

**Example 3**

Find the number of ways in which a panel of four men and three women can be chosen from seven men and five women.

Choose 4 men from 7 AND Choose 5 Women from 3

$$\begin{aligned} & \binom{7}{4} \times \binom{5}{3} \\ &= 35 \times 10 \\ &= 350 \end{aligned}$$

**Example 4**

In how many ways can a committee of six be formed from 5 teachers and 8 students if there are to be more teachers than students on each committee?

Option 1

4 Teachers and 2 students

OR

option 2

5 teachers and 1 student

$$\begin{aligned} & \binom{5}{4} \times \binom{8}{2} &= 5 \times 28 &= 140 \\ & \text{OR} &= &+ &= &+ \\ & \binom{5}{5} \times \binom{8}{1} &= 1 \times 8 &= 8 \end{aligned}$$

$$\text{ANSWER} = 148$$

5. How many different selections of 5 letters can be made from the letters of the word CHEMISTRY?
- How many 5-letter selections can be made if the letter C is included in each selection?
  - How many 5-letter selections can be made if the letter C is always included and Y is always excluded?

9 letters

$$\text{Total possible selections} = \binom{9}{5} = 126$$

(i) C AND other letters

$$1 \times \binom{8}{4} = 70$$

C, Y AND other letters

(ii)  $1 \times \binom{7}{4} = 35$

10. A school council consists of 10 teachers and 12 students.  
In how many ways can a group of 6 be selected if the group consists of
- 3 teachers and 3 students
  - 2 teachers and 4 students?



(i)  $\binom{10}{3}_T \times \binom{12}{3}_S = 26400$

(ii)  $\binom{10}{2}_T \times \binom{12}{4}_S = 22275$

18. Nine friends, including Ann and Barry, wish to go to a show but only five tickets are available.

In how many ways can the group of five be selected if

- (i) both Ann and Barry are included
- (ii) either Ann or Barry is included, but not both?

Another member of the group is named Claire.

- (iii) In how many ways can the group of five be selected, given that at least one of Ann, Barry and Claire must be included?

(i)	$1 \times \binom{7}{3} = 35$ Ann + Barry AND others				
(ii)	$\binom{2}{1} \times \binom{7}{4} = 70$ A or B AND others				
(iii) options	A, B and C picked or 2 of A, B and C picked or 1 of A, B and C picked	$\binom{3}{3} \times \binom{6}{2} = 15$ $\binom{3}{2} \times \binom{6}{3} = 60$ $\binom{3}{1} \times \binom{6}{4} = 45$	+ + +		
	ANSWER = 120				

21. Find the value of  $n \in N$  in each of the following:

(i)  $\binom{n}{2} = 10$

(ii)  $\binom{n}{2} = 45$

(iii)  $\binom{n+1}{2} = 28$

(i)

$n = n$   
 $r = 2$   
 $\binom{n}{2} = 10$

$$\binom{n}{r} = \frac{n(n-1)(n-2)\dots(n-r+1)}{r!}$$
 Formula

$$\binom{n}{2} = \frac{n(n-1)}{2!} = 10$$

$n(n-1) = 20$

$n^2 - n - 20 = 0$

$(n-5)(n+4) = 0$

$n = -4 \times$ ,  $n = 5$  ✓  
 non-sense!

check  $\binom{10}{2} = 5$