Mathematics

TARGET : JEE 2013

SCORE

JEE (Advanced)

Home Assignment # 05

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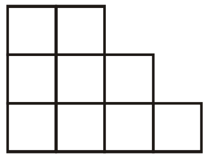
HOME ASSIGNMENT # 05

STRAIGHT OBJECTIVE TYPE

1. The number of ways in which 5 letters of word ALLEN can be placed in the squares of the figure so that no row remains empty is -



(A) 98 (B) 5880
(C) 7560 (D) none of these

2. A man is dealt a poker hand (consisting of 5 cards) from an ordinary pack of 52 playing cards . The number of ways in which he can be dealt a "straight" (a straight is five consecutive values not all of the same suit, eg. {Ace , 2 , 3 , 4 , 5}, {2, 3, 4, 5, 6} .... and {10 , J , Q , K , Ace}) is -

(A) 2^{10} (B) $4!\,.\,2^{10}$ (C) $10\,.\,2^{10}$ (D) 10200

3. Number of ordered triplets (a, b, c) of positive integers less than 10, for which the product abc is divisible by 20, are -

(A) 48 (B) 102 (C) 54 (D) 51

4. The greatest real number among cos(–1), cos2, sin3 and sin1 is -

(A) sin1 (B) cos(–1) (C) cos2 (D) sin3

5. If α, β, γ are three values lying in $[0, 2\pi]$ for which $\tan\theta = k$ then $\tan\frac{\alpha}{3}\tan\frac{\beta}{3} + \tan\frac{\beta}{3}\tan\frac{\gamma}{3} + \tan\frac{\gamma}{3}\tan\frac{\alpha}{3}$ is equal to -

(A) –3 (B) 3k (C) k (D) –3k

6. The value of $\sum_{r=1}^{4}\log_2\left(\sin\frac{r\pi}{5}\right) - \log_2 5$ is equal to -

(A) 4 (B) –4 (C) 0 (D) none of these

7. The number of soutions of the equation $6\cos^5\theta - 6\cos^4\theta - 5\cos^3\theta + 5\cos^2\theta + \cos\theta - 1 = 0$, where $0 < \theta < 360°$ is -

(A) 2 (B) 4 (C) 6 (D) 8

8. The number of solution(s) of the equation $3\sin^2x - \sin x + \ell n(\text{sgn}(\cot^{-1}x) = 0$ in $[-\pi, \pi]$, where sgn(.) denotes signum function, is -

(A) 0 (B) 3 (C) 4 (D) 5

9. Let 20 distinct balls have been randomly distributed into 4 distinct boxes, 5 into each. Let 'A' be the event that two specific balls have been put into a particular box. The probability of occurrence of event 'A' is -

(A) $\frac{1}{19}$ (B) $\frac{4}{19}$ (C) $\frac{8}{19}$ (D) $\frac{2}{19}$

FILL THE ANSWER HERE

1. Ⓐ Ⓑ Ⓒ Ⓓ	2. Ⓐ Ⓑ Ⓒ Ⓓ	3. Ⓐ Ⓑ Ⓒ Ⓓ	4. Ⓐ Ⓑ Ⓒ Ⓓ
5. Ⓐ Ⓑ Ⓒ Ⓓ	6. Ⓐ Ⓑ Ⓒ Ⓓ	7. Ⓐ Ⓑ Ⓒ Ⓓ	8. Ⓐ Ⓑ Ⓒ Ⓓ
9. Ⓐ Ⓑ Ⓒ Ⓓ			

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10. If sin A = sin B and cos A = cos B, then -

(A) $\sin\frac{1}{2}(A-B)=0$ (B) $\sin\frac{1}{2}(A+B)=0$

(C) $\cos\frac{1}{2}(A-B)=0$ (D) $\cos\frac{1}{2}(A+B)=0$

11. Let P is an interior point inside the triangle ABC. Let ΔPAB has semiperimeter s & exradius corresponding to side AB is r_x; ΔPBC has semiperimeter $\frac{s}{2}$ & exradius corresponding to side BC is r_y; ΔPAC has semiperimeter $\frac{s}{3}$ & exradius corresponding to side AC is r_z then -

(A) $r_x r_y r_z = \frac{s^3}{6}$ (B) $\frac{r_x}{6}+\frac{r_y}{3}+\frac{r_z}{2}=\frac{r_x r_y r_z}{s^2}$

(C) $6r_x^2+3r_y^2+2r_z^2=s^2$ (D) $\frac{r_x r_y}{2}+\frac{r_y r_z}{6}+\frac{r_z r_x}{3}=\frac{r_x r_y r_z}{s^2}$

12. The general solution of sin x – 3 sin 2x + sin 3x = cos x – 3 cos 2x + cos 3x is -

(A) $n\pi$ (B) $\frac{n\pi}{2}+\frac{\pi}{8}$ (C) $(-1)^n\frac{n\pi}{2}+\frac{\pi}{8}$ (D) $2n\pi+\cos^{-1}\left(\frac{3}{2}\right)$

13. If $\sin x+\cos x=\sqrt{y+\frac{1}{y}}$; $x\in[0,\pi]$, then -

(A) $x=\frac{3\pi}{4}, y=1$ (B) $x=\frac{\pi}{4}, y=1$ (C) $x=\frac{\pi}{2}, y=2$ (D) $x=\frac{\pi}{6}, y=2$

14. Circumradius of a ΔABC is 2, O is the circumcentre, H is the orthocentre then $\frac{1}{64}(AH^2+BC^2)(BH^2+AC^2)(CH^2+AB^2)$ is equal to -

(A) 64 (B) 16 (C) $\frac{1}{64}$ (D) 1

15. In ΔABC, if $\tan A\tan B=\frac{3}{4}$ & C is an acute angle, then -

(A) $0 < C < 30°$ (B) $30° < C < 45°$ (C) $45° < C < 60°$ (D) $75° < C < 90°$

16. If x & y are acute angle such that $\tan^4 x+\cot^4 y+8=8\tan x\cot y$, then the value of tanx – coty is equal to -

(A) –2 (B) 2 (C) 0 (D) 1

10.	Ⓐ Ⓑ Ⓒ Ⓓ	11.	Ⓐ Ⓑ Ⓒ Ⓓ	12.	Ⓐ Ⓑ Ⓒ Ⓓ	13.	Ⓐ Ⓑ Ⓒ Ⓓ
14.	Ⓐ Ⓑ Ⓒ Ⓓ	15.	Ⓐ Ⓑ Ⓒ Ⓓ	16.	Ⓐ Ⓑ Ⓒ Ⓓ		

17. If $f : x \to y$, where x = {a,b,c,d} & y = {A, B, C, D}, then the number of possible invertible function such that in mapping at least one element of set x is mapped with same alphabet in y are -

(A) 24 (B) 15 (C) 14 (D) 16

18. Number of numbers greater than zero and less than a million which can be formed using the digits 0, 7 and 8 are -

(A) 486 (B) 728 (C) 916 (D) 1086

19. A three digit number is selected at random from the set of all three digit numbers. The probability that the number selected has atleast two digits same is -

