# PERMUTATIONS & COMBINATIONS

1. If I have kept six different books on a shelf, in how many different ways can I arrange them?
   A. 6
   B. 24
   C. 120
   D. 720

2. In how many ways can the letters of the word "LEADER" be rearranged?
   A. 72
   B. 144
   C. 360
   D. 720

3. In how many ways can the letters of the word "OPTICAL" be rearranged such that vowels are always together?
   A. 120
   B. 720
   C. 2140
   D. 5360

4. In how many ways can the letters of the word "SIGNATURE" be rearranged such that vowels are never together?
   A. 14400
   B. 28800
   C. 43400
   D. 43200

5. In how many ways can the letters of the word "MACHINE" be arranged such that vowels occupy only even positions?
   A. 144
   B. 120
   C. 360
   D. 180

6. The number of 6-digit numbers that can be formed from 0, 1, 5, 6, 7 and 8 in which the first digit is not 0 are
   A. 120
   B. 600
   C. 720
   D. 800

7. The cause of productivity loss are to be written around a circle in the annual report. In how many ways can an analyst write them around the circle, if the number of causes are 5?
   A. 120
   B. 24
   C. 60
   D. 12

8. In how many ways can a group of 5 men and 2 women be selected from a group of 7 men and 5 women?
   A. 210
   B. 63
   C. 120
   D. 144

9. A box contains 2 white balls, 3 black balls and 4 red balls. In how many ways can three balls be drawn from the box if at least one black ball has to be included in the draw?
   A. 32
   B. 48
   C. 64
   D. 63

10. How many four digit numbers can be formed from the digits 2, 3, 5, 6, 7 and 9 which are divisible by 4 and none of the

digits is repeated?
A. 96
B. 88
C. 80
D. 144

11. There are five types of envelopes and nine types of stamps in a post office. How many ways are there to buy an envelope and a stamp?
A. 20
B. 45
C. 54
D. 9

12. Find the number of ways in which the letters of the word 'EQUATION' be written such that no two consonants are together?
A. 126000
B. 36000
C. 10000
D. 14400

13. How many different ways can the letters of the word 'ENGINEERING' be rearranged such that the vowels always come together?
A. 4200
B. $7! \times 5!$
C. 16840
D. 240!

14. There are 8 black balls and 8 white balls. In how many ways can these balls be arranged in a row so that balls of different colors are alternate?
A. $8 \times 7!$
B. $2 \times 8! \times 7!$
C. $2 \times 8!^2$
D. $8!^2$

15. How many 4 digit numbers divisible by 5 can be formed with the digits 0, 1, 2, 3, 4, 5,6 and 6? (Repetition not allowed, which means 6 can be used 2 times other numbers can be used only once)
A. 220
B. 249
C. 216
D. 288

16. There are 20 people among whom 2 are sisters. Find the number of ways in which we can arrange them around a circle so that there is exactly one person between the 2 sisters.
A. 18!
B. $2! \times 19!$
C. 19!
D. $2! \times 18!$

17. If you jumble and arrange the word LABOUR in all possible ways and arrange all the words so formed as in a dictionary. What will be the rank of the word LABOUR?
A. 275
B. 251
C. 240
D. 242

18. A student selects 3 digits from numbers 1 to 9 such that they are in strictly increasing order. How many selections have the property that the three digits form an arithmetic progression?
A. 7
B. 12
C. 16
D. 14

19. How many numbers can be made with digits 0, 7, 8 which are greater than 0 and less than a million?
A. 496
B. 486
C. 1084
D. 728

20. In how many ways can 5 apples (identical) be distributed among 4 children? (Some children may get no apples.)
A. 56
B. 144
C. 200
D. 256

21. The number of non-negative integral solutions of the equation $a + b + c + d = 20$ will be
A. 1208

B. 4024

C. 1140

D. 1771

22. How many ways can a group of 4 men and 3 women be selected from a group containing 7 men and 6 women so that Ms .X refuses to be in the same group as Mr. Y?

