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# 100 must-solve PnC AND PROBABILITY QUESTIONS

## For CAT 2017

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# 100 Must-Solve Questions on PnC and Probability

**1.** One Red, Three White and two Blue Flags are arranged in a straight line such that no adjacent flags have same colour. Also, the flags at the end have different colors. In how many ways can such an arrangement of flags be made?

1. 6 2. 4 3. 10 4. 2

**2.** Let S be the set of five digit numbers formed by the digits 1, 2, 3, 4 and 5 using each digits exactly once, such that exactly two odd positions are occupied by odd digits. What is the sum of the digits in the rightmost position of the numbers in S?

1. 228 2. 216 3. 294 4. 192

**3.** Three ladies have each brought a child for admission to a school. The head of the school wishes to interview the six people one by one, taking care that no child is interviewed before his/her mother. In how many different ways can the interviews be arranged?

1. 6 2. 720 3. 2 4. 90

**4.** The number of numbers lying between 3,000 and 8,000 (including 3,000 and 8,000) which have at least two digits equal is

1. 2481 2. 2479 3. 2489 4. 2478

**5.** How many 5 digit numbers can be formed from the digits 1, 2, 3, 4, 5 and 6, such that the numbers are divisible by 4 and their digits do not repeat?

1. 144 2. 168 3. 192 4. 186

**6.** A new flag is to be designed with six vertical Strips using some or all of the colours yellow, green, blue and red. The number of ways it can be done, such that no two adjacent strips have the same colour, is

1. $12 \times 81$ 2. $16 \times 192$ 3. $20 \times 125$ 4. $24 \times 216$

**7.** 10 Straight lines, no two of which are parallel and no three of which pass through any common points, are drawn on a plane. The total number of regions (including finite and infinite regions) into which the plane would be divided by the lines is

1. 56 2. 255 3. 1,024 4. Not Unique

**8.** Sam has forgotten his friend's seven digit number. He remembers the following: the first three digits are either 635 or 674, the number is odd, and the number 9 appears once. If Sam were to use a trial and error process to reach his friend, what is the maximum number of trials he has to make before he can be certain of success?

1. 10,000 2. 2,430 3. 3,402 4. 3,006

**9.** There are 6 Tasks and 6 persons. Task 1 cannot be assigned to either person 1 or to person 2; task 2 must be assigned to either person 3 or person 4. Every person is to be assigned one task. In how many ways can the assignment be done?

1. 144 2. 180 3. 192 4. 360

**10.** There are 10 positive numbers such that $n_1 < n_2 < n_3 ........< n_{10}$. Then how many triplets can be chosen such that 1st number < 2nd number < 3rd number?

1. 45 2. 90 3. 120 4. 180

**11.** How many positive five digit integers are there, consisting of the digits 1, 2, 3, 4, 5, 6, 7, 8, 9 in which one digit appears twice?

1. ${}^{9}C_4 \times \frac{4\times 5!}{2!}$ 2. $20\times {}^{9}C_4$ 3. $9^4 - 9\times 8\times 7\times 6$ 4. None of these

**12.** There were two women participating is a Chess tournament. Every participant played two games with the participants. The number of games that the men played between themselves proved to exceed by 66, the number of games that men played with the women. The number of participants is

1. 6 2. 11 3. 13 4. 15

**13.** There are 4 offer letters and 4 envelopes labeled with the names of the recipients. The number of ways in which all the offer letters can be put into the wrong envelopes is

1. 8 2. 9 3. 16 4. None of these

**14.** Ten points are marked on a straight line and eleven points on another straight line. How many triangles can be constructed with vertices from among the above points?

1. 495 2. 550 3. 1,045 4. 2,475

**15.** The number of all possible selections of one or more questions from 10 questions, where each question has two alternatives: question A and question B, is

1. $2^{20}$ 2. $2^{10} - 1$ 3. $3^{10}$ 4. $3^{10} - 1$

**16.** There are 6 balls of different colours and six boxes, having colours which are the same as that of the balls. Each ball has to be placed is a box. In how many ways can these balls be placed, if at least 2 of the balls are in boxes, having colors different from that of the balls?

1. 1 2. 729 3. 720 4. 719

**17.** If the letters of the word MOTHER are written in all possible orders and these words are written out as in a dictionary, the rank of the word MOTHER would be

1. 240 2. 261 3. 308 4. 309

**18.** In a plane there are 37 Straight lines, of which 13 pass through point A and 11 pass through point B. Besides, no three lines pass through one point, no lines pass through both points A and B, and no two are parallel, then the number of points of intersection the lines have, is equal to:

1. 666 2. 78 3. 55 4. 535

**19.** In how many ways is it possible to choose a white square and a black square on a chess board so that the squares do not lie in the same row or column?

1. 56 2. 896 3. 60 4. 768

**20.** The number of ways in which a mixed double game can be arranged from amongst 9 married couples if no husband and wife play in the same game is

1. 756 2. 1,512 3. 3,024 4. None of these

**21.** A five digit number is formed by the digits 1, 2, 3, 4, 5 without repetition. The probability that the number formed is divisible by 4 is

1. $\frac{1}{24}$ 2. $\frac{1}{120}$ 3. $\frac{24}{120}$ 4. $\frac{36}{120}$

**22.** Four whole numbers are taken at random and multiplied together. The probability that the last digit in the product is 1, 3, 7 or 9 is ____?

1. 2/5 2. 16/625 3. 8/25 4. None of these

**23.** The probability of a bomb hitting a target is 0.5 and two direct hits are required to completely destroy it. The least number of bombs required so that the probability of the bridge being destroyed is greater than 90 % is

1. 7 2. 8 3. 9 4. 11

**24.** A problem of mathematics is given to three students, whose chances of solving it are $\frac{1}{2}, \frac{1}{3}$ & $\frac{1}{4}$ respectively. The probability that the problem will be solved is

1. $\frac{1}{24}$ 2. $\frac{23}{24}$ 3. $\frac{1}{4}$ 4. $\frac{3}{4}$

**25.** Odds are 11 : 5 against a man who is 38 years old, living till he is 73 and 5 : 3 against another man, who is 43 years old, living till he is 78. The probability that at least one of them will be alive 35 years hence is

1. $\frac{1}{128}$ 2. $\frac{15}{128}$ 3. $\frac{73}{128}$ 4. None of these

**26.** There are 4 addressed envelopes. The letters are placed at random. The probability that not all letters are placed in the correct envelope is

1. $\frac{1}{24}$ 2. $\frac{1}{12}$ 3. $\frac{11}{12}$ 4. $\frac{23}{24}$

**27.** The probability of India winning a test match against West Indies is $^1/_2$. Assuming Independence from match to match, the probability that in a 5 match series India's second win occurs in the third test is

1. $\frac{1}{8}$  2. $\frac{1}{4}$  3. $\frac{1}{2}$  4. $\frac{2}{3}$

**28.** 6 boys and 6 girls sit in a row randomly. The probability that all the 6 girls sit together is

1. $\frac{1}{6}$  2. $\frac{1}{36}$  3. $\frac{1}{66}$  4. $\frac{1}{132}$

**29.** David, Peter and Paul throw a dice in succession till one gets a six and wins the game. The probability of David winning the game is _______, if David begins.

1. $\frac{25}{91}$  2. $\frac{30}{91}$  3. $\frac{36}{91}$  4. None of these

**30.** Five persons entered a lift on the ground floor of an 8 floor building. Each of them independently and with equal probability can leave the lift at any floor beginning with the first. The probability that all the five persons get out of the lift at different floors is

1. $\frac{1}{10^5}$  2. $\frac{1}{7^5}$  3. $\frac{360}{7^5}$  4. None of these

**31.** A and B are two candidates seeking admission in IIM. The probability that A gets selected is 0.5 and the probability that both A and B are selected is 0.3. The probability that B gets selected is

1. = 0.8  2. ≤ 0.8  3. = 0.9  4. Can't say

**32.** In order to get at least one head with probability ≥ 0.9, the minimum number of times a coin needs to be tossed is

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

**33.** The letters of the word RANDOM are written in all possible orders and these word are written out in a dictionary. Then the rank of the word RANDOM is

1. 614  2. 615  3. 613  4. 616

**34.** P, Q, R, S are to give lectures to an audience. The organizer can arrange the order of their presentation in

1. 4 ways  2. 12 ways  3. 256 ways  4. 24 ways

**35.** The number of straight lines that can be drawn out of 10 points of which 7 are collinear is

1. 24  2. 23  3. 25  4. 21

**36.** A box contains two white balls, three black balls and four red balls. The number of ways in which three balls can be drawn from the box so that at least one of the balls is black is

1. 74.  2. 84  3. 64  4. 20

**37.** In a cricket championship there are 36 matches. If each plays one match with every other, the number of teams is

1. 8 2. 9 3. 10 4. None of these

**38.** The number of five–digit telephone numbers having at least one of their digits repeated is

1. 90,000 2. 1,00,000 3. 30,240 4. 69,760

**39.** Every one of the 10 available lamps can be switched on to illuminate certain hall. The total number of ways in which, the hall can be illuminated is:

1. 55 2. 1,023 3. $2^{10}$ 4. 10!

