Tutorial: Counting

Aim

The aim of this tutorial is for students to be able to solve simple problems using combinatorics and permutations.

Questions

1. There are four train lines between A and B and three train lines between B and C. In how many ways can a person travel:

   a) by train from A to C via B?
   b) roundtrip by train from A to C via B?

2. Determine the following:

   a) $C(16, 3)$
   b) $C(12, 4)$
   c) $C(15, 5)$

3. Determine the number of distinct permutations that can be formed from all the letters in the words:

   a) `computer`
   b) `logic`
   c) `essentials`

4. How many ways can 12 people be split into three teams of four people?

5. A 'lucky dip' bag contains 6 white opals and five black opals. Find the number of ways 4 opals can be drawn according to the following scenarios.

   a) They can be either black or white.
   b) Two are black and two are white.
   c) They are all the same colour.

6. A committee of three is chosen from 20 people containing Batman and Superman who hate each other and refuse to be on any committee together. How many three- person committees are possible not involving both Batman and Superman?

7. How many students do we need to gather in ATC101 so that it is guaranteed that:

   a) at least five students have a surname starting with the same letter?
   b) at least ten students were born on the same day of the week?
   c) at least two students have the same birthday?