(A) $\frac{24}{25}$ (B) $\frac{18}{25}$ (C) $\frac{9}{25}$ (D) $\frac{7}{25}$

20. Solution set of the equation $\sqrt{2}(2\cos 2x - 1) + \sqrt{3 - 4\cos 2x + \cos 4x} = \sqrt{2}$ is -

(A) $n\pi \pm \frac{\pi}{2}, n \in I$ (B) $\frac{(2n+1)\pi}{4}, n \in I$ (C) $(4n+1)\frac{\pi}{4}, n \in I$ (D) $n\pi, n \in I$

21. The letters of the word RADHIKA are permuted and all permutations are arranged in an alphabetical order as in English dictionary. The number of words that appear before the word RADHIKA is -

(A) 2193 (B) 2195 (C) 2191 (D) 2192

22. N persons stand on the circumference of a circle at distinct points. Each possible pair of persons, not standing next to each other, sings a two-minute song one pair after the other. If the total time taken for singing is 28 minutes, then the value of N is -

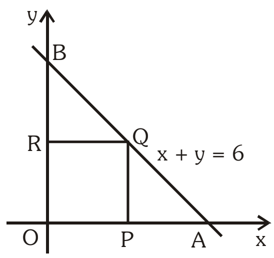
(A) 5 (B) 7 (C) 9 (D) 4

23. $x = n\pi - \tan^{-1}3, n \in I$ is a solution of the equation $12\tan 2x + \frac{\sqrt{10}}{\cos x} + 1 = 0$ for -

(A) no value of n (B) all integral values of n

(C) even value of n (D) odd value of n

24. Let T(a, b) is said to be an integral point if $a, b \in I$, then probability that T lies inside the triangle OAB but outside the square OPQR as shown in adjacent figure is -



(A) $\frac{2}{15}$ (B) $\frac{1}{10}$

(C) $\frac{1}{5}$ (D) $\frac{3}{5}$

25. The greatest value of the function $\log_{(4+\sqrt{10})}(\cos^2\theta - 6\sin\theta\cos\theta + 3\sin^2\theta + 2)$ is -

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

17.	(A) (B) (C) (D)	**18.**	(A) (B) (C) (D)	**19.**	(A) (B) (C) (D)	**20.**	(A) (B) (C) (D)
21.	(A) (B) (C) (D)	**22.**	(A) (B) (C) (D)	**23.**	(A) (B) (C) (D)	**24.**	(A) (B) (C) (D)
25.	(A) (B) (C) (D)						

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26. If t = tan20°, then $\frac{\tan 500° + 2\tan 470°}{1 + \tan 500° \tan 490°}$ is equal to -

(A) $\frac{1}{t(t^2-1)}$ (B) $\frac{1}{2t(1-t^2)}$ (C) $\frac{1}{2t(t^2-1)}$ (D) $\frac{1}{t(1-t^2)}$

27. In a triangle ABC, angle A is greater than angle B. If measure of angles A and B satisfy the equation $3\sin x - 4\sin^3 x - k = 0$, $0 < k < 1$, then the measure of angle C is :-

(A) $\frac{\pi}{3}$ (B) $\frac{\pi}{2}$ (C) $\frac{2\pi}{3}$ (D) $\frac{5\pi}{6}$

28. The sum of the factors of 9! which are odd and of the form 3m + 2, (where m ∈ N) is equal to -

(A) 45 (B) 53 (C) 51 (D) 40

29. Range of $y = \cos\left(\pi \sin\left(\frac{\pi}{2}\cos(\pi \sin x)\right)\right)$, where x ∈ R, is -

(A) [–1, 1] (B) [–π, π] (C) [0, 1] (D) [–1, 0]

30. The solution set of $(\sqrt{5}+1)^{\sin x} \geq 1$ is -

(A) $\left[2k\pi - \frac{\pi}{5}, 2k\pi + \frac{\pi}{5}\right]$ (B) $\left[2k\pi + \frac{\pi}{5}, 2k\pi + \frac{4\pi}{5}\right]$

(C) $\left[2k\pi + \frac{\pi}{10}, 2k\pi + \frac{9\pi}{10}\right]$ (D) $\left[k\pi - \frac{\pi}{10}, k\pi + \frac{9\pi}{10}\right]$

31. If $3^{\sin 2x + 2\cos^2 x} + 3^{1 - \sin 2x + 2\sin^2 x} = 28$, then x is -

(A) $\frac{(4k-1)\pi}{4}, (2k+1)\frac{\pi}{2}$ (B) $\frac{(2k\pi + (-1)^k \pi)}{4}, k\pi$

(C) ϕ (D) $\frac{k\pi}{2}, \frac{(3k+1)\pi}{3}$

32. Total number of even divisors of 2079000 which are divisible by 15 are -

(A) 54 (B) 128 (C) 108 (D) 72

33. If the median AD of triangle ABC divides the angle BAC in the ratio 2 : 1, then $\frac{\sin B}{\sin C}$ is equal to -

(A) $\frac{1}{2}\sec\frac{A}{3}$ (B) $\frac{1}{2}\cos\frac{A}{3}$ (C) $\frac{1}{2}\text{cosec}\frac{A}{3}$ (D) none of these

34. Let the 9 different letters A, B, C,..... I ∈ {1, 2, 3,..., 9}, then the probability that product (A – 1)(B – 2).... (I – 9) is even number will be -

(A) $\frac{1}{2}$ (B) $\frac{1}{4}$ (C) 1 (D) 0

26.	Ⓐ Ⓑ Ⓒ Ⓓ	27.	Ⓐ Ⓑ Ⓒ Ⓓ	28.	Ⓐ Ⓑ Ⓒ Ⓓ	29.	Ⓐ Ⓑ Ⓒ Ⓓ
30.	Ⓐ Ⓑ Ⓒ Ⓓ	31.	Ⓐ Ⓑ Ⓒ Ⓓ	32.	Ⓐ Ⓑ Ⓒ Ⓓ	33.	Ⓐ Ⓑ Ⓒ Ⓓ
34.	Ⓐ Ⓑ Ⓒ Ⓓ						

35. The value of x for which $2x^4 \le \cos^6x + \sin^4x - 1$ is/are -

(A) $\left(0, \frac{\pi}{4}\right)$ (B) $(-1, 1)$ (C) $\left\{\frac{\pi}{4}\right\}$ (D) $\{0\}$

36. If A + B and A – B are positive acute angles and satisfy the equation $\tan^2\theta - 4\tan\theta + 1 = 0$, then B is equal to -

(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{4}$ (C) $\frac{\pi}{3}$ (D) $\frac{\pi}{2}$

37. In a ΔABC, least value of $\frac{\sqrt{abc(a+b+c)}}{\Delta}$, where Δ is the area of ΔABC, equals -

(A) $2\sqrt{2}$ (B) $4\sqrt{2}$ (C) 4 (D) 8

38. The number of six digit numbers divisible by 15, in which sum of digits is 48, is -

(A) 25 (B) 90 (C) 20 (D) 15

39. The total number of ways of selecting 5 letters from the letters AAABBBCCDEF is -

(A) 3320 (B) 74 (C) 70 (D) 72

40. A solution (x, y) of the system of equations $x - y = \frac{1}{3}$ and $\cos^2(\pi x) - \sin^2(\pi y) = \frac{1}{2}$ is -