**40.** If *n* is an integer between 0 and 21; then the minimum value of $n!(21-n)!$ is:

1. 9 ! 12 ! 2. 10 ! 11! 3. 20 ! 4. 21 !

**41.** In an examination, a candidate is required to pass all four different subjects. The number of ways he can fail is:

1. 4 2. 10 3. 15 4. 24

**42.** Given 5 line segments of lengths 2, 3, 4, 5, 6 units. Then the number of triangles that can be formed by joining these lines is

1. ${}^5C_3$ 2. ${}^5C_3-3$ 3. ${}^5C_3-2$ 4. ${}^5C_3-1$.

**43.** There are 16 points in a plane, no three of which are in a straight line, except 8 which are all in a straight line. The number of triangles that can be formed by joining them equals

1. 504 2. 552 3. 560 4. 1,120

**44.** There are 5 roads leading to a town from a village. The number of different ways in which a villager can go to the town and return by a different route is

1. 25 2. 20 3. 10 4. 5

**45.** An *n*–digit number is a positive number with exactly *n* digits. Nine hundred distinct *n*–digit numbers are to be formed using only the three digits 2, 5 and 7. The smallest value of n for which this is possible is

1. 6 2. 7 3. 8 4. 9

**46.** The number of parallelograms that can be formed from a set of four parallel lines intersecting another set of three parallel lines is

1. 6 2. 9 3. 12 4. 18

**47.** A committee of 5 is to be formed from 9 ladies and 8 men. If the committee commands a lady majority, then the number of ways this can be done is

1. 2,352 2. 1,008 3. 3,360 4. 3486

**48.** The sum of all the numbers that can be formed with the digits 2, 3, 4, 5 taken all at a time is

1. 93,324 2. 66,666 3. 84,844 4. None of these

**49.** Four dice are rolled. The number of possible out comes in which at least one dice shows 2 is

1. 1,296 2. 671 3. 625 4. None of these

**50.** If eight persons are to address a meeting, then the number of ways in which a specified speaker is to speak before another specified speaker is

1. 2,520 2. 20,160 3. 40,320 4. None of these



**51.** How many 10 digit numbers can be written by using the digit 1 and 2?

1. ${}^{10}C_1 + {}^{9}C_2$ 2. $2^{10}$ 3. ${}^{10}C_2$ 4. 10!

**52.** The sum of the divisors of $2^5 . 3^7 . 5^3 . 7^2$ is

1. $2^6 . 3^8 . 5^4 . 7^3$ 2. $2^6 . 3^6 . 7^3 - 2.3.5.7.$ 3. $2^6 . 3^8 . 5^4 . 7^3 - 1$ 4. None of these

**53.** The number of times the digit 3 will be written when listing the integers from 1 to 1,000 is

1. 296 2. 300 3. 271 4. 302

**54.** The number of ways in which a mixed double game can be arranged from amongst 10 married couples if no husband and wife play in the same game is

1. 1260 2. 2520 3. 5040 4. None of these

**55.** The number of ways in which we can select four numbers from 1 to 30 so as to exclude every selection of four consecutive numbers is

1. 27,378 2. 27,405 3. 27,399 4. None of these

**56.** Between two junctions A and B there are 12 intermediate stations. The number of ways in which a train can be made to stop at 4 of these stations so that no two of the halting stations are consecutive is

1. ${}^{8}C_4$ 2. ${}^{9}C_4$ 3. ${}^{12}C_4 - 4$ 4. None of these

**57.** Eight chairs are numbered 1 to 8. Two women and three men wish to occupy one chair each. First the women chose the chairs from amongst the chair marked 1 to 4; and then the men select the chairs from amongst the remaining. The number of possible arrangements is

1. ${}^4C_3 \times {}^4C_2$ 2. ${}^4C_2 \times {}^4P_3$ 3. ${}^4P_2 \times {}^4P_3$ 4. None of these

**58.** There are 4 balls of different colours and four boxes of colours, same as those of those of the balls. The number of ways in which the balls, one in each box, could be placed such that a ball does not go to box of its own colour is

1. 9 2. 24 3. 12 4. None of these

**59.** A polygon has 44 diagonals, the number of its sides is

1. 9 2. 10 3. 11 4. 12

**60.** A box contains two white balls, three black balls and four red balls. In how many ways can three balls be drawn from the box if at least one black ball is to be included in the draw?

1. 129 2. 84 3. 64 4. None of these

**61.** The number of ways in which any four letters can be selected for the word CORGOO is

1. 15 2. 7 3. 11 4. None of these

**62.** The total number of natural numbers of six digits that can be made from the digits 1, 2, 3, and 4, if all the digits are to appear in the same number at least once is

1. 1,560 2. 840 3. 1,080 4. 480

**63.** The total number of seven digit numbers the sum of whose digits is even is

1. 9,00,00,00 2. 45,00,000 3. 8,10,00,000 4. None of these

**64.** In a chess tournament each contestant plays once against each of the other contestants. If in all 45 games are played, then the number of participants is

1. 9 2.10 3. 15 4. None of these

**65.** The number of ways in which 12 books can be put in 3 shelves, 4 on each shelf is

1. $\frac{12!}{(4!)^3}$ 2. $\frac{12!}{(3!)(4!)^3}$ 3. $\frac{12!}{(3!)^3 4!}$ 4. None of these

**66.** The total number of ways in which 12 persons can be divided into three groups of 4–persons each is

1. $\frac{12!}{(3!)^3 4!}$ 2. $\frac{12!}{(4!)^3}$ 3. $\frac{12!}{(4!)^3 3!}$ 4. $\frac{12!}{(3!)^4}$

**67.** There were two women participating in a chess tournament. Every participant played two games with the other participants. The number of games that the men played between themselves proved to exceed the number of games that the men played with the women by 66. The number of male participants is

1. 6   2. 11   3. 13   4. None of these

**68.** The number of ways in which 3 girls and 9 boys can be seated in two vans, each having numbered seats, 3 in the front and 4 at the back, under the condition that 3 girls sit together in the back row on adjacent seats.

1. ${}^{11}P_9 \times 4 \times 3!$   2. ${}^{14}P_{12} \times 4! \times 3!$   3. ${}^{14}P_9 \times (4!)^2$   4. None of these

**69.** 12 Persons are to be arranged on a round table. If two particular persons among them are not to be seated side by side, then total number of arrangements are -

1. $9(10!)$   2. $2(10!)$   3. $45(8!)$   4. 10!

