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## MATHS

## BOOKS - KC SINHA MATHS (HINGLISH)

## PERMUTATIONS AND COMBINATIONS - FOR

## COMPETITION

Solved Examples

1. How many ternary sequences of length 9 aare
there which either begin with 210 or end with 210.
2. In how many ways can the letters of the word ARRANGE be arranged so that two R's are never together ?

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3. In how many ways can the letters of he word ARRANGE be arranged so that the two A's are together but not two R's
4. If all the letters of the word $A R R A N G E$ are arranged in all possible ways, in how many of words we will have the A's not together and also the R's not together?

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5. John has $x$ children by his first wife. Mary has
$(x+1)$ children by her first husband. They marry and have children of their own. The whole family has

24 children. Assuming that two children of the same
parents do not fight prove that the maximum possible number of fights that can take place is 191.

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6. There are n letters and n corresponding envelopes. In how many ways the letters can be placed in the enveloped (one letters in each envelope) so that no letter is put in the right envelop.

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7. In how many ways 16 identical things can be distributed among 4 persons if each person gets atleast 3 things.
8. Find the number of non negative integral solutons of equation ${ }^{`} x+y+z+4 t=20$.

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9. Find the total number of ways of selecting five letters from the word INDEPENDENT.
10. Number of words of 4 letters that can be formed with theletters of the word BAMBOO is (A) 52 (B) 102
(C) 82 (D) 72

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11. A fruit basket contains 4 oranges, 5 apples and 6 mangoes. The number of ways person make selection of fruits from among the fruits in the basket is
12. Two packs of 52 playing cards are shuffled together. The number of ways in which a man can be dealt 26 cards so that does not get two cards of
the same suit and same denomination. (A) ${ }^{\wedge} 52 C_{26}$
(B) ${ }^{\wedge} 52 C_{26.2}$ (C) ${ }^{\wedge} 52 C_{26.2}^{26}$ (D) none of these

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13. An organisatiion has $n$ employees. If a committee needs to be fformed from among the employees ncluding at least tow employees and also excluding
at least two employees. The number of ways of
forming the committee is (A) $2^{n}-n-1$

$$
2^{n}-2 n-4 \text { (C) } 2^{n}-2 n-2 \text { (D) } 2^{n}-2 n
$$

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14. If $a, b, c \varepsilon N$ the number of points having vector $a \vec{i}+b \vec{j}+c \vec{k}$ such that $6 \leq a+b+c \leq 10$ is

## (A) 90 (B) 110 (C) 105 (D) 200

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15. The least possible is integral value of $x$ satisfying the inequality. ${ }^{10} C_{x-1}>2 \cdot{ }^{10} C_{x}$ is (A) 8 (B) 9 (C) 10

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16. The number of positive integers satisfying the inequality

$$
C(n+1, n-2)-C(n+1, n-1) \leq 100 \text { is }
$$

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17. If $a_{1}, a_{2}, a_{3}, \ldots ., a_{n+1}$ be $(n+1)$ different prime numbers, then the number of different factors (other than 1 ) of $a_{1}^{m} \cdot a_{2} \cdot a_{3} \ldots a_{n+1}$, is
18. Let $A=\{1,2, \ldots, n\}$ and $B=\{a, b\}$. Then number of subjections from $A$ into $B$ is nP2
$2^{n}-2$ (c) $2^{n}-1$ (d) nC2

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19. $m$ points on one straight line are joined to $n$ points on another straight line. The number of points of intersection of the line segments thus

$$
\frac{m n(m-1)(n-1)}{4}
$$

${ }^{\wedge} m C_{2}+{ }^{n} C_{2}$

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20. If $n$ objects are arrange in a row, then the number of ways of selecting three of these objects so that no two of them are next to each other is a.
${ }^{\wedge} n-2 C_{3}$ b. ^ $n-3 C_{2}$ c. ${ }^{\wedge} n-3 C_{3}$ d. none of these
21. Consider seven digit number $x_{1}, x_{2}, \ldots, x_{7}$, where $x_{1}, x_{2}, \ldots, x_{7} \neq 0$ having the property that $x_{4}$ is the greatest digit and digits towards the left and right of $x_{4}$ are in decreasing order. Then total number of such numbers in which all digits are distinct is

