Permutations and Combinations

1. 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. Then the number of such arrangements is **[AIEEE-2009]**

   (1) At least 500 but less than 750

   (2) At least 750 but less than 1000

   (3) At least 1000

   (4) Less than 500

2. 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]**

   (1) 3 (2) 36

   (3) 66 (4) 108

3. 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]**

   (1) 629 (2) 630

   (3) 879 (4) 880

4. 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 **[JEE (Main)-2013]**

   (1) 7 (2) 5

   (3) 10 (4) 8

5. 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]**

   (1) 216 (2) 192

   (3) 120 (4) 72

6. 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]**

   (1) 59^{th} (2) 52^{nd}

   (3) 58^{th} (4) 46^{th}

7. 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]**

   (1) 468 (2) 469

   (3) 484 (4) 485

8. 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]**

   (1) At least 1000

   (2) Less then 500

   (3) At least 500 but less than 750

   (4) At least 750 but less than 1000

9. Consider a class of 5 girls and 7 boys. The number of different teams consisting of 2 girls and 3 boys that can be formed from this class, if there are two specific boys *A* and *B*, who refuse to be the members of the same team, is **[JEE (Main)-2019]**

   (1) 200 (2) 350

   (3) 500 (4) 300

10. The number of natural numbers less than 7,000 which can be formed by using the digits 0, 1, 3, 7, 9 (repitition of digits allowed) is equal to **[JEE (Main)-2019]**

    (1) 374 (2) 375

    (3) 250 (4) 372

11. If $\sum_{r=0}^{25}\left\{{}^{50}C_r \cdot {}^{50-r}C_{25-r}\right\} = K\left({}^{50}C_{25}\right)$, then K is equal to **[JEE (Main)-2019]**

    (1) $2^{25} - 1$ (2) $(25)^2$

    (3) 2^{25} (4) 2^{24}

12. The value of r for which ${}^{20}C_r \, {}^{20}C_0 + {}^{20}C_{r-1} \, {}^{20}C_1 + {}^{20}C_{r-2} \, {}^{20}C_2 + ... + {}^{20}C_0 \, {}^{20}C_r$ is maximum, is

[JEE (Main)-2019]

(1) 10 (2) 20

(3) 15 (4) 11

13. The number of function f from {1, 2, 3, ...,20} onto {1, 2, 3, ..., 20} such that $f(k)$ is a multiple of 3, whenever k is a multiple of 4, is

[JEE (Main)-2019]

(1) $5^6 \times 15$ (2) $6^5 \times (15)!$

(3) $5! \times 6!$ (4) $(15)! \times 6!$

14. Consider three boxes, each containing 10 balls labelled 1, 2, ...,10. Suppose one ball is randomly drawn from each of the boxes. Denote by n_i, the label of the ball drawn from the i^{th} box, (i = 1, 2, 3). Then, the number of ways in which the balls can be chosen such that $n_1 < n_2 < n_3$ is

[JEE (Main)-2019]

(1) 240 (2) 120

(3) 164 (4) 82

15. There are m men and two women participating in a chess tournament. Each participant plays two games with every other participant. If the number of games played by the men between themselves exceeds the number of games played between the men and the women by 84, then the value of m is **[JEE (Main)-2019]**

(1) 9 (2) 7

(3) 11 (4) 12

16. If ${}^nC_4$, ${}^nC_5$ and ${}^nC_6$ are in A.P., then n can be

[JEE (Main)-2019]

(1) 12 (2) 9

(3) 14 (4) 11

17. The sum of the series $2.{}^{20}C_0 + 5.{}^{20}C_1 + 8.{}^{20}C_2 + 11.{}^{20}C_3 + ... + 62.{}^{20}C_{20}$ is equal to

[JEE (Main)-2019]

(1) 2^{23} (2) 2^{25}

(3) 2^{24} (4) 2^{26}

18. All possible numbers are formed using the digits 1, 1, 2, 2, 2, 2, 3, 4, 4 taken all at a time. The number of such numbers in which the odd digits occupy even places is **[JEE (Main)-2019]**

(1) 180 (2) 175

(3) 162 (4) 160

19. The number of four-digit numbers strictly greater than 4321 that can be formed using the digits 0, 1, 2, 3, 4, 5 (repetition of digits is allowed) is :

[JEE (Main)-2019]

(1) 360 (2) 306

(3) 288 (4) 310

20. A committee of 11 members is to be formed from 8 males and 5 females. If m is the number of ways the committee is formed with at least 6 males and n is the number of ways the committee is formed with at least 3 females, then

[JEE (Main)-2019]

