Exercise-1

Marked Questions may have for Revision Questions.

OBJECTIVE QUESTIONS

Section (A) : Fundamental principle of counting

A-1. There are 10 buses operating between places A and B. The number of ways a person can go from place A to place B and return to place A, if he returns in a different bus are
(1) 90 (2) 100 (3) 19 (4) 20

A-2. The number of numbers from 1000 to 9999 (both inclusive) that do not have all 4 different digits, is:
(1) 4048 (2) 4464 (3) 4518 (4) 4536

A-3. 10 different letters of an alphabet are given. Words with 5 letters are formed from these given letters, then the number of words which have atleast one letter repeated is:
(1) 69760 (2) 30240 (3) 99748 (4) none

A-4. How many three digit even numbers can be formed using the digits 1, 2, 3, 4, 5 (repetition allowed)?
(1) 10 (2) 60 (3) 25 (4) 50

A-5. The number of three digit odd numbers, that can be formed by using the digits 1,2,3,4,5,6 when the repetition is not allowed, is
(1) 60 (2) 108 (3) 36 (4) 30

A-6. In a 12 storey house 10 people enter the lift cabin. It is known that they will leave the lift in pre-decided groups of 2, 3 and 5 people at different storeis. The number of ways they can do so if the lift does not stop upto the second storey is –
(1) 820 (2) 720 (3) 1430 (4) 640

Section (B) :Permutation and combination of distinct objects gap and string method, Rank of a word

B-1. The numbers 1, 2, 3, 4, 5 are written on five cards. How many 3 digit numbers can be formed by placing three cards side by side?
(1) 60 (2) 30 (3) 12 (4) 10

B-2. How many nine digit numbers can be formed using the digits 2, 2, 3, 3, 5, 5, 8, 8, 8 so that the odd digits occupy even positions?
(1) 7560 (2) 180 (3) 16 (4) 60

B-3. 5 boys & 3 girls are sitting in a row of 8 seats. Number of ways in which they can be seated so that not all the girls sit side by side, is:
(1) 36000 (2) 9080 (3) 3960 (4) 11600

B-4. In how many ways n books can be arranged in a row so that two specified books are not together
(1) $n! - (n-2)!$ (2) $(n-1)!\,(n-2)$ (3) $n! - 2(n-1)$ (4) $(n-2)n!$

B-5. In how many ways can 5 boys and 5 girls stand in a row so that boys and girls are alternate ?
(1) $2(5!)^2$ (2) $5! \times 4!$ (3) $5! \times 6!$ (4) $6 \times 5!$

B-6. The sum of the digits in the unit place of all numbers formed with the help of 3,4,5,6 taken all at a time is
(1) 18 (2) 432 (3) 108 (4) 144

B-7. 8 chairs are numbered from 1 to 8. Two women & 3 men wish to occupy one chair each. First the women choose the chairs from amongst the chairs marked 1 to 4, then the men select the chairs from among the remaining. The number of possible arrangements is:
(1) ${}^6P_3$ (2) ${}^4P_3$ (3) 20 (4) ${}^4P_2 . {}^6P_3$

B-8. The number of signals that can be made with 3 flags each of different colour by hoisting 1 or 2 or 3 above the other, is:
(1) 3 (2) 7 (3) 15 (4) 16

B-9. How many cricket teams of members eleven each can be formed from 15 persons if captain is included in every team ?
(1) 364 (2) 1365 (3) 1001 (4) 1000

B-10. A bag contains 9 balls marked with digits 1, 2................9. If two balls are drawn from the bag, then number of ways of getting the sum of the digits on balls as odd number is-
(1) 20 (2) 2^9 (3) ${}^9C_2$ (4) ${}^9P_2$

B-11. In a football championship, 153 matches were played. Every team played one match with each other. The number of teams participating in the championship is-
(1) 17 (2) 18 (3) 9 (4) None of these

B-12. Out of seven consonants & four vowels, the number of words of six letters, formed by taking four consonants & two vowels, is (Assume each ordered group of letter is a word)
(1) 210 (2) 462 (3) 151200 (4) 332640

B-13. Out of 16 players of a cricket team, 4 are bowlers and 2 are wicket keepers. A team of 11 players is to be chosen so as to contain at least 3 bowlers and at least 1 wicketkeeper. The number of ways in which the team be selected, is
(1) 2400 (2) 2472 (3) 2500 (4) 960

B-14. The number of ways in which a mixed double tennis game can be arranged from amongst 9 married couple if no husband & wife plays in the same game is:
(1) 756 (2) 3024 (3) 1512 (4) 6048

B-15. Six married couple are sitting in a room. Number of ways in which 4 people can be selected so that there is exactly one married couple among the four is:
(1) 240 (2) 255 (3) 360 (4) 480

B-16. A box contains 2 white balls, 3 black balls & 4 red balls. In how many ways can three balls be drawn from the box if atleast one black ball is to be included in draw (the balls of the same colour are different).
(1) 60 (2) 64 (3) 56 (4) none

B-17. Passengers are to travel by a double decked bus which can accommodate 13 in the upper deck and 7 in the lower deck. The number of ways that they can be divided if 5 refuse to sit in the upper deck and 8 refuse to sit in the lower deck, is
(1) 25 (2) 21 (3) 18 (4) 15

B-18. Words are formed by arranging the letters of the word "STRANGE" in all possible manner. Let m be the number of words in which vowels do not come together and 'n' be the number of words in which vowels come together. Then the ratio of m: n is-
(1) 5: 4 (2) 5: 2 (3) 7 : 2 (4) 2 : 5

B-19. The sum of all the numbers which can be formed by using the digits 1, 3, 5, 7 all at a time and which have no digit repeated, is
(1) $16 \times 4!$ (2) $1111 \times 3!$ (3) $16 \times 1111 \times 3!$ (4) $16 \times 1111 \times 4!$.