(A) $\left(\frac{2}{3}, \frac{1}{3}\right)$ (B) $\left(\frac{1}{2}, \frac{1}{6}\right)$ (C) $\left(-\frac{5}{6}, -\frac{7}{6}\right)$ (D) $\left(-\frac{1}{3}, -\frac{2}{3}\right)$

41. Number of ways in which 25 identical pens can be distributed among Keshav, Madhav, Mukund and Radhika such that at least 1, 2, 3 and 4 pens are given to Keshav, Madhav, Mukund and Radhika respectively, is -

(A) ${}^{18}C_4$ (B) ${}^{28}C_3$ (C) ${}^{24}C_3$ (D) ${}^{18}C_3$

42. A 12 digit number starts with 2 and all its digits are prime, then the probability that the sum of any two consecutive digits of the number is prime is $\frac{1}{2^k}$, where k is equal to -

(A) 18 (B) 16 (C) 14 (D) 12

43. If $\vec{a} = x_1\hat{i} + x_2\hat{j} + x_3\hat{k}$ and $\vec{b} = \hat{i} - 2\hat{j} + \hat{k}$ $\forall$ $x_1, x_2, x_3 \in \{1, 2, 3, ..., 10\}$, then number of vectors $\vec{a}$ such that $\vec{a}.\vec{b} = 0$, is -

(A) 20 (B) 40 (C) 50 (D) 55

35.	Ⓐ Ⓑ Ⓒ Ⓓ	36.	Ⓐ Ⓑ Ⓒ Ⓓ	37.	Ⓐ Ⓑ Ⓒ Ⓓ	38.	Ⓐ Ⓑ Ⓒ Ⓓ
39.	Ⓐ Ⓑ Ⓒ Ⓓ	40.	Ⓐ Ⓑ Ⓒ Ⓓ	41.	Ⓐ Ⓑ Ⓒ Ⓓ	42.	Ⓐ Ⓑ Ⓒ Ⓓ
43.	Ⓐ Ⓑ Ⓒ Ⓓ						

44. Six people, all of different weights, are trying to build a human pyramid, that is they get into the formation

A

B C

D E F

We say that some one not in the bottom row is ''supported by'' each of the two closest people beneath her or him. The number of possible different pyramids, if nobody can be supported by anybody of lower weight, are -

(A) 24 (B) 18 (C) 16 (D) 14

45. The probability of ordered 4–tuple (x, y, z, w) defined as (x, y, z, w $=\frac{k\pi}{2} \in [0, 10]$), where k is non negative integer, satisfying the inequality, $2^{\sin^2 x}\ 3^{\cos^2 y}\ 4^{\sin^2 z}\ 5^{\cos^2 w} \geq 120$ is -

(A) 0 (B) $\frac{144}{7^4}$ (C) $\frac{81}{7^4}$ (D) none of these

46. If $0 \leq x \leq 4$ and $0 \leq y \leq 4$, then probability of a point randomly selected from given intervals to lie inside or on the parabola $y^2 = x$ is -

(A) $\frac{3}{16}$ (B) $\frac{5}{16}$ (C) $\frac{2}{3}$ (D) $\frac{1}{3}$

47. The total number of 4 digit numbers which can be formed using the digits 1, 2, 3, 4 without repetition such that the digit n + 1 never immediately follows the digit n, are -

(A) 10 (B) 11 (C) 13 (D) 14

48. In a certain country, the numerals in car registration marks range from 1 to 999. Then the probability that the first local car which you see while visiting that country have atleast two digits the same in its registration mark is -

(A) $\frac{30}{111}$ (B) $\frac{29}{111}$ (C) $\frac{28}{111}$ (D) $\frac{27}{111}$

49. Let A_1 is area bounded by $f(x) = \max(\cos x, \cos^{-1}(\cos x))$ and x axis for $x \in \left(\frac{\pi}{2}, \frac{3\pi}{2}\right)$ and A_2 is area bounded by $g(x) = \min(\sin x, \sin^{-1}(\sin x))$ and x axis for $x \in (\pi, 2\pi)$ then $\frac{A_2}{A_1}$ represent probability of -

(A) Getting a prime number when a die is rolled

(B) Getting a odd prime number when a die is rolled

(C) A point lying inside a smaller square of side 1 when a point is chosen randomly from a bigger square of side 2 enclosing smaller square.

(D) none of these

44. (A) (B) (C) (D) **45.** (A) (B) (C) (D) **46.** (A) (B) (C) (D) **47.** (A) (B) (C) (D)

48. (A) (B) (C) (D) **49.** (A) (B) (C) (D)

MULTIPLE OBJECTIVE TYPE

50. If E and F are two complementry events defined on a sample space with P(E) > 0 and P(F) > 0, then

(A) E and F must be disjoint. (B) E and F may be equally likely.

(C) E and F must be exhaustive. (D) E and F can be independent.

51. The probabilities that a man makes a certain dangerous journey by car, motor cycle or on foot are 1/2, 1/6 and 1/3 respectively. The probabilities of an accident when he uses these means of transport are 1/5, 2/5 and 1/10 respectively. Which of the following statement(s) hold good?

(A) The probability of an accident occurring in a single journey, is $1/5$.

(B) If an accident is known to have happened, the probability that the man was travelling by car, is $1/2$.

(C) If an accident is known to have happened, the probability that the man was travelling by motor cycle, is $1/5$.

(D) If an accident is known to have happened, the probability that the man was travelling on foot, is $1/3$.

52. Events A and B satisfy $P(A) = 0.4$, $P(B) = 0.5$ and $P(A \cup B) = 0.8$. Which of the following statement(s) is/are CORRECT?

(A) $P(\overline{A} \cap B) = \frac{2}{5}$ (B) $P(B/\overline{A}) = \frac{2}{3}$

(C) $P(A \cap B) < P(A) \cdot P(B)$ (D) P (exactly one of either A or B occurs) $= \frac{7}{10}$

53 Set of values of x of the equation $\cos 2x = (\cos^3 x - \sin^3 x)$ is -

(A) $\left\{x \mid x = n\pi + \frac{\pi}{4},\ n \in I\right\}$ (B) $\{x \mid x = 2n\pi,\ n \in I\}$

(C) $\left\{x \mid x = 2n\pi + \frac{\pi}{2},\ n \in I\right\}$ (D) $\left\{x \mid x = n\pi - \frac{\pi}{4},\ n \in I\right\}$

54. For the equation $2(\sin x - \cos 2x) - \sin 2x(1 + 2\sin x) + 2\cos x = 0$, $x \in [0, 2\pi]$ -

(A) the values of x satisfying the given equation forms an A.P.

