Easy Worksheet on Permutation and Combination

1. Evaluate **(i)** C_2^n **(ii)** C_3^{n+1}

(i) $C_2^n = \dfrac{n(n-1)}{2}$

(ii) $C_3^{n+1} = \dfrac{(n+1)n(n-1)}{3!}$

$= \underline{\underline{\dfrac{(n+1)n(n-1)}{6}}}$

$(\text{or}) = \dfrac{n^3 - n}{6}$

2. Simplify : $P_0^n + P_1^n + P_2^n$

$P_0^n + P_1^n + P_2^n = 1 + n + n(n-1)$

$= \underline{\underline{n^2 + 1}}$

3. Two colours are chosen from the colours red (R), yellow (Y), green (G) and blue (B) to be the colours of a logo. **(a)** List the possible combinations of two colours.
(b) How many combinations of two colours are available?

(a) RY RG RB YG YB GB

(b) Combinations of two colours

$= C_2^4 = \dfrac{4 \times 3}{2 \times 1} = \underline{\underline{6}}$

4. A Mark Six lottery ticket consists of marking 6 different numbers ranging from 1 to 49.
(a) How many different lottery tickets can you mark?
(b) If each ticket costs \$5, then how much do you pay for buying all lottery tickets in **(a)**?

(a) No.of different lottery tickets

$= C_6^{49} = \underline{\underline{13{,}983{,}861}}$

(b) Amount I pay

$= \$5 \times 13{,}983{,}861 = \underline{\underline{\$69{,}919{,}080}}$

5. A relay team of 4 persons is selected from a group of 9 runners. How many different teams can be formed if
(a) an outstanding runner must be included in the team?
(b) a wounded runner must also be excluded from the team?

(a) Different teams can be formed

$= C_3^8 = \dfrac{8 \times 7 \times 6}{3 \times 2 \times 1} = \underline{\underline{56}}$

(b) Different teams can be formed

$= C_3^7 = \dfrac{7 \times 6 \times 5}{3 \times 2 \times 1} = \underline{\underline{35}}$

6. In how many ways can a group of 5 printers be selected from 6 inkjet and 9 laser printers if the group must contain
(a) exactly 3 laser printers?
(b) at least 3 laser printers?

(a) No. of ways

$= C_3^9 \times C_2^6 = \dfrac{9 \times 8 \times 7}{3 \times 2 \times 1} \times \dfrac{6 \times 5}{2 \times 1} = \underline{\underline{1260}}$

(b) No. of ways

$= C_3^9 \times C_2^6 + C_4^9 \times C_1^6 + C_5^9 \times C_0^6$

$= 1260 + 756 + 126 = \underline{\underline{2142}}$

7. **(a)** Find the number of diagonals that can be drawn in an 4-sided polygon.

(b) Find the number of diagonals that can be drawn in an 5-sided polygon.

(c) Find the number of diagonals that can be drawn in an 6-sided polygon.

(d) Try to generalize the above cases, find the number of diagonals that can be drawn in an n-sided polygon.

(a) No. of diagonals = 2

(b) No. of diagonals = 5

(c) No. of diagonals = 9

(d) No. of diagonals = $C_2^n - n = \frac{n(n-1)}{2} - n = \frac{n^2 - n - 2n}{2}$

$= \frac{n^2 - 3n}{2} = \underline{\underline{\frac{n(n-3)}{2}}}$

8. In the Legislative Council, a special committee of 5 members has to be formed from 10 non-official members and 7 official members. In how many ways can the committee be formed if it consists of

(a) 5 non-official members? **(b)** 3 non-official and 2 official members? (c) Non-official members in majority?

(a) No. of ways can the committee be formed $= C_5^{10} = \underline{\underline{252}}$

(b) No. of ways can the committee be formed $= C_3^{10} \times C_2^7 = \underline{\underline{2520}}$

(c) No. of ways can the committee be formed $= C_3^{10} \times C_2^7 + C_4^{10} \times C_1^7 + C_5^{10} \times C_0^7$

$= 2520 + 1470 + 252 = \underline{\underline{4242}}$

9. A poker hand of 5 cards are selected from a deck of 52 playing cards. How many different poker hands contain

(a) all spades? **(b)** 3 Aces and 2 Kings? **(c)** 4 cards with identical number or letter?

(a) No. of different poker hand = $C_5^{13} = \underline{\underline{1287}}$

(b) No. of different poker hand = $C_3^4 \times C_2^4 = \underline{\underline{24}}$

(c) No. of different poker hand = $48 \times 13 = \underline{\underline{624}}$

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