Section (C) : Permutation and combination of alike objects

C-1. The number of permutations that can be formed by arranging all the letters of the word 'NINETEEN' in which no two E's occur together, is

(1) $\frac{8!}{3!\,3!}$ (2) $\frac{5!}{3! \times {}^6C_2}$ (3) $\frac{5!}{3!} \times {}^6C_3$ (4) $\frac{8!}{5!} \times {}^6C_3$.

C-2. 2m white identical coins and 2n red identical coins are arranged in a straight line with (m + n) identical coins on each side of a central mark. The number of ways of arranging the identical coins , so that the arrangements are symmetrical with respect to the central mark, is

(1) ${}^{2m-2n}C_{2m}$ (2) ${}^{2m+3n}C_m$ (3) ${}^{m+n}C_m$ (4) ${}^{2m+n}C_m$

C-3. The number of permutations which can be formed out of the letters of the word "SERIES" taking three letters together, is:

(1) 120 (2) 60 (3) 42 (4) none

C-4. If all the letters of the word "QUEUE" are arranged in all possible manner as they are in a dictionary, then the rank of the word QUEUE is:

(1) 15^{th} (2) 16^{th} (3) 17^{th} (4) 18^{th}

C-5. Sum of all the numbers that can be formed using all the digits 2, 3, 3, 4, 4, 4, is:

(1) 22222200 (2) 11111100 (3) 55555500 (4) 20333280

C-6. The number of words which can be formed from the letters of the word "MAXIMUM", if two consonants cannot occur together, is

(1) 4! (2) 3! × 4! (3) 7 ! (4) None of these

C-7. The number of words that can be formed by using the letters of the word 'MATHEMATICS' that start as well as end with T, is

(1) 80720 (2) 90720 (3) 20860 (4) 37528

Section (D) : Division into groups, Selection of one or more objects, divisors, factorisation of numbers

D-1. The total number of selections of fruits which can be made from 3 bananas, 4 apples and 2 oranges is, it is given that fruits of one kind are identical

(1) 60 (2) 59 (3) 286 (4) 70

D-2. Number of ways in which 9 different toys be distributed among 4 children belonging to different age groups in such a way that distribution among the 3 elder children is even and the youngest one is to receive one toy more, is :

(1) $\frac{(5!)^2}{8}$ (2) $\frac{9!}{2}$ (3) $\frac{9!}{3!\,(2!)^3}$ (4) none

D-3. Number of ways in which a pack of 52 playing cards be distributed equally among four players so that each may have the Ace, King, Queen and Jack of the same suit, is:

(1) $\frac{36!}{(9!)^4}$ (2) $\frac{36!\,.\,4!}{(9!)^4}$ (3) $\frac{36!}{(9!)^4\,.\,4!}$ (4) none

D-4. The number of ways in which the number 27720 can be split into two factors which are co-primes, is:

(1) 15 (2) 16 (3) 25 (4) 49

D-5. The number of ways in which the number 94864 can be resolved as a product of two factors is -

(1) 27 (2) 23 (3) 29 (4) 31

D-6. The total number of proper divisors of 38808 is

(1) 60 (2) 59 (3) 286 (4) 70

D-7. The number of divisors of $a^p b^q c^r d^s$ where a, b, c, d are primes & p, q, r, s ∈ N, excluding 1 and the number itself, is:
(1) p q r s
(2) (p + 1) (q + 1) (r + 1) (s + 1) − 4
(3) p q r s − 2
(4) (p + 1) (q + 1) (r + 1) (s + 1) − 2

D-8. How many divisors of 21600 are divisible by 10 but not by 15?
(1) 10 (2) 30 (3) 40 (4) none

D-9. 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) $2^6 . 3^8 . 5^4 . 7^3 - 2 . 3 . 5 . 7$
(3) $2^6 . 3^8 . 5^4 . 7^3 - 1$
(4) none of these

Section (E) : Circular permutation

E-1. The number of ways in which 6 red roses and 3 white roses (all roses different) can form a garland so that all the white roses come together, is
(1) 2170 (2) 2165 (3) 2160 (4) 2155

E-2. The number of ways in which 4 boys & 4 girls can stand in a circle so that each boy and each girl is one after the other, is:
(1) 3 !. 4 ! (2) 4 !. 4 ! (3) 8 ! (4) 7 !

