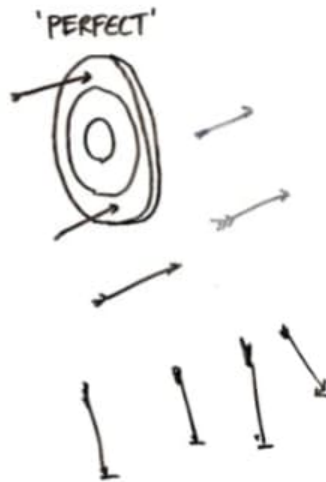


• Practice:

1. A person ordered 5 pairs of black socks and some pairs of brown socks. The price of a black pair was thrice that of a brown pair while preparing the bill the bill clerk interchanged the number of black and brown pairs by mistake which increased the bill by 100% what was the number of pair of brown socks in the original order?
2. Twelve people from a club, by picking lots. One of them will host a dinner for all once in a month. The number of dinners a particular member has to host in one year is?
3. In a society, it is customary for friends of the same sex to hug and for friends of opposite sex to shake hands when they meet. A group of friends met in a party and there were 24 hand shakers. Which one among the following numbers indicates the possible number of hugs?
4. There are 5 tasks and 5 persons, Task 1 cannot be assigned to either person 1 or person 2, Task 2 must be assigned to either person-3 or person-4 every person is to be assigned one task, In how many ways can the assignment be done?



PRACTICE

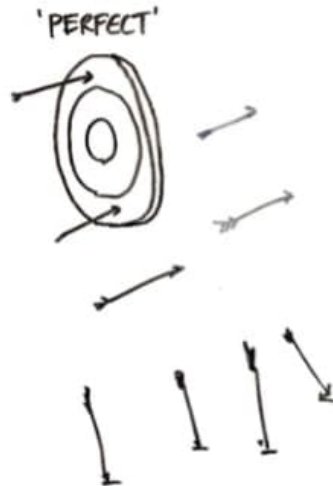


- Practice:

5. In how many different ways can the letters of the word 'MATHEMATICS' be arranged so that the vowels always come together?
6. In how many different ways can the letters of the word 'OPTICAL' be arranged so that the vowels always come together?
7. There are 30 people in a group. If all shake hands with one another, how many handshakes are possible?
8. How many 4-letter words with or without meaning, can be formed out of the letters of the word, 'LOGARITHMS', if repetition of letters is not allowed?
9. Amit has five friends, 3 girls and 2 boys. Amit's wife also has 5 friends, 3 boys, and 2 girls. In how many maximum numbers of different ways can they invite 2 boys and 2 girls such that two of them are Amit's friends and two are his wife's?



PRACTICE



Permutation & Combination

3

No

ED AT

$$3P_3$$

$$= 3!$$

$$= 6$$

$$3P_3$$

$$= 6$$

$$6 \times 6$$

$$= 36$$

1) A person ordered 5 pair of black socks and some pairs of brown socks. The price of a black pair was thrice that of a brown pair while preparing bill the bill clerk interchanged no. of black & brown pair by mistake which increased bill by 100% what was the no. of pair of brown socks in original order?

Ans: Let,

No. of Brown pairs be b

Cost price of one pair of brown socks

$$= 2x$$

Given,

no. of Black Pair = 5

Cost price of one Black pair = $3x$

Case 1) 5 pairs of black & b pair of brown sock were ordered.

Original order:

5 pair of B1 pair

$$= 3x \times 5$$

$$= 15x$$

b brown pairs = $b \times 2x$

$$= 2bx$$

Original bill = $15x + bx$ — (1)

Case (1) ^{mistaken} bill were interchanged such that 5 pair of Bl & ~~15~~ pair of brown sock were interchanged in order.

b black pairs $\rightarrow 3x \times b = ₹ 3bx$
 5 brown pair $\rightarrow 2x \times 5 = ₹ 5x$

Mistaken bill = $₹ 3bx + 5x$ — (2)

Case (3) Bill increased by 100% (double the)

Mistaken bill = $2 \times \text{original bill}$

$3bx + 5x = 2(15x + bx)$

$3bx + 5x = 30x + 2bx$

$3bx - 2bx + 5x - 30x = 0$

$bx - 25x = 0$

$x(b - 25) = 0$

$b - 25 = 0 \Rightarrow \boxed{b = 25}$

25 pair of brown socks were originally ordered.

Q) Twelve people from a club, by picking lots. One of them will host a dinner for all once in a month. No. of dinners a particular member has to host in one year is?

Ans. There are 12 people in club, and each month, one person is chosen to host a dinner.

