

25. PERMUTATION AND COMBINATION, PROBABILITY

$$n! = n(n-1)(n-2)\dots\cdot 2 \cdot 1$$

The number of possible different arrangements of a given things is called permutation.

Here order matters.

Eg: Listing your 3 favorite desserts, in order, from a menu of 10. $P(10,3) = 720$.

Eg: Possible arrangements of a, b, c, taking all together is (abc, acb, bca, bac, cab, cba).

Possible different groups/selections, that can be formed by taking some or all of a number of items is called combination. Here order doesn't matter.

Eg: Choosing 3 desserts from a menu of 10. $C(10,3) = 120$.

Eg: possible combinations of selecting two items from given a, b, c, d is ab, ac, ad, bc, bd, cd.

That is $C(4,2) = 6$

Probability of occurring an event = number of favorable outcomes/ total number of outcomes

Probability of occurring an event + Probability of not occurring that event = 1

Probability lies between 0 and 1.

Practice Exercise - 1

Directions for questions 1 to 30: Select the correct alternative from the given choices.

1. If there are 4 different roads from Hyderabad to Mumbai and 3 different roads from Mumbai to Delhi, how many roads are there from Hyderabad to Delhi that go through Mumbai?
(1) $4! \times 3!$ (2) 34 (3) 43 (4) 12
2. How many five digit numbers, which are divisible by 6, can be formed from the digits 1, 3, 2, 5, 7 (digits can not be repeated)?
(1) 48 (2) 36 (3) 12 (4) 24
3. In how many ways can 3 balls be kept in 4 baskets?
(1) 128 (2) 120 (3) 64 (4) 144
4. For a cricket team of 11 players, there are 17 probables, exactly 2 players are to be selected from Jharkhand there are 5 players from Jharkhand among the probables. In how many ways can the selection be made?
(1) 3400 (2) 2200 (3) 8800 (4) 4400
5. How many numbers, greater than 52000 can be formed with the digits 0, 3, 4, 7, 5 with out repetition?
(1) 96 (2) 25 (3) 42 (4) 30
6. In how many ways can 5 pens be selected from 10 different pens such that one particular pen is never

selected and one particular pen is always selected?

- (1) 56 (2) 126 (3) 70 (4) 100

7. A. There are 9 points in a plane of which 3 are collinear. How many different straight lines can be drawn by joining these points?
(1) 36 (2) 35 (3) 33 (4) 34
B. In the above question, how many different triangles can be formed?
(1) 84 (2) 83 (3) 63 (4) 20
8. Find the number of 4 digit numbers that can be formed from the digits 4, 5, 6, 7, 0 without repetition.
(1) 96 (2) 256 (3) 120 (4) 156
9. There is a question paper consisting of 8 questions. Each question has an internal choice of 2 questions where one can answer at most one of them. In how many ways can a student attempt one or more questions of the given 8 questions in the paper?
(1) 6561 (2) 6578 (3) 6560 (4) 6256
10. In how many ways can 6 letters be posted into 5 letterboxes?
(1) 15625 (2) 7776 (3) 1296 (4) 3125
11. Out of 4 boys and 6 girls of a class, a committee of 7 is to be selected. Find the number of ways in which this can be done when there is a majority of girls.
(1) 86 (2) 112 (3) 100 (4) 64
12. When two dice are thrown together, find the probability of getting the same number on both the dice?
(1) $\frac{1}{6}$ (2) $\frac{1}{2}$ (3) $\frac{3}{4}$ (4) 1
13. If two dice I and II are thrown together, what is the probability of getting 6 on the dice I and a prime number on the dice II?
(1) $\frac{1}{9}$ (2) $\frac{1}{2}$ (3) $\frac{5}{36}$ (4) $\frac{1}{12}$
14. When a dice is rolled, what is the probability of getting a composite number or a number less than 5?
(1) 1 (2) $\frac{1}{6}$ (3) $\frac{5}{6}$
(4) None of these
15. The probability that a leap year chosen at random has exactly 52 Tuesdays and 52 Wednesdays is
(1) $\frac{2}{7}$ (2) $\frac{4}{7}$ (3) $\frac{1}{7}$ (4) $\frac{3}{7}$
16. If six friends are to be seated in a row, then the probability that two particular friends never sit together is
(1) $\frac{2}{3}$ (2) $\frac{5}{6}$ (3) $\frac{1}{3}$ (4) $\frac{1}{6}$

