



## Experiment

- Using experimental data to estimate probability
- Understanding the difference between theoretical and experimental probability
- Understanding the effect of repeating an experiment many times

Keywords

You should know

explanation 1a

explanation 1b

- 1** Linda puts some red, yellow and blue counters in a bag. She takes a counter at random from the bag. She records the colour of the counter and then puts the counter back in the bag. Linda repeats this experiment 80 times. The table shows her results.

Colour of counter	Red	Yellow	Blue
Frequency	36	20	24
Experimental probability			

- a** Copy and complete the table to show the experimental probabilities.
- b** Which colour counter are there likely to be most of in the bag? Explain how you worked out your answer.
- c** If there are 16 counters in the bag, how many do you think there will be of each colour?
- 2** Ali is carrying out an experiment to see whether people can tell which is the cheaper of two different makes of chocolate. He has already asked 80 people to taste the chocolate and recorded the results. 48 of the people who tasted the chocolate identified the cheaper chocolate. What is the probability that the next person he asks will be able to tell which is the cheaper chocolate?

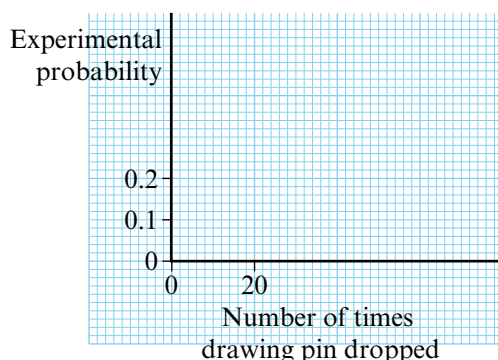


**3** Work with a partner. Carry out an experiment to work out the experimental probability of a drawing pin landing point up when dropped.

- a** Drop a drawing pin 20 times and count the number of times it lands point up. Copy the table below. Fill in the first column.

<b>Total number of times the drawing pin is dropped</b>	20	40	60	80	100
<b>Total number of times the drawing pin lands point up</b>					
<b>Experimental probability</b>					

- b** Repeat the experiment four times. Each time, fill in the row for the total number of times the pin lands point up.
- c** Work out the experimental probability for the drawing pin landing point up.
- d** Draw a graph with the horizontal axis going from 0 to 100 and the vertical axis going from 0 to 1. Scale your axes as shown in the diagram.



Label the horizontal axis 'Number of times drawing pin dropped' and the vertical axis 'Experimental probability'.

Plot the values in your table to draw a graph.

- e** What do you notice about the points on your graph?
- f** What would you expect to happen if you continued the experiment by dropping the pin more times?

- 4** Work with a partner to carry out an experiment using a six-sided dice to work out the experimental probability of getting the number 5.

- a** Roll the dice 20 times and count the number of 5s.

Draw and fill in a table like that used in question 3.

- b** Repeat the experiment four times. Each time, fill in the row for the total number of 5s.
- c** Work out the experimental probability of getting a 5.
- d** What do you notice about the experimental probabilities?
- e** What is the theoretical probability of getting a 5?  
How does this compare with your final experimental probability?

- 5** Prateek carried out an experiment. He spun three coins at the same time and recorded the number of heads he got. The table shows his results.

Number of heads	0	1	2	3
Frequency	8	25	21	6
Experimental probability				

- a** How many times did Prateek carry out his experiment?
- b** Copy and complete the table to show the experimental probabilities.  
Give your probabilities as decimals correct to three decimal places.

Sage carried out the same experiment. The next table shows her results.

Number of heads	0	1	2	3
Frequency	180	540	590	190
Experimental probability				

- c** How many times did Sage carry out her experiment?
- d** Copy and complete the table to show the experimental probabilities.  
Give your probabilities as decimals correct to three decimal places.
- e** Write down all the different outcomes that can be obtained when spinning three coins.
- f** Use your answer to part **e** to work out the theoretical probabilities of getting 0, 1, 2 and 3 heads when spinning three coins.
- g** Whose experimental probabilities are closer to the theoretical probabilities?  
Give a reason why this is the case.

**6** Work with a partner.

- a** Put a total of 10 counters in a bag. There should be some of each of three different colours. Do not let your partner see how many of each colour there are.  
Ask your partner to take a counter at random from the bag, record its colour in a frequency table and then put the counter back.  
Repeat this 20 times.
- b** Work out the experimental probability of taking each colour.  
Write this underneath your table.  
Your partner should use this to estimate how many counters of each colour there are in the bag.
- c** Repeat the experiment another 20 times.
- d** Work out the new experimental probabilities. Your partner should again estimate how many counters of each colour are in the bag.
- e** Repeat this experiment once more and allow your partner one more estimate.
- f** Empty the bag. Was your partner correct?  
Was their final estimate more accurate than their first? Explain your findings.
- g** Change roles and repeat the whole process with you estimating this time.

explanation 2a

explanation 2b

explanation 2c

explanation 2d

- 7** Carly spins a red and a blue spinner 50 times each. She records whether or not each spinner lands on a 1. The tables show her results.

Red spinner	
Lands on a 1	Does not land on a 1
7	43

Green spinner	
Lands on a 1	Does not land on a 1
24	26

- a** Work out the relative frequency of getting a 1 on each spinner.
  - b** Both spinners are fair six-sided spinners.  
How many sides of each spinner do you think will have a 1 on them?  
Give an explanation for your answers.
- 8** Susan rolls a dice 210 times. She gets a four 60 times.  
Is the dice likely to be fair? Give a reason for your answer.

- 9** A bag contains eight counters. Each counter is blue or red or yellow.

Helena takes a counter at random from the bag. She records the colour of the counter and then puts the counter back in the bag.

She repeats this experiment 400 times. The table shows her results.

Colour of counter	Blue	Red	Yellow
Frequency	210	98	92

- a** Estimate how many of the eight counters are blue.  
Give an explanation for your answer.
- b** Estimate how many of the eight counters are yellow.  
Give an explanation for your answer.
- 10** Max opens 15 tubes of the same type of sweets. He records whether or not there is a red sweet in each tube. Only 4 tubes contain a red sweet.
- a** Work out the relative frequency of a tube containing a red sweet.  
Give your answer as a fraction.
- b** Max buys a box containing 36 tubes of these sweets. Work out an estimate for the number of tubes that are likely to contain a red sweet.
- c** Explain why your answer to part **b** is an estimate rather than a definite answer.
- 11** Sasha rolls a fair six-sided dice 120 times.  
Work out an estimate for the number of times that Sasha will roll a 5.
- 12** The probability that a biased dice will land 3 up is 0.4.  
Mark rolls the biased dice 200 times.  
Work out an estimate for the number of times that the dice will land 3 up.
- 13** The probability of having to wait for more than 5 minutes at a post office is  $\frac{2}{7}$ .  
350 people use the post office in one day.  
Work out an estimate for the number of people who have to wait for more than 5 minutes.