MATHS

BOOKS - CENGAGE MATHS (HINGLISH)

PERMUTATION AND COMBINATION

Single Correct Answer

1. 116 people participated in a knockout tennis tournament. The players are paired up in the first round, the winners of the first round are paired up in the second round, and so on till the final is played between two players. If after any round, there is odd number of players, one player is given a by, i.e. he skips that round and plays the next round with the winners. The total number of matches played in the tournment is

A. 115

B. 53

C. 232

D. 116

Answer: A

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2. The number of three-digit numbers having only two consecutive digits identical is

A. 153

B. 162

C. 180

D. 161

Answer: B

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3. How many six-digit numbers are there in which no digit is repeated, even digits appear at even places, odd digits appear at odd places and the number is divisible by 4 ?

A. 3600

B. 2700

C. 2160

D. 1440

Answer: D

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4. The number of ordered pairs (m, n) where $m, n \in \{1, 2, 3, \ldots, 50\}$, such that $6^m + 9^n$ is a multiple of 5 is

A. 1250

B. 2500

C. 625

D. 500

Answer: A

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5. There are 10 different books in a shelf. The number of ways in which three books can be selected so that exactly two of them are consecutive is

A. 60

B. 54

C. 56

D. 36

Answer: C

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6. The number of ways of arranging 6 players to throw the cricket ball so that oldest player may not throw first is

A. 120

B. 600

C. 720

D. 7156

Answer: B

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7. Number of four digit positive integers if the product of their digits is divisible by 3 is.

A. 2700

B. 5464

C. 6628

D. 7704

Answer: D

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8. The number of five-digit numbers which are divisible by 3 that can be formed by using the digits $1, 2, 3, 4, 5, 6, 7, 8$ and 9, when repetition of digits is allowed, is

A. 3^9

B. 4.3^8

C. 5.3^8

D. 7.3^8

Answer: A

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9. If N is the number of positive integral solutions of $x_1x_2x_3x_4 = 770$, then N =

A. 256

B. 729

C. 900

D. 770

Answer: A

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10. I have tied my square bathroom wall with congruent square tiles. All the tiles are red, except those along the two diagonals, which are all blue. If I used 121 blue tiles, then the number of red tiles I used are

A. 900

B. 1800

C. 3600

D. 7200

Answer: A

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11. The number of ordered pairs of positive integers (m, n) satisfying $m \leq 2n \leq 60, n \leq 2m \leq 60$ is

A. 240

B. 480

C. 960

D. none of these

Answer: B

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12. Number of ways in which 6 distinct objects can be kept into two identical boxes so that no box remains empty is

A. 31

B. 32

C. 63

D. 64

Answer: A

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13. The number of four-digit numbers that can be formed by using the digits $1, 2, 3, 4, 5, 6, 7, 8$ and 9 such that the least digit used is 4, when repetition of digits is allowed is

A. 617

B. 671

C. 716

D. 761

Answer: B

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14. A fair coin is tossed n times. Let a_n denotes the number of cases in which no two heads occur consecutively. Then which of the following is not true ?

A. $a_1 = 2$

B. $a_2 = 3$

C. $a_5 = 13$

D. $a_8 = 55$

Answer: C

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15. Five oys and three 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

A. 36000

B. 9080

C. 3960

D. 11600

Answer: A

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16. Number of words that can be made with the letters of the word GENIUS if each word neither begins with G nor ends in S is

A. 24

B. 240

C. 480

D. 504

Answer: D

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17. The number of ways in which the letters of the word PESSIMISTIC can be arranged so that no two S's are together, no of two I's are together and letters S and I are never together is

A. 8640

B. 4800

C. 2400

D. 5480

Answer: C

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18. The number of different words that can be formed using all the letters of the word 'SHASHANK' such that in any word the vowels are separated by atleast two consonants, is

A. 2700

B. 1800

C. 900

D. 600

Answer: A

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19. The number of ways in which six boys and six girls can be seated at a round table so that no two girls sit together and two particular girls do not sit next to a particular boy is

A. $6!4!$

B. $2.5!4!$

C. $2.6!4!$

D. $5!4!$

Answer: C

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20. Six cards are drawn one by one from a set of unlimited number of cards, each card is marked with numbers $-1, 0$ or 1`. Number of different ways in which they can be drawn if the sum of the numbers shown by them vanishes is

A. 111

B. 121

C. 141

D. none of these

Answer: C

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21. The number of positive six-digit integers which are divisible by 9 and four of its digits are $1, 0, 0, 5$ is

A. 60

B. 120

C. 180

D. 210

Answer: C

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22. Number of nine-lettered word that can be formed using all the letters of the word 'MEENANSHU' if alike letters are never adjacent is

A. $12 \times 6!$

B. $11 \cdot 7!$

C. $13 \cdot 6!$

D. $12 \cdot 11 \cdot 6!$

Answer: B

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23. Number of ways in which the letters of the word 'ABBCABBC' can be arranged such that the word ABBC does not appear is any word is

A. 256

B. 391

C. 361

D. 498

Answer: C

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24. The number of 4 digit natural numbers such that the product of their digits is 12 is

A. 24

B. 36

C. 42

D. 48

Answer: B

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25. A class has tree teachers, Mr. X, Ms.Y and Mrs.Z and six students A, B, C, D, E, F. $Numberofways \in whichtheycanbeseated \in al \in eof$9` chairs,if between any two teachers there are exactly two students is

A. $18 \times 6!$

B. $12 \times 6!$

C. $24 \times 6!$

D. $6 \times 6!$

Answer: A

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26. The number of words that can be formed using all the letters of the word REGULATIONS such that G must come after R, L must come after A, and S must come after N are

A. $11!/8$

B. $11!$

C. ${}^{11}P_6$

D. none of these

Answer: A

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27. The number of permutation of all the letters of the word $PERMUTATION$ such that any two consecutive letters in the arrangement are neither both vowels nor both identical is

A. $63 \times 6! \times 5!$

B. $57 \times 5! \times 5!$

C. $33 \times 6! \times 5!$

D. $7 \times 7! \times 5!$

Answer: B

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28. A guard of 12 men is formed from a group of n soldiers. It is found that 2 particular soldiers A and B are 3 times as often together on guard as 3 particular soldiers C, D & E. Then n is equal to

A. 28

B. 27

C. 32

D. 36

Answer: C

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29. There are 10 stations on a circular path. A train has to stop at 3 stations such that no two stations are adjacent. The number of such selections must be: (A) 50 (B) 84 (C) 126 (D) 70

A. 50

B. 60

C. 70

D. 80

Answer: A

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30. Find the number of ways of arranging 15 students $A_1, A_2, \ldots\ldots . A_{15}$ in a row such that (i) A_2, must be seated after A_1 and A_2, must come after A_2 (ii) neither A_2 nor A_3 seated brfore A_1

A. $\dfrac{2! \times 15!}{3!}$

B. $\dfrac{15!}{3!}$

C. $2!15!$

D. None of these

Answer: A

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31. There are 15 different apples and 10 different pears. How many ways are apple or a pear and then Jill to pick an apple and a pear?

