913853

Series - A

Question Booklet No.

COMMON ENTRANCE TEST - 2013
QUESTION BOOKLET
MATHEMATICS (Code - 04)

Maximum Time Allowed : 1½ hours
Negative Marking : 0.2

No. of Questions : 75
Maximum Marks : 75

Roll No. | | | | | | |

Answer Sheet No. | | | | | | |

INSTRUCTIONS

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. **Check the booklet thoroughly :** In case of any defect - Misprint, Missing Question(s) or duplication of question(s)/ Page(s) get the booklet changed with the booklet of the same series from the Room Invigilator. No complaint shall be entertained after the entrance test.
2. Write your Roll Number and Answer Sheet No. in the space provided on the Question Booklet and on the OMR Answer Sheet. Incomplete and/or incorrect particulars will result in the non-evaluation of your answer sheet.
3. Strictly follow the instructions given by Centre Supervisor / Room Invigilator and those given on the Question Booklet.
4. Candidates are not allowed to carry any papers, notes, books, calculators, mobile phones, scanning devices etc. in the Examination Hall. Any candidate found using or in possession of such unauthorized material or indulging in copying or impersonation or adopting unfair means / reporting late / without Admit Card will be debarred from the Written Test.
5. Use ONLY blue/black ball point pen for darkening the circles on the OMR Answer Sheet. Use of eraser, whitener (fluid) and cutting on the OMR Answer Sheet is not allowed.
6. The test is of objective type containing multiple choice questions (MCQs). Each objective question is followed by four responses. Choose the correct/best response and mark your response on the OMR Answer Sheet and not in the Question Booklet.
7. Completely darken the CIRCLE so that the number inside the CIRCLE is not visible as shown in the example below.

Correct Method

Wrong Methods

8. Darken ONLY ONE CIRCLE for each answer. If you darken more than one circle, it will be treated as a wrong answer.
9. Mark answer only in the space provided. DO NOT make any stray mark anywhere on the OMR Answer Sheet. DO NOT fold or wrinkle the OMR Answer Sheet. Rough work MUST NOT be done on the answer sheet. Use your question booklet for this purpose.
10. Candidates are provided carbonless OMR Answer Sheet (optical mark reader answer sheet) having original copy and candidate's copy. After completing the examination candidates are directed to fold at perforation at the top of sheet, tear it to separate original copy and candidate's copy and then hand over the original copy of OMR Answer Sheet to the Room Invigilator and take candidate's copy with them.

DO NOT OPEN THE SEAL OF THIS BOOKLET UNTIL TOLD TO DO SO

1306/04

1. Suppose $A_1, A_2, \ldots\ldots, A_{30}$ are thirty sets each with five elements and $B_1, B_2, \ldots\ldots, B_n$ are 'n' sets each with three elements.

   Let $\bigcup_{i=1}^{30} A_i = \bigcup_{j=1}^{n} B_j = S$

   Assume that each element of S belongs to exactly ten of A_i's and exactly 9 of B_j's, then the value of n is

   1. 90 2. 15
   3. 9 4. 45

2. A survey shows that 63% of the Americans like cheese whereas 76% like apples. If x% of the Americans like both cheese and apples, then the value of x is

   1. $39 \le x \le 63$ 2. 63
   3. 39 4. $139 \ge x$

3. The cartesian product A x A has 9 elements among which are found (-1, 0) and (0, 1), then set A = ?

   1. {1, 0} 2. {1, -1, 0}
   3. {0, -1} 4. {1, -1}

4. Let S = {(a, b) : b = |a - 1|, a ∈ Z and |a| < 3} where Z denotes the set of Integers. Then the range set of S is

   1. {1, 2, 3}
   2. {-1, 2, 3, 1}
   3. {0, 1, 2, 3, 4}
   4. {-1, -2, -3, -4}

5. R is a relation from {11, 12, 13} to {8, 10, 12} defined by y = x - 3. Then R^{-1} is

   1. {(8, 11), (10, 13)}
   2. {(11, 8), (13, 10)}
   3. {(10, 13), (8, 11), (12, 10)}
   4. none of these

