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Discrete Structures

Tutorial-2

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1.

A	B	C	B∩C	C'∪B'	(A∪(B∩C))'	(C'∪B')∩A'
0	0	0	0	1	1	1
0	0	1	0	1	1	1
0	1	0	0	1	1	1
1	0	0	0	1	0	0
0	1	1	1	0	0	0
1	0	1	0	1	0	0
1	1	0	0	1	0	0
1	1	1	1	0	0	0

Thus. $(A \cup (B \cap C))' = (C' \cup B') \cap A'$

2. From home to downtown chicago,

Buses = 3
Trains = 2

From downtown chicago to Milwaukee;

Buses = 2
Trains = 3

Thus. total number of ways = ${}^5C_1 \times {}^5C_1 = \underline{25}$

Thus. there are 25 ways.

3.

${}^6C_6 \; {}^5C_5 \; {}^4C_4 \; {}^3C_3 \; {}^2C_2 \; {}^1C_1 = 6! = 720$

Hence, they can be seated in 720 ways.

This combination regards arrangement, hence it is a permutations problem.

4. $S = \{1, 2, 3\}$

three possible permutations are:

$\{1,2,3\}, \{3,2,1\}, \{3,1,2\}$

5. number of subsets $= {}^6C_3 = \frac{6!}{3! \cdot 3!} = \frac{6 \times 5 \times 4}{3 \times 2 \times 1}$

$= 20$ subsets

Hence, there are 20 such subsets.

6. Men - 6 women - 5.

total combinations $= {}^6C_3 \times {}^5C_2$

$= \frac{6!}{3! \times 3!} \times \frac{5!}{2! 3!}$

$= \frac{6 \times 5 \times 4}{3 \times 2 \times 1} \times \frac{5 \times 4}{2 \times 1} = 200$

hence, there are 200 ways to do so.

7. number of ways $= {}^{9}C_3 \cdot {}^{6}C_3 \cdot {}^{3}C_3$

$$= \frac{\overset{3}{9} \times 8 \times 7}{3 \times 2 \times 1} \times \frac{\overset{4}{6} \times 5 \times 4}{3 \times 2 \times 1} \times \frac{3 \times 2 \times 1}{3 \times 2 \times 1}$$

$$= 1680$$

hence, there are 1680 ways.

8. number of permutations $= \frac{{}^{5}C_4 \times {}^{4}C_1 \times {}^{3}C_1 \times {}^{2}C_1 \times {}^{1}C_1}{2!_6}$

$$= 5!/2!_6 = 5 \times 4 \times 3 = \underline{60 \text{ ways}}$$

hence, there are 60 ways to permutate "HAPPY".