**70.** The straight lines $l_1, l_2, l_3$ are parallel and lie in the same plane. A total number of *m* points are taken on $l_1$; *n* points on $l_2$, $k$ points on $l_3$. The maximum number of triangles formed with vertices at theses points is -

1. ${}^{m+n+k}C_3$   2. ${}^{m}C_3 + {}^{n}C_3 + {}^{k}C_3$

3. ${}^{m+n+k}C_3 - {}^{m}C_3 - {}^{n}C_3 - {}^{k}C_3$   4. None of these



**71.** There are *n*–white and *n*–black balls marked 1, 2, 3_______*n*. The number of ways in which we can arrange these balls in a row so that neighboring balls are of different colours is -

1. $n!$   2. $(2n)!$   3. $2.(n!)^2$   4. $\frac{(2n)!}{(n!)^2}$

**72.** If from each of the three boxes containing 3 white and 1 black; 2 white and 2 black; 1 white and 3 black, one ball is drawn at random, then the probability that 2 white balls and 1 black ball will be drawn is -

1. $\frac{13}{32}$   2. $\frac{1}{4}$   3. $\frac{1}{32}$   4. $\frac{3}{16}$

**73.** A fair coin is tossed repeatedly. If tails appear on the first four tosses, then the probability that a head appears on the fifth toss equals -

1. $\frac{1}{2}$   2. $\frac{1}{32}$   3. $\frac{31}{32}$   4. $\frac{1}{5}$

**74.** There are *n*–persons sitting in a row. Two of them are selected at random. The probability that two selected persons are not together is -

1. $\frac{2}{n}$  2. $1-\frac{2}{n}$  3. $\frac{n(n-1)}{(n+1)(n+2)}$  4. None of these

**75.** A and B play a game where each is asked to select a number from 1 to 25. If the two numbers match, both of them win a prize. The probability that they will not win a prize in a single trial is

1. $\frac{1}{25}$  2. $\frac{24}{25}$  3. $\frac{2}{25}$  4. None of these

**76.** The probability that a man will live 10 more years is $\frac{1}{4}$ and the probability that his wife will live 10 more years is $\frac{1}{3}$. The probability that neither of them will be alive in 10 years is

1. $\frac{5}{12}$  2. $\frac{1}{2}$  3. $\frac{7}{12}$  4. $\frac{11}{12}$

**77.** The probability that a person will hit a target in shooting practice is 0.3. If the person shoots 10 times, the probability that he hits the target is -

1. 1  2. $1-(0.7)^{10}$  3. $(0.7)^{10}$  4. $(0,3)^{10}$



**78.** A man alternatively tosses a coin and throws a dice beginning with the coin. The probability that he gets a head in the coin before he gets a 5 or 6 in the dice is

1. $\frac{3}{4}$  2. $\frac{1}{2}$  3. $\frac{1}{3}$  4. None of these

**79.** A box contains 10 mangoes out of which 4 are rotten. 2 mangoes are taken out together. If one of them is found to be good, the probability that the other is also good is

1. $\frac{1}{3}$  2. $\frac{8}{15}$  3. $\frac{5}{13}$  4. $\frac{2}{13}$

**80.** A box contains 24 identical balls of which 12 are white and 12 black. The balls are drawn at random from the box, one at a time with replacement. The probability that a white ball is drawn for the 4$^{th}$ time on the 7$^{th}$ draw is

1. $\frac{5}{64}$  2. $\frac{27}{32}$  3. $\frac{5}{32}$  4. $\frac{1}{2}$

**81.** A father has 3 children with at least one being a boy. The probability that he has 2 boys and one girl is

1. $\frac{1}{4}$ 2. $\frac{1}{3}$ 3. $\frac{2}{3}$ 4. None of these

**82.** The probability that a student will succeed in entering B-School '*X*' is 0.2 and the probability that he will succeed in entering B-School '*Y*' is 0.5. If the probability that he will be successful in entering both B-Schools is 0.3, then the probability that he does not succeed at both places is

1. 0.4 2. 0.3 3. 0.2 4. 0.6

**83.** A letter is known to have come either from LONDON OR CLIFTON. On the postmark only two consecutive letters - ON - are legible. The probability that it came from LONDON is

1. $\frac{5}{17}$ 2. $\frac{12}{17}$ 3. $\frac{17}{30}$ 4. $\frac{3}{5}$

**84.** Seven digits from the digits, 1, 2, 3, 4, 5, 6, 7, 8, 9 are written in a random order. The probability that this seven digit number is divisible by 9 is

1. $\frac{2}{9}$ 2. $\frac{1}{5}$ 3. $\frac{1}{3}$ 4. $\frac{1}{9}$

**85.** There are 6 shirts and 5 ties with a student. In how many ways can he go to the college with a different combination?

1. 30 2. 11 3. 150 4. 180

**86.** In a railway compartment 6 seats are vacant on a bench. In how many ways can 3 passengers sit on them?

1. 480 2. 240 3. 120 4. 60

**87.** Each section in the first year of plus two courses has exactly 40 students. If there are 4 sections, in how many ways can a set of 4 student representatives be selected, one from each section.

1. 5120000 2. 2560000 3. 1280000 4. 640000

**88.** How many 5 – digit numbers can be formed from the digits 2, 3, 4, 5 and 9, assuming no digit is repeated & is divisible by 5?

1.30 2. 12 3. 18 4. 24

**89.** Find the number of 8 letter words formed from the letter of the word EQUATION, if each word were to start with a vowel.

1.8 × 7! 2. 6 × 7! 3. 2 × 7! 4. 5 × 7!`



**90.** How many three-digit numbers are there with distinct digits, with each digit odd?

1. 90 2. 120 3. 60 4. 80

**91.** How many four-digit numbers are there with distinct digits?

1.4536 2. 9072 3. 2268 4. None of these

**92.** There are 8 students appearing in an examination of which 3 have to appear in a mathematics paper and the remaining 5 in different subjects. In how many ways can they be made to sit in a row, if all candidates in mathematics cannot sit next to each other?

1. 8! – 7! × 3! 2. 8! – 6! × 3! 3. 8! – 5! × 3! 4. 8! – 4! × 3!

**93.** The odds that A speaks the truth are 3 : 2 and the odds that B speaks the truth are 5 : 3. In what percentage of cases are they likely to contradict each other on an identical point?

1. 47.5% 2. 50% 3. 45% 4. 55%

**94.** Two dice are thrown. Find the probability that a multiple of 2 occurs on one dice and a multiple of 3 occurs on the other.

1. 1/2 2. 13/36 3. 1/3 4. 11/36

**95.** In how many ways can 6 persons be chosen from 4 officers and 8 jawans, to include at least one officer?

1. ${}^{12}C_6 - {}^{8}C_6$ 2. ${}^{12}C_6 - {}^{8}C_4$ 3. ${}^{12}C_6 - {}^{8}C_5$ 4. ${}^{12}C_6 - {}^{8}C_3$

**96.** Find the total number of 9 digit numbers, each of which has all digits different.

1. 9 × 9! × 2 2. 8 × 8! 3. 9 × 9! 4. 8 × 9!

**97.** Everybody in a room shakes hands with everybody else. The total number of handshakes is 66. The total number of persons in the room is

1. 14 2. 12 3. 11 4. 13

**98.** In a single throw of three dice, find the probability of getting a total of 17 or 18.

1. 1/108 2. 1/54 3. 1/27 4. 1/81

**99.** A coin is tossed successively three times. Determine the probability of getting at least one head

1. 1/2 2. 5/8 3. 3/4 4. 7/8

**100.** An urn contains 9 red, 7 white and 4 black balls. A ball is drawn at random. What is the probability that the ball drawn will be white or black?

1. 11/20 2. 9/20 3. 17/20 4. 13/20

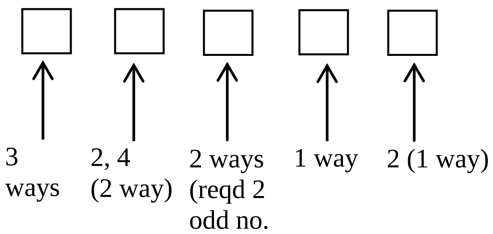
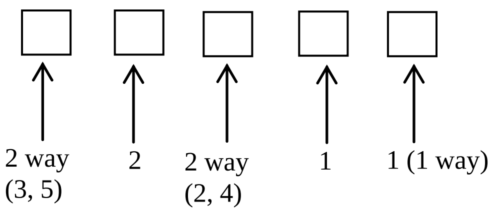
# 100 Must-solve Questions on PnC and Probability