6. The quotient of the identity function by the reciprocal function is given by

   1. $x^2 \; \forall \; x \in \Re$ (set of real numbers)
   2. $\frac{1}{x^2} \; \forall \; x \in \Re - \{0\}$
   3. $x^2 \; \forall \; x \in \Re - \{0\}$
   4. none of these

7. Which of the following is **not** a function ?

   1. $\{(x, y) : x, y \in \Re, x^2 = y\}$
   2. $\{(x, y) : x, y \in \Re, y^2 = x\}$
   3. $\{(x, y) : x, y \in \Re, x = y^3\}$
   4. $\{(x, y) : x, y \in \Re, y = x^3\}$

8. If $(1 + i)(2i + 1)(1 + 3i) \ldots\ldots (1 + ni) = x + iy$ then $2.5.10 \ldots\ldots (1 + n^2) = ?$

   1. 1 2. i
   3. $x^2 + y^2$ 4. $1 + n^2$

9. The value of $|z_1| = |z_2| = \ldots\ldots\ldots = |z_n| = 1$, then $|z_1 + z_2 + z_3 + \ldots\ldots + z_n| = ?$ (where z_i is a complex number with i = 1 to n)

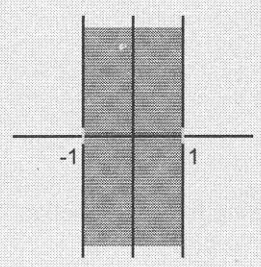
   1. $\left|\frac{1}{z_1 + z_2 + z_3 + \ldots\ldots + z_n}\right|$
   2. $\left|\frac{1}{z_1} + \frac{1}{z_2} + \frac{1}{z_3} + \ldots\ldots + \frac{1}{z_n}\right|$
   3. $\left|\frac{1}{z_1 z_2} + \frac{1}{z_3 z_4} + \ldots\ldots + \frac{1}{z_{n-1} z_n}\right|$
   4. 1

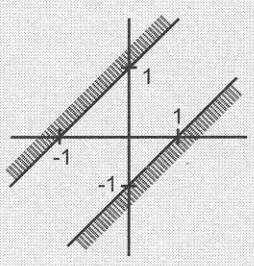
10. The non-zero solutions of the equation $z^2 + |z| = 0$, where z is a complex number are

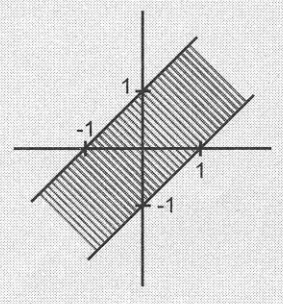
    1. ± 1 2. $\pm i$
    3. $1 \pm i$ 4. $\pm 1 \mp i$

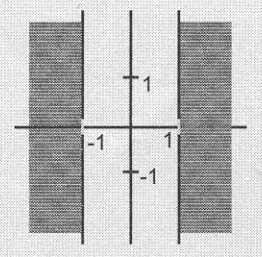
Space for Rough Work

11. Which of the following shaded regions represents the solution set of inequation $|x-y| \geq 1$

1. 

2. 

3. 

4. 

12. The values of x for which $-11 \leq 4x - 3 \leq 13$ is
    1. $-4 \leq x \leq 5$
    2. $-2 \leq x \leq 4$
    3. $-8 \leq x \leq 16$
    4. $-11 \leq x \leq 10$

13. The solution set of the following linear inequations
    $x - 2y \geq 0$
    $2x - y \leq -2$
    $x \geq 0, y \geq 0$
    is given by
    1. [1, 2]
    2. Null set
    3. $x \geq 1$
    4. set of real numbers

14. For the given LPP (linear programming problem)
    max $z = 5x + 3y$
    $2x + y \leq 12$
    $3x + 2y \leq 20$
    $x \geq 0, \ y \geq 0$
    the optimal solution set is
    1. (0, 0)
    2. (6, 0)
    3. (4, 4)
    4. (0, 10)