(B) the sum of all possible values of x satisfying the given equation is 4π

(C) the sum of all possible values of x in $[0, 2\pi]$ satisfying the given equation is $\frac{9\pi}{2}$

(D) there are five solutions of the equation in $[0, 2\pi]$

55. The maximum number of permutations of 2n letters in which there are only a's & b's, taken all at a time is given by -

(A) ${}^{2n}C_n$ (B) $\frac{2}{1} \cdot \frac{6}{2} \cdot \frac{10}{3} \ldots\ldots \frac{4n-6}{n-1} \cdot \frac{4n-2}{n}$

(C) $\frac{n+1}{1} \cdot \frac{n+2}{2} \cdot \frac{n+3}{3} \cdot \frac{n+4}{4} \ldots\ldots \frac{2n-1}{n-1} \cdot \frac{2n}{n}$ (D) $\frac{2^n . [1 . 3 . 5 \ldots\ldots (2n-3)(2n-1)]}{n\,!}$

50.	Ⓐ Ⓑ Ⓒ Ⓓ	51.	Ⓐ Ⓑ Ⓒ Ⓓ	52.	Ⓐ Ⓑ Ⓒ Ⓓ	53.	Ⓐ Ⓑ Ⓒ Ⓓ
54.	Ⓐ Ⓑ Ⓒ Ⓓ	55.	Ⓐ Ⓑ Ⓒ Ⓓ				

56. If 10 balls are selected randomly from unlimited number of red, white, green and blue balls then probability of these selections having balls of all 4 different colours is equal to -

(A) $\frac{42}{143}$ (B) $\frac{{}^{4}C_3}{{}^{10}C_3}$

(C) probability of obtaining a triangle if three points are joined randomly from given 13 points out of which 4 are collinear & rest are non collinear.

(D) probability of getting 3 cards which are neither Ace, nor king nor queen nor Jack drawn randomly from pack of 52 playing cards if it is known that drawn cards are all spade cards.

57. Ram post a letter to Ghanshyam. It is known that one letter out of 10 letters do not reach its destination. If it is certain that Ghanshyam will reply if he receives the letter. If A denotes the event that Ghanshyam receives the letter and B that Ram gets a reply, then -

(A) $P(B) = \frac{81}{100}$ (B) $P(A \cap B) = \frac{81}{100}$ (C) $P\left(\frac{A}{\overline{B}}\right) = \frac{9}{19}$ (D) $P(A \cup B) = \frac{9}{10}$

58. The number of possible values of ordered pair (m, n) such that $4^m + 3^n$ is divisible by 5 where m & n $\in$ N and ≤ 20, are -

(A) 100

(B) Equal to number of possible values of ordered pair (m, n) such that $4^m + 3^n$ is divisible by 7 with same conditions.

(C) Equal to number of possible values of ordered pair (m, n) such that $4^m + 3^n$ is divisible by 13 with same conditions.

(D) Equal to number of ways in which two gold medals one each in Physics and Maths can be won by 10 students.

59. Consider ΔABC in which its incircle touch sides AB, BC, CA at C_1, A_1, B_1 respectively. If the arc length of incircle along A_1B_1, C_1A_1 & B_1C_1 are 6, 8, 10 respectively then -

(A) $r = \frac{12}{\pi}$ (where r is the radius of incircle of ΔABC)

(B) angles A, B, C are in A.P.

(C) $R = \frac{6\sqrt{2}}{\pi \sin 15^\circ}$ (where R is the radius of circumcircle of ΔABC)

(D) for the circumcircle of ΔABC arc length AB, CA, BC are in A.P.

60. All the 7 digit numbers containing each of the digits 1, 2, 3, 4, 5, 6, 7 exactly once and not divisible by 5 are arranged in the increasing order. Then -

(A) 1800^{th} number in the list is 3124567 (B) 1897^{th} number in the list is 4213567

(C) 1994^{th} number in the list is 4312567 (D) 2001^{th} number in the list is 4315726

56.	Ⓐ Ⓑ Ⓒ Ⓓ	**57.**	Ⓐ Ⓑ Ⓒ Ⓓ	**58.**	Ⓐ Ⓑ Ⓒ Ⓓ	**59.**	Ⓐ Ⓑ Ⓒ Ⓓ
60.	Ⓐ Ⓑ Ⓒ Ⓓ						

61. Which of the following set of values of x satisfies the equation $2^{(2\sin^2 x-3\sin x+1)}+2^{(2-2\sin^2 x+3\sin x)}=9$?

(A) $x=n\pi\pm\frac{\pi}{6},\ n\in I$ (B) $x=n\pi\pm\frac{\pi}{3},\ n\in I$ (C) $x=n\pi,\ n\in I$ (D) $x=2n\pi+\frac{\pi}{2},\ n\in I$

62. If 2tan10° + tan50° = 2x, tan20° + tan50° = 2y, 2tan10° + tan70° = 2w and tan20° + tan70° = 2z, then which of the following is/are true -

(A) z > w > y > x (B) w = x + y (C) 2y = z (D) z + x = w + y

63. Suppose that M is a natural number with the property that if x is chosen randomly from the set {1, 2,.....,1000} the probability that x is divisor of M is $\frac{1}{2}$. If $M\le 1000$ then maximum possible value of M is divisible by -

(A) 2 (B) 61 (C) 3 (D) 5

64. The values of 't' which satisfies (t – [|sinx|])! = 3! 5! 7! is/are (where [.] denotes greatest integer function) -

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

65. In a triangle ABC, point D and E are taken on side BC such that BD = DE = EC. If ∠ADE = ∠AED = θ, then -

(A) tanθ = 3tanB (B) $\tan A=\frac{6\tan\theta}{\tan^2\theta-9}$ (C) $\cot^2\frac{A}{2}=\frac{1}{9}\tan^2\theta$ (D) tanθ = 3tanC

66. For a triangle ABC, which of the following is true?

(A) $\frac{a}{\cos A}=\frac{b}{\cos B}=\frac{c}{\cos C}$

(B) $\frac{a\cos A+b\cos B+c\cos C}{a+b+c}=\frac{r}{R}$

(C) $\frac{\cos A}{a}+\frac{\cos B}{b}+\frac{\cos C}{c}=\frac{a^2+b^2+c^2}{2abc}$

(D) $\frac{\sin 2A}{a^2}=\frac{\sin 2B}{b^2}=\frac{\sin 2C}{c^2}$

67. A box contains a fair coin and a two headed coin . A coin is selected at random and tossed . If head appears, the other coin is tossed . If tail appears, the same coin is tossed. Which of the following statements is/are true :

(A) the probability that head appears on the second toss is $\frac{5}{8}$

(B) if head appeared on the second toss, then the probability that it also appeared on the first toss is $\frac{4}{5}$

(C) if head appeared on the second toss, then the probability that tail appeared on the first toss is $\frac{2}{5}$

(D) the probability that tail appears on the second toss is $\frac{1}{8}$

61. (A) (B) (C) (D) 62. (A) (B) (C) (D) 63. (A) (B) (C) (D) 64. (A) (B) (C) (D)
65. (A) (B) (C) (D) 66. (A) (B) (C) (D) 67. (A) (B) (C) (D)

68. The number of five digit numbers that can be formed using all the digits 0, 1, 3, 6, 8 which are -

(A) divisible by 4 is 30

(B) greater than 30,000 and divisible by 11 is 12

(C) smaller than 60,000 when digit 8 always appears at ten's place is 6

(D) between 30,000 and 60,000 and divisible by 6 is 18.