17. If 5 coins are tossed together, what is the probability of getting exactly 3 heads?
 (1) $\frac{15}{32}$ (2) $\frac{5}{16}$ (3) $\frac{3}{5}$ (4) $\frac{3}{32}$
18. A card is drawn from a well-shuffled pack of cards; find the probability that it is a red honor.
 (1) $\frac{1}{26}$ (2) $\frac{1}{13}$ (3) $\frac{3}{26}$ (4) $\frac{2}{13}$
19. A bag contains 3 green, 2 white and 4 black balls. If two balls are drawn simultaneously, what is the probability that both are of same color?
 (1) $\frac{5}{18}$ (2) $\frac{11}{36}$ (3) $\frac{3}{18}$ (4) $\frac{1}{3}$
20. In a year, if a month is selected what is the probability that it has exactly 30 days?
 (1) $\frac{5}{12}$ (2) $\frac{7}{12}$ (3) $\frac{1}{2}$ (4) $\frac{1}{3}$
21. Find the number of arrangements that can be made using all the letters of the word 'EDUCATION' such that all the vowels come together.
 (1) $6! 5!$ (2) $6! 6!$ (3) $5! 5!$ (4) $4! 5!$
22. Harika picked a number from the set of two digit numbers and found it to be a perfect square. What is the probability that it ends with 4?
 (1) $\frac{1}{3}$ (2) $\frac{1}{6}$ (3) $\frac{2}{3}$ (4) $\frac{1}{7}$
23. If a number is chosen at random from the set {1, 2, 100}, then the probability that the chosen number is a perfect cube or a prime number is
 (1) $\frac{7}{50}$ (2) $\frac{29}{100}$ (3) $\frac{3}{10}$ (4) $\frac{1}{25}$
24. When 8 coins are tossed, what is the probability of getting no tail?
 (1) $\frac{255}{256}$ (2) $\frac{1}{256}$
 (3) $\frac{1}{512}$ (4) None
25. The chance that year 2016 has 52 Sundays and 53 Mondays is
 (1) $\frac{3}{7}$ (2) $\frac{4}{7}$ (3) $\frac{1}{7}$ (4) $\frac{2}{7}$
26. The probability of Pragnan telling the truth is 80% and that of Vignan is 75%. What is the probability that they both contradict each other in stating the same?
 (1) 77.5% (2) 50% (3) 35% (4) 45%
27. When two dice are thrown together, find the probability of getting the sum of the numbers on both the dice be more than 10?
 (1) $\frac{1}{6}$ (2) $\frac{1}{9}$ (3) $\frac{1}{12}$ (4) $\frac{1}{8}$
28. Out of 7 children, if the youngest is boy then find the probability that all the remaining children are boys
 (1) $\frac{1}{64}$ (2) $\frac{1}{32}$ (3) $\frac{1}{128}$ (4) $\frac{1}{256}$
29. There are two boxes named as I and II. Box I consists 4 white balls and 5 red balls. Box II consists 5 white balls and 4 red balls. A ball from box I is drawn randomly and placed in box II. Now if a ball from box II is drawn,
 a) what is the probability that it is white in color?
 (1) $\frac{49}{90}$ (2) $\frac{4}{15}$ (3) $\frac{1}{2}$ (4) $\frac{5}{9}$
 b) what is the probability that it is red in color?
 (1) $\frac{49}{90}$ (2) $\frac{1}{3}$ (3) $\frac{41}{90}$ (4) $\frac{1}{2}$
30. What is the probability of keeping exactly one letter in a wrong envelope out of 12 letters?
 (1) $\frac{1}{11}$ (2) $\frac{1}{12}$ (3) $\frac{11}{12}$ (4) 0
31. From the set of 17 cards in which each card is numbered with one of the numbers 1 to 17, if a card is drawn randomly, what is the probability that the number on the card is a perfect square and perfect cube?
 (1) $\frac{1}{7}$ (2) $\frac{2}{17}$ (3) $\frac{6}{17}$ (4) $\frac{7}{17}$ (5) 0
32. There are 6 boys and 5 girls. From these, head of the cultural events wants to form a cultural committee of 6. In how many ways this can be done if the committee has to be formed with equal number of boys and girls?
 (1) 150 (2) 180 (3) 200 (4) 225
33. How many three digit numbers greater than 700 can be formed by using the digits 4, 5, 6, 7, 8, 9 if the digits are allowed to repeat?
 (1) 80 (2) 60 (3) 45 (4) 108 (5) 120
34. How many three digit numbers greater than 700 can be formed by using the digits 4, 5, 6, 7, 8, 9 if the digits are not allowed to repeat?
 (1) 80 (2) 60 (3) 45 (4) 108
35. For IPL 2014 season, Sunrisers Hyderabad team has 18 probables; 7 of them are foreign players, 6 of them are Indian domestic players and rest are Indian international players. According to IPL rule, a team of 11 should comprises of 4 foreign players, 4 Indian domestic players and rest Indian international players. Then in how many ways, Sunrisers Hyderabad can select their team of 11?
 (1) 5520 (2) 5250 (3) 4525 (4) 5050
36. How many different 5 letter words which consists A in the middle can be formed using the letters of the word TABLE?
 (1) 96 (2) 48 (3) 24 (4) 30
 (5) None of these
37. Six friends appear in an examination. What is the probability that
 1) all of them pass in the examination?
 a) 0 b) $\frac{1}{6}$ c) $\frac{1}{64}$ d) 1
 e) Cannot be found

