Chapter 11 Likelihood of events

Specification

FS coverage and range	Use data to assess the likelihood
FS exemplification	Put events in order of likelihood on a probability scale Justify decisions based on the probability scale Explain results from the context of statistical diagrams and calculations

GCSE

GCSE specification	**SP m** Understand and use the vocabulary of probability and probability scale
Edexcel GCSE course	**Specification A:** **Foundation** 26.1–26.2 **Higher** 28.1 **Specification B:** **Foundation Unit 1:** 5.1–5.2 **Higher Unit 1:** 5.1

Resources

General resources	Coin Dice Washing line (or long piece of string) and pegs Pieces of card Bag and coloured counters Packs of playing cards Newspaper headlines involving risk or perception of risk
Resource sheets	11.1, 11.2
Links	http://www.transum.org/Software/SW/Starter_of_the_day (Click back through the calendar and choose 18 March) http://www.bbc.co.uk/schools/ks2bitesize/maths/data/ (Choose Probability, then Play) http://jmathpage.com/JIMSProbabilitypage.html http://www.shodor.org/interactivate/activities/ (Choose Probability then choose Racing Game With Two Die) http://www.mathsonline.co.uk/nonmembers/resource/prob (Choose Chase me)
ActiveTeach resources	Video ResultsPlus Problem Solving Question Audio Animations

Lesson 1

Objectives

- Decide if events are certain, impossible, likely or unlikely
- Find possible outcomes
- Know that some events can happen in more than one way
- Know when events are equally likely

Starter

- Ask a student volunteer to choose heads or tails and flip a coin to decide who wins. Explore students' informal notions of probability using coin flipping. Ask:
  - *Who won? If we flip the coin again who will win this time? Can you tell?*
  - *Are we more likely to get a head or tails?*
  - *Is it likely we will get six tails in a row?* (Although it is possible, it is not likely.)
- Give another student a dice. Ask: *What number is most likely on the dice? What number is least likely?*

Main teaching and learning

- String a washing line across the front of the class. Label one end 'impossible' (the left as the class is looking) and the other 'certain'. Ask students to peg the probability event cards from Resource sheet 11.1 in the correct place on the washing line. Students can also suggest additional events. Students must justify where they have placed each card.
- Refer students to *Take a look*: Deciding the likelihood of events (p113). Write the events listed on further cards and ask students to add them to the washing line.
- Ask students to complete *Have a go* Q1–4.
- Ask students to list all the outcomes of throwing a six-sided dice. Put some different coloured counters in a bag and ask students to list all the possible outcomes of taking a counter out of the bag. Emphasise the need to identify all the possible outcomes.
- Work through *Take a look*: Playing cards with students. Give students a pack of cards to help them identify the contents if needed.
- Ask students to begin working on *Have a go* Q5–7.

Issues and misconceptions

- Lack of familiarity of situations in probability can hinder students, e.g. not knowing the suits in a pack of cards.
- Be alert to ingrained incorrect notions such as a 6 being the least likely number to throw on a dice or that outcomes are equally likely when they are not.

Support

- Encourage students to reason correctly about the likelihood of events. Ask them to work in pairs to justify their reasoning to one another.

Extension

- In Q5, ask students to draw a sample space diagram for the two dice.

Plenary

- Write the answers to Q1–4 on cards and ask students to add them to the washing line.

Formative assessment

- During the Plenary, ask students to give the answers to Q1–4 and mark their own work.

Homework

- Ask students to design a probability experiment (e.g. a dice experiment, using a spinner, taking coloured counters from a bag), to try it out and to record their results.

Lesson 2

Objectives

- Use real data to decide on the likelihood of events

Starter

- Play 'Horse race' with the class. Hand out Resource sheet 11.2. Ask each student to pick a number from 2 to 12 to be their horse. Roll two dice and add the scores. Move the horse with that score one step forward. Repeat until a horse has won. Ask: *Why is there no horse numbered 1? Do all horses have the same chance of winning?*

Main teaching and learning

- Ask students to finish working on *Have a go* Q5–7 (p114).
- Discuss the fact that our perceptions are not always accurate: some things are more or less likely than people think. Emphasise the importance of using actual data to support arguments and draw conclusions. Use the following examples:
  - According to a survey, non-students watch 20.8 hours of television a week. Ask: *How long do you think university students spend watching television per week?* (Most people think students watch a lot of television, but the survey actually showed that they watch less than non-students – 13.58 hours a week.)
  - It is commonly said that you are more likely to be struck by lightning than win the lottery. (In fact, in the UK in 2009, 160 people won the Lotto jackpot, or a share of it, whereas 46 people were struck by lightning.)
- Work through *Take a look*: Crime in Manchester with students.
- Ask students to complete *Have a go* Q8 and Q9.

Issues and misconceptions

- Students may find it hard to be objective about using data to support a conclusion, instead following their preconceptions.
- Students may have difficulty picking key features out of a table or graph and communicating their findings clearly.

Support

- Some students will need to have Q8 and Q9 broken down into stages for them. Paired working with more confident peers will help them build confidence with such questions.

Extension

- Ask students to find their own data to analyse (e.g. survey or poll results, tables and charts in newspapers or on the internet) and to produce a poster showing their findings.

Plenary

- Discuss some newspaper headlines with the class (e.g. schools given metal detectors to counteract knife crime; climate change). Ask: *Do you think the advice is backed up by real data? How could we find out?*

Formative assessment

- Ask pairs of students to share their answers to Q8 and Q9 with other pairs.
- Encourage students to reflect on their work in this chapter and set their own targets.

Homework

- Ask students to find some newspaper articles that comment on data.