Answer & Solutions

Level-I

1. (c) $\square\square\square\square$

Last place can be filled by 0, 2, 4

So total sum = $5 \times 6 \times 6\ (0 + 2 + 4) + 5 \times 6 \times 3 \times 10\ (0 + 1 + 2 + 3 + 4 + 5) + 5 \times 6 \times 3 \times 100\ (0 + 1 + 2 + 3 + 4 + 5) + 6 \times 6 \times 3 \times 1000\ (0 + 1 + 2 + 3 + 4 + 5)$

$= 180 \times 6 + 900 \times 15 + 9000 \times 15 + 10800 \times 15$

$= 1080 + 13500 + 135000 + 1620000 = 1769580$

2. (a) There are 8 letters in the word EQUATION.

A/E/I/O/U							
5 ways	$^7P_7 = 7! = 5040$						

$\therefore$ Reqd. no. = $5 \times 5040 = 25200$

3. (a) There are 9 letters in the given word in which two T's, two M's and two E's are identical. Hence the required number of words = $\dfrac{9!}{2!2!2!} = \dfrac{9!}{(2!)^3}$

4. (c) Given, $^{10}P_r = 720$

$\therefore \dfrac{10!}{(10-r)!} = 720$

$\therefore$ $10 \times 9 \times 8 \times \ldots$ to r factors $= 720 = 10 \times 9 \times 8$

$\therefore\ r = 3$

5. (b) $\dfrac{12!}{5!4!3!}$

6. (a) Considering the two vowels E and A as one letter, the total no. of letters in the word 'EXTRA' is 4 which can be arranged in $^4P_4$, i.e. 4! ways and the two vowels can be arranged among themselves in 2! ways.

$\therefore$ reqd. no. $= 4! \times 2! = 4 \times 3 \times 2 \times 1 \times 2 \times 1 = 48$

7. (a) A committee of 5 out of 6 + 4= 10 can be made in $^{10}C_5 = 252$ ways.

If no woman is to be included, then number of ways $= {^5C_5} = 6$

$\therefore$ the required number $= 252 - 6 = 246$

8. (d) 4 digit number $\boxed{3}\boxed{4}\boxed{3}\boxed{2} = 72$,

5 digit number = 120

Total = 192

9. (b) If number of persons be n, then total number of hand-shaken $= {^nC_2} = 66$

$\Rightarrow n\,(n-1) = 132 \Rightarrow (n + 11)\,(\,n = 12) = 0$

$\therefore\ n = 12 \qquad (\because\ n \neq -11)$

10. (b) There are 6 letters in the word BHARAT, 2 of them are identical.

Hence total number of words with these letter = 360

Also the number of words in which B and H come together = 120

$\therefore$ The required number of words $= 360 - 120 = 240$

11. (a) The required number of selections

$= {^3C_1} \times {^4C_1} \times {^2C_1}\,({^6C_3} + {^6C_2} + {^6C_0}) = 42 \times 4!$

12. (d) MACHINE has 4 consonants and 3 vowels.

The vowels can be placed in position no. 1, 3, 5, 7

$\Rightarrow$ Total number of ways possible $= {^4P_3} = 24$.

For each of these 24 ways the 4 consonants can occupy the other 4 places in $^4P_4$ ways

$\Rightarrow$ Total $= 24 \times 24 = 576$

13. (b) We have, $^nP_r = {^nP_{r+1}}$

$\Rightarrow \dfrac{n!}{(n-r)!} = \dfrac{n!}{(n-r-1)!} \Rightarrow \dfrac{1}{(n-r)} = 1$

or $\quad n - r = 1 \qquad \ldots(1)$

Also, $^nC_r = {^nC_{r-1}} \Rightarrow r + r - 1 = n$

$\Rightarrow 2r - n = 1 \qquad \ldots(2)$

Solving (1) and (2), we get $r = 2$ and $n = 3$

14. (c) $^nP_r = 720\,{^nC_r}$

or $\dfrac{n!}{(n-r)!} = \dfrac{720(n!)}{(n-r)!r!}$

$\Rightarrow r! = 720 = 1 \times 2 \times 3 \times 4 \times 5 \times 6!$

or $r = 6$

15. (a) Total number of ways $= {^{16}C_{11}} = \dfrac{16!}{11! \times 5!} = 4368$.

$= \dfrac{16 \times 15 \times 14 \times 13 \times 12}{5 \times 4 \times 3 \times 2 \times 1} = 4368$.

16. (c) Two particular girls can be arranged in 2! ways and remaining 10 girls can be arranged in 10! ways.

