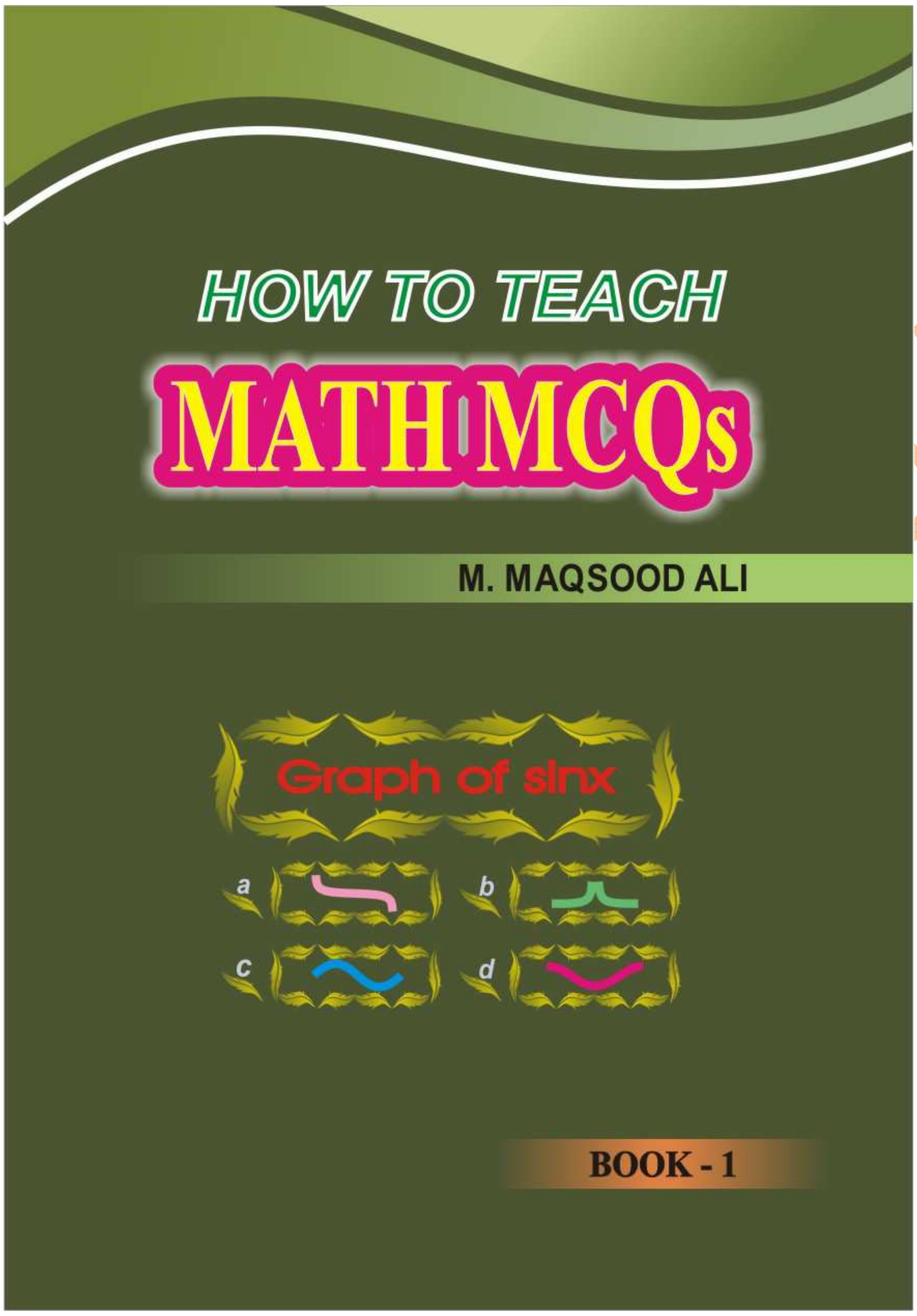

HOW TO TEACH
MATH MCQs
M. MAQSOOD ALI
Graph of sinx
a
b
c
d
BOOK - 1

PERMUTATION AND COMBINATION

COMBINATION

A combination is a “unordered selection” of r objects from n different objects.