(1) $m = n = 68$ (2) $m + n = 68$

(3) $m = n = 78$ (4) $n = m - 8$

21. Some identical balls are arranged in rows to form an equilateral triangle. The first row consists of one ball, the second row consists of two balls and so on. If 99 more identical balls are added to the total number of balls used in forming the equilateral triangle, then all these balls can be arranged in a square whose each side contains exactly 2 balls less than the number of balls each side of the triangle contains. Then the number of balls used to form the equilateral triangle is

[JEE (Main)-2019]

(1) 157 (2) 225

(3) 262 (4) 190

22. The number of 6 digit numbers that can be formed using the digits 0, 1, 2, 5, 7 and 9 which are divisible by 11 and no digit is repeated, is

[JEE (Main)-2019]

(1) 72 (2) 48

(3) 60 (4) 36

23. Suppose that 20 pillars of the same height have been erected along the boundary of a circular stadium. If the top of each pillar has been connected by beams with the top of all its non-adjacent pillars, then the total number of beams is

[JEE (Main)-2019]

(1) 210 (2) 180

(3) 170 (4) 190

24. If three of the six vertices of a regular hexagon are chosen at random, then the probability that the triangle formed with these chosen vertices is equilateral is **[JEE (Main)-2019]**

(1) $\frac{3}{20}$ (2) $\frac{1}{5}$

(3) $\frac{3}{10}$ (4) $\frac{1}{10}$

25. The number of ways of choosing 10 objects out of 31 objects of which 10 are identical and the remaining 21 are distinct, is **[JEE (Main)-2019]**

(1) $2^{20} + 1$ (2) 2^{21}

(3) $2^{20} - 1$ (4) 2^{20}

26. A group of students comprises of 5 boys and n girls. If the number of ways, in which a team of 3 students can randomly be selected from this group such that there is at least one boy and at least one girl in each team, is 1750, then n is equal to **[JEE (Main)-2019]**

(1) 24 (2) 27

(3) 25 (4) 28

27. Total number of 6-digit numbers in which only and all the five digits 1, 3, 5, 7 and 9 appear, is **[JEE (Main)-2020]**

(1) $\frac{1}{2}(6!)$ (2) $\frac{5}{2}(6!)$

(3) 5^6 (4) 6!

28. If the number of five digit numbers with distinct digits and 2 at the 10^{th} place is $336k$, then k is equal to **[JEE (Main)-2020]**

(1) 8 (2) 6

(3) 7 (4) 4

29. Let $n > 2$ be an integer. Suppose that there are n Metro stations in a city located along a circular path. Each pair of stations is connected by a straight track only. Further, each pair of nearest stations is connected by blue line, whereas all remaining pairs of stations are connected by red line. If the number of red lines is 99 times the number of blue lines, then the value of n is **[JEE (Main)-2020]**

(1) 199 (2) 201

(3) 101 (4) 200

30. The value of $(2\cdot{}^1P_0 - 3\cdot{}^2P_1 + 4\cdot{}^3P_2 - \text{... up to } 51^{th} \text{ term}) + (1! - 2! + 3! - \text{... up to } 51^{th} \text{ term})$ is equal to **[JEE (Main)-2020]**

(1) 1 (2) 1 + (52)!

(3) 1 – 51(51)! (4) 1 + (51)!

31. There are 3 sections in a question paper and each section contains 5 questions. A candidate has to answer a total of 5 questions, choosing at least one question from each section. Then the number of ways, in which the candidate can choose the questions, is **[JEE (Main)-2020]**

(1) 2250 (2) 3000

(3) 1500 (4) 2255

32. Two families with three members each and one family with four members are to be seated in a row. In how many ways can they be seated so that the same family members are not separated?

[JEE (Main)-2020]

(1) 2! 3! 4! (2) $(3!)^3\cdot(4!)$

(3) $(3!)^2\cdot(4!)$ (4) 3! $(4!)^3$

33. The number of 4 letter words (with or without meaning) that can be formed from the eleven letters of the word 'EXAMINATION' is _____. **[JEE (Main)-2020]**

34. If the letters of the word 'MOTHER' be permuted and all the words so formed (with or without meaning) be listed as in a dictionary, then the position of the word 'MOTHER' is _____ **[JEE (Main)-2020]**

35. The total number of 3-digit numbers, whose sum of digits is 10, is _____. **[JEE (Main)-2020]**

36. A test consists of 6 multiple choice questions, each having 4 alternative answers of which only one is correct. The number of ways, in which a candidate answers all six questions such that exactly four of the answers are correct, is _____. **[JEE (Main)-2020]**

37. The number of words, with or without meaning, that can be formed by taking 4 letters at a time from the letters of the word 'SYLLABUS' such that two letters are distinct and two letters are alike, is _____. **[JEE (Main)-2020]**

38. The number of words (with or without meaning) that can be formed from all the letters of the word "LETTER" in which vowels never come together is _____ . **[JEE (Main)-2020]**

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