

PART 3

UNIT
7

AUTUMN
second half

PROBABILITY

SECTION 1 How likely?

SECTION 2 Measuring probability

SECTION 3 Working out probabilities

UNIT 7

PROBABILITY

SUGGESTED TIME **3 hours**

TEACHING OBJECTIVES

- Discuss chance or likelihood.
- Use vocabulary and ideas of probability drawing on experience.
- Calculate simple probabilities.
- Understand and use the probability scale from 0 to 1.

SECTION 1 How likely?

SECTION 2 Measuring probability

SECTION 3 Working out probabilities

HOMEWORK

- Use the Star Challenges.
- You may want to take the opportunity to set a revision exercise on a topic covered earlier in the term, for example, fractions, that supports the work on probability.

Unit **7****Checklist for pupils**UNIT
7

How likely?

You will:

- decide whether events are certain, uncertain or impossible

Measuring probability

You will:

- use the probability scale of 0 to 1

Working out probabilities

You will:

- work out probabilities of events

UNIT 7

SECTIONS 1, 2 AND 3: HOW LIKELY? MEASURING PROBABILITIES WORKING OUT PROBABILITIES

DIRECT TEACHING POINTS

- Discuss ideas of chance and the associated vocabulary. Exercise 1, with pupils working in groups, is a possible follow-up activity.
- Explain and give examples of equally likely events. Emphasise that 'equally likely' and 'evens' do not mean the same.
- Pupils need to move from intuitive ideas about probability, exercise 1 in Section 1, to the calculation of simple probabilities.
- The examples in Sections 2 and 3 involve the calculation of probabilities. These are typically Level 5 activities but are accessible to many pupils.
- Explain notation for example, prob (6) or $p(6)$.



*probability chance likely unlikely
likelihood certain uncertain impossible
equally likely fair outcome*

How likely?

1

Certain, uncertain or impossible

Instructions to teacher

Preparation

- Photocopy and cut out the event cards on the next page. Make enough copies for each group in the class to have a complete set.

In class

- Make sure everyone in the class understands the meanings of the words **certain**, **uncertain** and **impossible**.
- Divide the class up into groups of about six students. Give each group a set of the event cards.
- Each group is to discuss each event shown on the cards, and decide, as a group, whether each event is **certain**, **uncertain** or **impossible**. They should put the event cards into three piles:

certain

uncertain

impossible

- Finally, lead a class discussion on which events have been put into each pile.

How likely?

1

Certain, uncertain or impossible *continued***Event cards**

I will go shopping this week.	I will eat some toast tomorrow.	Teacher will give me a sweet in the next five minutes.
I will eat something tomorrow.	The day after Sunday will be Monday	I will go swimming in the next four weeks.
Liverpool F.C. will play Manchester United next year.	Teacher will be eaten by a tiger tomorrow.	I will smile at the next teacher I see.
I will not say a word in the next ten minutes.	I will walk barefoot to school tomorrow.	The headteacher will come to school dressed as a gorilla.
The local football team will play Manchester United.	I will have a birthday next year.	I will trip over next week.
I will get out of bed tomorrow.	I will be nice to my brother today.	The sun will rise tomorrow.
I will go to school next year.	Teacher will set us homework tonight.	Liverpool F.C. will beat Manchester United next year.
Next week will be eight days long.	I will be older tomorrow than I am today.	I will buy some sweets tomorrow.
It will rain today.	I will wear green socks tomorrow.	Teacher will win the lottery this week.

How likely?



1

Fair game?



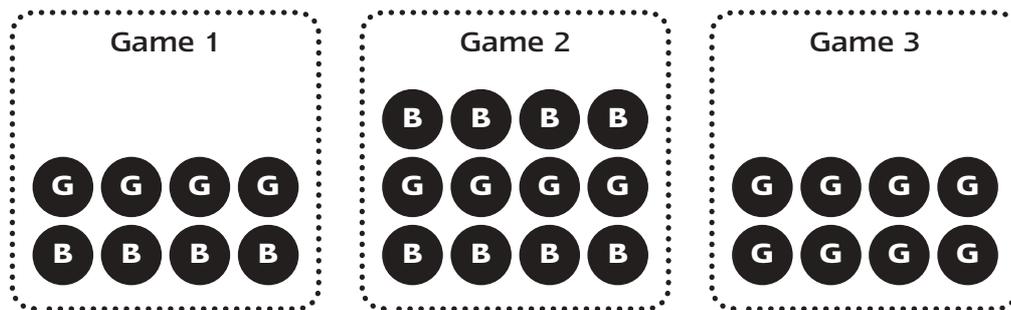
All correct 1 star

A teacher plays a game with a class.
Some green and blue counters are put into a bag.
One counter is taken out at random (without looking).