A. 23×150

B. 33×150

C. 43×150

D. 53×150

Answer: A

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32. There are 12 pairs of shoes in a box. Then the possible number of ways of picking 7 shoes so that there are exactly two pairs of shoes are

A. 63360

B. 63300

C. 63260

D. 63060

Answer: A

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33. There are two sets of parallel lines, their equations being $x\cos\alpha + y\sin\alpha = p$ and $x\sin\alpha - y\cos\alpha = p$, $p = 1, 2, 3, \ldots . n$ and $\alpha \in (0, \pi/2)$. If the number of rectangles formed by these two sets of lines is 225, then the value of n is equals to

A. 4

B. 5

C. 6

D. 7

Answer: C

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34. The number of rectangles that can be obtained by joining four of the twelves verties of a 12-sides regular polygon is -

A. 66

B. 30

C. 24

D. 15

Answer: D

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35. The interior angles of a regular polygon measure 150° each. The number of diagonals of the polygon is

A. 35

B. 44

C. 54

D. 78

Answer: C

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36. Number of ways in which 7 green bottles and 8 blue bottles can be arranged in a row if exactly 1 pair of green bottles is side by side, is (Assume all bottles to be alike except for the colour).

A. 84

B. 360

C. 504

D. none of these

Answer: C

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37. Which of the following is noth the number of ways of selecting n objects from $2n$ objects of which n objects are identical

A. 2^n

B. $\left({}^{2n+1}C_0 +^{2n+1} C_1 + \ldots +^{2n+1} C_n\right)^{1/2}$

C. the number of possible subsets $\{a_1, a_2, \ldots., a_n\}$

D. None of these

Answer: D

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38. Find number of seven-digit number in the form of $abcdefg(g, f, e,$ tc. Are digits at units, tens hundreds place etc.) $wherea\langle b\langle c\langle d\rangle e\rangle f\rangle g\cdot$

A. 1980

B. 1116

C. 1560

D. 1476

Answer: C

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39. Number of six-digit numbers such that any digit that appears in the number appears at least twice, where the digits of each number are from the set $\{1, 2, 3, 4, 5\}$, is (Example 225252 is valid but 222133 is not valid)

A. 1500

B. 1850

C. 1405

D. 1205

Answer: C

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40. All the five digit numbers in which each successive digit exceeds its predecessor are arranged in the increasing order of their magnitude. The 97^{th} number in the list does not contain the digit

A. 4

B. 5

C. 7

D. 8

Answer: B

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41. The number of n digit number formed by using digits $\{1, 2, 3\}$ such that if 1 appears, it appears even number of times, is

A. $2^n + 1$

B. $\frac{1}{2}(3^n + 1)$

C. $\frac{1}{2}(3^n - 1)$

D. $\frac{1}{2}(2^n - 1)$

Answer: B

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42. A, B, C, D develop 18 items. Five items jointly by A and C, four items by A and D, four items by B and C and five items by B and D. The number of ways of selecting eight ites out of 18 so that the selected ones belong equally to A, B, C, D is

A. 5226

B. 5626

C. 4418

D. 4936

Answer: B

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43. The number of pairs of diagonals of a regular polygon of 10 sides that are parallel are

A. 45

B. 56

C. 22

D. 64

Answer: A

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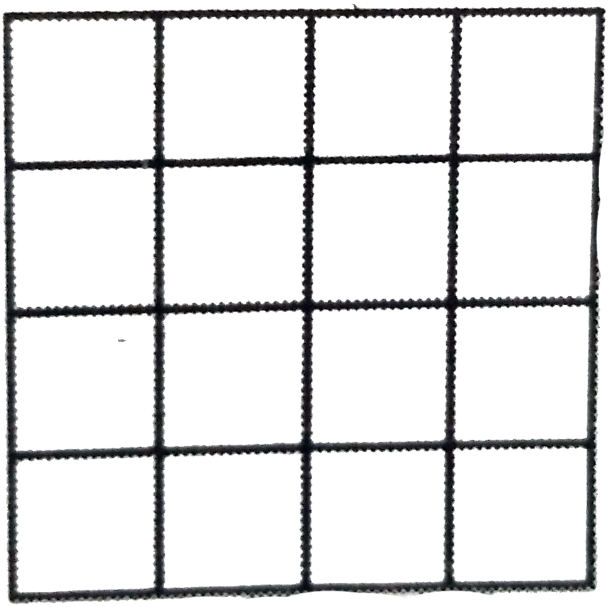
44. Four letters, two $'a'$ and two $'b'$ are filled into 16 cells of a matrix as given. It is required that each cell contains atmost one letter and each row or column cannot contain same letters. Then the number of ways the matrix can be filled is



A. 3600

B. 5200

C. 3960

D. 4120

Answer: C

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45. The number of increasing function from $f: A \to B$ where $A \in \{a_1, a_2, a_3, a_4, a_5, a_6\}$, $B \in \{1, 2, 3, \ldots.., 9\}$ such that $a_{i+1} > a_i \forall I \in N$ and $a_i \neq i$ is

A. 30

B. 28

C. 24

D. 42

Answer: B

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46. How many ordered pairs of (m,n) integers satisfy $\frac{m}{12} = \frac{12}{n}$?

A. 30

B. 15

C. 12

D. 10

Answer: A

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47. Product of all the even divisors of $N = 1000$, is

A. $2^{20} \cdot 5^{20}$

B. $2^{24} \cdot 5^{24}$

C. $64 \cdot 10^{18}$

D. None of these

Answer: B

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48. How many combinations can be made up of 3 hens, 4 ducks and 2 geese so that each combination has hens, ducks and geese ?

A. 305

B. 315

C. 320

D. 325

Answer: B

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49. A positive integer n is of the form $n = 2^{\alpha}3^{\beta}$, where $\alpha \geq 1, \beta \geq 1$. If n has 12 positive divisors and $2n$ has 15 positive divisors, then the number of positive divisors of $3n$ is

A. 15

B. 16

C. 18

D. 20

Answer: B

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50. Number of permutations of $1, 2, 3, 4, 5, 6, 7, 8,$ and 9 taken all at a time are such that digit 1 appearing somewhere to the left of 2 and digit 3 appearing to the left of 4 and digit 5 somewhere to the left of 6, is (e.g. 815723946 would be one such permutation)

A. $9.7!$

B. $8!$

C. $5!4!$

D. $8!4!$

Answer: A

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51. The number of arrangments of all digits of 12345 such that at least 3 digits will not come in its position is

A. 89

B. 109

C. 78

D. 57

Answer: B

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52. Sixteen players S_1, S_2, S_3,...,S_{16} play in a tournament. Number of ways in which they can be grouped into eight pairs so that S_1 and S_2 are in different groups, is equal to

A. $\frac{(14)!}{2^6 \cdot 6!}$

B. $\frac{(15)!}{2^7 \cdot 7!}$

C. $\frac{(14)!}{2^7 \cdot 6!}$

D. $\frac{(14)!}{2^6 \cdot 7!}$

Answer: A

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53. The number of homogenous products of degree 3 from 4 variables is equal to

A. 20

B. 16

C. 12

D. 4

Answer: A

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54. The number of ways of distributing 3 identical physics books and 3 identical methematics books among three students such that each student gets at least one books is

A. 45

B. 55

C. 64

D. 72

Answer: B

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55. Four different movies are running in a town. Ten students go to watch these four movies. The number of ways in which every movie is watched by atleast one student, is (Assume each way differs only by number of students watching a movie)