Symbol:

The number of combination of n different objects taken r at a time is denoted by

$$^{n}C_{r}$$

Formula:

$$^{n}C_{r}=\frac{n!}{(n-r)!\,r!}$$

Explanation:

ABCD are letters. The following four ways in which 3 letters can be selected from the letters ABCD.

In other words these are four sets, as given below.

{A,B,C}, {A,B,D}, {A,C,D}, {B,C,D}

Number of sets= 4

Using Formula:

Total letters= $n=4$

Selected letters= $r=3$

$$^{4}C_{3}=\frac{4!}{(4-3)!\,3!}=4$$

PERMUTATION

A permutation is an “ordered arrangement” of r objects from n different objects.

Symbol:

The number of permutation of n different objects taken r at a time is denoted by

$$^{n}P_{r}$$

Formula:

$$^{n}P_{r}=\frac{n!}{(n-r)!}$$

Explanation:

The combination of four letters ABCD taken 3 at a time is given below.

{A,B,C}, {A,B,D}, {A,C,D}, {B,C,D}

Each combination (set) has following six different arrangements.

	{A,B,C}	{A,B,D}	{A,C,D}	{B,C,D}
(1)	ABC	ABD	ACD	BCD
(2)	ACB	ADB	ADC	BDC
(3)	BAC	BAD	CAD	CBD
(4)	BCA	BDA	CDA	BDB
(5)	CAB	DAB	DAC	DBC
(6)	CBA	DBA	DCA	DCB

Total arrangements=24

Using Formula:

Total letters= $n=4$

Selected letters= $r=3$

$$^{4}P_{3}=\frac{4!}{(4-3)!}=24$$

FORMULAE

COMBINATION	PERMUTATION
i) Elements can not be repeated ($^{n}C_r$): Example: In how many ways three person can choose from 10 members. Solution: No. of ways = $^{10}C_3 = 120$	**i) Elements can not be repeated ($^{n}P_r$):** Example: In how many ways a president, a vice president and a secretary can choose from 10 members. Solutions: No. of ways = $^{10}P_3 = 720$
ii) Elements may be repeated ($^{n+r-1}C_r$): Example: A man has three types of cold drink A,B and C in his refrigerator. In how many ways he can serve the type of cold drink of his two guest. If the guest can get same type of cold drinks. Solution: No. of ways = $^{3+2-1}C_2 = 6$	**ii) Elements may be repeated (n^r):** Example: How many words of two letters out of three letters A, B and C be formed. The letters can be repeated. Solution: No. of words = $3^2 = 9$

PERMUTATION

LETTERS AND WORDS

MCQ- 1:

How many words can be formed using 4 letters out of the letters of the word DANGER?

(a) 150 (b) 120 (c) 360 (d) 15

Solution:

Total number of letters in the word DANGER= $n = 6$

Number of letters in required words= $r = 4$

Total number of word can be formed= ${}^{n}P_{r} = \frac{n!}{(n-r)!}$

$$= {}^{6}P_{4}$$

$$= \frac{6!}{(6-4)!}$$

$$= \frac{6!}{2!}$$

$$= 360$$

The answer is (c).

MCQ-2 :

How many words can be formed out of the letters of the word “EAT”?

(a) 3 (b) 4 (c) 5 (d) 6

Solution:

Total number of letters in the word EAT= $n = 3$

Total number of word can be formed = $n!$

$$= 3!$$

$$= 6$$

The answer is (d).

