Pupils should be taught to:

Collect and record experimental data, and estimate probabilities based on the data

As outcomes, Year 7 pupils should, for example:

Collect data from a simple experiment and record in a frequency table; estimate probabilities based on the data.

For example:

- Put four different coloured cubes in a bag. Shake it.
  Without looking, take a cube from the bag, but before you do so, guess its colour.
  If you are right, put a tick in the first column.
  If you are wrong, put a cross.
  Put the cube on the table.
  Carry on until you have taken out all four cubes.

  Repeat this experiment 10 times. Record your results.

Experiment number	Guesses			
	1st	2nd	3rd	4th
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

  What is the chance of being right on the 1st guess?
  On the 4th guess? Choose from: no chance, some chance, even chance, certain chance. Explain your choice.

- Use a bag containing an unknown mixture of identical, but differently coloured, counters.
  Draw one counter from the bag, note its colour, then replace it. Do this 10 times.
  Now estimate the probability of each colour.
  Check by emptying the bag.

- Make a dice (or spinner) from card in the shape of a regular solid or polygon. Weight it to make it biased, e.g. with Plasticine stuck to the inside or to the surface of the spinner.
  Throw the dice or spin the spinner 50 times.
  Estimate the probability of each score.
  Compare your estimated probabilities with what you would expect from a fair dice or spinner.

As outcomes, Year 8 pupils should, for example:

Estimate probabilities based on experimental data and use relative frequency as an estimate of probability. For example:

- Class 8C opened 20 small boxes of raisins.
  8 of the 20 boxes contained more than 28 raisins.
  What is the probability that an unopened box will contain fewer than 28 raisins?

- Throw two dice numbered 1 to 6 and sum the scores. Repeat 30 times and record each result on a frequency diagram.
  Compare results with another group.
  Are they different? Why?
  Predict what might happen if the experiment were repeated.
  Carry out the experiment again another 20 times and record the extra scores on the same diagram. What effect do the extra throws have on the results?
  Did the results match predictions? Why?

Understand that:
- If an experiment is repeated there may be, and usually will be, different outcomes.
- Increasing the number of times an experiment is repeated generally leads to better estimates of probability.

Solve problems such as:

- A girl collected the results of 50 European football matches:

home wins	35
away wins	5
draws	10

  Use these results to estimate the probability in future European matches of:
  a. a home win;
  b. an away win;
  c. a draw.

  The girl found the results of the next 50 matches.

home wins	37
away wins	4
draws	9

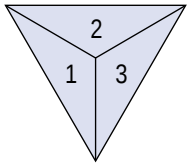
  Estimate, using all 100 results, the probability in future European matches of:
  a. a home win;
  b. an away win;
  c. a draw.
  Would these probabilities be more accurate than those based on the first 50 matches? Why?

Link to comparing experimental and theoretical probabilities (pages 284–5).

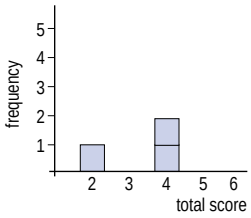
As outcomes, Year 9 pupils should, for example:

Estimate probabilities based on experimental data and use relative frequency as an estimate of probability. For example:

- Use an equilateral triangular spinner with three equal sections labelled 1, 2 and 3.
  Spin it twice. Add the two scores.
  Repeat this 40 times.



  As the experiment progresses, record results in a frequency diagram.



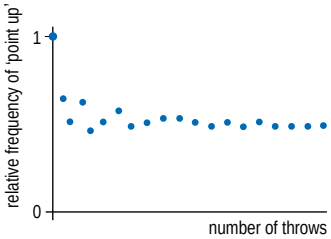
  Using the results:
  a. Which total is most likely?
  b. What is the estimated probability of a total of 5? How could you make a more accurate estimate?
  c. If the experiment were repeated 2000 times, how many times would you expect to get a total of 3?

  Justify your answers.

  What happens if the numbers on the spinner are changed, e.g. to 1, 2, 2 or 3, 2, 2 or 1, 1, 3 or 2, 2, 2?

Recognise that, with repeated trials, experimental probability tends to a limit. Relative frequency can give an estimate of probability, independent of the theoretical probability, and may be the only realistic way of estimating probability when events are not equally likely. For example:

- *Throw a drawing pin 10 times.*
  Record how many times it lands 'point up'.
  Estimate the probability of 'point up' from these 10 trials.
  Repeat the experiment another 10 times. Estimate the probability based on 20 trials.
  Repeat the procedure another 80 times, calculating and plotting the probabilities (relative frequencies) after every 10 throws.



Predict and sketch relative frequency diagrams for these pins.