A. 68

B. 72

C. 84

D. 104

Answer: C

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56. Ten identical balls are distributed in 5 different boxes kept in a row and labeled A, B, C, D and E. The number of ways in which the ball can be distributed in the boxes if no two adjacent boxes remains empty

A. 789

B. 875

C. 771

D. 692

Answer: C

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57. 5 different objects are to be distributed among 3 persons such that no two persons get the same number of objects. Number of ways this can be done is,

A. 60

B. 90

C. 120

D. 150

Answer: B

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58. Find number of negative integral solution of equation $x + y + z = -12$

A. 44

B. 55

C. 66

D. none of these

Answer: B

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59. The number of ways can five people be divided into three groups is

A. 20

B. 25

C. 30

D. 36

Answer: B

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60. The number of ways of partitioning the set $\{a, b, c, d\}$ into one or more non empty subsets is

A. 14

B. 15

C. 16

D. 17

Answer: B

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61. Let y be an element of the set $A = \{1, 2, 3, 4, 5, 6, 10, 15, 30\}$ and x_1, x_2, x_3 be integers such that $x_1 x_2 x_3 = y$, then the number of positive integral solutions of $x_1 x_2 x_3 = y$ is

A. 81

B. 64

C. 72

D. 90

Answer: B

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Multiple Correct Answer

1. A contest consists of ranking 10 songs of which 6 are Indian classic and 4 are westorn songs. Number of ways of ranking so that (mention correct statements)

A. There are exactly 3 indian classic songs in top 5 is $(5!)^3$.

B. Top rank goes to Indian classic song is $6(9!)$

C. The ranks of all western songs are consecutive is $4!7!$

D. The 6 Indian classic songs are in a specified order is ${}^{10}P_4$.

Answer: A::B::C::D

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2. $P = n(n^2 - 1)(n^2 - 4)(n^2 - 9)\dots(n^2 - 100)$ is always divisible by , $(n \in I)$

A. $2!3!4!5!6!$

B. $(5!)^4$

C. $(10!)^2$

D. $10!11!$

Answer: A::B::C::D

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Comprehension

1. Given are six $0'$s, five $1'$s and four $2's$. Consider all possible permutations of all these numbers. [A permutations can have its leading digit 0].

How many permutations have the first 0 preceding the first 1 ?

A. ${}^{15}C_4 \times {}^{10}C_5$

B. ${}^{15}C_5 \times {}^{10}C_4$

C. ${}^{15}C_6 \times {}^{10}C_5$

D. ${}^{15}C_5 \times {}^{10}C_5$

Answer: A

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2. Given are six $0's$, five $1's$ and four $2's$. Consider all possible permutations of all these numbers. [A permutations can have its leading digit 0].

In how many permutations does the first 0 precede the first 1 and the first 1 precede first 2.

A. ${}^{14}C_5 \times {}^8 C_6$

B. ${}^{14}C_5 \times {}^8 C_4$

C. ${}^{14}C_6 \times {}^8 C_4$

D. ${}^{14}C_6 \times {}^8 C_6$

Answer: B

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3. The are 8 events that can be schedules in a week, then

The total number of ways in which the events can be scheduled is

A. 8^7

B. 7^8

C. $7!$

D. 8

Answer: B

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4. The are 8 events that can be schedules in a week, then

The total number of ways that the schedule has at least one event in each days of the week is

A. 28×5040

B. $7!8!$

C. $7! \times (15!)$

D. None of these

Answer: A

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5. The are 8 events that can be schedules in a week, then

The total number of ways that these 8 event are scheduled on exactly 6 days of a week is

A. $210 \times 6!$

B. $7! \times 266$

C. $56 \times 7!$

D. $210 \times 7!$

Answer: B

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6. Let $\theta = (a_1, a_2, a_3, ..., a_n)$ be a given arrangement of n distinct objects $a_1, a_2, a_3, \ldots, a_n$. A derangement of θ is an arrangment of these n objects in which none of the objects occupies its original position. Let D_n be the number of derangements of the permutations θ.

D_n is equal to

A. $(n-1)D_{n-1} + D_{n-2}$

B. $D_{n-1} + (n-1)D_{n-2}$

C. $n(D_{n-1} + D_{n-2})$

D. $(n-1)(D_{n-1} + D_{n-2})$

Answer: D

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7. Let $\theta = (a_1, a_2, a_3, ..., a_n)$ be a given arrangement of n distinct objects $a_1, a_2, a_3, \ldots, a_n$. A derangement of θ is an arrangment of these

n objects in which none of the objects occupies its original position. Let D_n be the number of derangements of the permutations θ.

The relation between D_n and D_{n-1} is given by

A. $D_n - nD_{n-1} = (-1)^n$

B. $D_n - (n-1)D_{n-1} = (-1)^{n-1}$

C. $D_n - nD_{n-1} = (-1)^{n-1}$

D. $D_n - D_{n-1} = (-1)^{n-1}$

Answer: A

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8. Let $\theta = (a_1, a_2, a_3, ..., a_n)$ be a given arrangement of n distinct objects $a_1, a_2, a_3, \ldots, a_n$. A derangement of θ is an arrangment of these n objects in which none of the objects occupies its original position. Let D_n be the number of derangements of the permutations θ.

There are 5 different colour balls and 5 boxes of colours same as those of the balls. The number of ways in which one can place the balls into the boxes, one each in a box, so that no ball goes to a box of its own colour is

A. 40

B. 44

C. 45

D. 60

Answer: B

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Examples

1. In a class, there are 15 boys and 10 girls. How many ways a teacher can select 1 boy and 1 girl to represent the class at a seminar.

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2. If $x < 4 \quad \text{and} \quad x, y \in \{1, 2, 3, . . , 10\}$, then find the number of ordered pairs (x,y).

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3. Poor Dollys T.V. has only 4 channels, all of them quite boring. Hence it is not surprising that she desires to switch (change) channel after every one minute. Then find the number of ways in which she can change the channels so the she is back to her original channel for the first time after 4 min.

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4. The number of all possible subsets of a set containing n elements ?

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5. A dice is rooled n times. Find the number of outcomes

(i) if 6 never appear.

(ii) if 6 appears at least once.

(iii) if only even number appears.

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6. In how many ways 10 different balls can be put in 2 difference boxes ?

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7. A gentleman wants to invite 6 friends. In how many ways can he send invitation cards to them, if he three servants to deliver the cards ?

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8. There are n locks and n matching keys. If all the locks and keys are to be perfectly matched, find the maximum number of trails required to open a lock.

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9. Find the number of distinct rational numbers x such that `o

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10. Find the total number of integer n such that $2 \leq n \leq 2000$ and H.C.F. of n and 36 is 1.

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11. Find the number of different signals that can be generated by arranging at least 2 flags in order (one below that other) on a vertical staff, if five different flags are available.

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12. Find the number of 4 letter words, with or without meaning, which can be formed out of the letters of the word MAKE, where the repetition of the letters is not allowed.

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13. Find number of four-digit numbers in which repetition is not allowed. Also find number of four-digit numbers in which at least one digit is repeated.

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14. Find number of four-digit numbers in which repetition is not allowed.