69. In a ΔABC if $a^2 + b^2 + c^2 = ca + ab\sqrt{3}$, where a, b, c have their usual meaning, then identify correct statement -

(A) ΔABC is right angled triangle

(B) ΔABC is right angled isosceles triangle

(C) [tanA + tanC] = 2, where [.] is greatest integer function

(D) $\left\{\frac{r_2}{r_1}\right\} = \sqrt{3}-1$, where {.} is fractional part function.

70. If $(a + 2) \sin \alpha + (2a - 1) \cos \alpha = 2a + 1$, where $0 < \alpha < \frac{\pi}{2}$ and $a > 1$, then $\tan \alpha$ is equal to -

(A) $\frac{3}{4}$ (B) $\frac{4}{3}$ (C) $\frac{2a}{a^2+1}$ (D) $\frac{2a}{a^2-1}$

71. Suppose we have 7 coins (C_i), where i = 1, 2, ... 7 such that the probability of head on i^{th} coin is $P(H_i) = \frac{i+1}{8}$. One of the coin is randomly selected and tossed and H shows the event that it shows up the head. Then which of the following are true -

(A) $P(C_4/H) = \frac{1}{7}$ (B) $P(C_1/H) = \frac{2}{35}$ (C) $P(H) = \frac{5}{8}$ (D) $P(\bar{H}) = \frac{5}{8}$

72. A bag contains 3 red and 3 green balls and a person draws out 3 at random . He then drops 3 blue balls into the bag and again draws out 3 at random. The probability that the 3 later balls are all of different colours is equal to -

(A) $\frac{27}{50}$ (B) $\frac{27}{100}$ (C) $20\left(\frac{{}^3C_1 \cdot {}^2C_1}{{}^6C_3}\right)^3$

(D) probability of x satisfying the inequality $x^2 - 33x + 90 \le 0$ such that $x \in [1, 100]$

73. If a, b, c, d are prime numbers such that $a^2 - b^2 = c$ & $d = b + c$, then sum of all the 4 digit numbers formed by using the digits a, b, c, d without repetition is -

(A) 112233 (B) 113322

(C) an even number divisible by 11 (D) an odd number divisible by 11

68. Ⓐ Ⓑ Ⓒ Ⓓ **69.** Ⓐ Ⓑ Ⓒ Ⓓ **70.** Ⓐ Ⓑ Ⓒ Ⓓ **71.** Ⓐ Ⓑ Ⓒ Ⓓ

72. Ⓐ Ⓑ Ⓒ Ⓓ **73.** Ⓐ Ⓑ Ⓒ Ⓓ

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74. Which of the following statements is/are true -

(A) Exponent of 11 in 2009! is 199

(B) The total number of triangles that can be formed by joining any 3 points, from vertices and the centre of a regular octagon are 126

(C) The number of quadrilaterals that can be constructed by joining any four vertices of a dodecagon (polygon with 12 sides) such that none of the side of the quadrilateral is side of the given dodecagon are 105

(D) The total number of different selections of at least one letter from IITJEE are 35

COMPREHENSION

Paragraph for Question 75 to 77

The exponent of prime number p in n! is given by $\left[\frac{n}{p}\right]+\left[\frac{n}{p^2}\right]+......$ or $\sum_{r=1}^{\infty}\left[\frac{n}{p^r}\right]$

where [x] is greatest integer less than or equal to x.

On the basis of above information answer the following :

75. The exponent of prime number 7 in 300! is -

(A) 48 (B) 47 (C) 49 (D) 50

76. The number of zeros 3250! ends with is -

(A) 807 (B) 811 (C) 806 (D) 812

77. The exponent of 2 in ${}^{200}C_{100}$ is -

(A) 2 (B) 3 (C) 6 (D) 4

Paragraph for Question 78 to 80

The point P(x, y, z) in three-dimensional co-ordinate system is said to have integral co-ordinates if x, y, z $\in$ I. Now consider the following curves,

$C_1 \equiv xyz = 60$

$P_1 \equiv x + y + z = 15$

$P_2 \equiv x + y + z = 20$

Let P_1 cuts x, y & z axes at points A, B & C respectively and P_2 cuts x, y & z axes in points P, Q & R respectively. Let 'O' be the origin.

S_1 = set of points with positive integral co-ordinates lying on the curve C_1.

S_2 = set of points with integral co-ordinates lying inside the tetrahedron OABC.

S_3 = set of points with integral co-ordinates lying inside the tetrahedron OPQR.

On the basis of above information, answer the following questions :

78. The value of $n(S_1)$ is -

(A) 54 (B) 27 (C) 64 (D) 80

79. The value of $n(\overline{S_2} \cap S_3)$ is -

(A) 749 (B) 514 (C) 605 (D) 685

80. The sum of the reciprocal of all the divisors of the positive integer $n(S_1)$ is equal to -

(A) $\frac{20}{9}$ (B) $\frac{27}{31}$ (C) $\frac{9}{20}$ (D) $\frac{31}{27}$

74.	Ⓐ Ⓑ Ⓒ Ⓓ	**75.**	Ⓐ Ⓑ Ⓒ Ⓓ	**76.**	Ⓐ Ⓑ Ⓒ Ⓓ	**77.**	Ⓐ Ⓑ Ⓒ Ⓓ
78.	Ⓐ Ⓑ Ⓒ Ⓓ	**79.**	Ⓐ Ⓑ Ⓒ Ⓓ	**80.**	Ⓐ Ⓑ Ⓒ Ⓓ		

Paragraph for Questions 81 to 83

a_1, a_2, a_3 are three consecutive terms of an increasing A.P., where a_1 and a_2 are prime numbers such that their sum is minimum possible odd prime number.

Urn-1 : Contains a_1 red and a_3 green balls,

Urn-2 : Contains a_2 red and a_2 green balls,

Urn-3 : Contains a_3 red and a_1 green balls.

P(i) represents the probability of choosing i^{th} urn & P(R) represents probability of choosing red ball & similarly P(G) represents the probability of choosing green ball.

On the basis of above information answer the following :

81. If $P(i) \propto i^2$ and one ball is drawn from one of these urns then -

(A) $P(G) = \frac{3}{7}$ (B) $P(R) = \frac{6}{7}$ (C) P(R) > P(G) (D) P(R) = P(G)

82. If $P(i) = \frac{1}{3}, \forall\, i = 1, 2, 3$ and 2 balls are drawn randomly from one of these urns then the chance of drawing balls of different colours is -

(A) $\frac{3}{5}$ (B) $\frac{5}{9}$ (C) $\frac{2}{3}$ (D) $\frac{1}{5}$

83. If $P(i) = \frac{1}{3}, \forall\, i = 1, 2, 3$ and an urn is chosen and balls are drawn one by one with replacement 10 times then probability that all drawings result in red balls is -

(A) $\frac{2^{10}+3^{10}+4^{10}}{6^{10}}$ (B) $\frac{4.2^{10}+3^{10}}{6^{10}}$ (C) $\frac{2^{10}+3^{10}}{6^{10}}$ (D) $\frac{2^{10}+3^{10}+4^{10}}{3.6^{10}}$

Paragraph for Question 84 to 86

Consider the word "ALLENCAREER".