MCQ-3 :

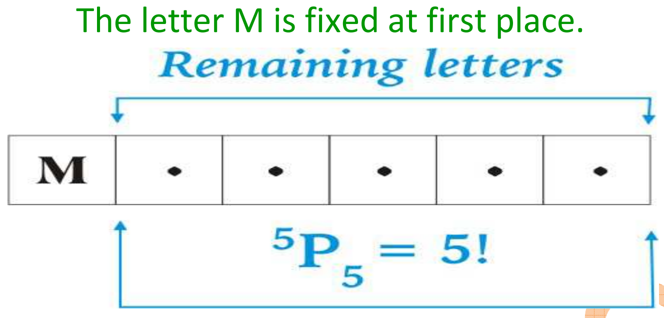
How many words can be formed out of the letters of the word DEMOLY, begin with M?

(a) 120 (b) 60 (c) 12 (d) 150

Solution:

Total number of letters in the word DEMOLY $= 6$

The letter M is fixed at first place.



Remaining letters$= 6 - 1$

$n = 5$

Total number of words$= n!$

$= 5!$

$= 120$

The answer is (a).

MCQ-4 :

How many words can be formed of the letters of the word REASON such that vowels come together?

(a) 144 (b) 120 (c) 24 (d) 720

Solution:

Total number of vowels=3

Tie the vowels A, E, O such as
Now the vowels move together, so count it one letter.

A, E, O

But they can interchange the position to each other.

Total number of arrangement of vowels $= \ 3!$

Total number of consonant $= \ 3$

Total letters=3 consonant+1 circle (containing three vowels A, E, O) $= \ 4$

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MCQ-6 :

How many words can be formed using the letters of the word MATHEMATICA, begin with A?

(a) $\dfrac{10!}{2!.2!.3!}$ (b) $\dfrac{11!}{(2!)^3}$ (c) $\dfrac{11!}{2!.2!.3!}$ (d) $\dfrac{10!}{(2!)^3}$

Solution:

Fix A at first place.

Total remaining letters $= 11 - 1 = 10$

Number of A $= 3 - 1 = 2$

Number of M $= 2$

Number of T $= 2$

$$\text{Number of words} = \frac{10!}{2!.2!.2!} = \frac{10!}{(2!)^3}$$

The answer is (d).

EXERCISE-1

(1) In how many ways r objects can be arranged out of n unlike objects?

(a) $n!\,(n-r)!$ (b) $\dfrac{n!}{(n-r)!}$ (c) $\dfrac{n!}{r!\ (n-r)!}$ (d) $\dfrac{n!\ r!}{(n-r)!}$

(2) How many words can be formed out of the letters of the word HOME?

(a) 24 (b) 12 (c) 18 (d) 6

(3) How many words of 3 letters out of the letters of the word "CAGE" can be formed?

(a) 16 (b) 4 (c) 24 (d) 8

(4) In how many ways 3 letters can be selected of the letters of the word "CAGE" ?

(a) 12 (b) 4 (c) 24 (d) 8

(5) How many different arrangements can be done using all letters of the word "HIGH"?

(a) 10 (b) 12 (c) 24 (d) 6

(6) How many different arrangements can be done using all letters of the word "AGREE"?

(a) 24 (b) 12 (c) 60 (d) 30

(7) How many different arrangements can be done using all letters of the word "COMMITTEE" begin with T?

(a) $\frac{9!}{4}$ (b) $\frac{8!}{8}$ (c) $\frac{9!}{8}$ (d) $\frac{8!}{4}$

(8) How many words can be formed using all letters of the word "TOMORROW" the word begin with W and end with R?

(a) $\frac{8!}{3!\,2!}$ (b) $\frac{6!}{3!\,2!}$ (c) $\frac{8!}{3!}$ (d) $\frac{6!}{3!}$

(9) How many words can be formed using all letters of the word "EIGHTEEN" all consonant occurs together?

(a) $\frac{8!}{3!}$ (b) $\frac{4!\,5!}{3!}$ (c) $\frac{8!\,4!}{3!}$ (d) $\frac{4!\,4!}{3!}$

(10) How many words can be formed using all letters of the word "COMMON" the words begin with C or N?