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15. Find the number of three-digit numbers which are divisible by 5 and have distinct digits

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16. Find the total number of n -digit number $(n > 1)$ having property that no two consecutive digits are same.

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17. There are ten points in the plane, no three of which are coolinear. How many different lines can be drawn through these points ?

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18. Find the number of diagonals in the convex polygon of n sides .

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19. A regular polygon of 10 sides is constructed. Triangles are formed joining vertices of the polygon. Find the number of triangles

(i) if two sides of trinangle coincide with the sides of polygon.

(ii) if only one side of triangle coincide with the side of polygon.

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20. Find n, if $(n+1) \neq 12 \times (n-1)$.

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21. Find the value of t which satisfies (t-[|sinx|]!=3!5! Where [.] denotes the greatest integer function.

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22. Prove that `(n !)^2

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23. Find the sum of the series $\left(\sum_{r=1}^{n} r \times r!\right)$

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24. Find the exponent of 3 in 100!

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25. Find the number of zeros at the end of 130.

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26. Find the number of zeros at the end in product $5^6.6^7.7^8.8^9.9^{10}.30^{31}$.

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27. If ${}^{10}P_r = 5040$ find the value of r.

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28. If $\hat{} \ 0P_5 + 5^9 P_4 =^{10} P_r,$ find the value of r.

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29. If $\hat{} \ 2n + 1P_{n-1} :^{2n-1} P_n = 3 : 5,$ then find the value of n.

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30. If $r < s \leq n$ then prove that ${}^nP_s$ is divisible by ${}^nP_r$.

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31. Seven athletes are participating in a race. In how many ways can the first three athletes win the prizes ?

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32. In how many ways can 6 persons stand in a queue?

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33. How many different signals can be given using any number of flags from 5 flags of different colors?

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34. Eleven animals of a circus have to be placed in eleven cages (one in each cage), if 4 of the cages are too small for 6 of the animals, then find the number of the ways of caging all the animals.

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35. If $A = \{x \mid x$ is prime number and $x < 30\}$, find the number of different rational numbers whose numerator and denominator belong to A.

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36. Five different digits from the setoff numbers $\{1, 2, 3, 4, 5, 6, 7\}$ are written in random order. How many numbers can be formed using 5 different digits from set $\{1, 2, 3, 4, 5, 6, 7\}$ if the number is divisible by 9?

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37. Find the sum of all the numbers that can be formed with the digits 2, 3, 4, 5 taken all at a time.

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38. A shelf contains 20 books of which 4 are single volume and the other form sets of 8, 5, and 3 volumes. Find the number of ways in which the books may be arranged on the shelf so that volumes of each set will not be separated. volumes of each set remain in their due order.

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39. The letters of word ZENITH are written in all possible ways. If all these words are written out as in a dictionary, then find the rank of the word ZENITH.

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40. Find the total number of permutations of n different things taken not more than r at a time, when each thing may be repeated any number of times.

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41. How many words can be formed using all the letters of the folloiwng words ?

(i) BANANA (ii) ALLAHABAD

INDEPENDENCE (iv) ASSASSINATION

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42. Find the total number of nine-digit numbers that can be formed using the digits 2, 2, 3, 3, 5, 5, 8, 8, 8 so that the odd digit occupy the even places.

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43. Find the number of permutation of all the letters of the word MATHEMATICS which starts with consonants only.

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44. There are six periods in each working day of a school. Find the number of ways in which 5 subjects can be arranged if each subject is allowed at least one period and no period remains vacant.

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45. Find the number of ways in which $5A' sand6B' s$ can be arranged in a row which reads the same backwards and forwards.

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46. Find the number of ways in which 5 girls and 5 boys can be arranged in row

(i) if no two boys are together.

(ii) if boys and girls are alternate.

(iii) all the girls sit together and all the boys sit together.

(iv) all the girls are never together.

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47. Find the number of arrangements of the letters of the word SALOON, if the two Os do not come together.

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48. Find the number of ways in which 3 boys and 3 girls can be seated on a line where two particular girls do not want to sit adjacent to a particular boy.

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49. The number of ways in which the letters of the word ARRANGE be arranged so that

(i) the two R's are never together,

(ii) the two A's are together but not two R's.

(iii) neither two A's nor two R's are together.

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50. If $.^{n} C_{8} = .^{n} C_{6}$, then find $.^{n} C_{2}$.

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51. Find the value (s) of r satisfying the equation

$.^{69} C_{3r-1} - .^{69} C_{r^2-1} - .^{69} C_{3r}$

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52. Prove that $.^{n} C_{r} + .^{n-1} C_{r} + .. + .^{r} C_{r} = .^{n+1} C_{r+1}$

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53. If $.^{n} C_{r-1} = 36, .^{n} C_{r} = 84 \text{ and } .^{n} C_{r+1} = 126$, find n and r.

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54. If the ratio ${}^{2n}C_3 \, . \, {}^{n}C_3$ is equal to 11:1 find n.

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55. If $\hat{} \; 15C_{3r} : {}^{15}C_{r+1} = 11 : 3$, find the value of r.

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56. Prove that $\dfrac{(n^2)!}{(n!)^n}$ is a natural number for all n $\in$ N.

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57. Twenty-eight games were played in a football tournament with each team playing once against each other. How many teams were there?

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58. There are n married couples at a party. Each person shakes hand with every person other than her or his spouse. Find the total m of hand shakes.

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59. In a network of railways, a small island has 15 stations. Find the number of different types of tickets to be printed for each class, if every stations must have tickets for other stations.

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60. In a certain an algebraical exercise book there and 4 examples on arithmetical progression, 5 examples on permutation and combination, and 6 examples on binomial theorem. Find the number of ways a teacher can select or his pupils at least one but not more than 2 examples from each of these sets.

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61. Find the number of ways of selecting 3 pairs from 8 distinct objects.

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62. A person tries to form as many different parties as he can, out of his 20 friends. Each party should consist of the same number. How many friends should be invited at a time? In how many of these parties would the same friends be found?

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63. Find the maximum number of points of intersection of 6 circles.

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64. There are 10 points on a plane of which no three points are collinear. If lines are formed joining these points, find the maximum points of intersection of these lines.

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65. There are 10 points on a plane of which 5 points are collinear. Also, no three of the remaining 5 points are collinear. Then find (i) the number of straight lines joining these points: (ii) the number of triangles, formed by joining these points.

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66. Find the maximum number of points of intersection of 7 straight lines and 5 circles when 3 straight lines are parallel and 2 circles are concentric

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67. A box contain 5 different red and 6 different white balls. In how many ways can 5 balls be selected so that there are at least two balls of each colour ?

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68. A delegation of four students is to be selected from al total of 12 students. In how many says can the delegation be selected. if all the students are equally willing? if two particular students have to be included in the delegation? if two particular students do not wish to be together in the delegation? if two particular students wish to be included together only in the delegation? if two particular students refuse to be together and two other particular students wish to be together only in the delegation?

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69. The number of pairs of diagonals of a regular polygon of 10 sides that are parallel are

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70. Find the total number of ways of selecting five letters from the letters of the word INDEPENDENT. How many words can be formed from these five letters ?

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71. Find the total number of rectangles on the normal chessboard.