On the basis of above information answer the following :

84. The total number of words using six letters which can be formed are -

(A) 16620 (B) 15900 (C) 10140 (D) 16680

85. The total number of words using all the letters without changing the relative order of vowels and consonants, are -

(A) 1800 (B) 180 (C) 1440 (D) 2230

86. The total number of words using all the letters such that no two vowels are together are -

(A) $\frac{15.6!}{2}$ (B) $\frac{7!}{3}$ (C) $\frac{15.7!}{2}$ (D) $\frac{15.6!}{4}$

81. Ⓐ Ⓑ Ⓒ Ⓓ 82. Ⓐ Ⓑ Ⓒ Ⓓ 83. Ⓐ Ⓑ Ⓒ Ⓓ 84. Ⓐ Ⓑ Ⓒ Ⓓ

85. Ⓐ Ⓑ Ⓒ Ⓓ 86. Ⓐ Ⓑ Ⓒ Ⓓ

Paragraph for Question 87 to 89

Consider three numbers a, b, c $\in$ W (whole numbers).

On the basis of above information answer the following :

87. If a & b are odd positive integers and c is even positive integer, then number of integral solutions of a + b + c = 16, is -

(A) 28 (B) 21 (C) 36 (D) 45

88. The number of 6 digit numbers of the form abcbac in which a < b are -

(A) 420 (B) 380 (C) 360 (D) 300

89. There are unlimited number of cards printed on them either "a" or "b" or "c". If number of ways of selecting n cards such that number abc cannot be written from selected cards is 45, then n is equal to -

(A) 3 (B) 4 (C) 5 (D) 6

Paragraph for Question 90 to 92

(i) If a pencil of length AB is having two specified mark P and Q in between AB, then probability of cutting the pencil between P and Q $= \frac{\text{length of PQ}}{\text{length of AB}}$.

(ii) If in an Archery competition, the arrow has to hit a circle made upon a rectangular wooden board, then the probability of hitting of arrow inside the circle $= \frac{\text{Area of circle}}{\text{Area of rectangular board}}$.

On the basis of above information answer the following :

90. If $k \in [0, 5]$, then the probability of the equation $x^2 + kx + \frac{1}{4}(k+2) = 0$ to have real roots is -

(A) $\frac{1}{5}$ (B) $\frac{2}{5}$ (C) $\frac{3}{5}$ (D) $\frac{4}{5}$

91. There are two circles in the x-y plane whose equations are $x^2 + y^2 - 2y = 0$ and $x^2 + y^2 - 2y - 3 = 0$. If A point (x,y) is picked up randomly inside the larger circle then the probability of the point has been taken from the smaller circle is -

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

92. If a stick of unit length is broken into three parts each of length x, y & z respectively, then probability of forming of triangle from broken length is -

(A) $\frac{1}{3}$ (B) $\frac{1}{4}$ (C) $\frac{2}{3}$ (D) $\frac{1}{5}$

87. Ⓐ Ⓑ Ⓒ Ⓓ **88.** Ⓐ Ⓑ Ⓒ Ⓓ **89.** Ⓐ Ⓑ Ⓒ Ⓓ **90.** Ⓐ Ⓑ Ⓒ Ⓓ
91. Ⓐ Ⓑ Ⓒ Ⓓ **92.** Ⓐ Ⓑ Ⓒ Ⓓ

Paragraph for Questions 93 to 95

Two teachers A and B write questions and corresponding solutions for a mathematics test. A writes 10 questions every hour but makes the mistakes in 10% of the solutions. B writes 20 questions per hour and makes the mistakes in the 20% of the solutions. Both of them work for 3 hours and send all the questions to teacher C to be checked. However, teacher C is not really so smart and only 75% of the questions he thinks are wrong are actually incorrect.

Teacher C thinks 20% of questions from A have incorrect solutions and that 10% of questions from B have incorrect solutions. Let the following events be defined as

W : solution to a problem is incorrect

S : teacher C thinks solution is incorrect

E_1 : Problem is formed by A

E_2 : Problem is formed by B

On the basis of above information answer the following :

93. The probability that solution to a randomly selected problem is correct, i.e. $P(\overline{W})$ is equal to -

(A) $\frac{5}{6}$ (B) $\frac{1}{6}$ (C) $\frac{17}{20}$ (D) $\frac{2}{3}$

94. The probability that teacher C thinks a given problem has correct solution, i.e. $P(\overline{S})$ is equal to -

(A) $\frac{4}{15}$ (B) $\frac{11}{5}$ (C) $\frac{13}{15}$ (D) $\frac{2}{15}$

95. If solution of a problem randomly selected is definitely correct, then the probability that it was formed by A, i.e. $P\left(\frac{E_1}{\overline{W}}\right)$ is equal to -

(A) $\frac{9}{10}$ (B) $\frac{4}{5}$ (C) $\frac{1}{3}$ (D) $\frac{9}{25}$

MATCH THE COLUMN

96.

	Column-I		Column-II
(A)	The number of non-congruent rectangles that can be found on a chess board are	(P)	31
(B)	In an examination minimum is to be scored in each of 5 subjects to pass. The number of ways in which student can fail is	(Q)	32
(C)	The number of divisors of 157500 which are divisible by 30 are	(R)	33
(D)	The remainder obtained when 1! + 2! + 3! + 4! ...... + 2009! is divided by 35 is	(S)	36

93. (A) (B) (C) (D) 94. (A) (B) (C) (D) 95. (A) (B) (C) (D) 96. (A) (P) (Q) (R) (S) (T) (B) (P) (Q) (R) (S) (T) (C) (P) (Q) (R) (S) (T) (D) (P) (Q) (R) (S) (T)

97. **Column-I** | **Column-II**

(A) If two numbers are chosen from odd natural numbers less than hundred and multiplied together in all possible ways, then the probability of the product to be divisible by 5 is — (P) $\frac{25}{52}$

(B) A bag 'A' contains 2 white and 3 red balls, another bag 'B' contains 4 white and 5 red balls. If one ball is drawn at random from one of the bag and it is found to be red, then the probability that it was drawn from the bag B is — (Q) $\frac{89}{245}$

(C) Eight coins are tossed at a time, the probability of getting heads up in majority is — (R) $\frac{24}{663}$

(D) From a well shuffled pack of 52 playing cards, if cards are drawn one by one without replacement till the black ace comes, then probability that the black ace comes in 4th draw is — (S) $\frac{93}{256}$

98. A bag contains 14 balls which are either white or black balls, (all number of white and black balls are equally likely). Five balls are drawn at random from the bag without replacement.