15. A dietician wishes to mix together two kinds of food X and Y in such a way that the mixture contains at least 10 units of vitamin A, 12 units of vitamin B and 8 units of vitamin C. The vitamin content of 1 kg food is given below :

Food	Vitamin A	Vitamin B	Vitamin C
X	1	2	3
Y	2	2	1

One kg of food X costs Rs. 16 and one kg of food Y costs Rs. 20. Find the least cost of the mixture which will produce the required diet ?
    1. Rs. 100
    2. Rs. 98
    3. Rs. 116
    4. Rs. 112

Space for Rough Work

16. Which of the following is a purely imaginary term of the sequence 8 - 6i, 7 - 4i, 6 - 2i, ... ?
1. 9th term 2. 2nd term
3. 4th term 4. 8th term

17. If S_n denotes the sum of first n terms of A.P $< a_n >$, such that $\frac{S_m}{S_n} = \frac{m^2}{n^2}$ then $\frac{a_m}{a_n} = ?$
1. $\frac{2m + 1}{2n + 1}$ 2. $\frac{2m - 1}{2n - 1}$
3. $\frac{m - 1}{n - 1}$ 4. $\frac{m + 1}{n + 1}$

18. The sum of all possible products of the first n natural numbers taken two by two is
1. $\frac{n (n + 1)}{2}$
2. $\frac{n (n + 1) (n + 2)}{6}$
3. $\frac{n (n^2 - 1) (3n + 2)}{24}$
4. $2n^3 + 3n^2 - 1$

19. How many four digit numbers are there with distinct digits ?
1. 5040 2. 4536
3. 30,240 4. 5274

20. If ${}^nC_r + {}^nC_{r+1} = {}^{n+1}C_x$, then x = ?
1. r 2. r - 1
3. n 4. r + 1

21. The coefficient of the term independent of x in the expansion $\left(\frac{x+1}{x^{2/3} - x^{1/3} + 1} - \frac{x-1}{x - x^{1/2}}\right)^{10}$ is
1. 8064 2. 210
3. - 546 4. 5040

22. There are 12 points in a plane. The number of straight lines joining any two of them, when 3 of them are collinear, is
1. 60 2. 63
3. 64 4. 65

23. Which of the following is the correct principle of Mathematical Induction ?
1. Let P(n) be a statement such that n be any integer and P(1) is true. Also P(m) is true for m, any natural number, then P(n) is true for all integers n
2. Let P(n) be a statement involving natural number n such that P(1) is true and P(m) is true whenever P(n) is true for every $n \geq m$, then, P(n) is true for all $n \in \mathbb{N}$ (set of natural numbers)
3. Let P(n) be a statement where $n \in \mathbb{N}$ such that P(1) is true and P(n), P(n + 1) also holds then P(n) is true $\forall\ n \in \mathbb{N}$
4. Let P(n) be a statement involving the natural number n, such that P(1) is true and P(m + 1) is true for all $n \leq m$. Then P(n) is true for all $n \in N$

24. If $x > 0$ and $\cot^{-1} x - \cot^{-1} (x + 2) = \frac{\pi}{12}$, then the value of x is
1. $2\sqrt{3}$ 2. $\sqrt{3}$
3. $\frac{1}{\sqrt{3}}$ 4. $\sqrt{3} - 1$

25. If $\cot\theta (1 + \sin\theta) = 4m$ and $\cot\theta (1 - \sin\theta) = 4n$ then $(m^2 - n^2)^2 = ?$
1. mn 2. $\tan\theta$
3. 1 4. $\frac{m + n}{4}$

Space for Rough Work

26. The value of

$$\cos\left(\frac{3\pi}{2}+x\right)\cos(2\pi+x)\left\{\cot\left(\frac{3\pi}{2}-x\right)+\cot(2\pi+x)\right\}=?$$

1. 0
2. 1
3. cos x
4. sin x

27. If sin B = 3 sin (2A + B), then
2 tan A + tan (A + B) = ?
1. 0
2. - 2
3. 1
4. 1/3

28. If $\theta=\frac{\pi}{2^n+1}$, then
$2^n \cos\theta \cos2\theta \cos2^2\theta \ldots\ldots \cos2^{n-1}\theta = ?$
1. sinθ
2. π/2
3. 0
4. 1

