) and (10cosθ, 10sinθ) internally in the ratio 2:3 is

(1) $x^2 + y^2 = 100$ (2) $2x^2 + y^2 = 1$

(3) $(x-3)^2 + y^2 = 16$ (4) $x^2 + (y-3)^2 = 16$

---

74. If a straight line is moving on the cartesian plane such that the sum of the reciprocals of its intercepts is unity, then the fixed point through which that line passes is

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

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

---

75. Consider the following pairs of parallel lines.

(A) $2x + 3y + 1 = 0, 2x + 3y + 14 = 0$

(B) $2x + y + 1 = 0, 2x + y + 5 = 0$

(C) $x + y + 7 = 0, x + y + 4 = 0$

(D) $4x + 3y + 1 = 0, 8x + 6y + 2 = 0$

If p, q, r, s denote the distance between the pair of lines in (A), (B), (C), (D) respectively then

(1) $s < q < p < r$ (2) $s < q < r < p$

(3) $p < q < r < s$ (4) $r < q < p < s$

---

76. Let A(1, 2) be a point on one side of the line $L \equiv x + y + 1 = 0$. A point 'B' lies on the other side of L = 0 such that the perpendicular distance from B to the line L is twice the perpendicular distance of A from the line L. Then the coordinates of B are

(1) (–5, –4) (2) (–3, –2)

(3) (3, 1) (4) (7, 8)

---

77. If |OP| = 13 and the direction ratios of line $\overleftrightarrow{OP}$ are 6, 8, –24, then the point P is

(1) (6, 8, –24) (2) (3, 4, –12)

(3) $\left(\frac{3}{2}, 2, -6\right)$ (4) (0, 0, 13)

---

78. Let S be the circle with centre at (2, 3) and radius 4. If S′ be the circle with centre (4, –1) and radius 3, then the point (6, 2) lies

(1) in the region common to the two circles

(2) in the region of the circle S, and out side the circle S′

(3) in the region of the circle S′ and out side the circle S

(4) out side the region of both the circles S and S′

---

79. A rod of given length moves with its end points on the fixed straight lines at right angles. Then any point on the rod describes

(1) a Circle (2) a Parabola
(3) an Ellipse (4) a Straight line

---

80. If the tangent drawn at A(5, 1) to the circle $x^2 + y^2 + 2x - 10y - 26 = 0$ touches the other circle $x^2 + y^2 = 13$ at P, then AP =

(1) $\sqrt{13}$ (2) $\sqrt{17}$ (3) $\sqrt{12}$ (4) 4

---

81. If the equation of the plane passing through the points (–1, 2, –3), (5, 0, –6) and (0, 4, –1) is $ax + by + cz + d = 0$, then $a + b + c + d =$

(1) 55 (2) 65 (3) 75 (4) 85

---

82. Let A be a fixed point and L be a fixed line on a plane. If a point P is moving in the plane such that twice the distance of P from A is equal to the distance of P from the line L, then the locus of P is

(1) a circle (2) a parabola
(3) an ellipse (4) a hyperbola

---

83. In a trepezium of area 480 m^2, the distance between two parallel sides is 15 m and one of the parallel sides is of length 20 m. The length of the other parallel side is

(1) 44 m (2) 20 m
(3) 64 m (4) 24 m

---

84. A solid cone is melted and with that entire material a sphere is made having volume 38808 cm^3. If the radius of the cone and sphere are the same, then height of the cone is

(1) 21 (2) 84 (3) 25 (4) 15

---

85. The ratio of the curved surface area of a right circular cylinder to its total surface area is 1:3. If the total surface are is 462 cm^3, its volume V is given by

(1) 489 cm^3 (2) 729 cm^3
(3) 539 cm^3 (4) 2729 cm^3

---

86. O is the centre of the circumcircle of ΔABC for which $\underline{|BAC} = \theta$. If the angle made by the chord BC of the circle at the centre O is 80°, then θ =

(1) 160° (2) 80° (3) 20° (4) 40°

---

87. 4 cows are tethered to the 4 corners of a square field of side 56 meters for grazing so that they just can reach one another on its sides. The area left ungrazed by the cows is

(1) 426 sq.m. (2) 289 sq.m.
(3) 672 sq.m. (4) 313 sq.m.