## ANSWER KEYS

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **1.** | 1 | **26.** | 4 | **51.** | 2 | **76.** | 2 |
| **2.** | 2 | **27.** | 2 | **52.** | 4 | **77.** | 2 |
| **3.** | 4 | **28.** | 4 | **53.** | 2 | **78.** | 1 |
| **4.** | 1 | **29.** | 3 | **54.** | 2 | **79.** | 3 |
| **5.** | 3 | **30.** | 4 | **55.** | 1 | **80.** | 3 |
| **6.** | 1 | **31.** | 2 | **56.** | 2 | **81.** | 2 |
| **7.** | 1 | **32.** | 2 | **57.** | 4 | **82.** | 4 |
| **8.** | 3 | **33.** | 1 | **58.** | 1 | **83.** | 2 |
| **9.** | 1 | **34.** | 4 | **59.** | 3 | **84.** | 4 |
| **10.** | 3 | **35.** | 3 | **60.** | 3 | **85.** | 1 |
| **11.** | 1 | **36.** | 3 | **61.** | 2 | **86.** | 3 |
| **12.** | 3 | **37.** | 2 | **62.** | 1 | **87.** | 2 |
| **13.** | 2 | **38.** | 4 | **63.** | 2 | **88.** | 4 |
| **14.** | 3 | **39.** | 2 | **64.** | 2 | **89.** | 4 |
| **15.** | 4 | **40.** | 2 | **65.** | 1 | **90.** | 3 |
| **16.** | 4 | **41.** | 3 | **66.** | 3 | **91.** | 1 |
| **17.** | 4 | **42.** | 2 | **67.** | 2 | **92.** | 2 |
| **18.** | 4 | **43.** | 1 | **68.** | 1 | **93.** | 1 |
| **19.** | 4 | **44.** | 2 | **69.** | 1 | **94.** | 4 |
| **20.** | 2 | **45.** | 2 | **70.** | 3 | **95.** | 1 |
| **21.** | 3 | **46.** | 4 | **71.** | 3 | **96.** | 3 |
| **22.** | 2 | **47.** | 4 | **72.** | 1 | **97.** | 2 |
| **23.** | 1 | **48.** | 1 | **73.** | 1 | **98.** | 2 |
| **24.** | 4 | **49.** | 2 | **74.** | 2 | **99.** | 4 |
| **25.** | 3 | **50.** | 2 | **75.** | 2 | **100.** | 1 |

# 100 Must-solve Questions on PnC and Probability

## EXPLANATIONS

<table>
<tr><th>Q. No</th><th>Explanation</th></tr>
<tr><td>1.</td><td>The required arrangements are<br>RW BW BW ; WR WB WB ; BW RW BW WB WR WB BW BW RB<br>WB WB WR,</td></tr>
<tr><td>2.</td><td>We have 1, 2, 3 , 4 and 5 (5digits) and 5 places viz 1st, 2nd, 3rd, 4th and 5th place i.e. 2 even (2nd and 4th place) 3 odd (1st, 3rd and 5th place)<br>(i) Number Ending with 2 = $3 \times 2 \times 2 \times 1 \times 1 = 12$<br><br><br>(ii) Numbers ending with 4 = $3 \times 2 \times 2 \times 1 \times 1 = 12$<br>(iii) Numbers ending with 1 = $2 \times 2 \times 2 \times 1 \times 1 = 8$<br><br><br>(iv) Numbers ending with 3 = $2 \times 2 \times 2 \times 1 \times 1 = 8$<br>(v) Numbers ending with 5 = $2 \times 2 \times 2 \times 1 \times 1 = 8$<br>Sum of the digits = $12 \times 2 + 12 \times 4 + 8 \times (1 + 3 + 5) \times 2 = 216$<br>Case (iii), (iv) and (v) will have repetition when odd digits are placed at 3rd and 5th place , Option (2)</td></tr>
<tr><td>3.</td><td>The no. of arrangements possible are<br>M M M C C C ($6 \times 6 = 36$ ways)<br>M C M C MC (6 ways)<br>M M C M C C ($3 \times 2 \times 2 \times 1 \times 2 = 24$ ways)<br>M C M M C C ($3 \times 2 \times 2 = 12$ ways)<br>M M C C M C ($3 \times 2 \times 2 \times 1 = 12$ ways)<br>So total of 36 + 6 + 24 + 12 + 12 = 90 ways, Option (4)</td></tr>
<tr><td>4.</td><td>The total numbers lie in the range = 5001 of these numbers where all digits are different is $5 \times 9 \times 8 \times 7 = 2520$<br>So the answer is = 5001 – 2520 = 2481. Option (1)</td></tr>
<tr><td>5.</td><td>The last two places can be filled 8 ways. Remaining 3 places can be filled in ${}^4P_3$ ways<br>Hence no. of 5 digit nos. which are divisible by 4 = $8 \times {}^4P_3 = 192$. Option (3)</td></tr>
<tr><td>6.</td><td>1 | 2 | 3 | 4 | 5 | 6<br>The 1st strip can be used from any of the four colours. The 2nd, 3rd, 4th, 5th and 6th Strip each can be used fn any of the 3 colours . Reqd no. = $4 \times 3 \times 3 \times 3 \times 3 \times 3 = 12 \times 81$. Option (1)</td></tr>
<tr><td>7.</td><td>Explanation: With two straight lines intersecting each other, the no. of regions = 4<br>With three Straight line, intersecting each other, the no. of regions = 7<br>With four Straight lines itersecting each other, the no. of regions = 11<br>Thus with n straight lines, the no. of regions = $\frac{n(n+1)}{2}+1$<br>With 10 St. lines = $\frac{10.11}{2}+1=56$, option (1)</td></tr>
<tr><td>8.</td><td>CaseI: No. of Ending with 9</td></tr>
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| | 635 or 674 2 ways    $\uparrow$ 9 way $\uparrow$ 9 way $\uparrow$ 9 way $\uparrow$ 1 way<br>Total nos = 2 × 9 × 9 × 9 × 1 = 1458<br>Case II: a appears at tens place<br>635 or 674 2 ways    $\uparrow$ 9 $\uparrow$ 9 $\uparrow$ 1 way $\uparrow$ 4 way (1, 3, 5, 7)<br>Total numbers = 2 × 9 × 9 × 1 × 4 = 648<br>Similarly there are 648 numbers in each of the case when 9 appears at hundred and thousand place.<br>Required no. of numbers = 1458 + 648 + 648 + 648 = 3402. Option (3) |
| **9.** | 1 2 3 4 5 6<br>Task 2 can be assigned in 2 ways<br>Task 1 can be assigned in 3 ways<br>Task 3 can be assigned in 4 ways<br>Task 4 can be assigned in 3 ways<br>Task 5 can be assigned in 2 ways<br>Task 6 can be assigned in 1 ways<br>Using Fundamental laws of Multiplication<br>Reqd. no. of way = 2 × 3 × 4 × 3 × 2 × 1 = 144 ways , Option (1) |
| **10.** | Using $n_1$ as 1st number & $n_2$ as 2nd number a total of 8 numbers can be formed<br>Using $n_1$ as 1st number & $n_3$ as 2nd number a total of 7 numbers can be formed and so on<br>Thus Using $n_1$ as 1st number total no. of number = 36.<br>Next total no. of numbers = 28 ….<br>Total no. of numbers = 36 + 28 + 21 + 15 + 10 + 6 + 3 + 1 = 120, Option (3) |
| **11.** | We can select 4 out of 9 digits in $^9C_4$ ways Now the repeating number can be chosen out of the remaining 4 digits in 4 ways Also each combination can be arranged in $\frac{5!}{2!}$ ways<br>So reqd. no. of ways = $^9C_4 \times \frac{4\times 5!}{2!}$ , |
| **12.** | Let the no. of make participants = m.<br>The no. of games that men played among themselves = 2 × $^mC_2$<br>The no. of games that men played with women<br>ATQ $2\times{}^mC_2 - 2\times 2m = 66 \Rightarrow m = 11, -6$<br>No. of Male participants = 11 . No. of participants = 11 + 2 = 13, Option (3) |
| **13.** | The reqd. no. = 4! – 1 – $^4C_2$ – 2($^4C_3$) = 9. Option (2) |
| **14.** | A triangle can be formed choosing 3 points, 2 points fn one live and the third point fm the other. This can be done in $^{11}C_2$ and $^{10}C_1$ or $^{11}C_1$ and $^{10}C_2$ ways . So requried number of ways $={}^{11}C_2\times{}^{10}C_1+{}^{11}C_1\times{}^{10}C_2$ = 1045, Option (3) |
| **15.** | The first question can be tackled in three ways i.e. either the main part or its alternative or it can be rejected.<br>Thus there are 3 × 3......... = $3^{10}$ ways in which all the 10 questions can be tackled.<br>There is going to be one method in which all the questions can be tackled. Thus reqd no. of ways = $3^{10} - 1$<br>Option (4) |
| **16.** | The number of all possible ways of putting 6 balls in 6 boxes is 6!<br>There is only one correct way of putting the balls. It is not possible that only one ball. IT is not possible that only one ball goes into the box and remaining 5 in the right to box.<br>Thus if there is a mistake, at least 2 balls will be in wrong box. Required number = 6! – 1 = 719, Option (4) |
| **17.** | Words beginning with letter E = 5! = 120<br>Words beginning with letter H = 5! = 120<br>Words beginning with letters ME = 4! = 24<br>Words beginning with letters MH = 4! = 24<br>Words beginning with letters MOE = 3! = 6<br>Words beginning with letters MOH = 3! = 6<br>Words beginning with letters MOR = 3! = 6<br>Words beginning with letters MOTE = 2! = 2<br>Words beginning with letters MOTHER – 1<br>Rank = 120 + 120 + 24 + 24 + 6 + 6 + 6 + 2 + 1 = 309, Option (4) |

