# Dr Oliver Mathematics
# Probability and Quadratic Equations

Give your answers as exact fractions. You may use a calculator.

1. A bag contains $n$ red discs and 7 blue discs.
   Two discs are chosen at random without replacement.
   The probability of obtaining two red discs is $\frac{4}{15}$.
   (a) How many red discs are there in the bag?

   The two red discs are now replaced and the experiment is repeated.
   (b) What is the probability of getting one disc of each colour?

2. A bag contains $n$ blue discs and 16 green discs.
   Two discs are chosen at random without replacement.
   The probability of getting one disc of each colour is $\frac{8}{21}$.
   (a) Show that $n^2 - 53n + 240 = 0$.
   (b) Hence, or otherwise, calculate how many blue discs the bag might contain.

3. A bag contains $n$ white and $(2n + 1)$ black discs.
   Two discs are chosen at random without replacement.
   The probability of obtaining two black discs is $\frac{11}{24}$.
   (a) How many discs of each colour does the bag contain?

   The discs are now replaced and the experiment is repeated.
   (b) What is the probability of getting two white discs?

4. A bag contains three more green discs than red discs.
   Two discs are chosen at random without replacement.
   The probability of obtaining one disc of each colour is $\frac{28}{55}$.
   (a) If $n$ represents the number of red discs, show that $n^2 - 25n + 84 = 0$.
   (b) Hence, or otherwise, calculate all possible combination of green and red discs that the bag could have contained.

   Assume that the bag contained the greater of the two possible totals of discs.
   The two discs are replaced and the experiment is repeated.
   (c) What is the probability of choosing two red discs?

5. There are 10 boys in a mixed gender class.
   Two pupils are chosen at random to come out and work at the board.
   The probability that one boy and one girl are chosen is $\frac{40}{77}$.

(a) If $x$ represents the total number of students in the group, show that

$$2x^2 - 79x + 770 = 0.$$

(b) Hence, or otherwise, find the total number of students in the group.

The two students return to their desks and another two students are chosen from the class at random.

(c) Calculate the probability that the two chosen are both girls.

6. A word contains five vowels and $c$ consonants.
Two letters are chosen at random.
The probability of choosing two consonants is $\frac{1}{6}$.

(a) How many letters did the word contain?

Another selection of two letters is made at random.

(b) What is the probability that one vowel and one consonant are selected?

7. A bag contains twice as many blue discs as red discs.
Two discs are chosen at random without replacement.
The probability of obtaining one disc of each colour is $\frac{16}{33}$.

(a) How many of the discs are blue?

The two discs are now replaced and the experiment is repeated.

(b) Calculate the probability of getting two red discs.

8. A bag contains four more black discs than green discs.
Two discs are chosen at random without replacement.
The probability of obtaining two green discs is $\frac{12}{77}$. Given that $g$ is the number of green discs in the bag,

(a) show that $29g^2 - 245g - 144 = 0$.

(b) Hence, or otherwise, calculate the number of black discs.

The two discs are now replaced and the experiment is repeated.

(c) Calculate the probability of getting one disc of each colour.