If a **blue** counter is drawn, team B get a point.

If a **green** counter is drawn, team G get a point.

The teacher plays the game with three different bags of counters.



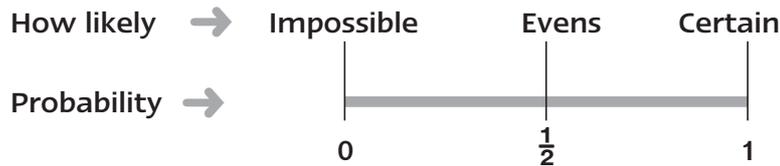
- 1 Which game is team G **certain** to win?
- 2 Which game is team B **most likely** to win?
- 3 Which game is team G **least likely** to win?
- 4 Which game is it **impossible** for team B to win?
- 5 For which game is it **equally likely** that team B or team G win?
- 6 Are all these games **fair**?

Measuring probability

1

The probability scale

The probability of an event describes how likely the event is. Probability is given as a number between 0 and 1.

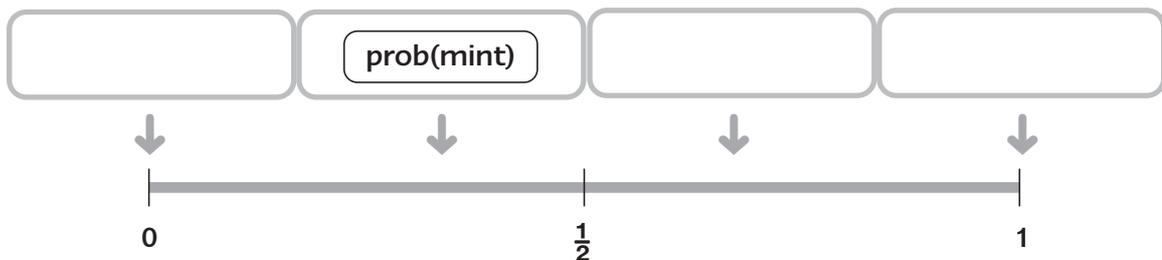


- 1 There are 3 sweets on this dish.

2 toffees
1 mint



Shafiq is given one of these sweets.



Put these labels into the correct boxes on the probability line:

prob(toffee or mint)

prob(toffee)

prob(fruit drop)

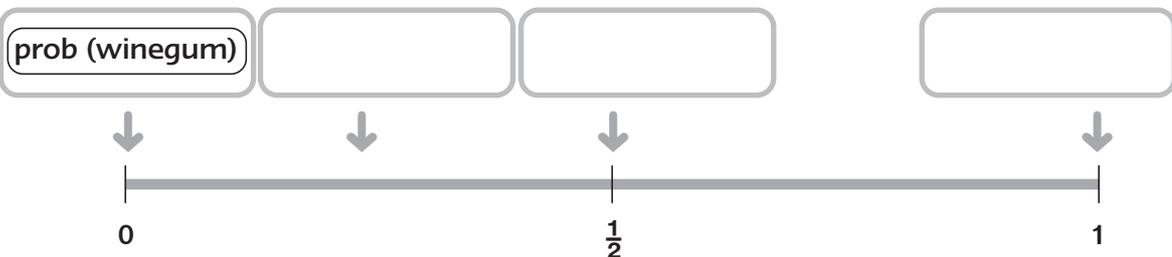
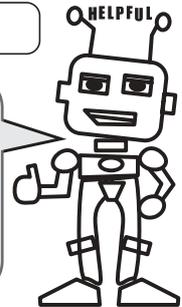
- 2 There are 4 sweets on this dish.

2 toffees
1 mint
1 fruit drop



Anna is given one of these sweets.

There aren't any wine gums on the dish, so it is impossible for Anna to get a wine gum.