29. Using the principal values, the value of

$$\sin^{-1}\left\{\sin\frac{5\pi}{6}\right\}+\tan^{-1}\left\{\tan\frac{\pi}{6}\right\}=?$$

1. π/6
2. 2π/3
3. π/3
4. 5π/6

30. Find $\cos^{-1}\left(\frac{4}{5}\right)+\tan^{-1}\left(\frac{3}{5}\right)=?$

1. $\tan^{-1}\left(\frac{7}{10}\right)$
2. $\tan^{-1}\left(\frac{27}{11}\right)$
3. $\sin^{-1}\left(\frac{7}{5}\right)$
4. $\tan^{-1}\left(\frac{1}{5}\right)$

31. If $X+Y=\begin{bmatrix}7 & 0\\ 2 & 5\end{bmatrix}$ and $X-Y=\begin{bmatrix}3 & 0\\ 0 & 3\end{bmatrix}$, then X = ?

1. $\begin{bmatrix}5 & 0\\ 0 & 4\end{bmatrix}$
2. $\begin{bmatrix}7 & 0\\ 1 & 5\end{bmatrix}$
3. $\begin{bmatrix}5 & 0\\ 1 & 4\end{bmatrix}$
4. $\begin{bmatrix}7 & 1\\ 0 & 4\end{bmatrix}$

32. If $\begin{vmatrix}x+7 & 5\\ x-3 & 3\end{vmatrix}=26$, then x = ?

1. 1
2. 3
3. 5
4. 7

33. The value of $\begin{vmatrix}a^2 & 2ab & b^2\\ b^2 & a^2 & 2ab\\ 2ab & b^2 & a^2\end{vmatrix}=?$

1. $(a^2+b^2)^3$
2. $(a^3+b^3)^2$
3. $(a^4+b^4)^2$
4. $(a^2+b^2)^4$

34. If $A=\begin{bmatrix}3 & -4\\ 1 & -1\end{bmatrix}$, then (A - A') is
(where A' is transpose of matrix A)
1. Null matrix
2. Identity matrix
3. Symmetric
4. Skew-symmetric

35. If $A^{-1}=\begin{bmatrix}5 & -2\\ -7 & 3\end{bmatrix}$ and $B^{-1}=\frac{1}{2}\begin{bmatrix}9 & -7\\ -8 & 6\end{bmatrix}$ then $(AB)^{-1}=?$

1. $\begin{bmatrix}94 & -39\\ -82 & 34\end{bmatrix}$
2. $\begin{bmatrix}94 & -82\\ -39 & 34\end{bmatrix}$
3. $\begin{bmatrix}-47 & 46\\ 39/2 & -17\end{bmatrix}$
4. $\begin{bmatrix}-47 & 39/2\\ 46 & -17\end{bmatrix}$

Space for Rough Work

36. The value of limit, $\lim_{x \to 1} \frac{x - 1}{\log_e x} = ?$

1. 1
2. 0
3. Not defined
4. - 1

37. $\lim_{x \to 0} \left\{ \tan\left(\frac{\pi}{4} + x\right) \right\}^{1/x} = ?$

1. e
2. e^2
3. 1/e
4. $1/e^2$

38. The value of $\lim_{n \to \infty} \left\{ \frac{1+2+3.....+n}{n+2} - \frac{n}{2} \right\}$ is

1. 1/2
2. 1
3. - 1
4. $-\frac{1}{2}$

39. If $y = 1 + \frac{x}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!}$, then $\frac{dy}{dx} = ?$

1. e
2. sin x
3. y
4. x

40. The value of $\frac{d}{dx}[x^n \log_a xe^x]$ is

1. $e^x \log_a x + \frac{x^{n-1}}{\log_e a}$
2. $e^x x^{n-1} \left\{ n \log_a x + \frac{1}{\log_e a} + x \log_a x \right\}$
3. $n x^{n-1} \log_a xe^x$
4. $x^n \log_a x.e^x$