(a) $\frac{5!}{2!}$ (b) $\frac{2.6!}{2!\,2!}$ (c) $\frac{6!}{(2!)^2}$ (d) $\frac{5!}{(2!)^2}$

(11) How many words consist of 3 different letters can be formed using the letters A,C,P,T and U if C must be in the middle?

(a) 12 (b) 2! (c) 6 (d) 8

DIGITS AND NUMBERS
(DIGIT NOT REPEATED)

MCQ- 7:

Given that 2, 3, 4, 5, 6 are five digits. How many natural numbers can be formed of three digits, such that none of the digit is repeated in any number?

(a) 60 (b) 30 (c) 10 (d) 40

Solution:

Total digits= 5
No. of digits in required natural number= 3

No. of natural numbers $= {}^{5}P_{3}$

$$= \frac{5!}{2!}$$

$$= 60$$

The answer is (a).

MCQ-8 :

Given that 2, 3, 4, 5, 6 are five digits. How many natural numbers can be formed of three digits, such that the digit may be repeated?

(a) 10 (b) 30 (c) 60 (d) 125

Solution:

Total digits= 5
No. of digits in required natural number= 3

No. of natural numbers $= 5^3$

$$= 125$$

The answer is (d).

MCQ- 9:

Given that 2, 3, 4, 5, 6 are five digits. How many even numbers can be formed of three digits, such that none of the digit is repeated in any number?

(a) 120 (b) 72 (c) 36 (d) 180

Solution:

Total digits= 5

No. of digits in required natural number= 3

For even number, the last digit must be 2, 4 or 6.

There are three choices and put one of them, so

·	·	2

·	·	4

·	·	6

Total remaining digits= $5-1$

$$= 4$$

Remaining digits in required even number= $3-1$

$$= 2$$

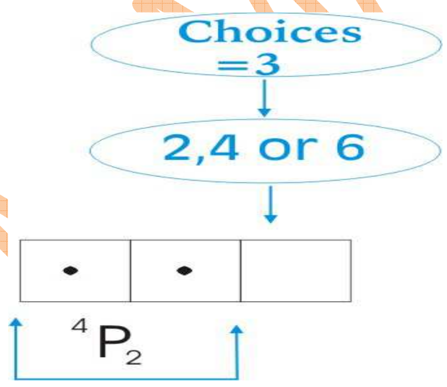
$$\text{Total even number} = 3 \times {}^4P_2$$

$$= 3 \times \frac{4!}{2!}$$

$$= 36$$

The answer is (c).

Shortcut:



$$\text{Total even number} = 3 \times {}^4P_2 = 3 \times \frac{4!}{2!} = 36$$

The answer is (c).

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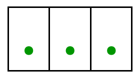
DIGIT CAN BE REPEATED

MCQ- 11:

Given that 2, 3, 4, 5, 6 are five digits. How many natural numbers can be formed of three digits, such that the digits may be repeated?

(a) 60 (b) 125 (c) 243 (d) 96

Solution:



No. of places = 3
No. of total digits = 5
Which thing is repeating, digit or places?
Digits are repeating. (base=No. of digits)

Total natural numbers of three digits $= (\text{No. of digits})^{\text{No. of places}}$

$= 5^3$

$= 125$

The answer is (b).

ANOTHER EXAMPLE FOR EXPLANATION:

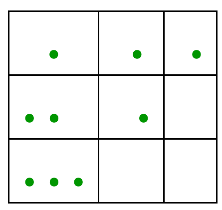
MCQ-12 :

Total number of ways in which 5 balls of different colors can be put in 3 boxes, when there is no restriction to the choice of a box?

(a) 60 (b) 125 (c) 243 (d) 96

Solution:

No. of balls = 5
No. of boxes = 3
There are three cases:



Which thing is repeating?

The box is repeating not balls. (base=No. of boxes)

$$\text{Total number of ways} = (\text{No.of boxes})^{\text{No. of balls}}$$

$$= 3^5$$

$$= 243$$

The answer is (c).