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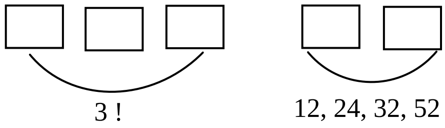
| **18.** | The reqd no. = ${}^{37}C_2 - {}^{13}C_2 - {}^{11}C_2 + 2$ = 666 – 78 – 55 + 2, Option (4) |
| **19.** | There are total of 64 Squares, out of which 32 are white and 32 are black.<br>The White Square can be chosen in 32 ways. The black square can be chosen in 32 – 8 = 24 ways .<br>So tota number of ways = 32 ×24 = 768. Option (4) |
| **20.** | We can choose two men out of 9 in ${}^{9}C_2$ ways.<br>Since no husband and wife are to play in the same game, two women out of the remaining 7 can be chosen in ${}^{7}C_2$ ways<br>If $M_1$ and $W_1$ and $W_2$ are chosen, then a team way consist of $M_1$ and $W_2$<br>Thus the number of ways of arranging the game is ${}^{9}C_2 \times {}^{7}C_2 \times 2 = 1512$, Option (2) |
| **21.** | Here the Sample Space is forming of a 5 digit number using the digits 1, 2, 3, 4 & 5 without repetition which can be done in = 5! Ways<br><br><br>The favorable cases will be when last two digits are divisible by 4 i.e. a total of 4 cases other 3 digits can be filled in 3! Ways. Thus favorable cases = 3! × 4 ∴Required Probability = $\frac{3!\times 4}{5!} = \frac{1}{5}$, Option (3) |
| **22.** | Here four whole numbers are multiplied, the last digit in each of the case can be selected in 10 ways.<br>Thus Sample space = 10 × 10 × 10 × 10 = $10^4$<br>Here the favourable cases will be when each of the multiplicand ends with the digits 1, 3, 7 or 9 i.e. 4 ways<br>Fav. Cases = 4 × 4 × 4 × 4 = $4^4$, Reqd. Prob = $\frac{4^4}{10^4}$ |
| **23.** | Let n = least no. of bombs<br>x = no. of bombs that hir the target<br>p = prob. that bomb hits the target<br>$\Rightarrow p(x = r) = {}^{n}C_r \left(\frac{1}{2}\right)^r \left(\frac{1}{2}\right)^{n-r}$, $p(x \ge 2) > 0.9$<br>$\Rightarrow 1 - p(x \ge 2) \le 0.1$, $\Rightarrow p(x = 0) + p(x = 1) \le 0.1$<br>$\Rightarrow {}^{n}C_o \left(\frac{1}{2}\right)^n + {}^{n}C_1 \left(\frac{1}{2}\right)^{n-1} \left(\frac{1}{2}\right) \le \frac{1}{10}$, $\Rightarrow \frac{n+1}{2^n} \le \frac{1}{10} \Rightarrow 10(n+1) \le 2^n$<br>The relation hold for Min n = 7 , Option (1) |
| **24.** | Prob. that 1st can solve = $P(A) = \frac{1}{2}$, Prob. 2nd can solve = $P(B) = \frac{1}{3}$<br>Prob. 3rd can solve = P(C) = $\frac{1}{4}$<br>Required probability = $P(A \cup B \cup C) = \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{2} \times \frac{1}{3} + \frac{1}{3} \times \frac{1}{4} + \frac{1}{2} \times \frac{1}{4} - \frac{1}{2} \times \frac{1}{3} \times \frac{1}{4} = \frac{3}{4}$<br><u>2nd Method,</u><br>Required Probability = 1 – None of them solves , $= 1 - \left(1 - \frac{1}{2}\right)\left(1 - \frac{1}{3}\right)\left(1 - \frac{1}{4}\right) = \frac{3}{4}$ Option (4) |
| **25.** | Prob. of 1st not surviving = $\frac{11}{16}$,<br>Prob. of 2nd not surviving = $\frac{5}{8}$<br>Required Prob. = 1 – None of the two survives = $1 - \frac{11}{16} \times \frac{5}{8} = \frac{73}{128}$, Option (3) |
| **26.** | There is one correct way of putting 4 letters in the 4 addressed envelopes and 23 other ways in which all the 4 letters can be placed in the 4 envelopes. Thus required Probability = $1 - \frac{1}{24} = \frac{23}{24}$, Option (4) |
| **27.** | Required Prob. = (Probability of India winning one Match out of first two matches) × (Prob. of India winning a test in third match) $= {}^{2}C_1 \times \left(\frac{1}{2}\right)^{2-1} \left(\frac{1}{2}\right)^1 \left(\frac{1}{2}\right) = \frac{2!}{1!} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$, Option (2) |

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| **28.** | The required probability is equal is equal to No. of ways in which 6 Boys & 6 girls sit together<br>$= \dfrac{\text{So that 6 girls are seated together}}{\text{No. of ways in which 6 Boys and 6 girls are seated in a random manner.}}$<br>$= \dfrac{7!\,6!}{12\,!} = \dfrac{1}{132}$, Option (4) |
| **29.** | The prob. of David winning = $\dfrac{1}{6}$ in the $1^{st}$ throw<br>Now David will get his turn only if David, Peter and Paul in Succession loose i.e. $4^{th}$ throw<br>Prob. of David winning in the $4^{th}$ draw $= \dfrac{5}{6} \times \dfrac{5}{6} \times \dfrac{5}{6} \times \dfrac{1}{6}$<br>Thus prob. of David winning $= \dfrac{1}{6} + \dfrac{1}{6} \times \left(\dfrac{5}{6}\right)^3 + \dfrac{1}{6}\left(\dfrac{5}{6}\right)^6 + \dfrac{1}{6} \times \left(\dfrac{5}{6}\right)^9 + \ldots\ldots.. = \dfrac{1/6}{1-(5/6)^3} = \dfrac{36}{91}$,<br>Option (3) |
| **30.** | The required probability = $\dfrac{\text{Five persons on 7 different floors}}{\text{Five persons on an any of the 7 floors}}$<br>$= \dfrac{{}^7P_5}{7^5} = \dfrac{7!}{2!} \times \dfrac{1}{7^5} = \dfrac{6 \cdot 5 \cdot 4 \cdot 3}{7^4}$, $= \dfrac{360}{7^4}$, Option (4) |
| **31.** | $E_1$ = A gets selected<br>$E_2$ = B gets selected<br>$P(E_1 \cup E_2) = P(E_1) + P(E_2) - P(E_1 \cap E_2) \Rightarrow P(E_1 \cup E_2) = 0.5 + P(E_2) - 0.3 \Rightarrow P(E_2) = P(E_1 \cup E_2) - 0.2$<br>Now $P(E_1 \cup E_2)$ can be at the most 1 $\Rightarrow P(E_2) \le 1 - 0.2$. Thus Prob. that B gets selected is at the most 0.8,<br>Option (2) |
| **32.** | Probability of getting at least one Head = $1 - \left(\dfrac{1}{2}\right)^n$<br>ATQ $1 - \left(\dfrac{1}{2}\right)^n \ge 0.9$, $\Rightarrow \left(\dfrac{1}{2}\right)^n \le 0.1 \Rightarrow 2^n \ge 10 \Rightarrow$ Min Value of n = 4 , Option (2) |
| **33.** | There are 5! = 120 words each beginning with the letters A, D, M, N and O respect.<br>There are 3! Words beginning with the letters RAD, and RAM respect.<br>Beginning with RAND we have RANDMO and RANDOM.;<br>Thus Rank = 120 + 120 + 120 + 120 + 120 + 6 + 6 + 2 = 614. |
| **34.** | Required number of ways = 4! = 24 |
| **35.** | The required number of lines $= 1 + {}^{10}C_2 - {}^7C_2 = 46 - 21 = 25$ |
| **36.** | The required number of ways (a) 1 black and 2 others = ${}^3C_1 . {}^6C_2 = 3 \times 15 = 45$ (b) 2 black and 1 other = ${}^3C_2 . {}^6C_1 = 3 \times 6 - 18$ (c) all the three black = ${}^3C_3 = 1$. Total = $45 + 18 + 1 = 64$ |
| **37.** | Let n be the number of terms. $\therefore\ {}^nC_2 = 36 \therefore \dfrac{n(n-1)}{1.2} = 36 \Rightarrow n(n-1) = 72 = 9.8 \Rightarrow n = 9$ |
| **38.** | The number of five–digit telephone numbers which can be formed using the digits of 0, 1, 2, …., 9 is $10^5$.<br>The number of five digit telephone numbers which have none of their digits repeated is ${}^{10}P_5 = 30240$. Hence the required number = $10^5 - 30240 = 69760$ |
| **39.** | The total number of ways in which the lamp can be illustrated $= {}^{10}C_1 + {}^{10}C_2 + \ldots . {}^{10}C_{10} = 2^{10} - 1 = 1023$. |
| **40.** | Min. Value = 10 ! 11 ! |
| **41.** | The candidate will fail if he fails either in 1 or 2 or 3 or 4 subjects,<br>$\therefore$ Required no. of ways = ${}^4C_1 + {}^4C_2 + {}^4C_3 + {}^4C_4 = 2^4 - 1 = 15$. |
| **42.** | We know that in any triangle the sum of two sides is always greater than the third side.<br>$\therefore$ the triangle will not be formed if we select segments of lengths (2, 3, 5) , (2, 3, 6) and (2, 4, 6). Hence no. of triangles formed = ${}^5C_3 - 3$ |
| **43.** | Required no. of triangles $= {}^{16}C_3 - {}^8C_3 = \dfrac{16 \times 15 \times 14}{1 \times 2 \times 3} - \dfrac{8 \times 7 \times 6}{1 \times 2 \times 3}$<br>$= 16 \times 5 \times 7 - 56 = 560 - 56 = 504$ |
| **44.** | Required number of ways $= {}^5P_2 = 5 \times 4 = 20$ |
| **45.** | For $n = 6,\ 3 \times 3 \times 3 \times 3 \times 3 \times 3 = 729 < 900$.<br>For $n = 7,\ 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 = 2187 > 900$. |