41. The interval in which the function $f(x) = \sin x - \cos x$ $0 \le x \le 2\pi$ is strictly decreasing is

1. $0 < x < \frac{3\pi}{4}$
2. $\frac{7\pi}{4} < x < 2\pi$
3. $\frac{3\pi}{4} < x < \frac{7\pi}{4}$
4. $0 < x < \frac{7\pi}{4}$

42. The slope of normal to the curve $y = x^3 + 2x + 6$ which is parallel to line $x + 14y + 4 = 0$ is

1. $-\frac{1}{3}$
2. $-\frac{1}{14}$
3. - 4
4. $-\frac{1}{2}$

43. The approximate value of $(0.009)^{1/3}$ is

1. 0.2
2. 0.2083
3. 0.0032
4. 0.0083

44. If $f(x) = \begin{cases} \frac{(1 - \cos 4x)}{x^2}, & \text{if } x < 0 \\ a & \text{if } x = 0 \\ \frac{\sqrt{x}}{\sqrt{16 + \sqrt{x}} - 4} & \text{if } x > 0 \end{cases}$

then f(x) is continuous at x = 0, for a = ?

1. 4
2. $\sqrt{32}$
3. 8
4. 16

Space for Rough Work

45. The value of $\int_0^{\pi/2} \frac{dx}{1+\tan x}$ is

1. $\pi/2$
2. 0
3. $\pi/4$
4. $\pi/8$

46. On evaluating $\int \frac{3x-2}{(x+3)(x+1)^2} dx = ?$

1. $\frac{11}{4}\log\left[|x+1||x+3|\right] + \frac{5}{2(x+1)} + C$
2. $\frac{11}{4}\log\left|\frac{x+3}{x+1}\right| + \frac{1}{x+1} + C$
3. $\frac{11}{4}\log|x+2| + \frac{5}{2}(x+3) + \frac{1}{x+1} + C$
4. $\frac{11}{4}\log\left|\frac{x+1}{x+3}\right| + \frac{5}{2(x+1)} + C$

47. The general solution of the linear differential equation $\frac{dy}{dx} + \sec x.y = \tan x \quad (0 \le x \le \frac{\pi}{2})$ is

1. $y = x(\sec x + \tan x)^{-1} + \frac{C}{\sec x + \tan x} + 1$
2. $y = x + \frac{C}{\sec x + \tan x} + \frac{1}{\tan x}$
3. $y = \frac{x+1}{\sec x + \tan x} + C$
4. $y = x + \sec x + \tan x + C$

48. On solving the differential equation $x^2ydx - (x^3+y^3)\,dy = 0$, the value of $\log y = ?$

1. $\frac{x^3}{3y^3} + C$
2. $\frac{x^2}{y^2} + C$
3. $\frac{x^2}{3y^3} + C$
4. $\frac{x^3}{x^3+y^3} + C$

49. The value of $\int \frac{2+\sin x}{1+\cos x} e^{x/2} dx = ?$

1. $2 . e^{x/2} \tan\frac{x}{2} + C$
2. $e^{x/2} \tan x + C$
3. $\frac{1}{2} e^{x/2} \sin x + C$
4. $\frac{1}{2} e^{x/2} \sin\frac{x}{2} + C$

50. On evaluation, the value of $\int_0^4 f(x)\,dx$ where $f(x) = \begin{cases} |x-2|+2 & x \le 2 \\ x^2 - 2 & x > 2 \end{cases}$ is

1. $\frac{56}{3}$
2. $\frac{60}{3}$
3. $\frac{66}{3}$
4. $\frac{62}{3}$

51. The particular solution of the differential equation $\frac{dy}{dx} + y\cot x = 2x + x^2\cot x$, such that $y(\pi/2) = 0$ is

1. $y = \frac{\pi^2}{4\cos x}, (x \ne 0)$
2. $y = x^2 - \frac{\pi}{2}\tan x$
3. $y = \frac{2x}{\sin x} + \frac{1}{x^2}, (x \ne 0)$
4. $y = x^2 - \frac{\pi^2}{4\sin x} (\sin x \ne 0)$