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72. m equi spaced horizontal lines are inersected by n equi spaced vertical lines. If the distance between two successive horizontal lines is same as that between two successive vertical lines, then find the number of squares formed by the lines if $(m < n)$

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73. In ;a plane, there are 5 straight lines which will pass through a given point, 6 others which all pass through another given point, and 7 others which all as through a third given point. Supposing no three lines intersect at any point and no two are parallel, find the number of triangles formed by the intersection of the straight line.

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74. A regular polygon of 10 sides is constructed. In how many way can 3 vertices be selected so that no two vertices are consecutive?

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75. In how many of the permutations of n thing taken r at a time will three given things occur?

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76. Out of 10 consonants and 4 vowels, how many words can be formed each containing 3 consonants and 2 vowels ?

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77. Number of different words that can be formed using all the letters of the word 'DEEPMALA' if two vowels are together and the other two are also together but separated from the fist two is

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78. A number of 18 guests have to be seated, half on each side of a long table. Four particular guests desire to sit on one particular side and three others on the other side. Determine the number of ways in which the sitting arrangements can be made.

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79. In a conference 10 speakers are present. If S_1 wants to speak before $S_2 and S_2$ wants to speak after $S_3,$ then find 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.

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80. Find the number of seen letter words that can be formed by using the letters of the word SUCCESS so that the two C are together but no two S are together.

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81. PERMUTATIONS शब्द के अक्षरों को कितने तरीकों से व्यवस्थित किया जा सकता है, यदि

(i) चयनित शब्द का प्रारंभ P से तथा अंत S से होता है ।

(ii) चयनित शब्द में सभी स्वर एक साथ हैं ?

(iii) चयनित शब्द में P तथा S के मध्य सदैव 4 अक्षर हों ?

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82. A six letters word is formed using the letters of the word LOGARITHM with or without repetition. Find the number of words that contain exactly three different letters.

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83. Number of ways arranging 4 boys and 5 girls if between two particular girls there is exactly two boys.

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84. Number of permutations of the word PANCHKULA where A and U are separated. The word PANCHKULA must be separated.

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85. Five boy and five girls sit alternately around a round table. In how many ways can this be done?

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86. A round-table conference is to be held among 20 delegates belonging from 20 different countries. In how many ways can they be seated if two particular delegates are (i) always to sit together, (ii) never to sit together .

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87. How many ways are there to seat n married couples $(n \geq 3)$ around a table such that men and women alternate and each women is not adjacent to her husband.

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88. The number of ways in which four persons be seated at a round table, so that all shall not have the same neighbours in any two arrangements,is

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89. A person invites a group of 10 friends at dinner and sits 5 on a round table and 5 more on another round table, 4 on one round table and 6 on the other round table. Find the number of ways in each case in which he can arrange the guest.

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90. Find the number of ways in which 10 different diamonds can be arranged to make a necklace.

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91. Six persons A, B, C, D, E, F, are to be seated at a circular table. In how many ways antis be one if A should have either B or C on his and B must always have either C or D on his right.

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92. The number of ways in which four persons be seated at a round table, so that all shall not have the same neighbours in any two arrangements,is

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93. Find the number of ways of selection of at least one vowel and one consonant from the word TRIlPLE.

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94. There are 3 books of mathematics, 4 of science, and 5 of literature. How many different collections can be made such that each collection consists of one book of each subject, at least one book of each subject, at least one book of literature.

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95. Nishi has 5 coins, each of the different denomination. Find the number different sums of money she can form.

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96. Find the number of groups that can be made from 5 different green balls., 4 different blue balls and 3 different red balls, if at least 1 green and 1 blue ball is to be included.

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97. A person is permitted to selected at least one and at most n coins from a collection of $(2n+1)$ distinct coins. If the total number o ways in which he can select coins is 255, find the value of n.

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98. There are p copies each of n different subjects. Find the number of ways in which a nonempty selection can be made from them. Also find the number of ways in which at least one copy of each subject is selected.

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99. Find the number of selections of one or more things from the group of p identical things of one type, q identical things of another type, r identical things of the third type and n different things.

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100. Find the number of ways of selecting r objects from p identical thing and q identical things of other type

(i) if $p, q < r$ $\quad (ii) \quad \text{if} p, q > r$

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101. For number N=35700, find

(i) number of divisors

(ii) number of proper divisors

(iii) number of even divisors

(iv) number of odd divisors

(v) sum of all divisors

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102. Find the number of divisors of the number $N = 2^3.3^5.5^7.7^9$ which are perfect squares.

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103. Find the number of ways in which the number 94864 can be resolved as a product of two factors.

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104. Find the number of ways in which the number 300300 can be split into two factors which are relatively prime.

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105. Find the number of ways of dividing 52 cards among four players equally.

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106. Find the number of ways to give 16 different things to three persons A, B, C so that B gets 1 more than A and C gets 2 more than B.

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107. In how any ways can 8 different books be distributed among 3 students if each receives at least 2 books?

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108. n different toys have to be distributed among n children. Find the number of ways in which these toys can be distributed so that exactly one child gets no toy.

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109. Prove that (mn)! Is divisible by $(n!)^m \text{ and}(m!)^n$.

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110. Find the number of ways in which n different prizes can be distributed among `m(

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111. Find the number of ways in which n distinct objects can be kept into two identical boxes o that n box remains empty.

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112. Find the number of non-negative integral solutions of the equation $x + y + z = 10$.

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113. Find the number of positive integral solutions of the equation $x + y + z = 12$.

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114. Find the number of non-negative integral solutions of equation $x + y + z + 2w = 20$.

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115. Find the number of non-negative integral solutions of $x + y + z + w \leq 20$.

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116. Find the number of ways in which 13 identical apples can be distributed among 3 persons so that no two persons receive equal number of apples and each can receive any number of apples.

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117. In an experiment, n six-faced normal dice are thrown. Find the number of sets of observations which are indistinguishable among themselves.

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118. Find the total number of positive integral solutions for (x, y, z) such that $xyz = 24.$ Also find out the total number of integral solutions.

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119. Consider the equation $\frac{2}{x}+\frac{5}{y}=\frac{1}{3} where x, y \in N$. Find the number of solutions of the equation.

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120. In how many ways can 10 persons take seats in a row of 24 fixed seats so that no two persons take consecutive seats.

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121. In how many ways te sum of upper faces of four distinct dices can be six.

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122. In how many different ways can 3 persons A, B, C having 6 one-rupee coin 7 one-rupee coin, 8 one-rupee coin, respectively, donate 10 one-rupee coin collectively?

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123. In an examination, the maximum mark for each of the three papers is 50 and the maximum mark for the fourth paper is 100. Find the number of ways in which the candidate can score 605 marks in aggregate.

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124. Find the number of non-negative intergral solutions of $x_1 + x_2 + x_3 + x_4 = 20.$

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125. In how many ways can we get a sum of at most 17 by throwing six distinct dice ? In how many ways can we get a sum greater than 17 ?

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126. In how many ways can 14 identical toys be distributed among three boys so that each one gets at least one toy and no two boys get equal number of toys.

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127. Find the numbers of positive integers from 1 to 1000, which are divisible by at least 2, 3, or 5.

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128. Find the number of ways in which two Americans, two British, one Chinese, one Dutuch, and one Egyptian can sit on a round table so that persons of the same nationality are separated.