E-3. 12 guests at a dinner party are to be seated along a circular table. Supposing that the master and mistress of the house have fixed seats opposite to one another and that there are two specified guests who must always be placed next to one another. The number of ways in which the company can be placed, is :
(1) 20. 10 ! (2) 22. 10 ! (3) 44. 10 ! (4) none

E-4. The number of ways in which 8 different flowers can be strung to form a garland so that 4 particular flowers are never separated, is :
(1) 4 !. 4 ! (2) $\frac{8\,!}{4\,!}$ (3) 288 (4) none

E-5. Number of ways in which 2 Indians, 3 Americans, 3 Italians and 4 Frenchmen can be seated on a circle, if the people of the same nationality sit together, is:
(1) $2. (4\,!)^2 (3\,!)^2$ (2) $2. (3\,!)^3 . 4\,!$ (3) $2. (3\,!) (4\,!)^3$ (4) none

Section (F) : Multinomial theorem, Distribution of objects (Method of fictitious partition)

F-1. Number of positive integral solutions of $x_1.x_2.x_3 = 30$, is
(1) 25 (2) 26 (3) 27 (4) 28

F-2. Number of positive integral solutions of xyz = 21600 is
(1) 1360 (2) 1260 (3) 1460 (4) 1270

F-3. If chocolates of a particular brand are all identical then the number of ways in which we can choose 6 chocolates out of 8 different brands available in the market, is:.
(1) ${}^{13}C_6$ (2) ${}^{13}C_8$ (3) 8^6 (4) none

F-4. The number of ways of selecting 10 balls from unlimited number of red, black, white and green balls is, it is given that balls of same colours are identical
(1) 60 (2) 59 (3) 286 (4) 70

F-5. If chocolates of a particular brand are all identical then the number of ways in which we can choose 6 chocolates out of 8 different brands available in the market, is:.
(1) ${}^{13}C_6$ (2) ${}^{13}C_8$ (3) 8^6 (4) none

F-6. The number of ways of selecting 10 balls from unlimited number of red, black, white and green balls is, it is given that balls of same colours are identical
(1) 60 (2) 59 (3) 286 (4) 70

F-7. The number of ways of selecting 8 books from a library which has 10 books each of Mathematics, Physics, Chemistry and English, if books of the same subject are alike, is:
(1) ${}^{13}C_4$ (2) ${}^{13}C_3$ (3) ${}^{11}C_4$ (4) ${}^{11}C_3$

F-8. Number of ways in which 3 persons throw a normal die to have a total score of 11, is
(1) 27 (2) 25 (3) 29 (4) 18

Section (G) : Geometrical Problems

G-1. If 7 points out of 12 are in the same straight line, then the number of triangles formed is
(1) 185 (2) 466 (3) 462 (4) 286

G-2. The number of triangles that can be formed by 5 points in a line and 3 points on a parallel line is
(1) ${}^{8}C_3$ (2) ${}^{8}C_3 - {}^{5}C_3$ (3) ${}^{8}C_3 - {}^{5}C_3 - 1$ (4) None of these

G-3. The number of diagonals in a octagon will be
(1) 28 (2) 20 (3) 10 (4) 16

G-4. If a polygon has 44 diagonals, then the number of its sides are
(1) 7 (2) 11 (3) 8 (4) None of these

G-5. How many triangles can be formed by joining four points on a circle
(1) 4 (2) 6 (3) 8 (4) 10

G-6. The number of straight lines that can be formed by joining 20 points no three of which are in the same straight line except 4 of them which are in the same line
(1) 183 (2) 186 (3) 197 (4) 185

G-7. There are n points in a plane of which 'p' points are collinear. How many lines can be formed from these points
(1) ${}^{(n-p)}C_2$ (2) ${}^{n}C_2 - {}^{p}C_2$ (3) ${}^{n}C_2 - {}^{p}C_2 + 1$ (4) ${}^{n}C_2 - {}^{p}C_2 - 1$

G-8. 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) 18 (3) 12 (4) 9

G-9. The greatest possible number of points of intersection of 8 straight lines and 4 circles is
(1) 32 (2) 64 (3) 76 (4) 104

Section (H) : Exponent of prime number p in n, Derangement

H-1. Exponent of 3 in 20 ! is -
(1) 6 (2) 4 (3) 8 (4) 9

H-2. Number of zeros at the end of 45! is -
(1) 10 (2) 4 (3) 5 (4) 6

H-3. A person writes letters to five friends and addresses on the corresponding envelopes. In how many ways can the letters be placed in the envelopes so that all letters are in the wrong envelopes?
(1) 20 (2) 40 (3) 44 (4) 109

H-4. A person writes letters to five friends and addresses on the corresponding envelopes. In how many ways can the letters be placed in the envelopes so that at least four of them are in the wrong envelopes?
(1) 89 (2) 40 (3) 44 (4) 109

Exercise-2

Marked Questions may have for Revision Questions.
*** Marked Questions may have more than one correct option.**

PART - I : OBJECTIVE QUESTIONS

1. The digits from 0 to 9 are written on slips of paper and placed in a box. Four of the slips are drawn at random and placed in the order. The number of outcomes possible are
(1) ${}^{10}P_4$ (2) ${}^{10}C_4$ (3) 10^4 (4) 4^{10}

2. How many words can be formed by using all the letters of the word 'MONDAY' if each word start with a consonant.
(1) 120 (2) 240 (3) 560 (4) 480