Column-I | **Column-II**

(A) Probability that all the five balls are black is equal to — (P) $\frac{3}{13}$

(B) If the bag contains 11 black and 3 white balls, then the probability that all five balls are black is equal to — (Q) $\frac{1}{6}$

(C) If all the five balls are black then the probability that the bag contains exactly 11 black balls is equal to — (R) $\frac{6}{65}$

(D) Probability that three balls are black and two are white is equal to — (S) $\frac{3}{65}$

99. Number of ways in which all the letters of the words given in column-I cab be arranged in matrix of 3×3 such that no letter in any row or column is repeated :

Column-I	**Column-II**
(A) INDIATIME	(P) $33 \times 6!$
(B) FORTUNATE	(Q) $18 \times 7!$
(C) SWEETNESS	(R) $3 \times 4!$
(D) CANDIDATE	(S) $6 \times 6!$
	(T) $36 \times 5!$

97. (A) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ (B) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ (C) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ (D) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ

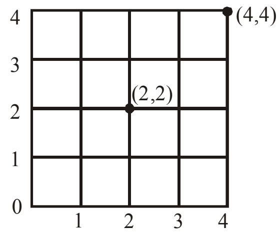
98. (A) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ (B) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ (C) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ (D) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ

99. (A) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ (B) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ (C) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ (D) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ

100. **Column-I** | **Column-II**

(A) $^{24}C_2 + {^{23}C_2} + {^{22}C_2} + {^{21}C_2} + {^{20}C_2} + {^{20}C_3}$ is equal to — (P) 102

(B) In the adjoining figure number of progressive ways to reach from (0,0) to (4, 4) passing through point (2, 2) are — (Q) 2300



(C) The number of 4 digit numbers that can be made with the digits 1, 2, 3, 4, 3, 2 — (R) 82

(D) If $\left\{\dfrac{500!}{14^k}\right\} = 0$, then the maximum natural value of k is equal to (where {.} is fractional part function) — (S) 36

101. 7 different toys are to be distributed between 4 brothers Suresh, Ramesh, Ganesh and Jignesh. Column-I has the constraints of distribution and column-II has number of ways in which the distribution can be made. Now match the entries in column-I with suitable entry in column-II.

Column-I | **Column-II**

(A) Suresh & Ramesh gets one toy each where as Ganesh & Jignesh gest more than one toy — (P) $\dfrac{7!}{8}$

(B) Jignesh gets exactly one toy & rest all gets exactly two toys — (Q) $\dfrac{7!}{24}$

(C) Ramesh gets maximum possible number of toys & each boy gets atleast one toy — (R) $\left(\dfrac{4!.5!}{45}\right)^2.4$

(D) Each boy can recieve none, one or more toys — (S) $\dfrac{7!}{12}$

100.
(A) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ
(B) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ
(C) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ
(D) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ

101.
(A) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ
(B) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ
(C) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ
(D) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ

102. Let a purse contains 12 coins of which 5 are 10 paise coins, 4 are 50 paise coins and 3 are 1 Re coins. Three coins are drawn one by one without replacement.

	Column-I		**Column-II**
(A)	Probability that 50 paise, 10 paise and 1 Re coins are respectively drawn is	(P)	$\frac{4}{15}$
(B)	Probability that drawn coins are two 10 paise coins and one 1 Re coin is	(Q)	$\frac{3}{16}$
(C)	If drawn coins are of same denomination, then probability that these are 50 paise coins, is	(R)	$\frac{1}{22}$
(D)	If atleast two coins are of same denomination then probability that these are two 10 paise coins and one 1 Re coin is	(S)	$\frac{3}{22}$

103.

	Column-I		**Column-II**
(A)	If $\Delta = a^2 - (b-c)^2$, where Δ is the area of the triangle ABC, then tanA is equal to	(P)	$\frac{1}{2}$
(B)	If in a ΔABC, tanA : tanB : tanC = 3 : 4 : 5, then the value of sinA sinB sinC is	(Q)	$\frac{8}{15}$
(C)	Let $f(\theta) = \frac{1-\sin 2\theta + \cos 2\theta}{2\cos 2\theta}$ and $\alpha + \beta = \frac{5\pi}{4}$ then the value of $f(\alpha) \cdot f(\beta)$ is	(R)	$\frac{8}{3}$
		(S)	$\frac{2\sqrt{5}}{7}$

104.

	Column-I		**Column-II**
(A)	The number of ways in which three numbers can be selected from the set $\{2^1, 2^2, 2^3, \ldots\ldots, 2^{11}\}$ so that they form G.P., are	(P)	5
(B)	The number of A.P. of positive integers having first term 5 and n^{th} term 365, is	(Q)	24
(C)	If there are 'n' circles such that no two have same radical axis & no three have same radical centre & numbers of radical centres are equal to number of radical axis in the system then 'n' is	(R)	25
(D)	If 'S' be the sum of all the numbers that can be formed using the digits 1, 1, 2, 2, 3, 3, then sum of digits of number 'S' is	(S)	54

102.
(A) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ
(B) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ
(C) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ
(D) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ

103.
(A) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ
(B) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ
(C) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ
(D) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ

104.
(A) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ
(B) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ
(C) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ
(D) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ

105. In a certain town, 40% of the people have brown hair, 25% have brown eyes and 15% have both brown hair and brown eyes. A person is randomly selected from the town. Match the events of column I with their corresponding probabilities given in column II.

	Column I		**Column II**
(A)	If he has brown hair, the probability that he also has brown eyes, is	(P)	0.25
(B)	If he has brown eyes, the probability that he also has brown hair, is	(Q)	0.375
(C)	The probability that he has neither brown hair nor brown eyes, is	(R)	0.60
		(S)	0.50

106.

	Column I		**Column II**
(A)	A gambler has one rupee in his pocket. He tosses an unbiased normal coin unless either he is ruined or unless the coin has been tossed for a maximum of five times. If for each head he wins a rupee and for each tail he looses a rupee, then the probability that the gambler is ruined is	(P)	$\frac{1}{2}$
		(Q)	$\frac{4}{5}$
(B)	The probability at least one of the events A and B occur is 0.6. If A and B occur simultaneously with probability 0.2, then $P(\overline{A}) + P(\overline{B})$ is		
(C)	3 firemen X, Y and Z shoot at a common target. The probabilities that X and Y can hit the target are 2/3 and 3/4 respectively. If the probability that exactly two bullets are found on the target is 11/24, then the proficiency of Z to hit the target is	(R)	$\frac{6}{5}$
		(S)	$\frac{11}{16}$

105.					
(A)	P	Q	R	S	T
(B)	P	Q	R	S	T
(C)	P	Q	R	S	T
(D)	P	Q	R	S	T

106.					
(A)	P	Q	R	S	T
(B)	P	Q	R	S	T
(C)	P	Q	R	S	T
(D)	P	Q	R	S	T

INTEGER TYPE / SUBJECTIVE TYPE

107. The sum of all divisors of the least natural number having 12 divisors is

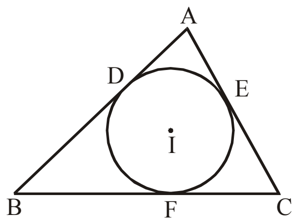
108. The number of ways to invite one of the three friends for dinner on 6 successive nights such that no friend is invited more than 3 times, is equal to

109. In ΔABC, $a = \sqrt{3}$, b = 3 and $\angle C = \frac{\pi}{3}$. Let angle bisector from C intersects side AB at D and altitude from B meets the angle bisector CD at E. If I_1 and I_2 are incentres of ΔBEC and ΔBED, then the distance between vertex B and orthocentre of $\Delta I_1 E I_2$ is

110. In ΔABC, a = 2, b = 3 and c = 4. D, E, F are mid points of sides BC, AC and AB respectively. If distance between orthocentre of ΔABC are orthocentre of ΔAEF is $\frac{x}{\sqrt{15}}$ (where x is a prime number), then value of '7x' is

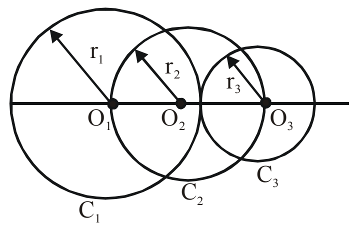
111. There are two packs A and B of 52 playing cards. All the four aces from the pack A are removed whereas from the pack B, one ace, one king, one queen and one jack is removed. One of these two packs is slected randomly and two cards are drawn simultaneously from it, and found to be a pair (i.e. both have same rank e.g. two 9's or two king etc). If $Q = \frac{m}{n}$ (expressed in lowest form) denotes the probability that the pack A was selected, find (m + n).

