

Maths Level 1

Chapter 7

Working with probability

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Maths Level 1

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Draft for pilot centres

- Chapter 1:** Working with Whole Numbers
- Chapter 2:** Working with Fractions, Decimals & Percentages
- Chapter 3:** Working with Ratio, Proportion, Formulae and Equations
- Chapter 4:** Working with Measures
- Chapter 5:** Working with Shape & Space
- Chapter 6:** Working with Data and Averages
- Chapter 7:** Working with Probability
- Chapter 8:** Test preparation & progress track

How to use the Functional mathematics materials

The skills pages enable learners to develop the skills that are outlined in the QCA Functional Skills Standards for mathematics. Within each section, the units provide both a summary of key learning points in the *Learn the skill* text, and the opportunity for learners to develop skills using the *Try the skill* activities. The *Remember what you have learned* units at the end of each section enable learners to consolidate their grasp of the skills covered within the section.

All Functional Skills standards are covered in a clear and direct way using engaging accompanying texts, while at the same time familiarising learners with the kinds of approaches and questions that reflect the Edexcel Functional Skills SAMs (see <http://developments.edexcel.org.uk/fs/> under 'assessment').

The *Teacher's Notes* suggest one-to-one, small-group and whole-group activities to facilitate learning of the skills, with the aim of engaging all the learners in the learning process through discussion and social interaction. Common misconceptions for each unit are addressed, with suggestions for how these can be overcome.

One important aspect of Functional mathematics teaching is to ensure that learners develop the necessary process skills of *representing*, *analysing* and *interpreting*. At Level 1, learners should select the methods and

procedures and adopt an organised approach to the task. The teacher may provide guidance, but learners should make their own decisions about finding the solutions to the task.

The inclusion of *Apply the skills* in the *Teacher's Notes* for each section, aims to provide real-life scenarios to encourage application of the skills that have been practised. To make the most of them, talk through how the tasks require the use of the skills developed within the section. The tasks can be undertaken as small-group activities so that the findings from each group can be compared and discussed in a whole-group activity. The scenarios can be extended and developed according to the abilities and needs of the learners. As part of the discussion, learners should identify other real-life situations where the skills may be useful.

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K Working with probability

You should already know:

- ✓ simplify common fractions to their lowest terms.

By the end of this section you will know how to:

- ➡ use probability to show that some events are more likely to occur than others
- ➡ calculate simple probabilities.

1 Measuring probability

The likelihood of events

Learn the skill

The measure of the likelihood of an event is called the **probability of an event**. Some events are more likely to occur than others.

Events that are definitely going to happen are described as **certain**. People are right when they say, 'The only thing we can all be sure of is that one day we will die'... this is a certain event.

Events that are definitely *not* going to happen are described as **impossible**. Events such as 'daylight lasting 24 hours in Britain' are impossible.

Other events may be **likely** or **unlikely**. The probability of it raining in England during the summer months is now **likely**. The probability of winning the National Lottery is **unlikely**.

➡ Try the skill

Decide whether the following events are impossible, unlikely, likely or certain.

- a It will snow on Mount Everest next year _____
- b The canteen at a factory serves food for lunch _____
- c You win first prize in a competition _____
- d There will be a cure for cancer in the next year _____
- e All the world's governments will agree to reduce carbon emissions _____

Measuring probability

As there is no chance of impossible events happening, the probability of **impossible events** is **zero**.

Certain events will definitely happen; the probability of **certain events** is **one**.

All other events have a probability between 0 and 1.

Unlikely outcomes have a probability closer to 0 than 1.

Likely outcomes have a probability closer to 1 than 0.

Outcomes that are equally likely of happening or not happening have a probability of $\frac{1}{2}$.

Example 1: What is the probability of it being light all night in England?

This is an impossible event.

Answer: 0

Example 2: What is the probability of a mother-to-be giving birth to a girl?

A boy or a girl child are equally likely.

Answer: $\frac{1}{2}$

Example 3: Position these events onto the probability line between 0 and 1.

A When you throw an ordinary coin, it will show heads.

B If you live a healthy life you will reach the age of sixty.

C When you buy a raffle ticket, you will win.

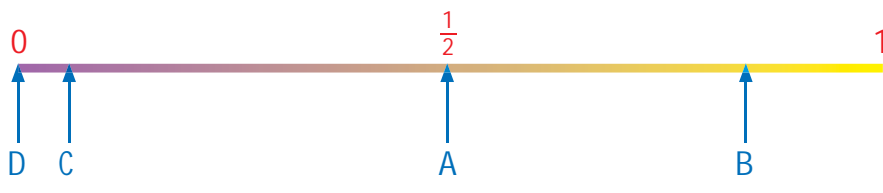
D Water will freeze at 100 °C.

Answer: There is an equal chance of tossing a head or a tail when you throw an ordinary coin, so even A is in the middle.

If you live a healthy life, you are reasonably likely to live to be 60 years old, so event B is closer to 1 than 0.

