11 Permutations and combinations

1 Without using a calculator, evaluate the following.

a) 6!

b) $\frac{8!}{6!}$

c) $\frac{5! \times 8!}{6! \times 3!}$

2 Simplify the following.

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

b) $\frac{(n-2)!}{n!}$

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

3 Factorise:

a) $7! - 5!$

b) $(n+1)! - (n-1)!$

4 How many different five letter arrangements can be formed from the letters A, B, C, D and E if letters cannot be repeated?

5 Eight friends are going to the theatre together and they all have tickets for adjacent seats in the same row. In how many ways can they be seated?

6 How many different arrangements are there of the letters in each word?

a) CHINA **b)** ISLAND **c)** DAUGHTER **d)** UNIVERSAL

7 A security keypad has the numbers 1, 2, 3, 4 and the letters A, B, C, D on it.
In order to unlock it, a passcode with five of these numbers and letters is needed.
How many possible passcodes are there if:

a) there are no restrictions

b) there must be at least two letters and at least two numbers?

8 Without using a calculator, evaluate the following.

a) ${}^{10}P_2$ **b)** ${}^{8}P_2$ **c)** ${}^{6}P_2$ **d)** ${}^{4}P_2$

9 Without using a calculator, evaluate the following.

a) ${}^{10}C_8$ **b)** ${}^{8}C_6$ **c)** ${}^{6}C_4$ **d)** ${}^{4}C_2$

10 There are ten cleaners at a supermarket, one of whom is supervisor. If only 6 cleaners are needed for each shift, including the supervisor, how many possible teams are there?

11 A quiz team of 4 people is chosen at random from 5 girls and 7 boys.
In how many ways can the team be chosen if:

a) there are no restrictions

b) there must be equal numbers of boys and girls

c) there must be more boys than girls?

12 Four letters are picked from the word MAJESTIC. In how many of these choices is there at least one of the letters A, E or I among the letters?