MCQ-13 :

Given that 0, 2, 5, 6, 7 are five digits. How many natural numbers of three digits can be formed, the digits can be repeated?

(a) 60 (b) 72 (c) 80 (d) 100

Solution:

Total digits $= 5$

No. of digits in required natural number $= 3$

Note: The natural numbers of three digits whose first digit is zero is a two digit natural number not three

Total natural numbers of three digits and two digits $= 5^3$

Note: For two digits numbers:

Zero is fixed at first place. So

0	.	.

Total remaining digits again 5, digits can be repeated.

Remaining selected digits $= 3 - 1 = 2$

Total natural numbers of two digits (three digits numbers whose first digit is zero) $= 5^2$

Total natural numbers of three digits $= 5^3 - 5^2$

$$= 100$$

The answer is (d).

Shortcut:

$0, 1, 2, 3, \cdots, n$

Total natural numbers of r digits$= n^r - n^{r-1}$

$$\text{Total natural numbers of three digits} = 5^3 - 5^2$$
$$= 100$$

The answer is (d).

EXERCISE-2

(1) How many natural numbers of 3 digit can be formed using the digit 2,5,9?

(a) 3 (b) 6 (c) 9 (d) 12

(2) How many natural numbers of 2 digits can be formed using the digits 1,2,3,4,5,6,7? The digits are not repeated.

(a) 28 (b) 21 (c) 14 (d) 42

(3) How many natural numbers of 2 digits can be formed out of the digits 2,3,4,5,6? The digits can be repeated.

(a) 10 (b) 20 (c) 32 (d) 25

MISCELLANEOUS

MCQ-14 :

Seven teams are playing matches in a tournament. In how many ways can the three teams stand on the stands for 1st, 2nd and 3rd prizes?

(a) 120 (b) 210 (c) 80 (d) 72

Solution:

Total teams= 7

Number of prizes= 3

$$\text{Number of ways} = {}^7P_3$$
$$= 210$$

The answer is (b).

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COMBINATION

MCQ-15 :

There are three same prizes and seven teams playing in a tournament. In how many ways can three teams get these prizes?

(a) 210 (b) 42 (c) 35 (d) 60

Solution:

Total teams= 7

Number of same prizes= 3

Number of ways $= {}^{7}C_3$

$= 35$

The answer is (c).

MCQ-16 :

There are four cards numbered 5, 6, 7, 8. In how many ways two cards can be selected?

(a) 18 (b) 12 (c) 8 (d) 6

Solution:

Total cards= 4

Selected cards= 2

No. of ways $= {}^{4}C_2$

$= 6$

The answer is (d).

MCQ-17 :

In how many ways can 2 men and 1 woman be chosen out of 4 men and 3 women?

(a) 6 (b) 12 (c) 18 (d) 36

Solution:

No. of ways $= {}^{4}C_2 . {}^{3}C_1$

$= 6 \times 3 = 18$

The answer is (c).

MCQ-18 :

In how many ways can a committee of 3 members including at least 2 women be formed from 4 men and 3 women?

(a) 12 (b) 13 (c) 8 (d) 16

Solution:

$$\text{No. of ways} = {}^4C_1 . {}^3C_2 + {}^4C_0 . {}^3C_3$$
$$= 4.3 + 1.1$$
$$= 13$$

The answer is (b).

EXERCISE-4

(1) In how many ways r object can be selected out of n unlike objects?

(a) $n!\ (n-r)!$ (b) $\frac{n!\,r!}{(n-r)!}$ (c) $\frac{n!}{(n-r)!}$ (d) $\frac{n!}{r!\,(n-r)!}$

(2) In how many ways 2 digits can be selected out of the digits 1,2,3,4,5,6,7?

(a) 12 (b) 21 (c) 42 (d) 48

(3) In how many ways can 2 men and 1 woman can be chosen out of 4 men and 3 women?

(a) 6 (b) 12 (c) 18 (d) 36

(4) In how many ways a cricket eleven can be selected two players?