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129. Find the number of permutations of letters a, n, c, d, e, f, g taken all together if neither $begn$ or cad pattern appear.

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130. Number of words formed using all the letters of the word 'EXAMINATION' if alike letters are never adjacent.

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131. Find the number of ways in which 5 distinct balls can be distributed in three different boxes if no box remains empty. Or If $n(A) = 5andn(B) = 3,$ then find the number of onto functions from A to B.

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132. There are four balls of different colours and four boxes of colours, same as those of the balls. The number of ways in which the balls, one in each box, could be placed such thast a ball does not go to a box of its own colour is: (A) $\lfloor 4 - 1$ (B) 9 (C) $\lfloor 3 + 1$ (D) none of these

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133. Seven people leave their bags outside al temple and returning after worshiping picked one bag each at random. In how many ways at least one and at most three of them get their correct bags?

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134. Find the number of ways of dividing 6 couples in 3 groups if each group has exactly one couple and each group has 2 males and 2 females.

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135. Prove that combinatorial argument that $\hat{} \; n+1C_r = {}^n C_r + {}^n C_{r-1}$.

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136. If $n_1 and n_2$ are five-digit numbers, find the total number of ways of forming $n_1 and n_2$ so that these numbers can be added without carrying at any stage.

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137. $n_1 and n_2$ are four-digit numbers, find the total number of ways of forming $n_1 and n_2$ so that n_2 can be subtracted from n_1 without borrowing at any stage.

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138. How many five-digit numbers can be made having exactly two identical digits?

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139. An ordinary cubical dice having six faces marked with alphabets A, B, C, D, E, and F is thrown n times and ht list of n alphabets showing p are noted. Find the total number of ways in which among the alphabets A, B, C D, E and F only three of them appear in the list.

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140. Find the number of three-digit numbers from 100 to 999 including all numbers which have any one digit that is the average of the other two.

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141. The members of a chess club took part in a round robin competition in which each player plays with other once. All members scored the same number of points, except four juniors whose total score ere 17.5. How many members were there in the club? Assume that for each win a player scores 1 point, 1/2 for a draw, and zero for losing.

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142. There are $2n$ guests at a dinner party. Supposing that eh master and mistress of the house have fixed seats opposite one another and that there are two specified guests who must not be placed next to one another, show that the number of ways in which the company can be placed is $(2n-2!)\times(4n^2-6n+4)$.

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143. In how many ways can two distinct subsets of the set A of $k(k\geq 2)$ elements be selected so that they haves exactly two common elements?

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144. There are n straight lines in a plane in which no two are parallel and no three pass through the same point. Their points of intersection are joined. Show that the number of fresh lines thus introduced is $\frac{1}{8}n(n-1)(n-2)(n-3)$

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145. The streets of a city are arranged like the like the lines of a chess board. There are m streets running from north to south and n streets from east to west. Find the number of ways in which a man can travel from north-west to south-east corner, covering shortest possible distance.

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146. A bats man scores exactly a century lb hitting fours and sixes in 20 consecutive balls. In how many different ways can e do it if some balls may not yield runs and the order of boundaries and over boundaries are taken into account?

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147. In how many ways can $2t+1$ identical balls be placed in three distinct boxes so that any two boxes together will contain more balls than the third?

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Illustration

1. Find the number of ways in which letters A, A, A, B, B, B can be placed in the squares of the figure so that no row remains empty.

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Exercise 7 1

1. Four buses run between Bhopal and Gwalior. If a man goes from Gwalior to Bhopal by a bus and comes back to Gwalior by another bus, find the total possible ways.

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2. Find the total number of ways of answering five objective type questions, each question having four choices

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3. A variable name in certain computer language must be either an alphabet or an alphabet followed by a decimal digit. The total number of different variable names that can exist in that language is equal to a. 280 b. 390 c. 386 d. 296

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4. In how many ways five persons can stand in a row ?

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5. In how many ways can the following prizes be given away to a class of 30 students, first and second in Mathematics, first and second in Physics, first in Chemistry and first in English?

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6. Five persons entered the lift cabin on the ground floor of an 8-floor building. If each of them can leave the cabin independently at any floor beginning with the first; find the total number of ways in which each of the five persons can leave the cabin: (i) at any one of the 7 floors and (ii) at different floors.

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7. If there are six straight lines in a plane, no two of which are parallel and no three of which pass through the same point, then find the number of points in which these lines intersect.

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8. Find the number ordered pairs (x, y) if $x, y \in \{0, 1, 2, 3, , 10\} and$ if $|x - y| > 5.$

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9. Find the number of ways in which two small squares can be selected on the normal chessboard if they are not in same row or same column.

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10. Find the number of natural numbers which are less than 2×10^8 and which can be written by means of the digit 1 and 2.

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11. Number of non-empty subsets of {1,2,3,...,12} having the property that sum of the largest and smallest element is 13.

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12. Find the number of three-digit number in which repetition is allowed and sum of digits is even.

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13. An n-digit number is a positive number with exactly n digits. Nine hundred distinct n-digit numbers are to be formed using only the three digits 2, 5, and 7. The smallest value of n for which this is possible is a.6 b. 7 c. 8 d. 9

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14. A five digit number divisible by 3 is to be formed using the numerals 0, 1, 2, 3, 4 and 5, without repetition. The total number of ways this can be done, is

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Exercise 7 2

1. Prove that: $\frac{(2n)!}{n!} = \{1.\ 3.\ 5(2n-1)\}2^n.$

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2. Show that $1! + 2! + 3! + \quad + n!$ cannot be a perfect square for any $n \in N, n \geq 4.$

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3. Prove that $(n! + 1)$ is not divisible by any natural number between $2andn\cdot$

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4. Find the remainder when $1! + 2! + 3! + 4! + \quad + n!$ is divided by 15, if $n \geq 5.$

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5. Find the exponent of 80 in 200!.

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Exercise 7 3

1. Prove that $\hat{}\ nP_r - 5^n P_r + r^{n-1} P_{r2-1}.$

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2. If $.^n P_5 = 20.^n P_3$, find the value of n.

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3. How many 4-letter words, with or without meaning, can be formed out of the letters in the word LOGARITHMS, if repetition of letters is not allowed ?

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4. (a) If $.^{22}P_{r+1}:^{20}P_{r+2}=11:52$, find r.

(b) If $.^{56}P_{r+6}:^{54}P_{r+3}=30800:1$, find r.

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5. How many numbers can be formed from the digits 1, 2, 3, 4 when repetition is not allowed?

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6. Find the three-digit odd numbers that can be formed by using the digits 1, 2, 3, 4, 5, 6 when the repetition is allowed.

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7. If the 11 letters $A, B, \ldots . K$ denote an arbitrary permutation of the integers $(1, 2\ldots .11)$, then $(A-1)(B-2)(C-3)\ldots .(K-11)$ will be

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8. Find the number of positive integers, which can be formed by using any number of digits from 0, 1, 2, 3, 4, 5 but using each digit not more than once in each number. How many of these integers are greater than 3000? What happened when repetition is allowed?

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9. Eight chairs are numbered 1 to 8. Two women and three men wish to occupy one chair each. First, the women choose the chairs from amongst the chairs marked 1 to 4, and then the men select th chairs from amongst the remaining. The number of possible arrangements is a. $\hat{} \ 6C_3 \times^4 C_2$ b. $\hat{} \ 4P_2 \times^4 P_3$ c. $\hat{} \ 4C_2 \times^4 P_3$ d. none of these

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10. How many automobile license plates can be made, if each plate contains two different letters followed by three different digits ?