Space for Rough Work

52. The differential equation corresponding to the equation $y^2 = a(b - x^2)$ where a, b are constants is

1. $y^2 \frac{d^2y}{dx^2} = a\left(b - \frac{dy}{dx} + x\right)$

2. $xy \frac{d^2y}{dx^2} + x\left(\frac{dy}{dx}\right)^2 - y\frac{dy}{dx} = 0$

3. $y\left(\frac{dy}{dx}\right)^2 - x\frac{dy}{dx} + 1 = 0$

4. none of these

53. The area bounded by the circle $x^2 + y^2 = 16$ and the line $y = x$ in the first quadrant is
1. 4π sq. units
2. 8π sq. units
3. 2π sq. units
4. π sq. units

54. The focal distance of the points (x, y) from the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, $a > b$ is

1. $a \pm \sqrt{1 - \frac{b^2}{a^2}}\, y$
2. $b \pm \sqrt{1 - \frac{a^2}{b^2}}\, y$
3. $a \pm \sqrt{1 - \frac{b^2}{a^2}}\, x$
4. $b \pm \sqrt{1 - \frac{a^2}{b^2}}\, x$

55. The lines $3x + y - 14 = 0$
$\lambda x - 2y = 0$
$3x - 8y + 4 = 0$
are concurrent. Then the value of λ is
1. 1
2. 2
3. 3
4. 4

56. The equation of a straight line which cuts off intercept on X-axis which is twice that on Y-axis and is at a unit distance from origin is given by
1. $x + y = 0$
2. $x + 2y \pm \sqrt{2} = 0$
3. $x + 2y \pm \sqrt{5} = 0$
4. $x + \sqrt{5}y \pm 2 = 0$

57. The equation of a straight line upon which the length of the perpendicular from the origin is 5 and slope of this perpendicular is 3/4 is
1. $2x + 5y \pm 16 = 0$
2. $4x + 3y \pm 25 = 0$
3. $4x + 3y \pm 5 = 0$
4. $2x + 5y \pm 4 = 0$

58. The radius of the circle
$(x\cos\theta + y\sin\theta - a)^2 + (x\sin\theta - y\cos\theta - b)^2 = k^2$ is
1. $a^2 + b^2 - k^2$
2. $a\sin\theta - b\cos\theta$
3. $a^2 + b^2$
4. k

59. The locus of a point which moves in a plane such that its distance from a fixed point in the plane is always equal to its distance from a fixed straight line in the same plane represents
1. a circle
2. a parabola
3. a hyperbola
4. an ellipse

60. The eccentricity of the ellipse
$25x^2 + 9y^2 - 150x - 90y + 225 = 0$ is
1. 4/5
2. 3/5
3. 4/15
4. 9/5

61. The mean deviation from the median is
1. equal to that measured from another value
2. maximum if all observations are positive
3. greater than that measured from any other value
4. less than that measured from any other value

Space for Rough Work

62. The variance of the data

x :	1	a	a^2	.....	a^n
f :	$^nC_0$	$^nC_1$	$^nC_2$	.....	^nC_n is

1. $\left(\frac{1+a^2}{2}\right)^n - \left(\frac{1+a}{2}\right)^{2n}$
2. $\left(\frac{1+a^2}{2}\right)^{2n} - \left(\frac{1+a}{2}\right)^n$
3. $\left(\frac{1+a}{2}\right)^{2n} - \left(\frac{1+a^2}{2}\right)^n$
4. $\left(\frac{1+a}{2}\right)^n - \left(\frac{1+a^{2n}}{2}\right)^n$

63. An analysis of the weekly wages paid to workers in two firms A & B, belonging to the same industry gives the following results :

	Firm A	Firm B
Number of wage earners	586	648
Average of weekly wages	Rs. 52.5	Rs. 47.5
Variance of the distribution of wages	100	121

then, which firm pays out larger amount and which shows greater variability respectively ?