(a) 55 (b) 110 (c) 84 (d) 22

(5) In how many ways 10 members of a committee can choose 3 members?

(a) 240 (b) 720 (c) 120 (d) 60

CIRCULAR PERMUTATION

ARRANGEMENT IN ROW:

Number of arrangement of three letters A, B, C in row=3!=6

List of arrangements:

ABC, CAB, BCA, ACB, CBA, BAC

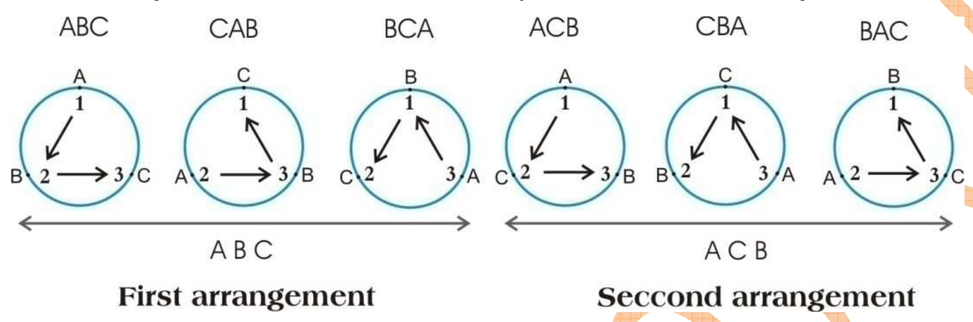
CIRCULAR ARRANGEMENT:

Compare the row and circular arrangement.

Row arrangement: ABC CAB BCA ACB CBA BAC

Circular arrangement:

A, B, C are three objects and 1, 2, 3 are the positions of the objects.



Note:

i) In circular arrangement starting from the same object (in above example rotation is start from object A), it does not depend on the position (1, 2, 3) of the object.

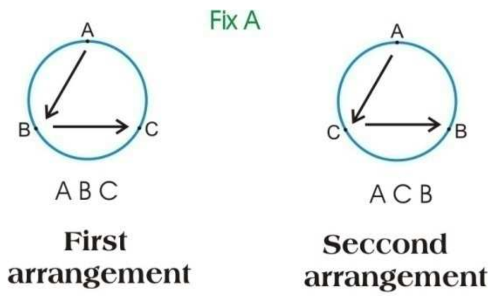
ii) Clockwise and anticlockwise are not same in circular arrangements.

Method for circular permutation:

i) A, B, C are three objects.

ii) Fix one object (i.e. A).

iii) Remaining elements= $3-1$



Two arrangements

iv) No. of circular arrangements= $(3-1)!$

$= 2!$

$= 2$

Note: In circular permutation fix one object from the given objects.

Formula:

Total objects $= n$

Number of circular arrangements $= (n-1)!$

MCQ- 19:

In how many ways can seven beads of different colors be arranged on a table?

(a) 720 (b) 360 (c) 120 (d) 2520

Solution:

Total beads= 7

$n = 7$

Number of arrangements $= (n-1)!$

$= (7-1)!$

$= 6!$

$= 720$

The answer is (a).

EXERCISE-5

(1) In how many ways seven beads of different colors can be arranged in a circle on a table?

(a) $6!$ (b) $\frac{6!}{2}$ (c) $7!$ (d) $\frac{7!}{2}$

(2) In how many ways 5 men and 3 women can be seated on a round table?

(a) $8!$ (b) $\frac{7!}{2}$ (c) $7!$ (d) $6!$

(3) In how many ways 7 persons can be seated at a round table if 4 particular persons must be seated next to each other.

(a) $6!\ 4!$ (b) $3!\ 4!$ (c) $\frac{6!}{4!}$ (d) $\frac{3!}{4!}$

(4) In how many ways 4 boys and 3 girls can be seated at a round table, if one particular boy and a particular girl must be next to each other.