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22. Number of ways in which three numbers in A.P.
can be selected from $1,2,3, \ldots, n$ is a. $\left(\frac{n-1}{2}\right)^{2}$ if
$n$ is even b. $\left(\frac{n-2}{4}\right)$ if $n$ is even c. $\left(\frac{n-1}{4}\right)^{2}$ if $n$
is odd d. none of these

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23. There are ten points in a plane. Of these ten points, four points are in a straight line and with the exceptionof these four points, on three points are in the same straight line. Find i . the number of triangles formed, ii the number of straight lines formed iii the number of quadrilaterals formed, by joining these ten points.
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25. There are ten points in a plane. Of these ten
points, four points are in a straight line and with the
exceptionof these four points, on three points are in
the same straight line. Find $i$. the number of triangles formed, ii the number of straight lines formed iii the number of quadrilaterals formed, by joining these ten points.

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26. A is a set containing n elements. A subset $P_{1}$ of A is chosen. The set $A$ is reconstructed by replacing the elements P Next, a of subset $P_{2}$ of A is chosen and again the set is reconstructed by replacing the elements of $P_{2}$, In this way, m subsets $P_{1}, P_{2} \ldots, P_{m}$ of A are chosen. The number of ways of choosing
$P_{1}, P_{2}, P_{3}, P_{4} \ldots P_{m}$
27. A is a set containing n elements. A subset $P_{1}$ of A is chosen. The set $A$ is reconstructed by replacing the elements P Next, a of subset $P_{2}$ of A is chosen and again the set is reconstructed by replacing the elements of $P_{2}$, In this way, m subsets $P_{1}, P_{2} \ldots, P_{m}$ of A are chosen. The number of ways of choosing

$$
P_{1}, P_{2}, P_{3}, P_{4} \ldots P_{m}
$$

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28. A is a set containing n elements. A subset $P_{1}$ of A
is chosen. The set $A$ is reconstructed by replacing
the elements P Next, a of subset $P_{2}$ of A is chosen
and again the set is reconstructed by replacing the elements of $P_{2}$, In this way, m subsets $P_{1}, P_{2} \ldots, P_{m}$
of A are chosen. The number of ways of choosing

$$
P_{1}, P_{2}, P_{3}, P_{4} \ldots P_{m}
$$

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29. The number of points in space, whose each co-
ordinate is a negative integer such that
$x+y+z+12=0$

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30. The number of ways in which a mixed double tennis game can be arranged from amongst 9 married couple if no husband \& wife plays in the same game is:

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31. On a railway there are 20 stations. The number of different tickets required in order that it may be possible to travel from every station to every station

## Exercise

1. If $\wedge(n+1) C_{r+1}:^{n} C_{r}:{ }^{n-1} C_{r-1}=11: 6: 2$ find the values of $n$ and $r$.

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2. Show that $\sum_{k=m}^{n}{ }^{n} k C_{r}={ }^{n+1} C_{r+1}-{ }^{m} C_{r+1}$

## 3. Each of two parallel lines has a number $f$ distinct

 points marked on them. on one line there are 2 points $P$ and $Q$ and ont eh other there are 8 points. i.Find the number of triangles formed hving three of
the 10 points as vertices. ii. How many of these triangles include $P$ but exclude Q ?

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4. m women and n men are too be seated in a row
so that no two men sit together. If $m>n$ then
show that the number of wys in which they can be
seated is $\frac{m!(m+1)!}{(m-n+1)!}$

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5. How many different words of 4 letters can be formed with the letters of the word EXAMINATION?

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6. How many selections and arrangementsof 4
letters can be made from the letters of the word PROPORTION?

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7. A tea party is arranged for 2 m people along two sides of a long table with $m$ chairs on each side, $r$ men wish to sit on one particular side and $s$ on the other. IN how many ways can they be seates ? $[r, s, \leq m]$

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8. 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?
9. 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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10. There are three sections in a question paper, each containing 5 questions. A candidate has to solve any 5 questions, choosing at least one from each section. Find the number of ways in which the candidate can choose the questions.
11. A copmmittee of 12 is to be formed from 9 women
and 8 men. In how many ways this casn be done if at
least five women have to be included in a committee? In how many of these committees: The women are in majority?