1. A, B
2. B, A
3. B, B
4. A, A

64. If the standard deviation of a variable X is σ then the standard deviation of variable $\frac{aX+b}{c}$ is

1. $a\sigma$
2. $\frac{a}{c}\sigma$
3. $\left|\frac{a}{c}\right|\sigma$
4. $\frac{a\sigma + b}{c}$

65. A bag contains 50 tickets numbered 1, 2, 3, ..., 50 of which five are drawn at random and arranged in ascending order of magnitude ($x_1 < x_2 < x_3 < x_4 < x_5$) then the probability that $x_3 = 30$ is

1. $\frac{^{29}C_2 \times {}^{20}C_2}{^{50}C_5}$
2. $\frac{^{30}C_1 \times {}^{29}C_1}{^{50}C_5}$
3. $\frac{^{5}C_1 \times {}^{50}C_2}{^{50}C_5}$
4. $\frac{^{50}C_2 \times {}^{29}C_1}{^{50}C_5}$

66. If S is the sample space and $P(A) = \frac{1}{3} P(B)$ and $S = A \cup B$ where A and B are two mutually exclusive events, then P(A) = ?

1. 1/4
2. 1/2
3. 3/4
4. 3/8

67. Five persons entered the lift cabin on the ground floor of an eight floor house. Suppose that each of them independently and with equal probability can leave the cabin at any floor beginning with the first, then the probability of all 5 persons leaving at different floors is

1. $\frac{^7P_5}{7^5}$
2. $\frac{7^5}{^7P_5}$
3. $\frac{6}{^6P_5}$
4. $\frac{^5P_5}{5^5}$

68. In a three dimensional space the equation $x^2 - 5x + 6 = 0$ represents

1. points
2. planes
3. curves
4. none of these

Space for Rough Work

69. Let (3, 4, - 1) and (- 1, 2, 3) be end points of the diameter of a sphere then the radius of the sphere is

1. 2
2. 3
3. 6
4. 7

70. If the position vector $\vec{a}$ of a point (12, n) is such that $|\vec{a}| = 13$, then value of n is

1. ± 3
2. ± 4
3. ± 5
4. ± 6

71. The following lines are

$$\vec{r} = (\hat{i} + \hat{j}) + \lambda(\hat{i} + 2\hat{j} - \hat{k})$$
$$\vec{r} = (\hat{i} + \hat{j}) + \mu(-\hat{i} + \hat{j} - 2\hat{k})$$

1. collinear
2. skew-lines
3. co-planar lines
4. parallel lines

72. The position vector of a point R which divides the line joining P(6, 3, - 2) and Q(3, 1, - 4) in the ratio 2 : 1 externally is

1. $\hat{i} + 3\hat{j} - 2\hat{k}$
2. $3\hat{i} - \hat{k}$
3. $-\hat{j} + 6\hat{k}$
4. $2\hat{i} - \hat{j}$

73. If $\vec{a} = \hat{i} + 2\hat{j} - 3\hat{k}$ and $\vec{b} = 2\hat{i} + 4\hat{j} + 9\hat{k}$, then the unit vector parallel to $\vec{a} + \vec{b}$ is

1. $\frac{1}{6}5\hat{i} - \hat{k}$
2. $\frac{1}{\sqrt{35}}(5\hat{i} + 3\hat{j} - \hat{k})$
3. $\frac{1}{5}(3\hat{j} - 5\hat{k})$
4. $3\hat{i} + 6\hat{j} - 6\hat{k}$

74. The angle between the lines

$\frac{x - 5}{- 3} = \frac{y + 3}{- 4} = \frac{z - 7}{0}$ and

$\frac{x}{1} = \frac{y - 1}{- 2} = \frac{z - 6}{2}$ is

1. $\pi/3$
2. $\tan^{-1}(1/5)$
3. $\cos^{-1}(1/3)$
4. $\pi/2$

75. If $|\vec{a}| = 2, |\vec{b}| = 5$ and $|\vec{a} \times \vec{b}| = 8$, then $\vec{a} \cdot \vec{b} = ?$

1. 3
2. 4
3. 5
4. 6

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