3. The number of natural numbers from 1 to 1000 having none of their digits repeated is
(1) 738 (2) 648 (3) 729 (4) 800

4. The number of words those can be formed by using all letters of the word 'DAUGHTER', if all the vowels must not be together is
(1) 3600 (2) 36000 (3) 40320 (4) 41420

5. A 5 digit number divisible by 3 is to be formed using the numerals 0, 1, 2, 3, 4 & 5 without repetition, then the total number of ways in which this can be done is -
(1) 36 (2) 256 (3) 108 (4) 216

6. Let P_m stand for ${}^nP_m$. Then the expression $1.\ P_1 + 2.\ P_2 + 3.\ P_3 + ... + n.\ P_n =$
(1) $(n + 1)! - 1$ (2) $(n + 1)! + 1$ (3) $(n + 1)!$ (4) none

7. The number of 6 digit numbers that ends with 21 (eg. 537621), without repetition of digits are
(1) $7.\ {}^7C_3$ (2) $7.\ {}^7P_3$ (3) $9.\ {}^7P_3$ (4) $9.\ {}^7C_3$

8. Two variants of a test paper are distributed among 12 students. Number of ways of seating of the students in two rows so that the students sitting side by side do not have identical papers & those sitting in the same column have the same paper is :
(1) $\frac{12!}{6!\,6!}$ (2) $\frac{(12)!}{2^5\,.\,6!}$ (3) $(6\,!)^2.\ 2$ (4) $12\,! \times 2$

9. If all the letters of the word 'AGAIN' are arranged in all possible ways & put in dictionary order, then the 50th word is
(1) NAAIG (2) NAAGI (3) NAIGA (4) NAIAG

10. The number of ways of arranging the letters AAAAA, BBB, CCC, D, EE & F in a row if the letter C are separated from one another is:
(1) ${}^{13}C_3.\ \frac{12!}{5!\,3!\,2!}$ (2) $\frac{13\,!}{5\,!\ 3\,!\ 3\,!\ 2\,!}$ (3) $\frac{14\,!}{3\,!\ 3\,!\ 2\,!}$ (4) $11.\ \frac{13\,!}{5!}$

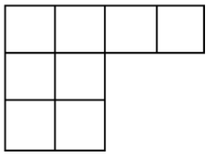
11. There are 3 white, 4 blue and 1 red flowers. All of them are taken out one by one and arranged in a row in the order. The number of different arrangements possible is (flowers of same colours are similar)
(1) 12 (2) 8 (3) 8! (4) 280

12. The number of different possible permutations using all the letters of the word "MISSISSIPPI", if no two I's are together is
(1) 7150 (2) 7350 (3) 7249 (4) ${}^8C_4$

13. In a unique hockey series between India & Pakistan, they decide to play on till a team wins 5 matches. The number of ways in which the series can be won by India, if no match ends in a draw is:
(1) 126 (2) 252 (3) 225 (4) none

14. The number of ways of selecting 11 players from 15 players, if only 6 of these players can bowl and the playing 11 must include atleast 4 bowlers is
(1) 540 (2) 1080 (3) 280 (4) 1170

15. The number of ways in which 5 X's can be placed in the squares of the figure so that no row remains empty is:



(1) 97 (2) 44 (3) 100 (4) 126

16. In a conference 10 speakers are present. If S_1 wants to speak before S_2 & S_2 wants to speak after S_3, then the number of ways all the 10 speakers can give their speeches with the above restriction if the remaining seven speakers have no objection to speak at any number is:
(1) ${}^{10}C_3$ (2) ${}^{10}P_8$ (3) ${}^{10}P_3$ (4) $\frac{10!}{3}$

17. In a cricket match against Pakistan, Azhar wants to bat before Jadeja and Jadeja wants to bat before Ganguli. Number of possible batting orders with the above restrictions, if the remaining eight team members are prepared to bat at any given place, is
(1) $\frac{11!}{3!}$ (2) ${}^{11}C_3$ (3) $\frac{11!}{3}$ (4) none of these

18. Seven different coins are to be divided amongst three persons. If no two of the persons receive the same number of coins but each receives atleast one coin & none is left over, then the number of ways in which the division may be made is:
(1) 420 (2) 630 (3) 710 (4) none

19. The number of ways in which 200 different things can be divided into groups of 100 pairs is:
(1) (1. 3. 5...... 199) (2) $\binom{101}{2}\binom{102}{2}\binom{103}{2}....\binom{200}{2}$
(3) $\frac{200!}{2^{100}\ (100)!}$ (4) All of these

20. The number of ways in which an insect can move from left bottom corner of a chess board to the right top corner, if it is given that it can move only upside or right, along the lines is-
(1) ${}^{8}C_4$ (2) ${}^{16}C_8$ (3) ${}^{15}C_8$ (4) ${}^{8}C_2$

21. In how many ways 14400 can be resolved into product of two factors ?
(1) 16 (2) 32 (3) 64 (4) 128

22. In how many ways the number 10080 can be written as product of two coprime factors ?
(1) 2 (2) 4 (3) 8 (4) 16

23. The number of ways in which 5 beads, chosen from 8 different beads be threaded on to a ring, is:
(1) 672 (2) 1344 (3) 336 (4) none

24. The number of ways in which 5 persons can sit at a round table, if two of the persons does not sit together is
(1) 12 (2) 24 (3) 60 (4) 72