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| | For $n$ = 8, Number of $n$ – digits formed > 900. Since the least n is required. $\therefore \ n = 7$. |
| **46.** | Since each parallelogram is formed by choosing two parallel straight lines from the first and two from the second set.<br>$\therefore$ total no. of parallelograms formed $= {}^4C_2 \times {}^3C_2 = 6 \times 3 = 18$ |
| **47.** | The required number<br>$= {}^9C_5 \times {}^8C_0 + {}^9C_4 \times {}^8C_1 + {}^9C_3 \times {}^8C_2 = \frac{9.8.7.6}{1.2.3.4} + \frac{9.8.7.6}{1.2.3.4} \times 8 + \frac{9.8.7}{1.2.3} \times \frac{8.7}{1.2} = 126 + 1008 + 2352 = 3486$. |
| **48.** | The total number of numbers that can be formed with the digits 2, 3, 4, 5 taken all at a time $= {}^4P_4 = 4! = 24$.<br>Consider the digit in the unit's place in all these numbers.<br>Each of the digits 2, 3, 4, 5 occurs in 3 ! = 6 times in the unit's place.<br>$\therefore$ Total for the digits in the unit's place = $(2+3+4+5)6 = 84$.<br>Since each of the digits 2, 3, 4, 5 occurs 6, times in any one of the remaining places.<br>$\therefore$ The required total = 84 $(1+10+0^2+10^3) = 84(1111) = 93324$. |
| **49.** | The total number of possible outcomes is $6^4$.<br>The number of possible outcomes in which 2 does not appear on any dice is $5^4$.<br>$\therefore$ the no. of possible outcomes in which at least one dice shows a 2 is $6^4 - 5^4 = 1296 - 625 = 671$ |
| **50.** | Let A, B be the corresponding speakers.<br>Without any restrictions the eight persons can be arranged among themselves in 8!<br>Ways, but the number of ways in which A speaks before B and the number of ways in which B speaks before A make up 8!<br>Also number of ways in which A speaks before B is exactly same as the number of ways in which B speaks before A.<br>$\therefore$ the required no. of ways = $\frac{1}{2}(8!) = 20160$. |
| **51.** | Since each place of 10 digit number can be filled in 2 ways. $\therefore$ Total number of 10 digits numbers formed<br>$= 2^{10}$. |
| **52.** | Any divisor of $2^5.3^7.5^3.7^2$ is of the form $2^a 3^b 5^c 7^d$ where $0 \le a \le 5, 0 \le b \le c \le 3$ and $0 \le d \le 2$.<br>Thus the sum of the divisors of $2^5.3^7.5^3.7^2$ is $(1+2+....2^5)(1+3....+3^7)(1+5+5^2+5^3) =$<br>$\left(\frac{2^6-1}{2-1}\right)\left(\frac{3^8-1}{3-1}\right)\left(\frac{5^4-1}{5-1}\right)\left(\frac{7^3-1}{7-1}\right) = \frac{(2^6-1)(3^8-1)(5^4-1)(7^3-1)}{2.4.6}$ |
| **53.** | Since 3 does no occur in 1000, we have to count the number of times 3 occur when we list the integers from 1 to 999.<br>Any number between 1 and 999 is of the form xyz where $0 \le x, y, z \le 9$.<br>Let us first count the numbers in which 3 occurs exactly once.<br>Since 3 can occur at one place in ${}^3C_1$ ways, there are $({}^3C_1)(9 \times 9) = 3 \times 9^2$ such numbers.<br>Next, 3 can occur in exactly two places in $({}^3c_2)(9) = 3 \times 9$ such numbers.<br>Lastly. 3 can occur in all three digits in one number only.<br>Hence the number of times 3 occurs is $1 \times (3 \times 9^2) + 2 \times (3 \times 9) + 3 \times 1$<br>$= 243 + 54 + 3 = 243 + 57 = 300$ |
| **54.** | Out of 10 men two men can be chosen in ${}^{10}C_2$ ways. Since no husband and wife are to play in the same game, so we have to select two women from the remaining 8 women.<br>This can be done in ${}^8C_2$ways.<br>If $M_1M_2$ and $W_1W_2$ are chosen then a team can be constituted in 4 ways viz $M_1W_2; M_1W_1; M_2W_1; M_2W_2$.<br>Thus the number of ways of arranging the game is ${}^{10}C_2 \times {}^8C_2 \times 2 = 2520$ |
| **55.** | The number of ways of selecting any four numbers from 1 to 30 is ${}^{30}C_4$.<br>Four consecutive numbers can be chosen in the following ways i.e. (1, 2, 3, 4); (2, 3, 4, 5)…..<br>(27, 28, 29, 30) i.e. 27 ways. Thus required no. of ways = ${}^{30}C_4 - 27 = 27378$. |
| **56.** | $\leftarrow x_1 \rightarrow \leftarrow x_2 \rightarrow \leftarrow x_3 \rightarrow \leftarrow x_4 \rightarrow \leftarrow x_5 \rightarrow$<br>$A \quad 1 \quad 2 \quad 3 \quad 4 \quad B$<br>Here $x_1 + x_2 + x_3 + x_4 + x_5 = 8$ (1)<br>$x_1, x_2, \ldots x_5$ is the no. of intermediate stns.,<br>(1, 2, 3, 4) are the stations.<br>Here $x_1 \ge 0; x_5 \ge 0; x_2, x_3, x_4 \ge 1$,<br>The total number of ways is the number of solutions of the above equation.<br>Let $y_2 = x_2 - 1;\ y_3 = x_3 - 1; y_4 = x_4 - 1;$<br>There for equation (1) reduces $x_1 + y_2 + y_3 + y_4 + x_5 = 5$ |