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12. A committee of 12 is to be formed from nine women and eight men. In how many ways can this be done if at least five women have to be included in a committee? In how many of these committees a.
the women hold majority? b. the men hold majority?

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13. $m$ 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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14. There are two sets of parallel lines, their equations being $x \cos \alpha+y \sin \alpha=p ; \mathrm{p}=1,2,3, \ldots, \mathrm{~m}$ and $y \cos \alpha-x \sin \alpha=q ; \mathrm{q}=1,2,3, \ldots, \mathrm{n}(\mathrm{n}>\mathrm{m})$ where
a given constant. Show that the lines form $\frac{1}{6} m(m-1)(3 n-m-1)$ squares

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15. In how any different ways can a set $A$ of $3 n$ elements be partitioned into 3 subsets of equal number of elements? The subsets $P, Q, R$ form a partition

$$
P \cup Q \cup R=A, P \cap R=\varphi, Q \cap R=\varphi, R \cap P=\varphi
$$

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## 16. Let $N=a b$ be a two digit number (where $b \neq 0$ )

 which is divisible by both $a$ and $b$, then
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17. Show that $\left\lfloor k n\right.$ is divisible by $\left(\lfloor n)^{k}\right.$

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18. Find the number of non negative integral solutions of equation $a+b+c+d=20$.

# 19. Find the number of non-negative integral 

 solutions of inequation$x_{1}+x_{2}+\ldots \ldots \ldots \ldots+x_{k} \leq n$

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

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21. A five letter word is to be formed such that the
letters appearing in the odd numbered positions are taken from the letters which appear without repetition in the word MATHEMATICS. Further the letters appearing in the even numbered positions are taken from the letters which appear with repetition in the same word MATHEMATICS. The number of ways in which the five letter word can be formed is:
22. Box 1 contains six block lettered $A, B, C, D, E$ and $F$.

Box 2 contains four blocks lettered $\mathrm{W}, \mathrm{X}, \mathrm{Y}$ and Z . How
many five letters codewords can be formed by using
three blocks from box 1 and two blocks from box2?

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23. There are $2 n$ 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
$(2 n-2!) \times\left(4 n^{2}-6 n+4\right)$.

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24. 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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25. Find the number of equal positive integral solutions of equation $x_{1}+x_{2}+x_{3}=10$.

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26. The number of non negative integral solutions of $3 x+y+z=24$ is

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27. The number of integral solutions of equation

$$
x+y+z+t=29
$$

$x \geq 1, y \geq 2, z \geq 2,3$ and $t \geq 0$ is
28. The number of diagonals of a polygon of 20 sides

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si (A) 25 (B) 150 (C) 170 (D) 210
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29. 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
30. The number of paralle,ograms that can be formed form a set of four paralel lines intersecting another set of three parallel lines is (A) 8 (B) 18 (C) 12 (D) 9

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31. In a football championship, there were played 153 matches. Every two teams played one match with each other. The number of tems participating nt eh championship is (A) 17 (B) 18 (C) 9 (D) none of these
32. Out of 18 points in as plane, no three are in the same straight line except five points which re collinear. The num,ber of straight lines formed by joining them is (A) 143 (B) 144 (C) 153 (D) none of these

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33. The number of divisors of the form $(4 n+2)$ of the integer 240 is
34. How many different nine digit numbers can be formed from the number 22335588 by rearranging its digits so that odd digits occupy even positions 16 (b) 36 (c) 60 (d) 180

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35. If ^ $(n+1) C_{3}=2 .{ }^{n} C_{2}$, then $\mathrm{n}={ }^{\wedge}(\mathrm{A}) 3$ ( B$) 4$ (C)

5 (D) 6

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36. How many numbers of five digits can be found from the numbers $2,0,4,3,8$ when repetition of digits is not allowed? (A) 96 (B) 120 (C) 144 (D) 14