25. The number of ways in which four men and three women may sit around a round table if all the women are together is
(1) 144 (2) 720 (3) 120 (4) 24

26. Seven persons including A, B, C are seated on a circular table. How many arrangements are possible if B is always between A and C ?
(1) 5040 (2) 24 (3) 720 (4) 48

27. In a shooting competition a man can score 0, 2 or 4 points for each shot. Then the number of different ways in which he can score 14 points in 5 shots, is:
(1) 20 (2) 24 (3) 30 (4) none

28. The number of negative integral solutions of equation $x + y + z = -12$ is
(1) 54 (2) 53 (3) 120 (4) None of these

29. The total number of positive integral solutions of $15 < x_1 + x_2 + x_3 \le 20$ is
(1) 635 (2) 645 (3) 685 (4) None of these

30. The number of ways in which 15 identical apples & 10 identical oranges can be distributed among three persons, each receiving none, one or more is:
(1) 5670 (2) 7200 (3) 8976 (4) none of these

31. The number of non-negative integral solutions of $x_1 + x_2 + x_3 + x_4 \le n$ (where n is a positive integer) is
(1) ${}^{n+3}C_3$ (2) ${}^{n+4}C_4$ (3) ${}^{n+5}C_5$ (4) none of these

32. The number of integers which lie between 1 and 10^6 and which have the sum of the digits equal to 12 is:
(1) 8550 (2) 5382 (3) 6062 (4) 8055

33. There are 12 points in a plane of which 5 are collinear. The number of distinct quadrilaterals which can be formed with vertices at these points is:
(1) 210 (2) ${}^7P_3$ (3) $10 \cdot {}^7C_3$ (4) 420

34. Number of derangement of all the digits of number 1234567 such that even digits occupy even places and odd digits occupy odd places is
(1) 12 (2) 14 (3) 16 (4) 18

PART - II : MISCELLANEOUS QUESTIONS

Section (A) : ASSERTION/REASONING

DIRECTIONS :

Each question has 4 choices (1), (2), (3) and (4) out of which ONLY ONE is correct.
(1) Both the statements are true.
(2) Statement-I is true, but Statement-II is false.
(3) Statement-I is false, but Statement-II is true.
(4) Both the statements are false.

A-1. **Statement-I** : $\frac{(n+1)!}{(n-1)!}$ is divisible by 6 for some $n \in N$.
Statement-II : Product of three consecutive integers is divisible by 3!.

A-2. **Statement-I :** If a, b, c are positive integers such that $a + b + c \le 8$, then number of possible values of the ordered triplets (a, b, c) is 56
Statement-II : The number of ways in which n identical things can be distributed into r different groups is ${}^{n-1}C_{r-1}$

A-3. **Statement-I :** If N is number of positive integral solutions of $x_1.x_2.x_3.x_4 = 770$, then N is divisible by 4 distinct primes.

Statement-II : Prime numbers are 2, 3, 5, 7, 11, 13, ...

A-4. **Statement-I :** The maximum number of points of intersection of 8 unequal circles is 56.

Statement-II : The maximum number of points into which 4 unequal circles and 4 non coincident straight lines intersect, is 50.

A-5. **Statement-I :** If there are six letters $L_1, L_2, L_3, L_4, L_5, L_6$ and their corresponding six envelopes $E_1, E_2, E_3, E_4, E_5, E_6$. Letters having odd value can be put into odd value envelopes and even value letters can be put into even value envelopes, so that no letter go into the right envelopes, the number of arrangement will be equal to 4.

Statement-II : If P_n number of ways in which n letter can be put in 'n' corresponding envelopes such that no letter goes to correct envelope, then $P_n = n!\left(1-\frac{1}{1!}+\frac{1}{2!}-....+\frac{(-1)^n}{n!}\right)$

A-6. **Statement-I :** The maximum value of k such that $(50)^k$ divides 100! is 2.

Statement-II : If P is any prime number, then power of P in n! is equal to $\left[\frac{n}{P}\right]+\left[\frac{n}{P^2}\right]+\left[\frac{n}{P^3}\right]$ .... where [·] represents greatest integer function.

Section (B) : MATCH THE COLUMN

B-1. Consider the number N = 249480

Column-I	**Column-II**	
(A) Number of ways N is divisible by 3 but not by 5	(p)	20
(B) Number of ways N is divisible by 5 but not by 7	(q)	40
(C) Number of ways N is divisible by 3 but not by 21	(r)	64
(D) Number of ways N is divisible by 35 but not by 77	(s)	60

Section (C) : ONE OR MORE THAN ONE OPTIONS CORRECT

C-1. The integral value of x which satisfies the inequality ${}^{10}C_{x-1} > 2 \cdot {}^{10}C_x$ is

(1) 7 (2) 8 (3) 9 (4) 10

C-2. A student has to answer 10 out of 13 questions in an examination. The number of ways in which he can answer if he must answer atleast 3 of the first five questions is:

(1) 276 (2) 267

(3) ${}^{13}C_{10} - {}^{5}C_3$ (4) ${}^{5}C_3 . {}^{8}C_7 + {}^{5}C_4 . {}^{8}C_6 + {}^{8}C_5$

C-3. You are given 8 balls of different colour (black, white,...). The number of ways in which these balls can be arranged in a row so that the two balls of particular colour (say red & white) may never come together is:

(1) $8! - 2.7!$ (2) $6. 7!$ (3) $2. 6!. {}^{7}C_2$ (4) none of these

C-4. The number of ways in which 10 students can be divided into three teams, one containing 4 and others 3 each, is

(1) $\frac{10!}{4!3!3!}$ (2) 2100 (3) ${}^{10}C_4 . {}^{5}C_3$ (4) $\frac{10!}{6!3!3!} . \frac{1}{2}$

C-5. If $10! = 2^p.3^q.5^r.7^s$, then

(1) p = 7 (2) q = 4 (3) r = 2 (4) s = 2

Exercise-3

Marked Questions may have for Revision Questions.
*** Marked Questions may have more than one correct option.**

PART - I : JEE (MAIN) / AIEEE PROBLEMS (PREVIOUS YEARS)

1. Let T_n denotes the number of triangles which can be formed using the vertices of a regular polygon of n sides. If $T_{n+1} - T_n = 21$, then n equals **[AIEEE-2002(3, –1), 225]**
(1) 5 (2) 7 (3) 6 (4) 4

2. A student is to answer 10 out of 13 questions in an examination such that he must choose at least 4 from the first five questions. The number of choices available to him is- **[AIEEE-2003(3, –1), 225]**
(1) 140 (2) 196 (3) 280 (4) 346

3. The number of ways in which 6 men and 5 women can dine at a round table, if no two women are to sit together, is given by - **[AIEEE-2003(3, –1), 225]**
(1) $6! \times 5!$ (2) 30 (3) $5! \times 4!$ (4) $7! \times 5!$

4. How many ways are there to arrange the letters in the word "GARDEN" with the vowels in alphabetical order ? **[AIEEE-2004(3, –1), 225]**
(1) 120 (2) 240 (3) 360 (4) 480

5. The number of ways of distributing 8 identical balls in 3 distinct boxes, so that none of the boxes is empty, is - **[AIEEE-2004(3, –1), 225]**
(1) 5 (2) 21 (3) 3^8 (4) ${}^8C_3$

6. If the letters of the word "SACHIN" are arranged in all possible ways and these words are written out as in dictionary, then the word "SACHIN" appears at serial number - **[AIEEE 2005 (3, –1), 225]**
(1) 602 (2) 603 (3) 600 (4) 601

7. At an election, a voter may vote for any number of candidates, not greater than the number to be elected. There are 10 candidates and 4 are to be elected. If a voter votes for at least one candidate, then the number of ways in which he can vote is **[AIEEE 2006 (3, –1), 120]**
(1) 5040 (2) 6210 (3) 385 (4) 1110

8 The set S = {1, 2, 3 ....12} is to be partitioned into three sets A, B, C of equal size.
Thus, $A \cup B \cup C = S$,
$A \cap B = B \cap C = A \cap C = \varphi$
The number of ways to partition S is - **[AIEEE 2007 (3, –1), 120]**
(1) $12!/3!\,(4!)^3$ (2) $12!/3!(3!)^4$ (3) $12!/(4!)^3$ (4) $12!/(3!)^4$

9. In a shop there are five types of ice-creams available.. A child buys six ice-creams. **[AIEEE 2008 (3, –1), 105]**
Statement-1 : The number of different ways the child can buy the six ice-creams, is ${}^{10}C_5$.
Statement-2 : The number of different ways the child can buy the six ice-creams is equal to the number of different ways of arranging 6A' s and 4B' s in a row.
(1) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
(2) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1
(3) Statement-1 is True, Statement-2 is False
(4) Statement-1 is False, Statement-2 is True

10. How many different words can be formed by jumbling the letters in the word "MISSISSIPPI" in which no two S are adjacent ? **[AIEEE 2008 (3, –1), 105]**
(1) $8.\ {}^6C_4\ .\ {}^7C_4$ (2) $6.\ 7\ {}^8C_4$ (3) $6.\ 8.\ {}^7C_4$ (4) $7.\ {}^6C_4\ .\ {}^8C_4$

11. From 6 different novels and 3 different dictionaries, 4 novels and 1 dictionary are to be selected and arranged in a row on the shelf so that the dictionary is always in the middle. Then the number of such arrangements is- **[AIEEE 2009 (4, –1), 144]**
(1) atleast 500 but less than 750 (2) atleast 750 but less than 1000
(3) atleast 1000 (4) less than 500

12. There are two urns. Urn A has 3 distinct red balls and urn B has 9 distinct blue balls. From each urn two balls are taken out at random and then transferred to the other. The number of ways in which this can be done is **[AIEEE 2010 (4, –1), 144]**
(1) 36 (2) 66 (3) 108 (4) 3

13. **Statement-1 :** The number of ways of distributing 10 identical balls in 4 distinct boxes such that no box is empty is ${}^9C_3$. **[AIEEE 2011, I, (4, –1), 120]**
Statement-2 : The number of ways of choosing any 3 places from 9 different places is ${}^9C_3$.
(1) Statement-1 is true, Statement-2 is true; Statement-2 is a correct explanation for Statement-1.
(2) Statement-1 is true, Statement-2 is true; Statement-2 is **not** a correct explanation for Statement-1.
(3) Statement-1 is true, Statement-2 is false.
(4) Statement-1 is false, Statement-2 is true.