112. In a ΔABC as shown in figure; area of quadrilateral ADIE is 5 units & area of quadrilateral BFID is 10 units, then $\frac{\cos\frac{C}{2}}{\sin\left(\frac{A-B}{2}\right)}$ is



113. If $\frac{\tan 8°}{1-3\tan^2 8°}+\frac{3\tan 24°}{1-3\tan^2 24°}+\frac{9\tan 72°}{1-3\tan^2 72°}+\frac{27\tan 216°}{1-3\tan^2 216°} = x\tan 108° + y\tan 8°$. Then $(x+y)$ is equal to

114. If centres of three circles C_1, C_2, C_3 are collinear, such that C_2 passes through the centres O_1 & O_3 and areas of C_1, C_2, C_3 are in arithmetic progression, then $\left(\frac{r_1^3 + r_2^3 + r_3^3}{r_1 r_2 r_3}\right)$ is equal to



(**Note :** The adjacent figure is not upto the scale)

107.	**108.**	**109.**	**110.**
111.	**112.**	**113.**	**114.**

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115. Number of solutions of the equation $(\sin x - 1)^3 + (\cos x - 1)^3 + (\sin x)^3 = (2\sin x + \cos x - 2)^3$ in the interval $[0,2\pi]$ is equal to

116. The complete values of x satisfying $\frac{2\sin 6x}{\sin x - 1} < 0$ and $\sec^2 x - 2\sqrt{2}\tan x \le 0$ in $\left(0, \frac{\pi}{2}\right)$ is $[a,b) \cup (c,d]$, where $(a + b + c + d) = k\pi$, then 'k' is equal to

117. If $4\sin^2x + \operatorname{cosec}^2x$, a, $\sin^2y + 4\operatorname{cosec}^2y$ are in A.P. then minimum value of (2a) is

118. If $\prod_{k=1}^{29}\left(\sqrt{3} + \tan K^\circ\right) = a^b$ (where a is an even prime & $b \in N$), then $(b - 13a)$

119. Let $a = \sum_{r=1}^{11} \tan^2\left(\frac{r\pi}{24}\right)$ and $b = \sum_{r=1}^{11} (-1)^{r-1} \tan^2\left(\frac{r\pi}{24}\right)$ then find the value of $\log_{(2b-a)}(2a - b)$.

120. If circumradius and inradius of ΔABC be 10 and 3 respectively, then find the value of $a\cot A + b\cot B + c\cot C$.

121. If $x = \frac{\pi}{5}$ & the value of $y = \frac{1}{\sqrt{2}}\left[\sqrt{1+\cos 2x} + \sqrt{1+\cos 4x} + \sqrt{1+\cos 6x} + ... + \sqrt{1+\cos 12x}\right]$ can be written as $\frac{5}{4}\left[\sqrt{p} + q^2\right]$ then what will be the value of $\frac{5}{6}[p + q^2]$?

122. In a Δ ABC, the median to the side BC is of length $\frac{1}{\sqrt{11 - 6\sqrt{3}}}$ and it divides the angle A into angles of 30° and 45° the length of BC is

123. If the number of quadratic polynomials $ax^2 + 2bx + c$ which satisfy the following conditions:
(i) a, b, c are distinct
(ii) $a, b, c \in \{1, 2, 3, ..., 2001, 2002\}$
(iii) $x + 1$ divides $ax^2 + 2bx + c$
is equal to 1000λ, then find the value of λ.

124. Find the number of quadrilateral which can be constructed by joining the vertices of a convex polygon of 20 sides, if none of the side of the polygon is also the side of the quadrilateral.

125. If the value of α for which the equation $\sin x + \cos(\alpha + x) + \cos(\alpha - x) = 2$ has real solution is $\alpha \in \left[n\pi - \frac{\pi}{k_1}, n\pi + \frac{\pi}{k_2}\right]$; $n \in I$, then $k_1 + k_2$ is equal to _____.

115.		**116.**		**117.**		**118.**	
119.		**120.**		**121.**		**122.**	
123.		**124.**		**125.**			

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ANSWER KEY

1. B	2. D	3. B	4. A	5. A	6. B	7. D	8. D	9. A	10. A
11. B	12. B	13. B	14. A	15. D	16. C	17. B	18. B	19. D	20. D
21. A	22. B	23. D	24. C	25. A	26. A	27. C	28. D	29. A	30. C
31. A	32. C	33. D	34. C	35. D	36. A	37. C	38. D	39. D	40. C
41. D	42. B	43. C	44. C	45. B	46. D	47. B	48. C	49. B	

50. A,B,C	51. A,B	52. A,B,C,D	53 A,B,C	54. C,D
55. A,B,C,D	56. A,D	57. A,B,C,D	58. A,D	59. A,B,C,D
60. B,D	61. A,D	62. A,B,C,D	63. A,B	64. B,C
65. A,B,C,D	66. B,C	67. A,B,D	68. A,B,D	69. A,C,D
70. B,D	71. A,C,D	72. A,C	73. B,C	74. A,C,D

75. A	76. D	77. B	78. A	79. C	80. A	81. C	82. B	83. D	84. D
85. A	86. C	87. A	88. C	89. B	90. C	91. A	92. B	93. A	94. C

95. D

96. (A)→(S), (B)→(P), (C)→(Q), (D)→(R)

97. (A)→(Q), (B)→(P), (C)→(S), (D)→(R)

98. (A)→(Q), (B)→(P), (C)→(R), (D)→(Q)

99. (A)→(S,T); (B)→(Q); (C)→(R); (D)→(P)

100. (A)→(Q), (B)→(S), (C)→(P), (D)→(R)

101. (A)→(S), (B)→(P), (C)→(Q), (D)→(R)

102. (A)→(R), (B)→(S), (C)→(P), (D)→(Q)

103. (A)→(Q); (B)→(S); (C)→(P)

104. (A)→(R); (B)→(Q); (C)→(P); (D)→(S)

105. (A)→(Q); (B)→(R); (C)→(S)

106. (A)→(S) ; (B)→(R); (C)→(P)

107. 168	108. 510	109. 1	110. 49	111. 35
112. 3	113. 10	114. 3	115. 5	116. 1
117. 9	118. 3	119. 2	120. 26	121. 5
122. 2	123. 2002	124. 2275	125. 12	

Important Notes

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Important Notes