doubtnut
India's Number 1 Education App

MATHS

BOOKS - CENGAGE PUBLICATION

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. A. 115

B. B. 53

C. C. 232

D. 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

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. A. 1250

B. B. 2500

C. C. 625

D. 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. A. 60

B. B. 54

C. C. 56

D. 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^{10} (b)4.3^{8} (c)5.3^{8} (d)7.3^{8}

A. 3^{10}

B. 4.3^{8}

C. 5.3^{8}

D. 7.3^{8}

Answer: A

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9. Statement-1: If N the number of positive integral solutions of $x_1x_2x_3x_4 = 770$, then N is divisible by 4 distinct prime numbers.

Statement-2: Prime numbers are 2,3,5,7,11,13, . . which of the statements are true ?

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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. A. 900

B. B. 1800

C. C. 3600

D. 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. The number of ways in which 6 different balls can be put in two boxes of different sizes so that no box remain 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. A. 617

B. B. 671

C. C. 716

D. 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 boys 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. A. 36000

B. B. 9080

C. C. 3960

D. 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. A. 24

B. B. 240

C. C. 480

D. 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. A. 8640

B. B. 4800

C. C. 2400

D. 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. If the 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 N, then the value of $\left(N^{1/2} - 10\right)$ 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 Number of ways in which they can be seated in a line of 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_3, must come after A_2 (ii) neither A_2 nor A_3 seated brfore A_1

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

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

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

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 not 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.) $where a \langle b \langle c \langle d \rangle e \rangle f \rangle g.$

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. Find the number of pairs of parallel diagonals in a regular polygon of 10 sides.

A. 45

B. 35

C. 22

D. 64

Answer: A

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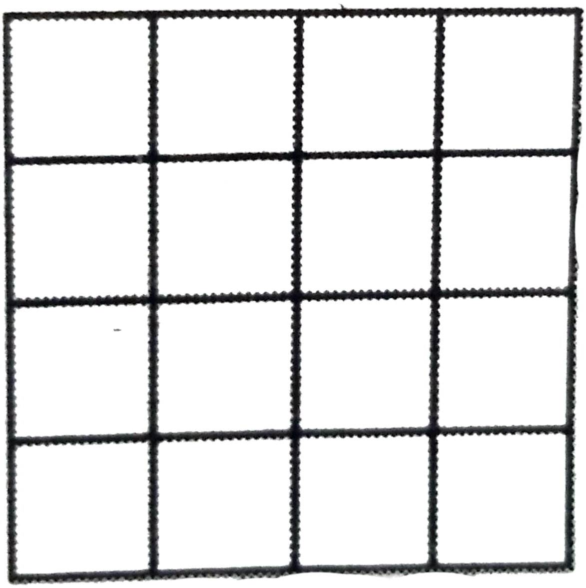
44. Four letters, two $'a'$ and two $'b'$ are filled into 16 cells of a matrix as given. It is required that each cell contains atmost one letter and each row or column cannot contain same letters. Then the number of ways the matrix can be filled is



(A) 3600 (B) 5200 (C) 3960 (D) 4120

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

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. about to only mathematics

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 mathematics 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. $(a)20$

B. (b) 25

C. $(c)30$

D. (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 $x_1x_2x_3 = y$, then the number of positive integral solutions of $x_1x_2x_3 = y$ 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, There are exactly 3 indian classic songs in top 5 is $(5!)^3$.

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2. $P = n(n^2 - 1)(n^2 - 4)(n^2 - 9)\ldots(n^2 - 100)$ is always divisible by , $(n \in I)$ (a) $2!3!4!5!6!$ (b)

$(5!)^4$ (c) $(10!)^2$ (d) $10!11!$

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) ${}^{15}C_5 \times {}^{10}C_5$

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

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 $a_1, a_2, \ldots.$ and $b_1, b_2, \ldots.$ be arithemetic progression such that $a_1 = 25,\ b_1 = 75$ and $a_{100} + b_{100} = 100$, then the sum of first hundred term of the progression$a_1 + b_1,\ a_2 + b_2$,.... 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 $\theta=(a_1, a_2, a_3, \ldots, a_n)$ 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. 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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Illustration

1. Compute: $\frac{24}{8}!$

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2. Compute: $\frac{48}{8}!$

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3. Evaluate: 11! - 7!