Put these labels into the correct boxes on the probability line:

prob(toffee, fruit drop or mint)

prob(fruit drop)

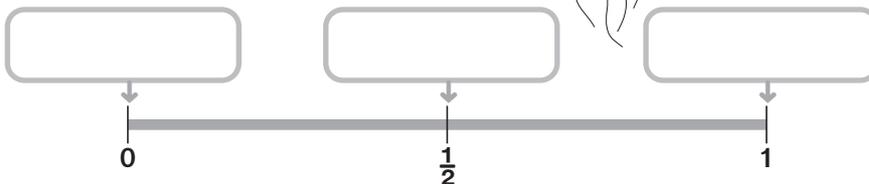
prob(toffee)

Measuring probability

2

Balloons

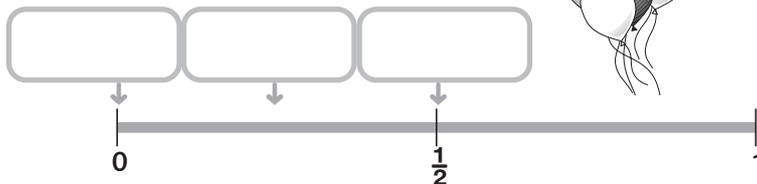
- 1 There are four balloons in this bunch. Two are red and two are blue.



Put these labels into the correct boxes:

prob(white) prob(red) prob(red or blue)

- 2 There are eight balloons in this bunch. Four are red, two are white and two are green.



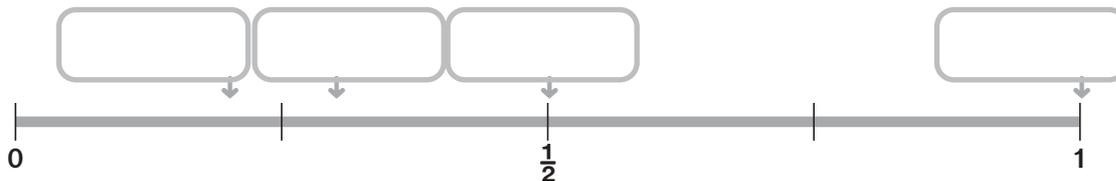
Put these labels into the correct boxes:

prob(blue) prob(red) prob(white)

- 3 10 balloons:
5 blue (B)
2 red (R)
3 green (G)

Put the labels into the correct boxes:

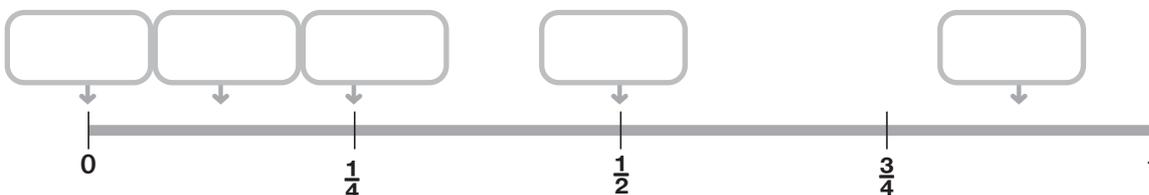
prob(R, G or B) prob(R) prob(B) prob(G)



- 4 16 balloons:
8 red (R)
4 green (G)
2 blue (B)
2 white (W)

Put the labels into the correct boxes:

prob(R, G or B) prob(G) prob(R) prob(pink) prob(W)