A. 500

B. 375

C. 350

D. 275

23. There are 4 different letters and 4 addressed envelopes. In how many ways can the letters be put in the envelopes so that at least one letter goes to the correct address?

A. 64

B. 23

C. 15

D. 63

24. A manager has to send 10 letters to 10 clients. She writes the 10 envelopes and addresses the 10 envelopes and then calls in her secretary and asked her to put the letters in the envelopes and mail them. In how many ways can the manager send the letter such that she gets exactly 6 letters correct?

A. 210

B. 1890

C. $10^6$

D. $6^{10}$

25. There are six friends who take 6 different buses which go in six different routes from a particular junction. Given that, one person can board only one bus at a time. How many combinations are possible such that none of the six friends reaches the correct destination?

A. 265

B. 360

C. 719

D. 714

26. In how many ways is it possible to choose a white square and a black square on a chessboard so that the squares must not lie in the same row or column?

A. 56

B. 896

C. 60

D. 768

27. How many natural numbers less than 4300 can be formed with the digits 0, 1, 2, 3, 4 (if repetitions are not allowed)?

A. 113

B. 158

C. 154

D. 159

28. In how many ways can you pack 5 different gifts in 3 identical boxes such that no box is empty, if any of the boxes may hold all of the gifts?

A. 20

B. 25

C. 30

D. 600

29. A polygon has 54 diagonals. Find the number of sides.

A. 10

B. 14

C. 12

D. 9

30. In how many ways can the letters of the word EDUCATION be rearranged so that the relative position of the vowels and consonants remain the same as in the word EDUCATION?

A. 576

B. 14400

C. 2880

D. 144

31. In how many ways can the letters of the English alphabet be arranged so that there are 7 letters between the letters A and B?

A. $31! \times 2!$

B. $24_{P_7} \times 18! \times 2$

C. $24! \times 32$

D. $26_{P_7} \times 20! \times 2$

32. At a business meeting, every person shakes each other's hands once. How

many people were present for the meeting if there was a total of 91 handshakes?
A. 14
B. 15
C. 24
D. 46

33. The number of permutations of the letters a, b, c, d, e, f, g such that neither the pattern 'beg' nor 'acd' occurs is
A. 4806
B. 420
C. 2408
D. None of these

34. How many teams of 4 persons can be formed out of 7 men, 3 women and 5 boys if each team has a man and contains at least one woman?
A. 322
B. 350
C. 224
D. None of these

35. The number of ways which a mixed double tennis game can be arranged amongst 9 married couples if no husband and wife play in the same is
A. 1514
B. 1512
C. 3024
D. 3028

36. How many numbers can be formed from 1, 2, 3, 4, 5 (without repetition), when the digit at the unit's place must be greater than that in the ten's place?
A. 54
B. 60
C. 17
D. $2 \times 4!$

37. Some boys are standing on a circle at distinct points. Each possible pair of persons, who are not adjacent, sing a 3 minute song, one pair after another. The total time taken by all the pairs to sing is 1 hour. Find the number of boys?
A. 6
B. 7

C. 8
D. 9

38. In an examination, a question paper consists of 12 questions divided into two parts (i.e) Part I and Part II containing 5 and 7 questions respectively. A student is required to attempt 8 question in all selecting at least 3 from each part. In how many ways can a student select the questions?
A. 320
B. 420
C. 520
D. 620

39. Ten points are marked on a straight line and 11 points are marked on another straight line. How many triangles can be constructed with vertices from among the above points?
A. 495
B. 550
C. 1045
D. 2475

40. An intelligence agency forms a code of two distinct digits selected from 0, 1, 2, ....., 9 such that the first digit of the code is nonzero. The code, handwritten on a slip, can however potentially create confusion, when read upside down-for example, the code 91 may appear as 16. How many codes are there for which no such confusion can arise?
A. 80
B. 78
C. 71
D. 69