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| | Where $y_2, y_3, y_4 \geq 0$ ; The no. of solution = ${}^{5+5-1}C_{5-1} = {}^9C_4$ |
| **57.** | The required no. $= {}^4P_2 \times {}^6P_3$ |
| **58.** | The required no. of ways = 4! – 1 – ${}^4C_2$ – 2 (${}^4C_3$) = 9 |
| **59.** | If the $n = no.$ of sides of polygon of n–vertices. $\Longrightarrow$ No. of diagonals $= {}^nC_2 - n = \frac{n(n-1)}{2} - n, \Rightarrow 44 = \frac{n(n-1)}{2} -$ n, $\Rightarrow 44 = \frac{(n-3)n}{2}, \Rightarrow n(n-3) = 88, \Rightarrow n = 11$. |
| **60.** | At least one black ball can be drawn in the following ways<br>(i) One black and two non–black balls<br>(ii) Two black and one non–black ball<br>(iii) All the three black balls<br>$\Longrightarrow$ No. of ways = ${}^3C_1 \times {}^6C_2 + {}^3C_2 \times {}^6C_1 + {}^3C_3 = 64$ . |
| **61.** | Four letters can be selected in the following ways:<br>(i) all different i.e. C, O, R, G,<br>(ii) 2 – alike and 2 different i.e. 2 alike and 1R and 1G.<br>(iii) 3 alike and 1 different i.e. three O's and 1 for R, G and C for<br>(i) ${}^4C_4$ = 1, for (ii) ${}^3C_2 \times {}^2C_2 = 3$ , for<br>(iii) ${}^3C_3 \times {}^3C_1 = 3$ ,<br>Reqd. No. = $1+3+3=7$ . |
| **62.** | There can be two types of numbers i.e. (i) any one of the digits repeats thrice and the remaining digits only once i.e. of the type 1, 2, 3, 4, 4, 4, = $\frac{6!}{3!} \times {}^4C_1 = 480$ .<br>(ii) any two of the digits 1, 2, 3, 4 repeats twice and the remaining two only once i.e. of the type 1, 1, 2, 2, 3, 4 $= \frac{6!}{2!2!} \times {}^4C_2 = 1080$ . Reqd. No. = 1080 + 480 = 1560 |
| **63.** | If $a_1 a_2 a_3 a_4 a_5 a_6 a_7$ represents a seven digit number.<br>Now $a_1$ takes values $-1, 2, 3, ---9$ $a_2, a_3, a_4 --- a_7$ takes values $-0, 1, 2, 3, ---9$ .<br>If we keep $a_1, a_2, ----$ $a_6$ fixed, then $a_1 + a_2 + ....a_6$ is either even or odd.<br>Since $a_7$ takes 10 values 0, 1, 2, —— 9 five of the numbers formed will be even and 5 odd.<br>Thus Reqd. No. of numbers 9.10.10.10.10. 10.5 = 45,00,000. |
| **64.** | If there $n$ – participants $\Rightarrow {}^nC_2 = 45 \Rightarrow \frac{n(n-1)}{2} = 45 \Rightarrow n = 10$ |
| **65.** | Here the shelves are different 4 – Books on 1st Shelf in for 12 Books $= {}^{12}C_4 = \frac{12!}{4!8!}$.4 –<br>Books on 2nd shelf the remaining 8 Books $= {}^8C_4 = \frac{8!}{4!4!}$ .<br>4 Books on 3rd shelf for the 4 – books $= {}^4C_4 = \frac{4!}{4!O!} = 1$ . Required. No. $\frac{12!}{4!8!} \times \frac{8!}{4!4!} = \frac{12!}{(4!)^3}$ |
| **66.** | Here mere grouping is of concern. Thus Required No. of ways $= \frac{12!}{(4!)^3 3!}$ |
| **67.** | If there are 'n' men participants.<br>No of games that men played between themselves = 2. ${}^nC_2.No$ .<br>Of games that men played with women 2 × $2n$ $\quad 2.{}^nC_2 - 2.2n = 66, \Rightarrow 2.\frac{n(n-1)}{2} - 4n = 66,$<br>$\Rightarrow n^2 - 5n - 66 = 0, \Rightarrow n = 11.$<br>No of male participants = 11. |
| **68.** | Total number of persons = 3 girls + 9 boys = 12. total no. of numbered seats $= 2 \times 3 + 4 \times 2 = 14$ . Three girls can be seated together in a back row on adjacent seats in the ways 1, 2, 3, or 2, 3, 4 of first van and 1, 2, 3 or 2, 3, 4, of second van.<br>In each of these 4 ways the three girls can interchange among themselves in 3! ways .<br>Now 9 boys can be seated on remaining 11 seats which can be done in ${}^{11}P_9$ ways.<br>Required. no. of ways $= {}^{11}P_9 \times 4 \times 3\,!$ |
| **69.** | 12 persons on a round table is = 11! ways. 12 persons on a round table so that two people are side by side = 2!×10! .<br>Required no = $11! - 2! \times 10! = 9 \times 10!$ |

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| **70.** | Total points $=(m+n+k)$.<br>Total triangles $={}^{m+n+k}C_3$ out $(m+n+k)$, $m$ points lie on $l_1$, n points lie on $l_2$ and $k$ points lie on $l_3$.<br>By joining points on a straight line we do not get triangles.<br>Hence the number of triangles is - $={}^{m+n+k}C_3-\left({}^mC_3+{}^nC_3+{}^kC_3\right)$. |
| **71.** | We can arrange $n$ white and $n$ black balls alternatively in the following ways<br>(i) WB WB———,<br>(ii) BW BW———,<br>So required. number $=n!\times n!+n!n!=2(n!)^2$ |
| **72.** | Contents of three boxes are<br><br>I: 3W, 1B; II: 2W, 2B; III: 1W, 3B<br><br>Required Probability = $P(W_1\cap W_2\cap B_3)\cup(W_1\cap B_2\cap W_3)\cup(B_1\cap W_2\cap W_3)$<br>$=P(W_1).P(W_2).P(B_3)+P(W_1).P(B_2).P(W_3)+P(B_1).P(W_2).P(W_3)=\frac{3}{4}\times\frac{2}{4}\times\frac{3}{4}+\frac{3}{4}\times\frac{2}{4}\times\frac{1}{4}+\frac{1}{4}\times\frac{2}{4}\times\frac{1}{4}=\frac{13}{32}$. |
| **73.** | Getting head on fifth toss is an independent event. Hence required. probability = $\frac{1}{2}$ |
| **74.** | The total no. of ways selecting 2 persons out of n is = ${}^nC_2=\frac{n(n-1)}{2}$.<br>The number of ways in which two selected persons are together is $(n-1)$.<br>Probability that selected persons are together is $=\frac{(n-1)}{\frac{n(n-1)}{2}}=\frac{2}{n}$ Required. Probability $=1-\frac{2}{n}$. |
| **75.** | The total number of ways of choosing number from 1 to 25 by both the players $=25\times25=625$. There are 25 ways in which number chosen by both the players is same.<br>The probability that they will prize in a single trial $=\frac{25}{625}=\frac{1}{25}$.<br>Required. Probability that they will not win a prize in a single trial $=1-\frac{1}{25}=\frac{24}{25.}$ |
| **76.** | Reqd. Probability $=\left(1-\frac{1}{4}\right)\left(1-\frac{1}{3}\right)=\frac{1}{2}$. |
| **77.** | Reqd. Prob. =1 – Prob. that he does not hit the target in any trial.$=1-(0.7)^{10}$ |
| **78.** | Prob. of getting a head in a single toss of a coin = $\frac{1}{2}=p$.<br>Prob of getting 5 or 6 in a single throw of a dice $=\frac{2}{6}=q$. Reqd. Probability $=p+(1-p)(1-q)p+(1-p)(1-q)(1-p)(1-q)p+.....,$<br>$=p+(1-p)(1-q)p+(1-p)^2(1-q)^2p+....=\frac{p}{1-(1-p)(1-q)}=\frac{\frac{1}{2}}{1-\frac{1}{2}\times\frac{2}{3}}=\frac{3}{4}$ |
| **79.** | A = Event that first mango is good.<br>B = Event that second mango is good.<br>Reqd. Prob. $=P(B/A)=\frac{P(A\cap B)}{P(A)}$. $P(A\cap B)=$ Prob. that both the mangoes are good $=\frac{{}^6C_2}{{}^{10}C_2}$.$P(A)$ = Prob. that first mango is good $=\frac{{}^6C_2}{{}^{10}C_2}+\frac{{}^6C_1\times{}^4C_1}{{}^{10}C_2}$.<br>Hence $P\left(\frac{B}{A}\right)=\frac{{}^6C_2}{{}^6C_2+{}^6C_1\times{}^4C_1}=\frac{5}{13}$. |
| **80.** | $P_1=$ prob. of drawing a white ball.<br>$P_2=$ prob. Of drawing a black ball. $P_1=P_2=\frac{1}{2}$. White ball is drawn 4th time in 7[th] draw, means that three white balls have been drawn in first six draws and 4[th] white balls is drawn in 7[th] draw. Reqd. prob |