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4. Compute: $\frac{50}{10}!$

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5. Evaluate: 4! + 3!

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6. Evaluate: 4! + 5!

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7. Evaluate: 2! + 10!

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8. Evaluate: 10! +3!

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9. Evaluate: 9! +6!

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10. Evaluate: 7! - 4!

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11. Compute: $\frac{88}{11}!$

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12. Evaluate: 11! - 5!

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13. Evaluate: 10! - 6!

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14. Find n, if $\frac{n}{5!} = \frac{3}{6!} + \frac{1}{4!}$

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

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16. Find n, if $\frac{n}{6!} = \frac{1}{5!} + \frac{1}{4!}$

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

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18. Simplify: $\frac{(2n+3)!}{(2n)!}$

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

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20. Simplify: $\frac{(2n-1)!}{(2n)!}$

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21. Prove that $(n!)^2 < n^n(n!) < (2n)!$ for all positive integers n

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22. Simplify: $\frac{(n+2)!}{(n)!}$

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23. Find the exponent of 3 in 100!

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

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

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

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

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29. Simplify: $\frac{(n-3)!}{(n-1)!}$

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

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

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32. Simplify: $\frac{(n+3)!}{(n)!}$

Watch Video Solution

33. Simplify: $\frac{(n+1)!}{(n-1)!}$

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34. 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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35. 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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36. Is 5! + 4! = 7! ?

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37. Is 3! + 2! = 4! ?

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38. 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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39. Is 2! + 4! = 5! ?

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40. If $.^{n}C_{n-1} = 15$, then find n.

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

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43. If $.^{n+1}C_n = 11$, then find n.

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44. Find the number of ways in which $5A's$ and $6B's$ can be arranged in a row which reads the same backwards and forwards.

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

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47. If $.^{n+1}C_n = 17$, then find n.

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48. If $.^{n+1}C_n = 16$, then find n.

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49. If $.^nC_8 = .^nC_6$, then find $.^nC_2$.

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

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

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51. Compute: $\frac{8!}{6!}$

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52. Compute: $\frac{9!}{5!}$

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53. Compute: $\frac{10!}{7!}$

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54. Compute: $\frac{11!}{3!}$

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55. Compute: $\frac{15!}{9!}$

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56. Evaluate: (5+3)!

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57. There are n married couples at a party. Each person shakes hand with every person other than their spouse. The total number of hand-shakes must be:

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58. Evaluate: (9+2)!

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59. If $.^{n}C_{n-1} = 15$, then find n.

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60. Evaluate: (12-6)!

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61. Evaluate: (15-9)!

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

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63. 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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64. 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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65. 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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66. A box contains 5 different res and 6, different whit balls. In how many ways can 6 balls be selected so that there are at least two balls off each color?

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67. If $.^n C_7 = .^n C_2$, then find $.^n C_2$.

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

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69. Compute: $\frac{15!}{12!}$

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70. Compute: $\frac{10!}{5!}$

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71. If $.^n C_3 = .^n C_2$, then find $.^n C_2$.

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72. If $.^n C_5 = .^n C_3$, then find $.^n C_4$.

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

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

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76. 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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77. Find the value of $.^{9}P_4$

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78. Find the value of $.^{7}P_4$

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79. Evaluate $\frac{n!}{((n-r)!\}}$ when n=5, r=3

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80. Evaluate $\frac{n!}{((n-r)!\}}$ when n=9, r=7

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81. Evaluate $\frac{n!}{((n-r)!\}}$ when n=8, r=5

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82. If $.^{n}C_{4}=.^{n}C_{2}$, then find $.^{n}C_{3}$.

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83. Evaluate $\frac{n!}{((n-r)!\}}$ when n=6, r=3

Watch Video Solution

84. If $.^{n} C_{5} = .^{n} C_{4}$, then find $.^{n} C_{7}$.

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85. Evaluate $\frac{n!}{((n-r)!\}}$ when n=7, r=2

Watch Video Solution

86. Evaluate $\frac{n!}{((n-r)!\}}$ when n=7, r=5

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87. Find the value of $.^{9}C_{6}$

Watch Video Solution

88. Find the value of $.^{11}C_{10}$

Watch Video Solution

89. Find the value of $.^{10}C_{4}$

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90. Find the value of $.^{10}C_2$

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91. If $.^{n}C_4 = .^{n}C_6$, then find $.^{n}C_9$.