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37. The number of ways of dividing equally a pack of

52 playing cards among 4 players is (A) $52 \frac{!}{13}$ !
$52 \frac{!}{(13!)^{2}}$ (C) $52 \frac{!}{(13!)^{2}}$ (D) $52 \frac{!}{((13!))^{4}}$

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38. Let $E=[] 1,2,3,4]$ and $F=(12)$ Then the number o onto functions from $E$ to $F$ is (A) 14 (B) 16
(C) 2 (D) 8

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39. The number of circles that can be drawn out of 10 points of which 7 are collinear is (A) 120 (B) 113 (C) 85 (D) 86

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40. A box contains two white balls, three black balls nd four red balls. The number of ways in which three balls can be drawn from the box so that at least one of the balls is black is
A. 74
B. 84
C. 64
D. 20

## Answer: C

41. The number of words that can be formed by using the letters of the word MATHEMATICS that start as welll as end with T are (A) 90720 (B) 28060
(C) 71390 (D) none of these

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42. The number of ways in which 20 one rupee coins
can be distributed among 5 people such that each person, gets at least 3 rupees, is

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43. In a group of boys, two boys are brothers and in
this group 6 more boys are there. In how many ways they can sit in a row if the brothers are not to sit side by side? (A) 30240 (B) 1410 (C) 2830 (D) 8420

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44. A five-digit number divisible by 3 is to be formed using the digits $0,1,2,3,4$, and 5 , without repetition.

The total number of ways this can done is a .216 b .
240 c. 600 d. 3125
45. If $n C_{r-1}=36, n C_{r}=84$ and $n C_{r+1}=126$, then
(a) $n=8, r=4$
(b) $\quad n=9, r=3$
$n=7, r=5(\mathrm{~d})$ non of these

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46. The number of ways of distributing 50 identical
things among 8 persons in such a way that three of
them get 8 things each, two of them get 7 things
each and remaining 3 get 4 things each, is equal to
47. Let $x y z=105$ where $x, y, z \in N$. Then number of ordered triplets ( $x, y, z$ ) satisfying the given equation is

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48. A committtee of three people is to be chosen
from 4 married couples. The number of committees
that can be made such that it consists one woman and two men except that a husbnd and wife both cannot serve on the committee is (A) 2 (B) 4 (C) 8 (D)

12
49. Find the number of ways in which four particular persons $\mathrm{A}, \mathrm{B}, \mathrm{C}, \mathrm{D}$ and six more persons can stand in a queue so that $A$ always stands before $B, B$ before and C before D .

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50. The number of ways in which 10 persns can sit around a table so that they do not have sam neighbour in any tow arrangements? (A) 9!
$\frac{1}{2}(9!)$ (C) 10 ! (D) $\frac{1}{2}(10)^{\prime}$
51. How many different signals can be made by hoisting 6 differently coloured flags one above the other when any number of them may be hoisted at once?

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52. If $n(B)=p, n(B)=q$ and total number of
functions from $A$ to $B$ is 343 , then $p-q(A) 3$ (B) -3 (C)
4 (D) none of these
53. If $n(B)=2$ and the number of functions from A and $B$ which are onto is 30 , then number of elements in $A$ is (A) 4 (B) 5 (C) 6 (D) none of these

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54. The number of ordered triplets of positive integers which satisfy the inequality
$20 \leq x+y+z \leq 50$ is
(A) ${ }^{50} C_{3}-{ }^{19} C_{3}$
(B) ${ }^{50} C_{2}-{ }^{19} C_{2}$
(C) ${ }^{51} C_{3}-{ }^{20} C_{3}$
(D) none of these

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55. Number of ways in which 5 boys and 4 girls can be arranged on a circular table such that no two girls sit together and two particular boys are always together: (A) 276 (B) 288 (C) 296 (D) 304

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56. The number of six digit numbers that can be formed from the digits $1,2,3,4,5,6 \& 7$ so that digits do not repeat and terminal digits are even is:
57. 