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11. How many six-digit odd numbers, greater than 6,00,000, can be formed from the digits 5, 6, 7, 8, 9, and 0 if repetition of digits is allowed repetition of digits is not allowed.

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Exercise 7 4

1. Total number of 6-digit numbers in which all the odd digits appear, is

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2. How many new words can be formed using all the letters of the word 'MEDITERRANEAN', if vowels and consonants occupy the same relative positions ?

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3. Find the number of words which can be formed using all the letters of the word 'INSTITUTION' which start with consonant.

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4. A library has a copies of one book, b copies each of two books, c copies each of three books, a single copy of d books. The total number of ways in which these books can be arranged in a shelf is equal to a. $\frac{(a+2b+3c+d)!}{a!(b!)^2(c!)^3}$ b. $\frac{(a+2b+3c+d)!}{a!(2b!)^{c!}\ \hat{}\ 3}$ c. $\frac{(a+b+3c+d)!}{(c!)^3}$ d. $\frac{(a+2b+3c+d)!}{a!(2b!)^{c!}\ \hat{}}$

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5. The number of ways in which we can get a score of 11 by throwing three dice is a. 18 b. 27 c. 45 d. 56

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Exercise 7 5

1. If the best and the worst paper never appear together, find in how many ways six examination papers can be arranged.

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2. There are six teachers. Out of them tow are primary teacher, two are middle teachers, and two are secondary teachers. They are to stand in a row, so as the primary teachers, middle teacher, and secondary teachers area always in a set. Find the number of ways in which they can do so.

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3. In how many ways can 5 boys and 3 girls sit in a row so that no two girls are together ?

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4. Find the number of words that can be made out of the letters of the word MOBILE when consonants always occupy odd places.

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5. m men and n women ae to be seated in a row so that no two women sit together. If $m > n$ then show that the number of ways n which they fan be seated as $\frac{m!(m+1)!}{(m-n+1)!}$.

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Exercise 7 6

1. If $\hat{} \; 15C_{3r} =^{15} C_{r+3}$, then find r.

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2. If $\hat{} \; n+2C_8 :^{n-2} P_4 : 57 : 16,$ find n.

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3. Find the ratio of $\hat{} \; 20C_r and^{25} C_r$ when each of them has the greatest possible value.

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4. On the occasion if Deepawali festival, each student in a class sends greeting cards to other. If there are 20 students in the class, find the total number of greeting cards exchanged by the students?

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5. A committee of 6 is chosen from 10 men and 7 women so as to contain at least 3 men and 2 women. In how many ways can this be done if two particular women refuse to serve on the same committee? a. 850 b. 8700 c. 7800 d. none of these

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6. A bag contains 50 tickets numbered 1, ,2 3, ...50. Find the number of set of five tickets `x_1

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7. Four visitors A, B, C, D arrived at a town that has 5 hotels. In how many ways, can the disperse themselves among 5 hotels.

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8. Out of 15 balls, of which some are white and the rest are black, how many should be white so that the number of ways in which the balls can be arranged in a row may be the greatest possible? It is assumed that the balls of same color are alike?

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9. In how many shortest ways can we reach from the point (0, 0, 0) to point (3, 7, 11) in space where the movement is possible only along het x-axis, y-axis, and z-axis or parallel to them and change of axes is permitted only at integral points. (An integral point is one, which has its coordinate as integer.)

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10. For examination, a candidate has to select 7 subjects from 3 different groups A, B, C which contain 4, 5, 6 subjects, respectively. The number of different way in which a candidate can make his selection if he has to select at least 2 subjects form each group is 25 b. 260 c. 2700 d. 2800

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11. A question paper on mathematics consists of 12 questions divided in to 3 pars A, B and C, each containing 4 questions. In how many ways can an examinee answer questions selecting at least one from each part.

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12. Find the number of all three elements subsets of the set $\{a_1, a_2, a_3, a_n\}$ which contain a_3.

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13. There are five boys A, B, C, D and E. The order of their height is $A < B < C < D < E$. Number of ways in which they have to be arranged in four seats in increasing order of their height such that C and E are never adjacent.

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14. Find the number of ways in which 3 distinct numbers can be selected from the set $\{3^1, 3^2, 3^3, \ldots, 3^{100}, 3^{101}\}$ so that they form a G.P.

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15. 7 relative of a man comprises 4 ladies and 3 gentleman, his wife has also 7 relatives. 3 of them are ladies and 4 gentlemen. In how ways can they invite a dinner party of 3 ladies and 3 gentlemen so that there are 3 of man's relative and 3 of the wife's relatives.

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16. The sides AB, BC, CA of a triangle ABC have 3, 4 and 5 triangles that can be constructed by using these points as vertices, is

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17. An examination consists of 10 multiple choice questions, where each question has 4 options, only one of which is correct. In every question, a candidate earns 3 marks for choosing the correct opion, and -1 for choosing a wrong option. Assume that a candidate answers all questions by choosing exactly one option for each. Then find the number of distinct combinations of anwers which can earn the candidate a score from the set {15, 16,17,18, 19, 20}.

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18. There are n points in a plane in which no large no three are in a straight line except m which are all i straight line. Find the number of (i) different straight lines, (ii) different triangles, (iii) different quadrilaterals that can be formed with the given points as vertices.

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Exercise 7 7

1. The number of permutation of all the letters of the word $PERMUTATION$ such that any two consecutive letters in the arrangement are neither both vowels nor both identical is

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2. The number 916238457 is an example of a nine-digit number which contains each of the digit 1 to 9 exactly once. It also has the property that the digits 1 to 5 occur in their natural order, while the digits 1 to 6 do not. Find the number of such numbers.

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3. The total number of ways in which six '+' and four '-' signs can be arranged in a line such that no two signs '-' occur together, is ....

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4. Find the number of permutations of n distinct things taken r together, in which 3 particular things must occur together.

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5. Find the number of three-digit numbers formed by using digits 1,2,3,4,6,7,8,9 without repetition such that sum of digits of the numbers formed is even.

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6. Out of 8 sailors on a boat, 3 can work only on one particular side and 2 only on the other side. Find the number of ways in which the ways in which the sailors can be arranged on the boat.

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7. In how many ways the letters of the word COMBINATORICS can be arranged if all vowel and all consonants are alphabetically ordered.

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8. Find the number of ways in which all the letters of the word 'COCONUT' be arranged such that at least one 'C' comes at odd place.

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9. Find the number of ways in which the letters of word 'MEDICAL' be arranged if A and E are together but all the vowels never come together.

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10. Six X ' s have to be placed in thesquares of the figure below, such that each rowcontains atleast one X. In how many different wayscan this be done?

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Exercise 7 8

1. In how many ways can 3 ladies and 3 gentlemen be seated around a round table so that any two and only two of the ladies sit together?

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2. In how many ways can 15 members of a council sit along a circular table, when the secretary is to sit on one side of the chairman and the deputy secretary on the other side?

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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

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4. Find number of ways that 8 beads o different colors be strung as a necklace.