- 2) Exactly 4 of them pass in the examination?
 a) 5/16 b) 15/64 c) 4/64 d) 4/6
 e) none of these
- 3) At most 2 of them fail in the examination?
 a) 22/64 b) 21/64 c) 2/6 d) 3/6
 e) none of these
38. The probability that a card drawn from a pack of 52 cards will be a diamond or a king is
 (1) 2/13 (2) 4/13 (3) 1/13 (4) 1/52
 (5) 5/52
39. If we list all numbers from 100 to 10,000, how many times would the digit 5 be printed?
 (1) 3980 (2) 3700 (3) 3840 (4) 3780
40. In how many ways can 3 boys and 4 girls be made to stand in a line such that all the girls always stand together?
 (1) $3! \cdot 4!$ (2) $4! \cdot 4!$
 (3) $5! \cdot 3!$ (4) $4! \cdot P(5,3)$
41. If there are 49 white, 52 blue, 56 red and 63 black balls in a bag, then how many minimum number of balls to be taken by a man randomly so that he can have 50 balls of same color, confidently?
 (1) 201 (2) 204 (3) 196 (4) 197
 (5) 53
42. Sum of three natural numbers a, b and c is 10. How many ordered triplets (a, b, c) exist?
 (1) 45 (2) 36 (3) 40 (4) 30
43. When all possible six letter arrangements of the letters of the word "MASTER" are sorted in alphabetical order, what will be the 49th word?
 (1) AREMST (2) ARMEST
 (3) AMERST (4) ARMSET
44. A local delivery company has three packages to deliver to three different homes. If the packages are delivered at random to the three houses, how many ways are there for at least one house to get the wrong package?
 (1) 0 (2) 3 (3) 5 (4) 6
45. Find the number of arrangements that can be made using all the letters of the word 'ENGINEERING' such that all the consonants come together.
 (1) $6!5!/3!3!2!$ (2) $6!6!/3!3!2!2!$
 (3) $6!5!/3!3!2!2!$ (4) $6!6!/3!3!2!$

Exercise - 2

- In how many ways can three marbles be selected simultaneously from a box containing 12 different marbles?
 (1) 110 (2) 220 (3) 660 (4) 240
- In how many ways can 4 girls be seated on 10 different chairs in a row?
 (1) 3080 (2) 720 (3) 1080 (4) 5040
- The number of different words that can be formed using all the letters of the word SPECIAL that begin with S and end with L is
 (1) 5! (2) 7! (3) 6! (4) 4!
- How many even numbers that can be formed using the digits 1, 3, 5, 6, 7, without repetition?
 (1) 24 (2) 120 (3) 65 (4) 60 (5) 48
- Find the number of ways of arranging all the letters of the word ARRANGE.
 (1) 5040 (2) 1260 (3) 2520
 (4) 4260 (5) None of these
- The number of words that can be formed using all the letters of the word LIMPET, so that the vowels are always together is
 (1) 720 (2) 48 (3) 120 (4) 240
 (5) None of these
- In how many ways can the letters of the word COUPLE be arranged, so that no two vowels are together?
 (1) $6! - 4! \cdot 3!$ (2) $3! \cdot 3!$ (3) $3! \cdot 4!$
 (4) $(2)(3!)^2$ (5) $2(4!)^2$
- How many 5-digit numbers can be formed using the digits 0, 2, 3, 4, 5, 8 and 9, if repetition of the digits is not allowed?
 (1) 2160 (2) 2520 (3) 180 (4) 1260
 (5) None of these
- How many 5-digit numbers that are divisible by 4 can be formed using the digits 0 to 6, if no digit is to occur more than once in each number?
 (1) 612 (2) 624 (3) 780 (4) 684
 (5) 764
- How many 5-digit numbers that are divisible by 2 can be formed using the digits 3, 7, 9, 2, 6, if no digit is to occur more than once in each number?
 (1) 24 (2) 48 (3) 72 (4) 12 (5) 96