$A=\left\{x_{1}, x_{2}, x_{3}, x_{4}, x_{5}\right\}, B=\left\{y_{1}, y_{2}, y_{3}, y_{4}\right\}$,
Function $f$ is defined from $A$ to $B$. Such that $f\left(x_{1}\right)=y_{1}$, and $f\left(x_{2}\right)=y_{2}$ then, number of onto functions from $A$ to $B$ is (A) 12 (B) 6 (C) 18 (D) 27

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58. If $n(A)=2$ and total number of relations from
$A$ to $B$ is 1024 , then number of elements in $B$ is (A) 4
(B) 5 (C) 6 (D) none of these
59. The sum of odd divisors of 360 is

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60. There are 6 balls of different colours and 3 boxes of different sizes. Each box can hold all the 6 balls.

The balls are put in the boxes so that no box remains expty. The number of ways in which this can be done is (A) 534 (B) 543 (C) 540 (D) 28
61. Number of divisors of $2^{2} \cdot 3^{3} \cdot 5^{3} \cdot 7^{5}$ of the form ' $4 n+1$ ', is (A) 46 (B) 47 (C) 96 (D) none of these

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62. If m=number of distinct rational numbers $\frac{p}{q} \in(0,1)$ such that $p, q \in\{1,2,3,4,5\}$ and $n=$ number of onto mappings from $\{1,2,3\}$ onto $\{1,2\}$, then $m-n$ is
63. $n$ dice are thrown and the total number of possible outcomes in which at least one die shows 1 is 671 , then $n=(A) 3$ (B) 4 (C) 5 (D) none of these

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64. If the number of words of 4 letters formed with $n$
different letters of an alphabet such that at least on
letter is repeated in the word is 936 , then $n=(A) 4$ (B)
5 (C) 6 (D) none of these
65. There are n different books each having m copies
. If the total number of ways of making a selection from them is 255 and $m-n+1=0$ then distance of point (m,n) from the origin (A) 3 (B) 4 (C) 5 (D) none of these

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66. If $a, b, c \varepsilon N$ then number of points having positions vector $a \vec{i}+b \vec{j}+c \vec{k}$ such that 5
$\leq a+b+c \leq 10$ is (A) 120 (B) 116 (C) 100 (D) none of these
67. A five digit number divisible by 6 is to be formed using the digits $0,1,2,3,4,5$ without repition. Number of ways it can be done is

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68. The number of ways in which a mixed double game can be arranged from amongst 5 maried couples if at least one husband and wife play in the same game (A) 200 (B) 140 (C) 60 (D) none of these
69. $n$ boys and $n$ girls sit alternately along a line in $x$
ways and along a circle in y ways such that $x=10 y$,
then the number of ways in which n boyscan sit
around a round table so that none of themhas same
two neighbours, is

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70. A person goes in for an examination in which there are four papers with a maximum of $m$ marks
from each paper. The number of ways in which one can get 2 m marks is
71. Find the number of non negative integral solutons of equation ${ }^{~} x+y+z+4 t=20$.

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72. The number of ways of arranging seven persons
(having $A, B, C$ and $D$ among them) in a row so that
$\mathrm{A}, \mathrm{B}, \mathrm{C}$ and D are always in order $\mathrm{A}-\mathrm{B}-\mathrm{C}-\mathrm{D}$ (not necessarily together) is (A) 24 (B) 5040 (C) 210 (D)

720
73. The number of ways of selecting two numbers from the set $\{1,2, \ldots \ldots \ldots \ldots \ldots .12\}$ whose sun is divisible by 3 is (A) 66 (B) 16 (C) 6 (D) 22

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74. The total number of flags with three horizontal
strips in order, which can be formed using 2 identical red, 2 identical green, and 2 identical whit strips is equal to a. $4!$ b. $3 \times(4!)$ c. $2 \times(4!)$ d. none of these
75. A polygon has 44 diagonals. The number of its sides are

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76. The sum of the digits in tens place of all numbers
formed with the digits $1,2,3,4,5$ taken all at a time without repetition is

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77. On a raiway there are 10 stations. The number of
types of tickets required in order that it may be
possible to book a passenger from every staton to every other is