41. In the figure given below, the lines represent one way road allowing travel from any point, only to up or to the left. Along how many distinct routes can a vehicle reach a point B from Point A?
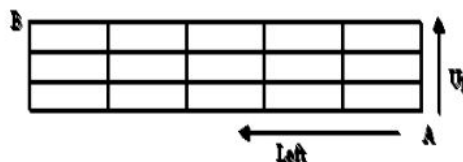
A. 15
B. 56
C. 120
D. 336

42. An ant starts moving on the mesh shown below along the wires towards a food particle . If the ant is at the bottom-left corner of cell A and the food is at the top-right corner of cell F, then find the number of optimal routes for the ant.
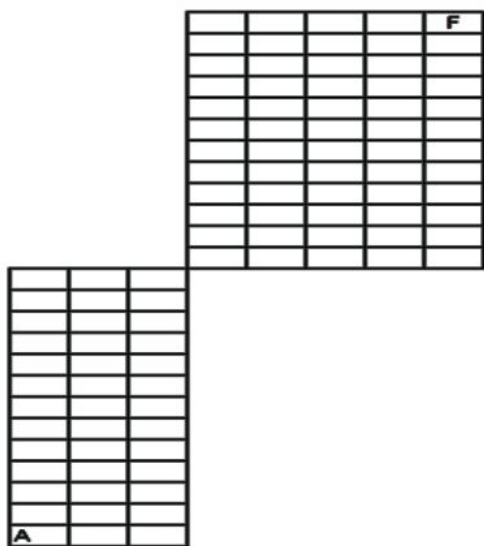


A. 13884156
B. 3465280
C. 4368
D. 6748

43. There are 100 articles numbered $n_1, n_2, n_3, n_4, ...., n_{100}$. They are arranged in all possible ways. How many arrangements would be there in which $n_{28}$ will always be before $n_{29}$.
A. $5050 \times 99!$
B. $5050 \times 98!$
C. $4950 \times 98!$
D. $4950 \times 99!$

44. A five-digit number is formed using digits 1, 3, 5, 7 and 9 without repeating any one of them. What is the sum of all such possible numbers?
A. 6666600
B. 6666660

C. 6666666
D. None of these

45. A party of 'n' persons sits around a table. Find the odds against two specified persons sitting next to each other.
A. $\frac{n-1}{2}$
B. $\frac{n-3}{2}$
C. $\frac{n+3}{2}$
D. None of these

46. In how many possible ways can we write 3240 as a product of 3 positive integers a, b and c?
A. 420
B. 360
C.450
D.240

47. In how many possible ways can you write 1800 as a product of 3 positive integers a, b and c?
A. 360
B. 450
C. 240
D. 120

48. In how many ways you can select two letters from the English alphabets such that none of the alphabets is a consecutive consonant.
A. 325
B. 309
C. 318
D. None of these

49. The letters in the word ADOPTS are permuted in all possible ways and arranged in the alphabetical order. Find the word at position 42 in the permuted alphabetical order.
A. AOTDPS
B. AOTPDS
C. AOTDPS
D. AOSTPD

50. A 3 × 3 grid is colored using red and blue colors such that if we rotate the grid about its center in the plane by 180 degrees, the grid looks the same. The number of ways

to color this grid is
A. 256
B. 128

C. 16
D. 32

ANSWER KEY

| 1. D | 2. C | 3. B | 4. D | 5. A | 6. B | 7. B | 8. A | 9. C | 10. C |
|------|------|------|------|------|------|------|------|------|-------|
| 11. B | 12. D | 13. A | 14. C | 15. B | 16. D | 17. D | 18. C | 19. D | 20. A |
| 21. D | 22. A | 23. C | 24. B | 25. A | 26. D | 27. B | 28. B | 29. C | 30. C |
| 31. B | 32. A | 33. A | 34. A | 35. B | 36. B | 37. C | 38. B | 39. C | 40. C |
| 41. B | 42. B | 43. C | 44. A | 45. B | 46. C | 47. A | 48. B | 49. D | 50. D |