Required no. of ways $= 2! \times 10!$

17. (c) Required no. of the ways $= {^6C_3} \times {^4C_2} = 20 \times 6 = 120$

18. (b) Required number of ways $= \dfrac{5!}{2!3!} = 10$.

19. (b) Selection of 2 members out of 11 has $^{11}C_2$ number of ways

$^{11}C_2 = 55$

20. (b) From each railway station, there are 19 different tickets to be issued. There are 20 railway station

So, total number of tickets $= 20 \times 19 = 380$.

21. (d) Since $^{32}P_6 = k\,{^{32}C_6}$

$\Rightarrow \dfrac{32!}{(32-6)!} = k.\dfrac{32!}{6!(32-6)!}$

$\Rightarrow k = 6! = 720$

22. **(a)** For a straight line we just need to select 2 points out of the 8 points available. $^8C_2$ would be the number of ways of doing this.

23. **(b)** $^3C_1 \times {}^4C_1 \times {}^6C_1 = 72$

24. **(c)** At $r = 7$, the value becomes
(28!/14! × 14!) /(24!/10! × 14!) → 225 : 11

25. **(c)** The digits are 1, 6, 7, 8, 7, 6, 1. In this seven-digit no. there are four odd places and three even places OEOEOEO. The four odd digits 1, 7, 7, 1 can be arranged in four odd places in [4!/2!×2] = 6 ways [as 1 and 7 are both occurring twice].
The even digits 6, 8, 6 can be arranged in three even places in 3!/2! = 3 ways.
Total no. of ways = 6 × 3 = 18

26. **(d)** First arrange the two sisters around a circle in such a way that there will be one seat vacant between them. [This can be done in 2! ways since the arrangement of the sisters is not circular.]
Then, the other 18 people can be arranged on 18 seats in 18! ways.

27. **(c)** Let the total number of employees in the company be n.

Total number of gifts = $^nC_2 = \dfrac{n(n-1)}{2} = 61$

$\Rightarrow \ n^2 - n - 132 = 0$ or $(n+11)(n-12) = 0$

or $n = 12$ [– 11 is rejected]

28. **(a)** Choose 1 person for the single room & from the remaining choose 2 people for the double room & from the remaining choose 4 people for the 4 persons room $\rightarrow {}^7C_1 \times {}^6C_2 \times {}^4C_4$.

29. **(b)** $^{10}P_3 = 720$

30. **(a)** Ist book can be given to any of the five students. Similarly other six books also have 5 choices. Hence the total number of ways is 5^7.

31. **(c)** Total possible arrangements = $^{13}P_{13} = 13!$
Total number in which f and g are together
$= 2 \times {}^{12}P_{12} = 2 \times 12!$

32. **(a)** Order of vowels of fixed

$\therefore$ required number of ways are $\dfrac{6!}{2!}$

33. **(b)** Number of parallelograms = $^5C_2 \times {}^4C_2 = 60$.

34. **(a)** A couple and 6 guests can be arranged in (7 – 1) ways. But in two people forming the couple can be arranged among themselves in 2! ways.
$\therefore$ the required number of ways = 6! × 2! = 1440

35. **(b)** 6! ways, O fixed 1st and E fixed in last.

36. **(a)** For the number to be divisible by 4, the last two digits must be any of 12, 24, 16, 64, 32, 36, 56 and 52. The last two digit places can be filled in 8 ways. Remaining 3 places in $^4P_3$ ways. Hence no. of 5 digit nos. which are divisible by 4 are 24 × 8 = 192.

37. **(b)** Let the vice-chairman and the chairman from 1 unit along with the eight directors, we now have to arrange 9 different units in a circle.
This can be done in 8! ways.
At the same time, the vice-chairman & the chairman can be arranged in two different ways. Therefore, the total number of ways = 2 × 8!.

38. **(e)**
C R E A M
1 2 3 4 5

Required number of ways = 5!
= 5 × 4 × 3 × 2 × 1 = 120

39. **(c)** (a) The word STABLE has six distinct letters.
$\therefore$ Number of arrangements = 6 !
= 6 × 5 × 4 × 3 × 2 × 1 = 720
(b) The word STILL has five letters in which letter 'L' comes twice.
$\therefore$ Number of arrangements
$= \dfrac{5!}{2} = 60$
(c) The word WATER has five distinct letters.
$\therefore$ Number of arrangements = 5 ! = 5 × 4 × 3 × 2× 1 = 120
(d) The word 'NOD' has 3 distinct letters.
$\therefore$ Number of arrangements = 3 ! = 6
(e) Number of arrangements = 4 ! = 24