1   Simplify the following:

     a $\dfrac{8!}{6!}$

     b $\dfrac{10!}{7!}$

     c $\dfrac{(n+2)!}{n!}$

     d $^{10}C_3$

     e $^{n+2}C_{n+1}$

2   Simplify the following by factorising the numerator and denominator:

$$\frac{(n+2)! + (n+1)!}{(n+1)! + n!}$$

3   In how many ways can six books be arranged on a shelf?

4   Five students are to be arranged on a bench with space for three. How many ways can this be done?

5   How many ways can the five digits 1, 2, 3, 4 and 5 be arranged without repetition and using all digits if:

     a   there is no restriction

     b   the resulting number is odd

     c   the odd numbers are kept together

     d   the numbers 1 and 2 are not next to one another

     e   the resulting number is even and less than 40 000?

6   How many different groups of three students can be selected from a group of eight if

     a   there are no restrictions

     b   the oldest student must be selected

     c   the oldest and youngest cannot both be selected?

7   Find positive integer k if $^{k}C_{k-4} = 2 \times {}^{k-1}C_4$.

8   Using the digits 1,2,3,4,5 and 6 as many times as you like, how many three-digit numbers can you form where one digit is the product of the other two digits.

9   Find the number of arrangements in the word SASSAFRAS.

10   Using four red and four blue flags, how many different signals can be made by lining four flags in a row.

11   A bag contains ninety-nine balls numbered from 1 to 99. How many balls must be randomly selected without replacement to guarantee that:

a   at least two balls will leave the same remainder when divided by 3

b   at least three balls will have the same units digit.

c   the two numbers of some pair of balls will have a sum of 100.

d   the two numbers of some pair of balls will have a sum of 30.