(a) $7!\ 2!$ (b) $\frac{5!\,2!}{2}$ (c) $2!\ 5!$ (d) $2!\ 6!$

(5) In how many ways 2 ladies and 5 gents can be seated at a around table if the ladies must not be seated together?

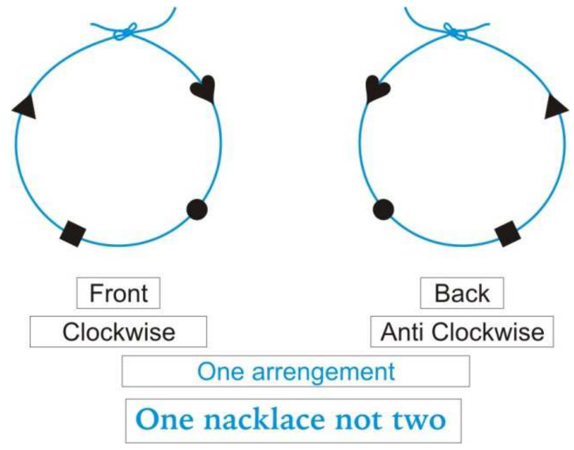
(a) $6! - 2!$ (b) $7! - 2!\ 5!$ (c) $\frac{6!}{2!}$ (d) $6! - 2!\ 5!$

(6) In how many ways 2 red, 3 blue and 1 green bulbs can be arranged in a circle?

(a) $\frac{6!}{2!\,3!}$ (b) $\frac{5!}{2!\ 3!}$ (c) $\frac{5!}{2.2!\,3!}$ (d) $\frac{6!}{2.2!\,3!}$

CIRCULAR PERMUTATION FOR NECKLACE

For a necklace clockwise and anticlockwise arrangements are same, because if clockwise arrangement is the front of the necklace than anticlockwise arrangement is the back of the necklace, so it is a one necklace not two, as shown in the diagram.



Formula:

Total objects $= n$

$$\text{No. of arrangements for a necklace } = \frac{(n-1)!}{2}$$

MCQ- 20:

In how many ways can seven beads of different colors be arranged to form a necklace?

(a) 720 (b) 360 (c) 120 (d) 2520

Solution:

Total beads= 7

$$n = 7$$

$$\text{Number of arrangement to form a necklace} = \frac{(n-1)!}{2}$$

$$= \frac{(7-1)!}{2}$$

$$= \frac{6!}{2}$$

$$= 360$$

The answer is (b).

EXERCISE-6

(1) In how many ways seven beads of different colors can be threaded to make a breclet?

(a) $\frac{7!}{2}$ (b) 7! (c) 7! (d) $\frac{6!}{2}$

(2) In how many ways 3 beads of blue colors and 4 beads of different colors be threaded to make a necklace?

(a) $\frac{6!}{2.3!}$ (b) $\frac{4!}{3!}$ (c) $\frac{4!}{2.3!}$ (d) $\frac{2.4!}{3!}$

(3) In how many ways 3beads of blue color and 4 beads of different colors (green, red, white, black) be threaded to make a necklace if red and green beads must next to each other.

(a) $\frac{6!}{2!}$ (b) $\frac{7!2!}{2.3!}$ (c) $\frac{6!2!}{2.3!}$ (d) $\frac{5!2!}{2.3!}$

DIVISION INTO SECTIOINS OR PARCELS

The number of ways m things is divided into two groups containing r_1 and r_2 things respectively.