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5. Find the number of ways in which 8 different flowered can be strung to form a garland so that four particular flowers are never separated.

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Exercise 7 9

1. In a n election, the number of candidates exceeds the number to be elected y 2. A man can vote in 56 ways. Find the number of candidates.

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2. There are 5 historical monuments, 6 gardens, and 7 shopping malls in a city. In how many ways a tourist can visit the city if he visits at least one shopping mall.

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3. Out of 10 white, 9 black, and 7 red balls, find the number of ways in which selection of one or more balls can be made (balls of the same color are identical).

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4. Find the number f divisors of 720. How many of these are even? Also find the sum of divisors.

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5. Find the number of odd proper divisors of $3^p \times 6^m \times 21^n$.

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6. In how many ways the number 7056 can be resolved as a product of 2 factors.

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7. Find the number of ways in which India can win the series of 11 matches (If no match is drawn and all matches are played).

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8. Statement 1: Number of ways of selecting 10 objects from 42 objects of which 21 objects are identical and remaining objects are distinct is 2^{20}.

Statement 2: $\hat{} \ 42C_0 +^{42} C_1 +^{42} C_2 + \ +^{42} C_{21} = 2^{41}$.

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Exercise 7 10

1. Find the number of ways in which four distinct balls can be kept into two identical boxes so that no box remains empty.

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2. Find the number of ways in which 22 different books can be given to 5 students, so that two students get 5 books each and all the remaining students get 4 books each.

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3. Find the number of ways in which 16 constables can be assigned to patrol villages, 2 for each.

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4. In how many ways can 10 different prizes be given to 5 students if one particular boy must get 4 prizes and rest of the students can get any number of prizes?

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5. Find the number of ways in which the birthday of six different persons will fall in exactly two calendar months.

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6. A double-decker bus carry $(u+e)$ passengers, u in the upper deck and e in the lower deck. Find the number of ways in which the $u+e$ passengers can be distributed in the two decks, if $r(\leq e)$ particular passengers refuse to go in the upper deck and $s(\leq u)$ refuse to sit in the lower deck.

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7. In how any different ways can a set A of $3n$ elements be partitioned into 3 subsets of equal number of elements? The subsets P, Q, R form a partition if $P \cup Q \cup R = A, P \cap R = \varphi, Q \cap R = \varphi, R \cap P = \varphi$.

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8. A firm of Chartered Accountants in Bombay has to send 10 clerks to 5 different companies, two clerks in each. Two of the companies are in Bombay and the others are outside. Two of the clerks prefer to work in Bombay while three others prefer to work outside. In how many ways can the assignment be made if the preferences are to be satisfied.

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Exercise 7 11

1. In how many ways can Rs. 16 be divided into 4 persons when none of them gets less than Rs. 3?

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2. Find the number of ways of selecting 10 balls out o fan unlimited number of identical white, red, and blue balls.

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3. If x, y, z, t are odd natural numbers such that $x + y + z + w = 20$ then find the number of values of ordered quadruplet (x, y, z, t).

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4. In how many ways, two different natural numbers can be selected, which less than or equal to 100 and differ by almost 10.

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5. Find the number of positive integral solutions of $xyz = 21600.$

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6. Find the number of positive integral solutions satisfying the equation $(x_1 + x_2 + x_3)(y_1 + y_2) = 77.$

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7. In how many ways 3 boys and 15 girls can sits together in a row such that between any 2 boys at least 2 girls sit.

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8. In how many ways can 30 marks be allotted to 8 question if each question carries at least 2 marks?

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9. Find the number of integral solutions of $x_1 + x_2 + x_3 = 24$ subjected to the condition that $1 \leq x_1 \leq 5, 12 \leq x_2 \leq 18 \text{ and } -1 \leq x_3$.

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10. Find the number of integers between 1 and 1000 having the sum of the digits 18.

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Exercise 7 12

1. Find the number of n digit numbers, which contain the digits 2 and 7, but not the digits 0, 1, 8, 9.

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2. Let $f: A \to A$ be an invertible function where $A = \{1, 2, 3, 4, 5, 6\}$ The number of these functions in which at least three elements have self image is

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3. The number of arrangments of all digits of 12345 such that at least 3 digits will not come in its position is

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Question Bank

1. If the number of ways in which a selection of 100 balls can be made out of 100 identical red balls, 100 identical blue balls and 100 identical white balls is $abcd$ (where $abcd$ is four digit number), then $(a+c-b-d)$ is equal to

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2. If the number of circular permutations of 20 letters P, Q, $R, S, T, A, A, A ... A(A$'s are 15 $) such t\hat{b}etweentwodist \in ct \leq erstherea reoddv mberofalike \leq ers(A's)$ overset(10) underset(5) \C` then k is

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3. Let N be the number of points (x, y, z) in space such that $x + y + z = 12$, where $x, y, z \in N$. The number of divisors of N is equal to

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4. On the sides AB, BC, CA of $a \triangle ABC, 3, 4, 5$ distinct points (excluding vertices $A, B, C)$ are respectively chosen. The number of triangles that can be constructed using these chosen points as vertices are

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5. The number of ways in which the letters of the word 'LONDON' can be rearranged if the two 'O's are together but the two 'N 's are separated is

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6. We have 19 identical gems available with us which are needed 'to be distributed among A, B and C such that A always gets an even number of gems. The number of ways this can be done is

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7. If ' N ' denotes the number of ways in which 8 different mobilès can be distributed among 3 people then find the number of different digits in ' N '.

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8. If the number of arrangements of 4 alike apples, 5 alike mangoes, 1 banana and 1 orange in which all the apples are together or all the mangoes are together is K, then find the sum of digits in K.

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9. Duronto express bound from Jaipur to Mumbai stops at 7 intermediate stations. 4 passengers enter the train during the journey holding 4 different tickets. The tickets can be of AC first class, AC second class, AC third class or chair car. If the number.of different sets of tickets they may have had is N then find the number of divisors of N which are divisible by 220 .

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10. There are 6 different balls and 6 different boxes of the colour same as of the colour of balls then the number of ways in which no ball goes in the box of its own colour is

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11. Consider $M = 2^4 3^4 5^2 7^2 11^2$ and number of ways in which M can be resolved as the product of 2 divisors is

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12. Consider the word 'HALEAKALA'. The number of ways the letters of this word can be arranged if all ' A ' are separated

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13. Consider the word 'CARCASSONNE'. Words are formed' using all the letters of this word. If number of words which contain the word 'CAR' and vowels are separated is $k(5!)$ then k is equal to

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14. If (201) ! is divided by 24^k then the largest value of k is

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15. If there are 10 stations on a route and the train has to be stopped at 4 of them, then the number of ways in which the train can be stopped so that atleast two stopping stations are consecutive is

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16. Let $A = \{1, 2, 3, 4]$. The number of different ordered pairs (B, C) that can be formed such that $B \subseteq A, C \subseteq A$ and $B \cap C$ is empty, is

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17. Number of ways in which three distinct numbers can be selected between 1 and 20 both inclusive, whose sum is even is

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18. Matrices are formed using four given distinct real numbers, taking all at a time, of'all possible orders. Number of such distinct possible matrices is

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19. If n is a factor of 72 , such that $xy = n$, then number of ordered pairs (x, y) are (where $x, y \in N$)

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