14. There are 10 points in a plane, out of these 6 are collinear. If N is the number of triangles formed by joining these points. then : **[AIEEE 2011, II, (4, –1), 120]**
(1) $N \le 100$ (2) $100 < N \le 140$ (3) $140 < N \le 190$ (4) $N > 190$

15. Assuming the balls to be identical except for difference in colours, the number of ways in which one or more balls can be selected from 10 white, 9 green and 7 black balls is : **[AIEEE-2012, (4, –1)/120]**
(1) 880 (2) 629 (3) 630 (4) 879

16. Let X = {1, 2, 3, 4, 5}. The number of different ordered pairs (Y, Z) that can formed such that $Y \subseteq X$, $Z \subseteq X$ and $Y \cap Z$ is empty, is : **[AIEEE-2012, (4, –1)/120]**
(1) 5^2 (2) 3^5 (3) 2^5 (4) 5^3

17. Let T_n be the number of all possible triangles formed by joining vertices of an n-sided regular polygon. If $T_{n+1} - T_n = 10$, then the value of n is : **[AIEEE - 2013, (4, – 1) 120]**
(1) 7 (2) 5 (3) 10 (4) 8

18. The number of integers greater than 6,000 that can be formed, using the digits 3, 5, 6, 7 and 8, without repetition, is : **[JEE(Main) 2015, (4, – 1), 120]**
(1) 216 (2) 192 (3) 120 (4) 72

19. If all the words (with or without meaning) having five letters, formed using the letters of the word SMALL and arranged as in a dictionary; then the position of the word SMALL is :
[JEE(Main) 2016, (4, – 1), 120]
(1) 59^{th} (2) 52^{th} (3) 58^{th} (4) 46^{th}

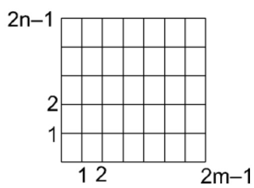
20. A man X has 7 friends, 4 of them are ladies and 3 are men. His wife Y also has 7 friends, 3 of them are ladies and 4 are men. Assume X and Y have no common friends. Then the total number of ways in which X and Y together can throw a party inviting 3 ladies and 3 men, so that 3 friends of each of X and Y are in this party, is **[JEE(Main) 2017, (4, – 1), 120]**
(1) 485 (2) 468 (3) 469 (4) 484

21. From 6 different novels and 3 different dictionaries, 4 novels and 1 dictionary are to be selected and arranged in a row on a shelf so that the dictionary is always in the middle. The number of such arrangements is :
[JEE(Main) 2018, (4, – 1), 120]
(1) at least 500 but less than 750 (2) at least 750 but less than 1000
(3) at least 1000 (4) less than 500

PART - II : JEE (ADVANCED) / IIT-JEE PROBLEMS (PREVIOUS YEARS)

1. The number of arrangements of the letters of the word BANANA in which the two N's do not appear adjacently is **[IIT-JEE-2002,Scr, (3, – 1), 90]**
(A) 40 (B) 60 (C) 80 (D) 100

2. A rectangle with sides 2m – 1 and 2n – 1 is divided into squares of unit length by drawing parallel lines as shown in the diagram, then the number of rectangles possible with odd side lengths is



[IIT-JEE-2005,Scr, (3, – 1), 84]

(A) $(m + n - 1)^2$ (B) 4^{m+n-1} (C) $m^2 n^2$ (D) $m(m + 1)n(n + 1)$

3. If r, s, t are prime numbers and p, q are the positive integers such that the LCM of p, q is $r^2 t^4 s^2$, then the number of ordered pair (p, q) is **[IIT-JEE-2006, (3, –1), 184]**

(A) 252 (B) 254 (C) 225 (D) 224

4. The letters of the word **"COCHIN"** are permuted and all the permutations are arranged in an alphabetical order as in an english dictionary. Then number of words that appear before the word **COCHIN** is

[IIT-JEE-2007,P-II, (3, – 1), 81]

(A) 360 (B) 192 (C) 96 (D) 48

5. Consider all possible permutations of the letters of the word "ENDEANOEL". Match the Statements/ Expressions in **Column I** with the Statements / Expressions in **Column II** and indicate your answer by darkening the appropriate bubbles in the 4 × 4 matrix given in the ORS. **[IIT-JEE-2008,P-II, (6, 0), 81]**

	Column I		**Column II**
(A)	The number of permutations containing the word "ENDEA" is	(p)	5!
(B)	The number of permutations in which the letter E occurs in the first and the last positions is	(q)	2 × 5!
(C)	The number of permutations in which none of the letters D, L, N occurs in the last five positions is	(r)	7 × 5!
(D)	The number of permutations in which the letters A, E, O occur only in odd positions is	(s)	21 × 5!