11. How many 5-digit numbers that are divisible by 4 can be formed using the digits 9, 7, 2, 5, 3, if no digit is to occur more than once in each number?
 (1) 24 (2) 12 (3) 18 (4) 48 (5) 30
12. How many 5-digit numbers that are divisible by 3 can be formed using the digits 3, 5, 2, 6, 8, if no digit is to occur more than once in each number?
 (1) 12 (2) 24 (3) 48 (4) 96 (5) 120
13. How many 5-digit numbers that are divisible by 6 can be formed using the digits 3, 5, 2, 6, 8, if no digit is to occur more than once in each number?
 (1) 24 (2) 48 (3) 72 (4) 96 (5) 120
14. How many 5-digit numbers that are divisible by 12 can be formed using the digits 3, 5, 2, 6, 8, if no digit is to occur more than once in each number?
 (1) 120 (2) 24 (3) 48 (4) 30 (5) 36
15. In how many ways can 3 boys and 3 girls be seated in a row of 6 seats if girls want to occupy 1st, 3rd and 5th seats?
 (1) $3!^*3!$ (2) $4!^*3!$ (3) $2^*3!^*3!$
 (4) $6!$ (5) $5!^*3!$
16. In how many ways a committee of 6 members be formed from 6 girls & 5 boys so that the committee consist at most 2 boys?
 (1) 180 (2) 216 (3) 181 (4) 193
 (5) None of these
17. A couple invited 3 of their friends to come along with their spouse for their marriage anniversary. After the celebrations they all want to stand in a row for a photograph. How many different photographs can be taken if the hosting couple do not want to stand together?
 (1) 15120 (2) 30240 (3) 1440
 (4) 30420 (5) None of these
18. In a month of February of a non-leap year, the probability that it will have 5 Saturdays is
 (1) $1/7$ (2) 1 (3) $6/7$ (4) 0
 (5) Can't be found
19. Three letters are selected at random from the English alphabet. What is the probability that all are consonant?
 (1) $25/132$ (2) $163/260$ (3) $33/65$
 (4) $133/260$ (5) $127/260$
20. Three letters are selected at random from the English alphabet. What is the probability that one is a consonant and the other two are vowels?
 (1) $7/180$ (2) $33/65$ (3) $21/260$
 (4) $133/260$ (5) $239/260$
21. The probability that a square selected at random from a 8×8 chessboard is of size 5×5 is
 (1) $4/51$ (2) $14/17$ (3) $13/17$ (4) $25/204$ (5) $3/17$
22. A five digit number is formed using the digits 0, 1, 2, 3, 4 and 5 at random but without repetition. The probability that the number so formed is divisible by 5 is
 (1) $1/5$ (2) $2/5$ (3) $4/25$ (4) $3/10$ (5) $9/25$
23. A bag contains 9 white and 5 yellow balls, and another bag contains 6 white and 8 yellow balls. If one of the bags is selected at random and two balls are drawn at random from the bag, then the probability that both the balls are white is
 (1) $15/26$ (2) $51/91$ (3) $40/91$
 (4) $131/182$ (5) $51/182$
24. A number is selected at random from the set of first 50 natural numbers. Probability that the number is divisible by either 3 or 4 is
 (1) $12/25$ (2) $14/25$ (3) $29/50$
 (4) $27/50$ (5) $13/25$
25. A number is selected at random from the set of 3 digit natural numbers. Find the probability that the number is divisible by 4&9.
 (1) $1/25$ (2) $24/899$
 (3) $25/899$ (4) $2/75$ (5) $1/36$

Permutation, Combination & Probability Exercise-1																		
1	4	6	3	11	3	16	1	21	3	26	3	31	1	36	3	41	4	
2	4	7	4,2	12	1	17	2	22	2	27	3	32	3	37	c,b,a	42	2	
3	3	8	1	13	4	18	4	23	2	28	1	33	4	38	2	43	1	
4	2	9	3	14	3	19	1	24	2	29	1,3	34	2	39	1	44	3	
5	3	10	1	15	2	20	4	25	3	30	4	35	2	40	2	45	2	

Permutation, Combination & Probability Exercise-2									
1	2	6	4	11	1	16	3	21	4
2	4	7	3	12	5	17	2	22	5
3	1	8	1	13	3	18	4	23	5
4	3	9	2	14	5	19	4	24	1
5	2	10	2	15	1	20	3	25	5

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