

Permutations

A permutation is an **ordered** set of objects
i.e. an **arrangement**

Case 1: Ordered Sets of n Different Objects, from a Set of n Such Objects
(i.e. use all of the objects)

If we arrange n different objects in a line, the number of ways we could arrange them are;

possibilities for object 1 possibilities for object 2 possibilities for object 3 possibilities for last object

$$\begin{aligned} \text{Number of Arrangements} &= n \times (n-1) \times (n-2) \times \cdots \times 1 \\ &= n! \end{aligned}$$

e.g. In how many ways can 5 boys and 4 girls be arranged in a line if;

(i) there are no restrictions?

$$\begin{aligned}\text{Arrangements} &= 9! \\ &= \underline{362880}\end{aligned}$$

With no restrictions, arrange 9 people
gender does not matter

(ii) boys and girls alternate?

(ALWAYS look after any restrictions first)

first person MUST

be a boy

number of ways of
arranging the boys

$$\begin{aligned}\text{Arrangements} &= 1 \times 5! \times 4! \\ &= \underline{2880}\end{aligned}$$

number of ways of
arranging the girls

(iii) What is the probability of the boys and girls alternating?

$$P(\text{boys \& girls alternate}) = \frac{2880}{362880}$$
$$= \frac{1}{126}$$

(iv) Two girls wish to be together?

the number of ways the
girls can be arranged

number of ways of
arranging 8 objects
(2 girls) + 7 others

$$\text{Arrangements} = 2! \times 8!$$
$$= \underline{80640}$$

Exercise 17B; 6, 15, 18, 21, 23, 25

Exercise 17C; 2, 4, 5, 9, 10, 12, 14, 16, 18, 19