---

88. How many candles of 1 cm radius and height 7 cms can be made from a thin square sheet of wax whose one side is of length 22 cm and thickness 1 cm?

(1) 11 (2) 7 (3) 4 (4) 22

---

89. A spherical iron ball of radius 'r' was melted to make 'n' square sheets of side half its radius and unit thickness. The ratio of r to n is

(1) $\frac{11}{3}$ (2) $\frac{21}{16}$ (3) $\frac{41}{22}$ (4) $\frac{21}{352}$

---

90. A cylinder having a surface area 616 sq. meter is cut along its height and made into a single rectangular sheet. If the height of the cylinder is twice its raduis, then the perimeter of that rectangle is

(1) 58 m (2) 616 m (3) 116 m (4) 1232 m

---

91. The density of a metallic sphere of diameter 9.8 cm is 8 gm/cm^3. If it costs Rs. 500 per kilogram, then the cost of that metallic sphere (in Rs.) is nearly

(1) 1972 (2) 1960 (3) 1942 (4) 1928

---

92. If the volume of a sphere and a cube are equal, then the ratio of their respective surface areas is

(1) $\sqrt[3]{11} : \sqrt[3]{21}$ (2) 2:3
(3) $\sqrt[3]{11} : \sqrt{21}$ (4) $\sqrt[3]{11} : 1$

---

93. Let x_1, x_2, ... x_n be distinct observations in decreasing order. If the first observation is increased by K and the last observation is decreased by K, then

Which one of the following does not get altered?

(1) Only mean
(2) Both mean and median
(3) Both mean and mode
(4) All mean, median and mode

---

94. Match the following:

Let $x_1, x_2, \ldots x_n$ be a set of observations and $f_1, f_2, \ldots f_n$ be their frequencies.

List - A		List - B	
A)	$\sum_{i=1}^{n}(x_i - \overline{x})$	I)	Variance of x_i's
B)	Mean deviation	II)	Zero
C)	$\dfrac{\sum_{i=1}^{n}(y_i - \overline{y})^2 f_i}{\sum f_i}$ Where $y_i = x_i + \text{K}$	III)	$\left(\dfrac{\sum x_i^2 f_i}{\left(\sum f_i\right)\overline{x}^2} - 1\right)100^2$
D)	Square of the coefficient of variation of x_i	IV)	Mean of the absolute deviations from mean
		V)	$\left(\dfrac{\sigma_y}{\overline{x}} \times 100\right)^2$

Then the correct match is

	(A)	(B)	(C)	(D)
(1)	IV	I	II	V
(2)	I	II	III	IV
(3)	II	III	IV	V
(4)	II	IV	I	III

---

95. If each one of the value of n observations is increased by K(>0), then the coefficiect of variation of the distribution

(1) decreases (2) increases

(3) is unaltered (4) becomes zero

---

96. For a distribution, if the median is 6 and mode is 8, then its mean is

(1) 5 (2) 7 (3) 10 (4) 4

---

97. If 5 boys and 6 girls are arranged in a row, then the probability of having an arrangement in which all the girls are together, is

(1) $\frac{5!\,6!}{11!}$ (2) $\frac{6!\,6!\,2!}{11!}$

(3) $\frac{6!\,6!}{11!\,2!}$ (4) $\frac{6!\,6!}{11!}$

---

98. From a box containing 10 red balls and some blue balls, two balls are drawn at random. If the probability of getting both the blue balls is the same as the probability of getting two different colored balls, then the number of blue balls in the box is

(1) 11 (2) 20 (3) 21 (4) 9

---

99. Two sets of observations with equal means and unequal number of observations have the coefficient of variations α and β respectively. The first set of observations is more consistent when

(1) $\alpha < \beta$ (2) $\alpha > \beta$

(3) $\alpha = \beta$ (4) $\alpha = \beta = 0$

---

100. A mapping is selected at random from the set of all mappings from a set A with n(A) = 7 into itself. The probability that the mapping thus selected is an injection, is

(1) $\frac{7}{7!}$ (2) $\frac{7!}{2\times 7!}$

(3) $\frac{6!}{7\,p_6}$ (4) $\frac{6!}{7^6}$

SPACE FOR ROUGH WORK

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