



## Experimental probability

- Using experimental data to estimate probabilities
- Understanding the effect of repeating an experiment many times
- Comparing theoretical and experimental probabilities

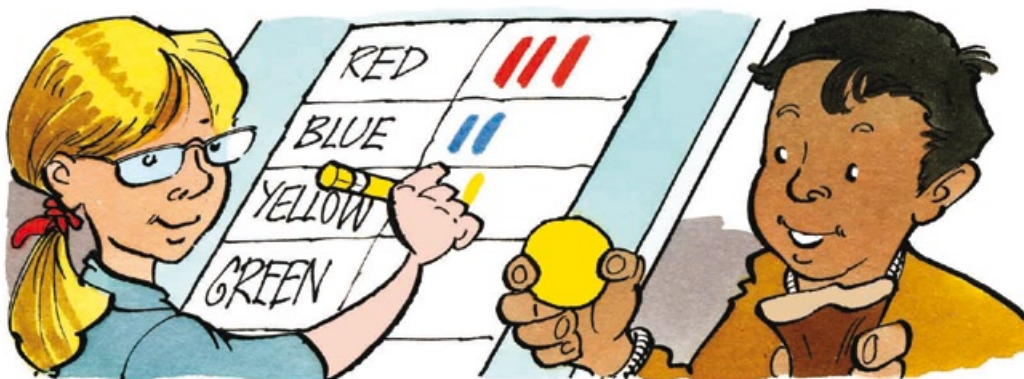
Keywords

You should know

### explanation 1

#### 1 Work with a partner.

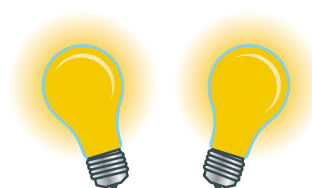
You need a bag containing a small selection of different coloured counters or cubes. Take one counter/cube from the bag and note its colour before replacing it. Do this 10 times. Now estimate the probability of each colour in the bag. Check by emptying the bag and counting the number of counters/cubes of each colour.



#### 2 If, in question 1, you selected a counter/cube from the bag 50 times would you be able to make a more reliable prediction?

#### 3 The lifetimes of 500 light bulbs are given in the table.

Lifetime	Frequency
0–99 hours	150
100–199 hours	300
200–299 hours	50



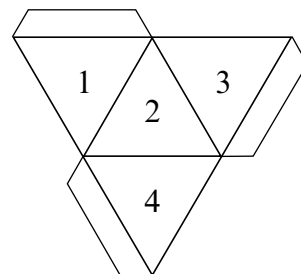
If I buy a similar bulb, what is the probability that it will last at least 200 hours?

- 4** Avnee has cards numbered 1, 2, 3, 4 or 5. She puts several cards in a bag. She takes out a random card, records the number on the card and then replaces it in the bag. The table shows her results.

Number on Card	1	2	3	4	5
Tally					
Frequency					

- Copy the table and complete the last row.
- How many times did Avnee take a card out of the bag?
- Which number did she take out most often?
- Estimate the probability that the next card Avnee picks has the number 2 on it.

- 5** You need a four-sided dice numbered from 1 to 4. If you do not have one, you can make one using a net like the one shown.



- What is the probability of rolling a 4 with your four-sided dice?
  - Roll your dice 20 times and record the result each time. Comment on your results.
  - Now roll the dice another 20 times and combine both sets of results. How have the results changed?
- 6**
- Roll two four-sided dice and add together the scores. Do this 30 times and record the results in a frequency diagram.
  - Work out the relative frequency of each outcome. Compare your results with those of someone else in your class. Are the results different? Why do you think this happens?
  - What do you think might happen to the results if you repeat the experiment? Carry out the experiment another 20 times and record these scores on your diagram.
- What effect do the extra throws have on the results? Is this what you expected?

**explanation 2**

- 7** The table shows the results in the Premiership at one stage in the football season.

<b>Home wins</b>	24
<b>Away wins</b>	9
<b>Draws</b>	4



- a** Use the data in the table to estimate the probability of getting the following results in a randomly selected match taking place the next week. Give each answer as a decimal rounded to 2 decimal places.
- i** a home win
  - ii** an away win
  - iii** a draw

These were the results much later in the season.

<b>Home wins</b>	145
<b>Away wins</b>	79
<b>Draws</b>	76

- b** Calculate the probability of each outcome, as a decimal rounded to 2 decimal places, based on the final table.
- c** Will your answers to part **a** or part **b** be more reliable? Why?

## explanation 3

- 8 a** Roll two dice 40 times. Record the total score and represent the different outcomes on a frequency diagram. Calculate the experimental probability of each score.
- b** Draw a sample space diagram showing all the possible scores. Calculate the theoretical probability of each score.
- Comment on the differences or similarities between the theoretical and the experimental probabilities.
- c** Describe how the experimental results would change if you increase the number of trials.
- 9** Ravi bought a combination padlock for his sports locker. He knows the last three digits of the code are 850, but he cannot remember the first digit, which is a number from 0 to 9.
- a** What is the probability that he will choose the correct number on his first attempt?
- b** Design and carry out an experiment to calculate an experimental probability for Ravi's problem.
- c** Compare your answer with the theoretical probability.
- 10** In the National Lottery there are 49 balls numbered from 1 to 49.
- a** What is the probability of these events for the first ball picked?
- i** an even number
  - ii** a prime number
  - iii** a multiple of 6
  - iv** a number greater than 35
- b** Design and carry out an experiment to test the theoretical probabilities.
- 11** Drop 5 multilink cubes onto your desk and record, in a table, whether each lands bump up, bump to the side, or tilted with bump down. Repeat this 10 times so that you have 50 results. Collate the results from everyone in your class. Compare your results with the total class results.