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92. Find the value of $.^{7}C_5$

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93. Find the factorials of $6 \times 7 \times 8 \times 9 \times 5$

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94. Find the factorials of $3 \times 8 \times 5$

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95. Find the factorials of $15 \times 8 \times 6$

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96. Find the factorials of $6 \times 20 \times 8 \times 42$

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97. Find the factorials of $10 \times 12 \times 6$

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98. If $.^{15}C_{r+1} = ^{15}C_{r+2}$, find r.

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99. If $.^{n}C_{14} = ^{n}C_{2}$, then find n.

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100. If $.^{13}C_r = ^{13}C_{r+5}$, find r.

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101. If $.^{n}C_6 = ^{n}C_{13}$, then find n.

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102. Write in terms of factorials: $6 \times 7 \times 12 \times 10$

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103. Write in terms of factorials: $3 \times 6 \times 9 \times 12 \times 15$

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104. Write in terms of factorials: $5 \times 10 \times 15 \times 20$

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105. Write in terms of factorials: $6 \times 8 \times 7 \times 9$

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106. Find the value of $.^9 C_3$

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107. If $.^n C_{12} =^n C_{11}$, then find n.

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108. Find the value of $.^6 C_3$

Watch Video Solution

109. Find the value of $.^8 C_4$

Watch Video Solution

110. Find the value of $.^{9}C_{2}$

Watch Video Solution

111. Find the value of $.^{12}C_{2}$

Watch Video Solution

112. Find the value of $.^{7}C_{4}$

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113. Find the value of $.^5 C_2$

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114. If $.^n C_{22} =^n C_7$, then find n.

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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. If $.^{n}C_{8} = ^{n}C_{7}$, then find n.

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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 $n(A) = 5 and n(B) = 3,$ 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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Solved Examples

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

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2. 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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3. $n_1 and n_2$ 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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4. How many five-digit numbers can be made having exactly two identical digits?

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5. 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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6. 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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7. 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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8. 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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9. 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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10. 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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11. 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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12. 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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13. 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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Exercise 7 1

1. If $.^{22}C_{r+4} = ^{22}C_{r+2}$, find r.

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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 first and second rank in mathematics, first and second rank in physics, first rank in chemistry, and first rank in English be given away to a class of 30 students.

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6. Five persons entered the lift cabin on the ground floor of an 8-floor house. Suppose 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 (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 5-digit number divisible by 3 is to be formed using the number 0,1,2,3,4 and 5 without repetiition. Find total of ways in whiich this can be done.

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Exercise 7 2

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

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2. Show that $1! + 2! + 3! + \ + n!$ 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 $2 and n\cdot$

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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 $\hat{} \ (n-1)P_r + r.^{n-1}P_{r-1} = .^nP_r$

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2. If $.^nP_5 = 20.^nP_3$, 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. The number of six-digit numbers all digits of which are odd, 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 two 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 are 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 sit 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 ${}^{15}C_{3r} = {}^{15}C_{r+3}$, find r.

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

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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 they 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. If $x, 2y, 3z$ are in A.P., where the distinct numbers x, y, z are in G.P, then the common ratio of the G.P. is a.3 b. $\frac{1}{3}$ c. 2 d. $\frac{1}{2}$

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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. about to only mathematics

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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. Roorkee University has to send 10 professors to 5 centers for its entrance examination, 2 to each center. Two of the enters are in Roorkee and the others are outside. Two of the professors prefer to work in Roorkee while three prefer to work outside. In how many ways can this 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 of an 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 $x+y+z+t=20$ 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. If $x, 2y, 3z$ are in A.P., where the distinct numbers x, y, z are in G.P, then the common ratio of the G.P. is a.3 b. $\frac{1}{3}$ c. 2 d. $\frac{1}{2}$

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10. Find the number of integers between 1 and 100000 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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