Measuring probability



3

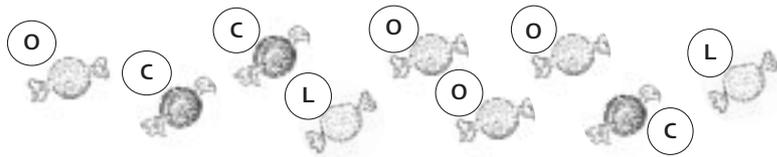
Fruit drops



All correct 1 star

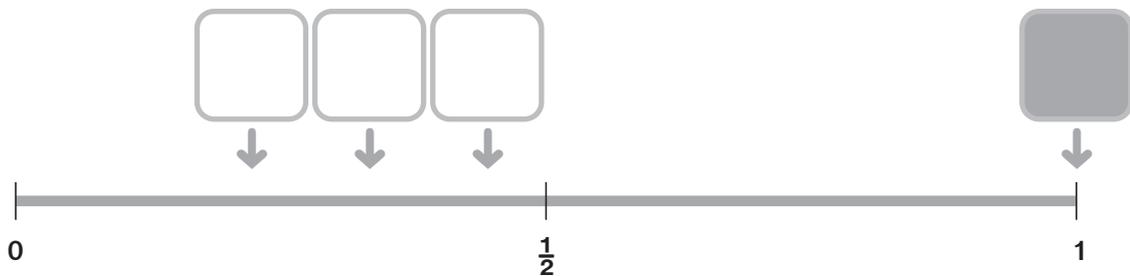
Olwen has been eating fruit drops.
She has these fruit drops left:

- O = orange
- L = lemon
- C = cherry



She puts them back in the packet.
Later, she tips just one out.

- 1 Which flavour is she most likely to get?
- 2 Which flavour is she least likely to get?
- 3 Put the probabilities of orange $p(O)$, lemon $p(L)$, cherry $p(C)$ into the unshaded boxes.
- 4 What would go in the shaded box?



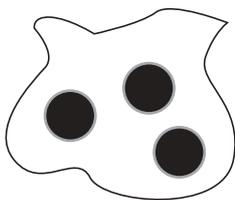
Working out probabilities

1 Simple probabilities

Imagine that a few black and white counters are placed in different bags. One counter is picked out at random (without looking) from each bag.

Example 1

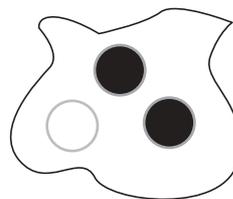
The probability of getting a black counter is 1.
We write this as $\text{prob}(\text{black}) = 1$



The probability of getting a white counter is 0.
or $\text{prob}(\text{white}) = 0$

Example 2

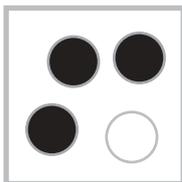
The chance of getting a white counter is 1 out of 3
or $\text{prob}(\text{white}) = \frac{1}{3}$



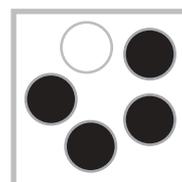
The chance of getting a black counter is 2 out of 3
or $\text{prob}(\text{black}) = \frac{2}{3}$

Fill in the gaps:

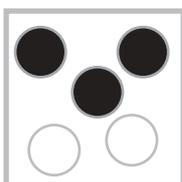
1 $\text{prob}(\text{white}) = \dots\dots\dots$
 $\text{prob}(\text{black}) = \dots\dots\dots$



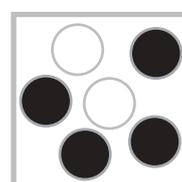
2 $\text{prob}(\text{white}) = \dots\dots\dots$
 $\text{prob}(\text{black}) = \dots\dots\dots$



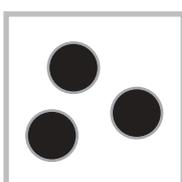
3 $\text{prob}(\text{white}) = \dots\dots\dots$
 $\text{prob}(\text{black}) = \dots\dots\dots$



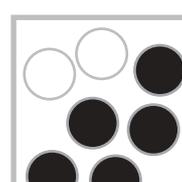
4 $\text{prob}(\text{white}) = \dots\dots\dots$
 $\text{prob}(\text{black}) = \dots\dots\dots$



5 $\text{prob}(\text{white}) = \dots\dots\dots$
 $\text{prob}(\text{black}) = \dots\dots\dots$



6 $\text{prob}(\text{white}) = \dots\dots\dots$
 $\text{prob}(\text{black}) = \dots\dots\dots$



Working out probabilities

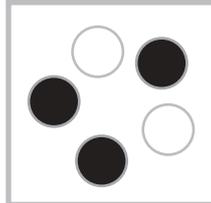
2

More probabilities

1

$$\text{prob(white)} = \dots\dots\dots$$

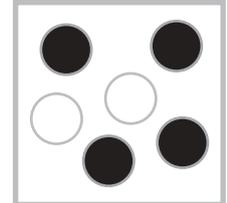
$$\text{prob(black)} = \dots\dots\dots$$