6. The number of seven digit integers, with sum of the digits equal to 10 and formed by using the digits 1, 2 and 3 only, is **[IIT-JEE-2009, Paper-I, (3, – 1), 240]**

(A) 55 (B) 66 (C) 77 (D) 88

7. The total number of ways in which 5 balls of different colours can be distributed among 3 persons so that each person gets at least one ball is **[IIT-JEE 2012, PAPER- 1, (3, –1)/70]**

(A) 75 (B) 150 (C) 210 (D) 243

8. Six cards and six envelopes are numbered 1, 2, 3, 4, 5, 6 and cards are to be placed in envelopes so that each envelope contains exactly one card and no card is placed in the envelope bearing the same number and moreover the card numbered 1 is always placed in envelope numbered 2. Then the number of ways it can be done is **[JEE (Advanced) 2014, Paper-2, (3, –1)/60]**

(A) 264 (B) 265 (C) 53 (D) 67

9. A debate club consists of 6 girls and 4 boys. A team of 4 members is to be selected from this club including the selection of a captain (from among these 4 members) for the team. If the team has to include at most one boy. Then the number of ways of selecting the team is

[JEE (Advanced) 2016, Paper-1, (3, –1)/62]

(A) 380 (B) 320 (C) 260 (D) 95

10. Let S = {1, 2, 3, ..., 9}. For k = 1, 2,......,5, let N_k be the number of subsets of S, each containing five elements out of which exactly k are odd. Then $N_1 + N_2 + N_3 + N_4 + N_5$ =

[JEE(Advanced) 2017, Paper-2,(3, –1)/61]

(A) 210 (B) 252 (C) 126 (D) 125

Answers

EXERCISE - 1

Section (A) :

A-1.	(1)	**A-2.**	(2)	**A-3.**	(1)	**A-4.**	(4)	**A-5.**	(1)	**A-6.**	(2)

Section (B) :

B-1.	(1)	**B-2.**	(4)	**B-3.**	(1)	**B-4.**	(2)	**B-5.**	(1)	**B-6.**	(3)	**B-7.**	(4)
B-8.	(3)	**B-9.**	(3)	**B-10.**	(1)	**B-11.**	(2)	**B-12.**	(3)	**B-13.**	(2)	**B-14.**	(3)
B-15.	(1)	**B-16.**	(2)	**B-17.**	(2)	**B-18.**	(2)	**B-19.**	(3)				

Section (C) :

C-1.	(3)	**C-2.**	(3)	**C-3.**	(3)	**C-4.**	(3)	**C-5.**	(1)	**C-6.**	(1)	**C-7.**	(2)

Section (D) :

D-1.	(2)	**D-2.**	(3)	**D-3.**	(2)	**D-4.**	(2)	**D-5.**	(2)	**D-6.**	(4)	**D-7.**	(4)
D-8.	(1)	**D-9.**	(4)										

Section (E) :

E-1.	(3)	**E-2.**	(1)	**E-3.**	(1)	**E-4.**	(3)	**E-5.**	(2)

Section (F) :

F-1.	(3)	**F-2.**	(2)	**F-3.**	(1)	**F-4.**	(3)	**F-5.**	(1)	**F-6.**	(3)	**F-7.**	(4)
F-8.	(1)												

Section (G) :

G-1.	(1)	**G-2.**	(3)	**G-3.**	(2)	**G-4.**	(2)	**G-5.**	(1)	**G-6.**	(4)	**G-7.**	(3)
G-8.	(2)	**G-9.**	(4)										

Section (H) :

H-1.	(3)	**H-2.**	(1)	**H-3.**	(3)	**H-4.**	(1)

EXERCISE - 2

PART-I

1.	(1)	**2.**	(4)	**3.**	(1)	**4.**	(2)	**5.**	(4)	**6.**	(1)	**7.**	(2)
8.	(4)	**9.**	(1)	**10.**	(1)	**11.**	(4)	**12.**	(2)	**13.**	(1)	**14.**	(4)
15.	(2)	**16.**	(4)	**17.**	(1)	**18.**	(2)	**19.**	(4)	**20.**	(2)	**21.**	(2)
22.	(3)	**23.**	(1)	**24.**	(1)	**25.**	(1)	**26.**	(4)	**27.**	(3)	**28.**	(4)
29.	(3)	**30.**	(3)	**31.**	(2)	**32.**	(3)	**33.**	(4)	**34.**	(4)		

PART-II

Section (A) :

A-1.	(1)	**A-2.**	(2)	**A-3.**	(2)	**A-4.**	(1)	**A-5.**	(1)	**A-6.**	(3)

Section (B) :

B-1. A $\rightarrow$ r, B $\rightarrow$ q, C $\rightarrow$ r, D $\rightarrow$ p

Section (C) :

C-1.	(2,3,4)	**C-2.**	(1,3,4)	**C-3.**	(1,3,4)	**C-4.**	(2,3)	**C-5.**	(2,3)

EXERCISE - 3

PART-I

1.	(2)	**2.**	(2)	**3.**	(1)	**4.**	(3)	**5.**	(2)	**6.**	(4)	**7.**	(3)
8.	(3)	**9.**	(4)	**10.**	(4)	**11.**	(3)	**12.**	(3)	**13.**	(1)	**14.**	(1)
15.	(4)	**16.**	(2)	**17.**	(2)	**18.**	(2)	**19.**	(3)	**20.**	(1)	**21.**	(3)

PART-II

1. (A) **2.** (C) **3.** (C) **4.** (C)

5. (A) → (p), (B) → (s), (C) → (q), (D) → (q)

6. (C) **7.** (B) **8.** (C) **9.** (A) **10.** (C)