Permutations

Starter

1. How many ways are there of arranging the letters A, B and C?

2. How many different arrangement of eight books can be made on a bookshelf?

Notes

A ***permutation*** is the fancy name for an ***arrangement***.

Factorial notation

The factorial notation is denoted by an exclamation mark, !.

$n! = n(n-1)(n-2) \times \ldots \times 3 \times 2 \times 1$

So $5! = 120$

Use the ! button on your calculator (on the Classwiz: SHIFT >> x^{-1})

Arranging n objects

The number of permutations (or arrangements) of n distinct objects is $n!$.

When restrictions are put on the arrangement, you may need to use the addition or product principles.

Hint: draw a box for each place.

E.g. 1 How many arrangements can be made from the letters of the word PRINCE if:

(a) there are no restrictions

(b) the first letter must be a consonant

(c) the last letter must be a vowel

Working:

(a) $6! = 720$

(b) 1st place: 4 options (PRNC)
2nd-6th places: $5!$
Total arrangements $= 4 \times 5! = 480$

(c) 1st place: 2 options (IE)
2nd-6th places: $5!$
Total arrangements $= 2 \times 5! = 240$

E.g. 2 How many different number plates can be formed if each is to contain the 3 letters A, C and E followed by four digits 4, 5, 7 and 8?

E.g. 3 How many numbers greater than 4000 can be formed from the integers 1, 3, 5 and 7 using each digit once only?

E.g. 4 (a) How many numbers are there between 1245 and 5421 which contain each of the digits 1, 2, 4, and 5 once and once only?

(b) One of these numbers is chosen at random. Find the probability that it is:

(i) divisible by 5

(ii) greater than 3000

Video: Permutations of n different items

Solutions to Starter and E.g.s

Exercise
p6 1B Qu 1i, 2i, 3-9, (10-11 red)

Summary
Factorial notation: $n! = n(n-1)(n-2) \times \ldots \times 3 \times 2 \times 1$
The number of permutations (or arrangements) of n distinct objects is $n!$.
With restrictions on the arrangement, you may need to use the addition or product principles.