2

$$\text{prob(white)} = \dots\dots\dots$$

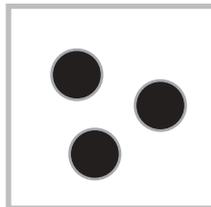
$$\text{prob(black)} = \dots\dots\dots$$



3

$$\text{prob(white)} = \dots\dots\dots$$

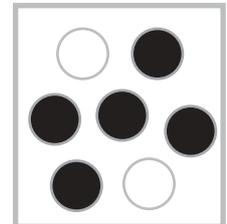
$$\text{prob(black)} = \dots\dots\dots$$



4

$$\text{prob(white)} = \dots\dots\dots$$

$$\text{prob(black)} = \dots\dots\dots$$

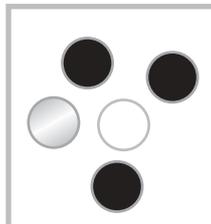


5

$$\text{prob(white)} = \dots\dots\dots$$

$$\text{prob(black)} = \dots\dots\dots$$

$$\text{prob(silver)} = \dots\dots\dots$$

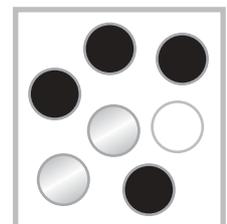


6

$$\text{prob(white)} = \dots\dots\dots$$

$$\text{prob(black)} = \dots\dots\dots$$

$$\text{prob(silver)} = \dots\dots\dots$$

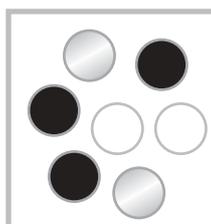


7

$$\text{prob(white)} = \dots\dots\dots$$

$$\text{prob(black)} = \dots\dots\dots$$

$$\text{prob(silver)} = \dots\dots\dots$$

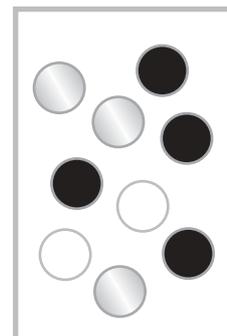


8

$$\text{prob(white)} = \dots\dots\dots$$

$$\text{prob(black)} = \dots\dots\dots$$

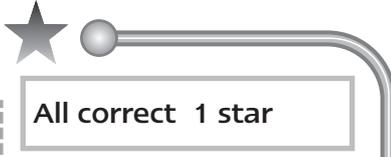
$$\text{prob(silver)} = \dots\dots\dots$$



Working out probabilities



4 Random letters



Example The letters which make up the word
S C H O O L are placed in a bag.
 What is the chance that the letter L will be picked out?
 $\text{prob}(L) = \frac{1}{6}$ $\text{prob}(O) = \frac{2}{6}$

1 **M A T H S** are in the bag.
 $\text{prob}(M) = \dots\dots\dots$ $\text{prob}(A) = \dots\dots\dots$ $\text{prob}(H) = \dots\dots\dots$

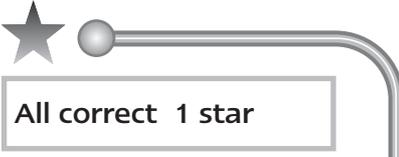
2 **M A D N E S S** are in the bag.
 $\text{prob}(A) = \dots\dots\dots$ $\text{prob}(M) = \dots\dots\dots$ $\text{prob}(S) = \dots\dots\dots$

3 **P R O B A B I L I T Y** are in the bag.
 $\text{prob}(A) = \dots\dots\dots$ $\text{prob}(O) = \dots\dots\dots$ $\text{prob}(B) = \dots\dots\dots$

4 **E L E P H A N T S** are in the bag.
 $\text{prob}(A) = \dots\dots\dots$ $\text{prob}(E) = \dots\dots\dots$ $\text{prob}(T) = \dots\dots\dots$



5 Probabilities with one dice



Example



One dice is rolled.
 The possible outcomes are
 1 2 3 4 5 6
 The chance of getting 5.
 $\text{Prob}(5) = \frac{1}{6}$
 The chance of getting 4 or 5.
 $\text{Prob}(4 \text{ or } 5) = \frac{2}{6}$

- 1 What is the probability of getting a 2?
- 2 What is the probability of getting a 3?
- 3 $\text{Prob}(\text{an even score}) =$
- 4 $\text{Prob}(3 \text{ or } 4) =$
- 5 $\text{Prob}(\text{a score less than } 4) =$
- 6 $\text{Prob}(\text{a score more than } 4) =$
- 7 $\text{Prob}(7) =$

Working out probabilities



6

Probabilities with two dice



10-11 correct 2 stars
8-9 correct 1 star

- 1 This table shows the **sum of the scores** when two dice are thrown.