Case-1: $r_1 \neq r_2$

The number of ways m things can be divided into two groups containing r_1 and r_2 things respectively.

$$= \frac{m!}{r_1!\,r_2!}$$

In general:

The number of ways m different things be divided into n bundles of $r_1, r_2, \dots, r_n$ things, if $r_1 \neq r_2 \neq \dots \neq r_n$

$$= \frac{m!}{r_1!\ r_2!\ \dots r_n!}$$

Case-2: $r_1 = r_2 = r$

$$\text{The number of ways} = \frac{m!}{r!r!2!} = \frac{m!}{(r!)^2 2!}$$

In general:

The number of ways m different things be divided into n bundles of $r_1, r_2, \dots, r_n$ things, if $r_1 = r_2 = \dots = r_n = r$

$$= \frac{m!}{n!\ (r!)^n}$$

Case-3:

The number of ways m different things be divided into n bundles of $r_1, r_2, \dots, r_n$ things and to be handed over to n persons, if

$r_1 = r_2 = \dots = r_n = r$, then

$$\text{The number of ways } = \frac{m!}{(r!)^n}$$

MCQ- 21:

In how many ways 12 different things be divided into two bundles of 3 and 9 things?

(a) 120 (b) 72 (c) 90 (d) 220

Solution:

Total things= 12

$r_1 = 3$ and $r_2 = 9$

$$\text{Number of ways} = \frac{m!}{r_1!r_2!}$$

$$= \frac{12!}{3!\,9!}$$

$$= \frac{12.11.10.9!}{3.2.1\ 9!}$$

$$= 220$$

The answer is (d).

MCQ- 22:

In how many ways five equal packets can be formed from the given 30 books.

(a) $\frac{30!}{5!\,(6!)^5}$ (b) $\frac{30!}{(6!)^5}$ (c) $\frac{30!}{6!\,(5!)^6}$ (d) $\frac{30!}{(5!)^6}$

Solution:

Total books= $m = 30$

Number of packets= $n = 5$

Number of books in a packet= $r = 6$

$$\text{Number of ways} = \frac{m!}{n!\,(r!)^n}$$

$$= \frac{30!}{5!\,(6!)^5}$$

The answer is (a).

MCQ- 23:

In how many ways 15 different books can be divided among five persons?

or

In how many ways 15 different books can be divided into five bundles and then to be handed over to five five persons A,B,C,D and E?

(a) $\frac{15!}{5!\,(3!)^5}$ (b) $\frac{15!}{3!\,(5!)^3}$ (c) $\frac{15!}{(3!)^5}$ (d) $\frac{15!}{(5!)^3}$

Solution:

Total books$= m = 15$

Number of bundles$= n = 5$

Number of books in a bundle$= r = 3$

Number of persons$= n = 5$

$$\text{Number of ways} = \frac{m!}{(r!)^n}$$

$$= \frac{15!}{(3!)^5}$$

The answer is (c).

EXERCISE-7

(1) In how many ways can 16 different thing be divided into 3 packets of 4,5 and 7 things?

(a) $\frac{4!5\,!\,7!}{16!}$ (b) $\frac{16!}{9!}$ (c) $\frac{16!}{3!\,4!\,5!\,7!}$ (d) $\frac{16!}{4!\,5!\,7!}$

(2) In how many ways can m different things be divided into bundles of $r_1, r_{2,} \dots r_n$ things if $r_1 = r_2 = \dots = r_n$ = r?

(a) $\frac{m!}{(r!)^2}$ (b) $\frac{n!}{m!\,(r!)^n}$ (c) $\frac{m!}{n!\,(r!)^n}$ (d) $\frac{m!}{(n!)^r}$

(3) In how many ways 4 equal packets are to be formed from the given 12 different things?

(a) $\frac{12!}{(3!)^4}$ (b) 12! 3! (c) $\frac{12!}{4!(3!)^4}$ (d) $\frac{12!}{3!(4!)^3}$

(4) In how many ways 12 different things be divided equally into 2 persons?

(a) $\frac{12!}{(6!)^2}$ (b) $\frac{12!}{2\times 6!}$ (c) $\frac{12!}{2\times(6!)^2}$ (d) $\frac{12!}{2\times 2!}$

(5) In how many ways can 8 persons be aboarded equally into two buses?

(a) $\frac{8!}{2(4!)^2}$ (b) $\frac{8!}{(4!)^2}$ (c) $\frac{8!}{(4!)^2}$ (d) $\frac{8!}{4!(2!)^2}$

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