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78. The number of ' $n$ ' digit numbers such that no two consecutive digits are same is

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79. The number of divisors of 3630 , which have a remainder of 1 when divided by 4 , is
80. The number of positive numbers of not more than 10 digits formed by using $0,1,2$ and 3 is (A) 18 (B)

24 (C) $4^{10}, 3^{10}$ (D) $4^{10}-1$

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81. Number of ways in which the number 44100 can be resolved as a product of two factors which are relatively prime is (A) 7 (B) 15 (C) 8 (D) 16
82. If $\sum_{r=1}^{20}\left(r^{2}+1\right) r \neq k!20$ then sum of all divisors of $k$ of the from $7^{n}, n \varepsilon l \in N$ is (A) 7 (B) 58 (C) 350
(D) none of these

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83. A bag contains $n$ white and $n$ red balls. Pairs of balls are drawn without replacement until the bag is
empty. If the number of ways in which each pair
consists of one red and one white ball is 14400 , then

$$
\text { n is: (A) } 120 \text { (B) } 144 \text { (C) } 5 \text { (D) } 10
$$

84. Ten different letters of an alphabet are given.

Words with five letters are formed from these given
letters. Determine the number4 of words which have
at least one letter repeated.

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85. A five digit number divisible by 3 is to be formed using the digits $0,1,2,3,4$ and 5 without repetitioon. If the tota number of ways in which this casn bedone is $n^{3}$, then $\lfloor n=$ (A) 720 (B) 120 (C) 48 (D) 12
86. The number of weays in which a mixed doubles
tenis game can be arranged between 10 players
consisting of 6 men and 4 women is (A) 180 (B) 90
(C) 48 (D) 12

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87. A number is said to be a nice number if it has
exactly 4 factors (includng 1 and the number itself).
Then number of divisor of 2520 which are nice numbers is (A) 7 (B) 8 (C) 9 (D) none of these
88. If number of two-digit numbers which are of the form xy with $y$

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89. The number of seven digit numbers divisible by 9
formed with the digits , ,,2,3,4,5,6,7,8,9 without repetition is (A) 7 ! (B) ${ }^{\wedge} 9 P_{-} 7(C) 3(7!)(D) 4(7!)^{\wedge}$

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90. Number of positive unequal integral solutions $f$
equation $x+y+z=6$ is (A) 4! (B) 3! (C) 6! (D)
none of these

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91. $\sum_{k=1}^{m}\left(k^{2}+1\right) k=2009 \times 2010!$, thenm $=$

2009 (B) 2010 (C) 2011 (D) none of these

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92. The number of different words (with or without meaning) of 3 letters from the word INDIA is (A) 30

$$
\text { (B) } 27 \text { (C) } 33 \text { (D) } 60
$$

93. The number of zeros at the end of (108!) is (A) 25
(B) 16 (C) 21 (D) 10

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94. Find the number of ways of arranging six persons (having $A, B, C$ and $D$ among them) in a row sothat $A, B, C$ and $D$ are always in order $A B C D$ (not necessarily together).
95. 2nd idetical coins are arrangeed in a row and the number of ways in which the number of heads is equal to the nuber of tails is 70 , then $n=(A) 4$ (B) 5
(C) 3 (D) none of these

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96. If the number of ways of selecting $r$ balls with replcement out of $n$ balls numbered $1,2,3 . . . . . ., 100$ such that the largest number selected is 10 is 271 , then $r=$ (A) 4 (B) 5 (C) 3 (D) none of these
97. Let $A$ be a set containing $n$ elements. If the number of elements in the set,
$B=\{(x, y, z): x \varepsilon A, y \varepsilon A, z \varepsilon A$ and $x, y, z$ are not all distict) is equal to 280 , the $n=(A) 8$ (B) 10 (C) 20
(D) none of these

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98. Number of ways in which three numbers in A.P.
can be selected from $1,2,3, \ldots, n$ is a. $\left(\frac{n-1}{2}\right)^{2}$ if
$n$ is even $b$. $\left(\frac{n-2}{4}\right)$ if $n$ is even c. $\left(\frac{n-1}{4}\right)^{2}$ if $n$ is odd d. none of these
99. Let $p=2520 x=$ number of divisor of p which re multiples of $6, y=n u m b e r s$ of divisors of $p$ which are multiples of 9 then (A) $x=24$ (B) $x=12$ (C) $y=16$ (D)
$y=12$