It is not complete.

Complete the table of outcomes.

		<u>Totals on 2 dice.</u>					
		Second dice	1	2	3	4	5
First dice	6	7	8	9	10	11	12
	5	6					
	4				8	9	10
	3						
	2						
	1	2	3	4	5	6	7

Each entry in the table is an outcome.



- 2 How many outcomes are there altogether? (They are not all different.)

$$\text{Prob}(12) = \frac{1}{36}$$

$$\text{Prob}(11) = \frac{2}{36}$$

$$\text{Prob}(11 \text{ or } 12) = \frac{3}{36}$$

3 $\text{prob}(2) = \dots\dots\dots$

8 $\text{prob}(3, 4 \text{ or } 5) = \dots\dots\dots$

4 $\text{prob}(5) = \dots\dots\dots$

9 $\text{prob}(7) = \dots\dots\dots$

5 $\text{prob}(5 \text{ or less}) = \dots\dots\dots$

10 $\text{prob}(10 \text{ or more}) = \dots\dots\dots$

6 $\text{prob}(3) = \dots\dots\dots$

11 $\text{prob}(\text{multiple of } 5) = \dots\dots\dots$

7 $\text{prob}(10) = \dots\dots\dots$

Unit 7 Answers

Section 1

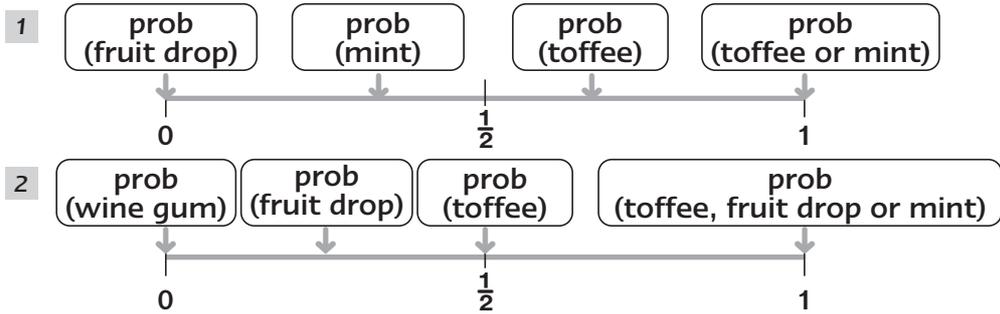
How likely?

- 1 Certain, uncertain or impossible
 The children decide together which event should go in each pile.

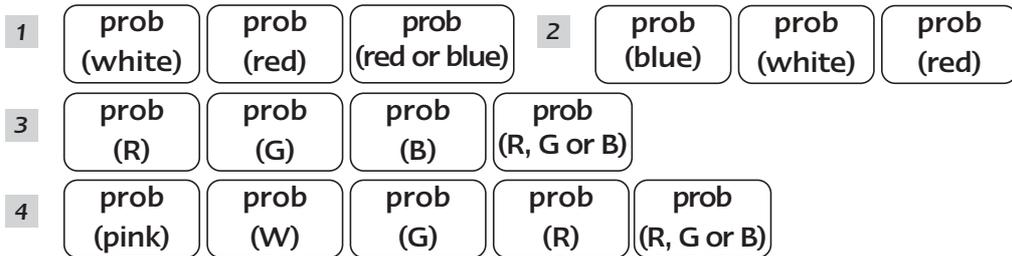
Section 2

Measuring probability

- 1 The probability scale



- 2 Balloons



Section 3

Working out probabilities

- 1 Simple probabilities

1	$\text{prob}(\text{white}) = \frac{1}{4}$	3	$\text{prob}(\text{white}) = \frac{2}{5}$	5	$\text{prob}(\text{white}) = 0$
	$\text{prob}(\text{black}) = \frac{3}{4}$		$\text{prob}(\text{black}) = \frac{3}{5}$		$\text{prob}(\text{black}) = 1$
2	$\text{prob}(\text{white}) = \frac{1}{5}$	4	$\text{prob}(\text{white}) = \frac{2}{6}$	6	$\text{prob}(\text{white}) = \frac{2}{7}$
	$\text{prob}(\text{black}) = \frac{4}{5}$		$\text{prob}(\text{black}) = \frac{4}{6}$		$\text{prob}(\text{black}) = \frac{5}{7}$