1. In a year There are 12 months, where all 12 dinner is total which is been hosted by 12 people

Expected dinner per person

$$= {}^{12}C_{12}$$

$$= \frac{12!}{12!(12-12)!} = 1$$

2) In a society it is customary for friends of the same sex to hug and for friends of opposite sex to shake hands when they meet. A group of friends had a party and there was 24 handshakes which one among the following no. indicated possible no. of hugs.

Ans: Hugs = Same gender

Handshake = opp gender

Total Handshakes = 24

Let M = Male no

F = Female no

No. of Handshake = $M \times F = 24$

(Fact Pair)

$$24 = (1, 24) (2, 12) (3, 8) (4, 6) (6, 4) (8, 3) (12, 2) (24, 1)$$

Let (M=4, F=6)

$$\therefore \text{Male-Male hug} = {}^4C_2 = 6 //$$

$$\text{Female-Female hug} = {}^6C_2 = 15 //$$

$$\therefore \text{Total} = 6 + 15 = 21 //$$

- 4) There are 5 tasks and 5 persons, Task 1 cannot be assigned to either person 1 or person 2, Task 2 must be assigned to either person 3 or person 4 every person is to be assigned one task, in how many ways can the assignment be done?

Ans:- Here, 5 tasks \rightarrow assign to 5 persons
 Task 1 \rightarrow only to person 1 or 2 $\rightarrow 2$ choices
 Task 2 \rightarrow only to person 3 or 4 $\rightarrow 2$ choices

proceed with restricted first, then assign rest (3 tasks to 3 people $\rightarrow 3!$)

$$\therefore \text{Total way} = 2 \times 2 \times 3! = 4 \times 6 = 24 //$$

- 5) In how many different way can the letters of the word 'MATHEMATICS' be arranged so that the vowels always come together

Ans:- Word: MATHEMATICS

Letters: 11 letters

Repeated letters:

M: 2 times

A: 2 times T: 2 times

→ Vowels in the word: A, A, E, I

→ Group vowels together as a block
→ [Vowels] + other letter

→ Treat (AAEI) as 1 unit ⇒ Remaining:
M, T, H, M, T, C, S ⇒ 7 consonants

→ Arranging 8 units (1 vowel block + 7 consonants):

• Repeating letter among consonants:
M(2), T(2)

• arrangements = $8! / (2! * 2!)$

→ Inside the vowel block (A, A, E, I):

• Arrangements = $4! / 2!$

⇒ $(8! / (2! * 2!)) * (4! / 2!)$

= $(40320 / 4) * (24 / 2)$ = 120,960 ways

B) In how many different ways can the letters of the word 'OPTICAL' be arranged so that vowels always come together?

Ans: ① word: OPTICAL
Letters: 7

Vowels: O, I, A ⇒ 3 vowels

Remaining: P, T, C, L ⇒ 4 consonants

Treat (OIA) as one unit $\Rightarrow 5$

Arranging 5 units: $5! = 120$

Arranging vowels within it: $3! = 6$

$$\Rightarrow 5! \times 3! = 120 \times 6 = 720 \text{ ways,} \\ ({}^5C_5 \times {}^3C_3)$$

7) There are 30 people in a group. If all shake hands with one another. How many handshakes are possible?

$$\text{Ans} - {}^{30}C_2 = \frac{30!}{2!(30-2)!} = \frac{30 \times 29 \times 28!}{2 \times 28!} \\ = 435 \text{ (handshakes)}$$

29
 15
 19 458) How many 4 letter words can be formed from 'LOGARITHMS' without repetition?

$$\text{Ans} - \text{So, no. of ways} = {}^{10}P_4 = 10 \times 9 \times 8 \times 7 \\ = 5040$$

9) Amit and his wife each have 5 friends (3 boys, 2 girls for Amit; 3 girls, 2 boys for wife)

Ans:- Total friends:
 - Boys: 2 (Amit) + 2 (wife) = 4 boys
 - Girls: 3 (Amit) + 3 (wife) = 6 girls

1. Select 2 boys & 2 girls;

2 are Anit, 2 are wife friends.

(1) Boy Selection:

From 2 boys (Anit), 2 boys (wife) - 2 total boys

- (1 boy from Anit, 1 from wife):
 $C(2,1) * C(2,1) = 2 * 2 = 4 \text{ ways}$

(2) Girl Selection:

From 3 girls (Anit), 3 girls (wife)

- (1 girl from Anit, 1 from wife):
 $C(3,1) * C(3,1) = 3 * 3 = 9 \text{ ways}$

$\therefore 4(\text{boys}) * 9(\text{girls}) = 36 \text{ ways}$