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100. Find the number of ways of selecting 10 balls out o fan unlimited number of identical white, red, and blue balls.
101. In a shop there are five types of ice-creams available. A child buys six ice-creams. Statement -1:

The number of different ways the child can buy the
six ice-creams is ${ }^{\wedge} 10 C_{5}$. Statement -2 : The number
of different ways the child can buy the six ice-creams
is equal to the number of different ways of arranging 6 As and 4 Bs in a row. (1) Statement 1 is
false, Statement (2)(3) - 2(4) is true (6) Statement
1 is true, Statement $(7)(8)-2(9)(10)$ is true,
Statement $(11)(12)-2(13)$ is a correct explanation
for Statement 1 (15) Statement 1 is true, Statement
$(16)(17)-2(18) \quad(19)$ is true; Statement
$(20)(21)-2(22)$ is not a correct explanation for

Statement 1. (24) Statement 1 is true, Statement
$(25)(26)-2(27)$ is false.

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102. Let the letters of the word SACHIN be arranged in all possible ways and these words be written as in a dictionary. If $x$ be the serial number where the word SACHIN appears, then (A) x is a multiple of 10
(B) $x$ is a multiple of 15 (C) $x$ is a multiple of 105 (D) $x$ is a multiple of 24
103. If the total number of relations form set $A$ to set Bis1024, and $n(A)>1, n(B)>1, \quad$ then

$$
\begin{equation*}
n(A)=2, n(B)=5 \text { (В) } n(A)=5, n(B)=2 \tag{C}
\end{equation*}
$$

$n(A)=10, n(B)=1(\mathrm{D}) n(A)=1, n(B)=10$

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104. Number iof ways in which $m$ men and $n$ women
can be arranged in a rwo so that no two women are
together is $m!^{m=1} P_{n}$ Also number oif ways in which
m men and n women can be seated in a row so that
all the n women are together is $(m=1)!n$ ! On the
basis of above information answer the following question: Number of ways in which 10 boys and 5
girls can be seated in a row so that no boy sits between girls is (A) $5!\times 10_{P} \quad 5$ (B) $5!\times 11_{P}{ }_{-} 5$
(C) $10!\times 11_{P}-5$ (D) $5!\times 11^{`}$

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105. How many number from 1 and 100 written in the decimal form have the digit 5 in them? (i)11 (ii)10 (iii)

15 (iv)20
106. The number of ways in which we can choose 2 distinct integers from 1 to 100 such that difference between them is at most 10 is

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107. The number of factors (excluding 1 and the expression itself) of the product of $a^{7} b^{4} c^{3}$ def, where $\mathrm{a}, \mathrm{b}, \mathrm{c}, \mathrm{d}, \mathrm{e}$, fare all prime numbers, is

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108. The largest integer n for which 34 ! Is divisible by $3^{n}$ is

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109. The number of different messages produced by using five signals with three dots and two dashes is

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110. Assertion: If $m$ parallel lines are intersected by $n$ other parallel llines, then the number of parallelograms thus formes is $(m n(m-1)(n-1)) / 4$,

Reason: A selection of 4 lines 2 form $m$ parallel lines
and 2 from n parallel lines givers one parallelogram.
(A) Both A and R are true and R is the correct explanation of $A(B)$ Both $A$ and $R$ are true $R$ is not te correct explanation of $A(C) A$ is true but $R$ is false.
(D) $A$ is false but $R$ is true.

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111. Assertion: Number of different squares which
can be formed on as chess board is 204. Reason

Number ways in which $r$ consecutive squares can be selected from n square in a row is $(n-r)$ (A) Both A and $R$ are true and $R$ is the correct explanation of $A$
(B) Both A and R are true R is not te correct explanation of $A$ (C) $A$ is true but $R$ is false. (D) $A$ is false but $R$ is true.

