1. Use a tree diagram to answer the following:

   (a) How many different soccer uniforms are possible if there is a choice of two types of shirts, three types of shorts and two types of socks?

   (b) How many three scoop cones can be made from vanilla, chocolate and rocky road ice cream?

   (c) How many different cars can be purchased if you can choose from four colours, three interior styles and three types of wheels?

2. A standard die is rolled 5 times. How many different outcomes are possible?

3. Six pens and 11 pencils are sitting on a table. One of each is selected for an exam. Should you use the multiplication rule or the addition rule to count the number of possible pen/pencil selections? How many are there?

4. In how many ways could you choose

   (a) two fives, one after the other, from a standard deck of cards?

   (b) a red five and a spade, one after the other?

   (c) a red five or a spade?

   (d) a red five or a heart?

5. Evaluate.

   (a) $\dfrac{7!}{4!}$ (b) $\dfrac{13!}{11!}$ (c) $\dfrac{8!}{5!2!}$ (d) $\dfrac{15!}{3!8!}$

6. Express in the form ${}_nP_r$.

   (a) $6 \times 5 \times 4$

   (b) $9 \times 8 \times 7 \times 6$

   (c) $82 \times 81 \times 80 \times 79$

   (d) $20 \times 19 \times 18 \times 17 \times 16 \times 15 \times 14$

7. (a) How many ways are there to arrange the letters in the word HOCKEY?

   (b) How many ways are there to arrange eight texbooks on a shelf in your locker?

   (c) How many ways are there to arrange 4 books on a shelf if you have nine books to choose from?

8. Nine student award recipients are to line up for a photo.

   (a) How many different arrangements are possible?

   (b) How many arrangements are possible if the math award winner must be in the middle?

   (c) How many arrangements are possible if the art award winner is at the left end and the drama award winner is at the right end?

   (d) How many arrangements are possible if the science and math award winners must be side-by-side?

9. If you have a standard deck of 52 cards, in how many different ways can you deal out

   (a) five cards? (b) ten cards? (c) five red cards? (d) four queens?

10. How many different permutations are there of all the letter in each word below?

    (a) LONDON (b) OTTAWA (c) WASAGA (d) MISSISSIPPI

11. A coin is tossed eight times. In how many different orders could five heads and three tails occur?

12. After a training run, six members of the track team split a bag of assorted doughnuts. How many ways can the team share the doughnuts if the bag contains

    (a) six different doughnuts?

    (b) three each of two varieties?

    (c) two each of three varieties?