- 2 More probabilities

1	$\text{prob}(\text{white}) = \frac{2}{5}$	4	$\text{prob}(\text{white}) = \frac{2}{7}$	7	$\text{prob}(\text{white}) = \frac{2}{7}$
	$\text{prob}(\text{black}) = \frac{3}{5}$		$\text{prob}(\text{black}) = \frac{5}{7}$		$\text{prob}(\text{black}) = \frac{5}{7}$
2	$\text{prob}(\text{white}) = \frac{2}{6}$	5	$\text{prob}(\text{white}) = \frac{1}{5}$		$\text{prob}(\text{silver}) = \frac{2}{7}$
	$\text{prob}(\text{black}) = \frac{4}{6}$		$\text{prob}(\text{black}) = \frac{4}{5}$	8	$\text{prob}(\text{white}) = \frac{2}{9}$
3	$\text{prob}(\text{white}) = 0$		$\text{prob}(\text{silver}) = \frac{1}{5}$		$\text{prob}(\text{black}) = \frac{4}{9}$
	$\text{prob}(\text{black}) = 1$	6	$\text{prob}(\text{white}) = \frac{1}{7}$		$\text{prob}(\text{silver}) = \frac{3}{9}$
			$\text{prob}(\text{black}) = \frac{4}{7}$		
			$\text{prob}(\text{silver}) = \frac{2}{7}$		

Unit 7 Answers

Star Challenge answers



1

Fair game?

All correct 1 star

- 1 Game 3 3 Game 2 5 Game 1
2 Game 2 4 Game 3 6 No



2

Order of likelihood

All correct 1 star

- 1 Jets are the best 3 Jets are the best
2 Giants walk tall Manchester Giants
4 B, C, A, D Chester Jets
I love basketball
Giants walk tall



3

Fruit drops

All correct 1 star

- 1 Orange 3 L C O
2 Lemon 4 Orange / lemon / cherry



4

Random letters

All correct 1 star

- 1 $\text{prob}(M) = \frac{1}{5}$ $\text{prob}(A) = \frac{1}{5}$ $\text{prob}(H) = \frac{1}{5}$
2 $\text{prob}(A) = \frac{1}{7}$ $\text{prob}(M) = \frac{1}{7}$ $\text{prob}(S) = \frac{2}{7}$
3 $\text{prob}(A) = \frac{1}{11}$ $\text{prob}(O) = \frac{1}{11}$ $\text{prob}(B) = \frac{2}{11}$
4 $\text{prob}(A) = \frac{1}{9}$ $\text{prob}(E) = \frac{2}{9}$ $\text{prob}(T) = \frac{1}{9}$



5

Probabilities with one dice

All correct 1 star

- 1 $\frac{1}{6}$ 3 $\frac{3}{6}$ 5 $\frac{3}{6}$ 7 0
2 $\frac{1}{6}$ 4 $\frac{2}{6}$ 6 $\frac{2}{6}$



6

Probabilities with two dice

10-11 correct 2 stars
8-9 correct 1 star

1st dice	1	2	3	4	5	6	2nd dice
6	7	8	9	10	11	12	2 $\frac{36}{36}$
5	6	7	8	9	10	11	7 $\frac{3}{36}$
4	5	6	7	8	9	10	3 $\frac{1}{36}$
3	4	5	6	7	8	9	8 $\frac{9}{36}$
2	3	4	5	6	7	8	4 $\frac{4}{36}$
1	2	3	4	5	6	7	9 $\frac{6}{36}$
							5 $\frac{10}{36}$
							6 $\frac{2}{36}$
							10 $\frac{6}{36}$
							11 $\frac{7}{36}$