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112. Assertion: The number of different number plates which can be made if the number plte contain three letters of the English alphabet followied by athree digit number is $(26)^{3} \times(900)$ (if represents are allowed) Reason: The number of permutationis of n different things taken r at time when repetitios are allowed is $n^{r}$. (A) Both A and R are true and R is the correct explanation of $A(B)$ Both $A$ and $R$ are
true $R$ is not te correct explanation of $A(C) A$ is true but $R$ is false. (D) A is false but $R$ is true.

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113. Assertion: Numberof four fdifferent digits is formed wilth of the digits $1,2,3,4,5,6,7$ in all possible ways. Then nuber of nubers whch are divisible by 4 is
200., Reason: A number is divisible by 4 if the digit at units place is divisible by 4. (A) Both $A$ and $R$ are true and $R$ is the correct explanation of $A(B)$ Both $A$ and $R$ are true $R$ is not te correct explanation of $A(C) A$ is true but $R$ is false. (D) $A$ is false but $R$ is true.
114. Assertion: The nuber of non -negative integral solutions of equation
$x_{1}+x_{2}+x_{3}+\ldots \ldots \ldots+x_{n}=r i s^{r+n-1} C_{r}$,
Reason: The number of ways in which $r$ identical things can be distributed among $n$ persons is ${ }^{\wedge}(r+n-1) C_{r}(\mathrm{~A})$ Both A and R are true and R is
the correct explanation of $A(B)$ Both $A$ and $R$ are true $R$ is not te correct explanation of $A(C) A$ is true but $R$ is false. (D) A is false but $R$ is true.

## D Watch Video Solution

115. If $a_{n}=\sum_{r=0}^{n} \frac{1}{{ }^{n} n C_{r}}$, then $\sum_{r=0}^{n} \frac{r}{{ }^{n} n C_{r}}$ equals $(n-1) a_{n}$ b. $n a_{n}$ c. $(1 / 2) n a_{n}$ d. none of these

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116. The number of divisors of the form $(4 n+2)$ of the integer 240 is

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117. 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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118. How many different nine digit numbers can be formed from the number 22335588 by rearranging its digits so that odd digits occupy even positions 16
(b) 36 (c) 60 (d) 180

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119. The number of arrangements of the letters of the word BANANA in which the two Ns do not appear adjacently is a. 40 b. 60 c .80 d .100

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120. ${ }^{\wedge} n C_{r}+{ }^{n} C_{r+1}+{ }^{n} C_{r+2}$ is equal to
$(2 \leq r \leq n)$
(A) $2^{n} C_{r+2}$
(B) $2^{n+1} C_{r+1}$
$2^{n+2} C_{r+2}$ (D) none of these

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121. Using permutation or otherwise, prove that ${ }^{`}\left(n^{\wedge} 2\right)!/(n!)^{\wedge} n$ is an integer, where $n$ is a positive integer. (JEE-2004]

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122. If $\quad n-1 C_{r}=\left(k^{2}-3\right)^{n} C_{r+1}$, then k $\in$
$(-\infty,-2]$ b. $[2, \infty)$ c. $[-\sqrt{3}, \sqrt{3}]$ d. $(\sqrt{3}, 2]$

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123. A rectangle with sides of lengths
$(2 n-1)$ and $(2 m-1)$ units is divided into
squares of unit length. The number of rectangles
which can be formed with sides of odd length, is (a)
$m^{2} n^{2}$
(b) $m n(m+1)(n+1)$
(c) $4^{m+n-1}$
(d) non of
these

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124. If $r, s, t$ are prime numbers and $p, q$ are the positive integers such that their LCM of $p, q$ is $r^{2} t^{4} s^{2}$, then the numbers of ordered pair of $(p, q)$ is
(A) 252 (B) 254
(C) 225
(D) 224
125. The letters of the word COCHIN are permuted and all the permutations are arranged in an alphabetical order s in an English dictionary. The number of words that appear before the word COCHIN is a. 360 b. 192 c. 96 d. 48

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126. The number of seven digit integers, with sum of
the digits equal to 10 and formed by using the digits
1,2 and 3 only, is

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