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| | $= \left({}^6C_3 P_1^3 P_2^3\right) P_1 = {}^6C_3 \left(\frac{1}{2}\right)^3 \left(\frac{1}{2}\right)^3 \left(\frac{1}{2}\right)$ |
| **81.** | A = Event that father has at least one boy. B = Event that father has 2 boys and 1 girl. Then $A = 1$.<br>Boy & 2 girls; 2 boys and 1 girls; 3 boys & no girl. $A \cap B = 2$ boys & 1 girls.<br>Reqd. prob. = P($\frac{B}{A}$) = $\frac{P(A \cap B)}{P(A)} = \frac{1}{3}$. |
| **82.** | A = Event that he is selected in B–schools '$x$', B = Event that he is selected in B–schools '$y$'<br>$P(A) = 0.2, P(B) = 0.5, P(A \cap B) = 0.3$<br>Reqd. Probability $= P(\bar{A} \cap \bar{B}) = 1 - P(A \cup B)$<br>$= 1 - [P(A) + P(B) - P(A \cap B)],$<br>= 0.6 |
| **83.** | Al = Selecting a pair of consecutive letters for the word LONDON.<br>A2 = Selecting a pair of consecutive letters for the Word CLIFTON.<br>E= Selecting a pair of letters 'ON'. $P(A_1 \cap E) = \frac{2}{3}$; there are 5 pairs of consecutive letters out of which 2 are ON.<br>$P(A_2 \cap E) = \frac{1}{6;}$ there are 6 pairs of consecutive letters of which one is ON.<br>Reqd. Prob. = $P\left(\frac{A_1}{E}\right) = \frac{P(A_1 \cap E)}{P(A_1 \cap E) + P(A_2 \cap E)} = \frac{\frac{2}{5}}{\frac{2}{5} + \frac{1}{6}} = \frac{12}{17}$. |
| **84.** | We have 1 + 2 + 3 +….+ 9 = 45.<br>Seven digit number formed will be divisible by 9, if the two digits which are not used are (1, 8) or (2, 7) or (3, 6) or (4, 5) favourable number of ways = 4.<br>Since 2 digits can be selected from 9 in ${}^9C_2$ ways, there for exhaustive ways = ${}^9C_2$. Reqd. Prob. = $\frac{4}{{}^9C_2} = \frac{1}{9}$ |
| **85.** | Number of ways to select a shirt=6 and the no. of ways to select a tie = 5.<br>By principle of fundamental product total no combinations= 6 × 5 = 30. |
| **86.** | Since there are 3 different passengers the question concerns permutations.<br>The first passenger can occupy 6 different seats. The second passenger has got 5 different possible seats to occupy.<br>Similarly the 3rd passenger has 4 seats to occupy, therefore the total number of permutations possible $= 6 \times 5 \times 4 = 120$. |
| **87.** | Since there are 40 students in one section the number ways in which a student representative can be selected is 40.<br>In the same way there are 40 ways of selection of a representative from each section.<br>The total number of ways of forming a set $= 40 \times 40 \times 40 \times 40$. |
| **88.** | The number of 5 digit numbers that can be formed using the given digits without repetition = 5!<br>For the numbers to be divisible by 5. The numbers should end with 5.<br>In that case the last digits can be filled in 4! Ways without repetition.<br>Therefore the total number of 5 digit numbers divisible by 5 is $1 \times 4 = 4!$. |
| **89.** | There are five word EQUATION.<br>So the first place can be filled in 5 different ways. The remaining places can be filled in 7 ! ways. Therefore the total number of words formed $= 5 \times 7!$ |
| **90.** | There are 5 odd digits.<br>Since the required numbers contain distinct digits the first place can be filled in 5 different ways.<br>Having exhausted one of the digits the second place can be filled in 4 different ways.<br>Similarly the third place can be filled in 3 different ways.<br>Therefore the total numbers having distinct odd digit is $5 \times 4 \times 3 = 60$. |
| **91.** | There are 10 digits in all.<br>Since the required number is a four digit number the thousands place can be occupied by all digits except 0.<br>Therefore the possible number of digits is 9.<br>The number has to have distinct digits.<br>Having consumed one of the 10 digits the hundred's place can be filled in 9 different ways. The tens place can be filled in 8 ways and the units place in 7 ways.<br>Therefore the total number of four digit numbers with distinct digits $= 9 \times 9 \times 8 \times 7 = 4536$. |
| **92.** | Let the student appearing for the mathematics paper sit together (thereby clubbing them together).<br>The number of entities will therefore reduce to 6. These 6 can be arranged amongst themselves in 6! Ways.<br>The students of mathematics can be arranged amongst themselves in 3!<br>Therefore keeping the students appearing for the mathematics the total number of arrangements are $= 6! \times 3!$.<br>The total 8 students can be arranged in 8! ways. Therefore the number of ways of arranging the students without keeping those appearing for mathematics together $= 8! - 6! \times 3!$. |
| **93.** | There are two cases where the two would surely contradict each other. |

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| | The first case where A speaks the truth and B lies. The probability of such a case $=\frac{3}{5}\times\frac{3}{8}=\frac{9}{40}$<br>Here we have the product of the probabilities because two independent are to performed.<br>The second case where A and B would contradict each other is when A lies and B speaks the truth. The probability of such an event $=\frac{2}{5}\times\frac{5}{8}=\frac{10}{40}$.<br>The probabilities of the two independent cases $=\frac{9}{40}+\frac{10}{40}=\frac{19}{40}=0.475=47.5\%$ |
| **94.** | We have a total of 11 favorable cases viz. 2,3 2,6, 4,3 4,6 6,3 3,6 6,4 3,4 6,2 3,2 and 6,6 out of a total of 36 cases.<br>So the answer is $\frac{11}{36}$. |
| **95.** | There are a total of 12 men. Selection of 6 men can be done in ${}^{12}C_6$ ways.<br>However these will also include combinations in which there is no officer.<br>The number of ways of selecting a team in which there is no officer $={}^{8}C_6$.<br>Therefore the number of ways of selecting a team which contains at least one officer $={}^{12}C_6-{}^{8}C_6$. |
| **96.** | There are a total of 10 digits.<br>In a 9 digit number the first digit can be any digit other than 0.<br>Therefore the first digit can be filled in 9 ways. Having consumed 1 digit the second digit of the 9 digit number can be filled in 9 ways, similarly the 3rd digit can be filled in 8 ways.<br>In this manner the total number of 9 digit numbers with distinct digits $9\times9\times8\times7\times6\times5\times4\times3\times2$. |
| **97.** | If there are $n+1$ n men in the room then the first man shakes hands n times and the second man $n-1$ times and the third man $n-2$ times.<br>Therefore the sum of the shake hands $=n+(n-1)+(n-2)+...+1=n(n+1)/2=66$. Therefore $n = 11$.<br>Hence the number of men is 12. |
| **98.** | The total number of different sums generated by a throw of three dice is $6^3=216$.<br>The instances when we get a sum of 17 or 18 are $6+6+6, 6+6+5, 6+5+6, 5+6+6$.<br>Therefore the number of favorable instance is 4. The required probability is $\frac{4}{216}=\frac{1}{54}$. |
| **99.** | The instance when one will not get any head is when all three coins will yield tail.<br>In all other instance the result will have at least one head.<br>The probability of getting all tails is $\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}=\frac{1}{8}$. The probability of getting at least one head $=1-\frac{1}{8}=\frac{7}{8}$. |
| **100.** | The probability of drawing a white ball $=\frac{7}{20}$. The probability of drawing a black ball $=\frac{4}{20}$. Therefore the probability of drawing a white ball or a black ball $\frac{7}{20}+\frac{4}{20}=\frac{11}{20}$.<br>Whenever two activities independent of each other are to be performed the probability that either of the activities is done is equal to the sum of the probabilities of the two activities.<br>When both the activities are to be performed the req. probability is the product of the two probabilities.<br>The necessary condition is that the two activities should by independent of each other. |

*"The distance between your Dreams and Reality is called Action."*