When you buy a raffle ticket, you are not very likely to win, so event C is closer to 0.

There is no chance of water freezing at 100 °C so event D is at 0.



Try the skill

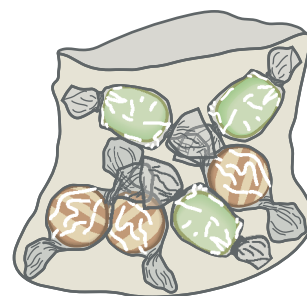
1. Position these events on to the probability line below.

- a You will eat today.
- b You will meet an alien today.
- c You will pass your numeracy test.



2. A bag of sweets contains 3 humbugs and 3 chocolate limes. If you pick one sweet from the bag without looking, what is the probability that you pick

- a a sweet? _____
- b a stick of chewing gum? _____
- c a humbug? _____



Probabilities which are not 0 or 1

We know that the probability of tossing a coin and getting a 'head' with an ordinary coin is $\frac{1}{2}$. This can also be written as 0.5 or 50%.



When you toss a coin, there are only 2 possible outcomes: heads or tails.

Heads is 1 outcome out of a possible 2, or $\frac{1}{2}$.

This leads to a method for calculating probability.

Tip

Probabilities can be written in fractions, decimals or percentages.

The probability of an outcome = $\frac{\text{number of ways the outcome occurs}}{\text{Total number of outcomes}}$

Example 1: When you throw an ordinary dice, what is the probability of scoring:

- a 6
- b An odd number?



a 6 is on one face of the dice. There are 6 faces in total.

Answer: Probability (scoring 6) = $\frac{1}{6}$

b There are 3 odd number faces, 1, 3 and 5.

Answer: Probability (scoring an odd number) = $\frac{3}{6} = \frac{1}{2}$

Example 2: A sock drawer contains 2 red socks, 1 black sock and 5 white socks. If you pick out a sock from the drawer without looking, what is the probability that the sock is:
a red **b** white

- a** There are 2 red socks, and there are 8 socks in total.

Answer: Probability (picking out a red sock) = $\frac{2}{8} = \frac{1}{4}$

- b** There are 5 white socks out of a total of eight.

Answer: Probability (picking out a white sock) = $\frac{5}{8}$

Remember

Simplify fractions to their lowest terms where possible.

Try the skill

1. An ordinary dice is thrown. What is the probability of scoring:

- a** 2 _____
- b** an even number _____
- c** a number more than 3 _____
- d** a number less than 3 _____

2. A bag of sweets contains 5 toffees, 10 chocolate éclairs and 10 pieces of fudge.

If you pick a sweet out at random, what is the probability of picking out:

- a** a toffee _____
- b** a chocolate éclair _____

Tip

'At random' means not aiming for a particular result.

Challenge question!

3. A packet of cards contains 20 cards numbered 1 to 20. All even cards are red and all odd cards are blue.

If you pick one card out at random, what is the probability of picking out






- a** card number 1 _____
- b** a blue card _____
- c** a card with a multiple of 5 on it _____

Remember

Multiples of 5 are 5, 10, 15, ...

2 Remember what you have learned

First complete this ...

-  The measure of the likelihood of an outcome of an event is called _____.
-  The probability of an impossible event is _____.
-  The probability of a certain event is _____.
-  All probability values are in the range from _____ to _____.
-  To find the probability of an event occurring, you divide the number of times the outcome can occur by _____.

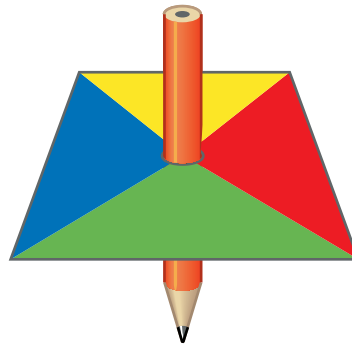
Practise the skill

1. The chances of you rowing across the Atlantic Ocean in a paddle boat are:

- A ☐ 0
 B ☐ between 0 and $\frac{1}{2}$
 C ☐ 1 hour 55 minutes
 D ☐ $\frac{1}{2}$

2. A four-sided spinner is divided into equal sectors, coloured red, yellow, blue and green.

The probability of the spinner landing on red when it is spun is:



- A ☐ 0
 B ☐ $\frac{1}{4}$
 C ☐ $\frac{1}{2}$
 D ☐ 1

3. Rosie broke her arm last week in an accident. The probability that she will break her other arm this week is:

- A ☐ impossible
 B ☐ unlikely
 C ☐ likely
 D ☐ certain

4. A bag contains 1 black ball, 2 blue balls, 3 green balls and 4 red balls. If you pick a ball out at random, what is the probability that it will be blue?

- A ☐ $\frac{1}{10}$
 B ☐ $\frac{1}{5}$
 C ☐ $\frac{2}{5}$
 D ☐ $\frac{3}{5}$