

Mathematics Level 3

Chapter 7 — Probability

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The language of chance: likely, unlikely, certain, impossible

Code: VC2M3P01 (.E01, .E02, .E03)

This is the first time you will do chance work in maths. Some things we know will happen, and some things we cannot know before they happen. In this topic you will learn four words for talking about what might happen — **likely**, **unlikely**, **certain** and **impossible** — and you will say why you chose each word.

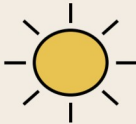
You will need: a spinner, a die, counters, a bag, cards and a pencil.

Learn the words of chance

1. Chance means we do not know what will happen

Some things we know before they happen. The sun rises every morning. A dropped ball falls down. There is no chance here.

Other things we cannot know before they happen. Will it rain tomorrow? Which counter will you pick from a bag? We say **chance** is part of it, because the result is not fixed until it happens.

We know what will happen	We do not know — chance!
 The sun rises every morning	 Will it rain tomorrow?
 A dropped ball falls down	 Which counter will you pick?

Some things are sure. Other things involve chance.

Two groups of event cards side by side. The left group is headed 'We know what will happen' and holds two cards: 'The sun rises every morning' with a sun picture, and 'A dropped ball falls down' with a ball and a down arrow. The right group is headed 'We do not know — chance!' and holds two cards: 'Will it rain tomorrow?' with a cloud, and 'Which counter will you pick?' with a bag.

The things that can happen in an activity are called the **outcomes**. When you spin a spinner, the outcomes are the colours it can land on.

2. The four words of chance

We use four words to say how likely an outcome is.

The four words of chance



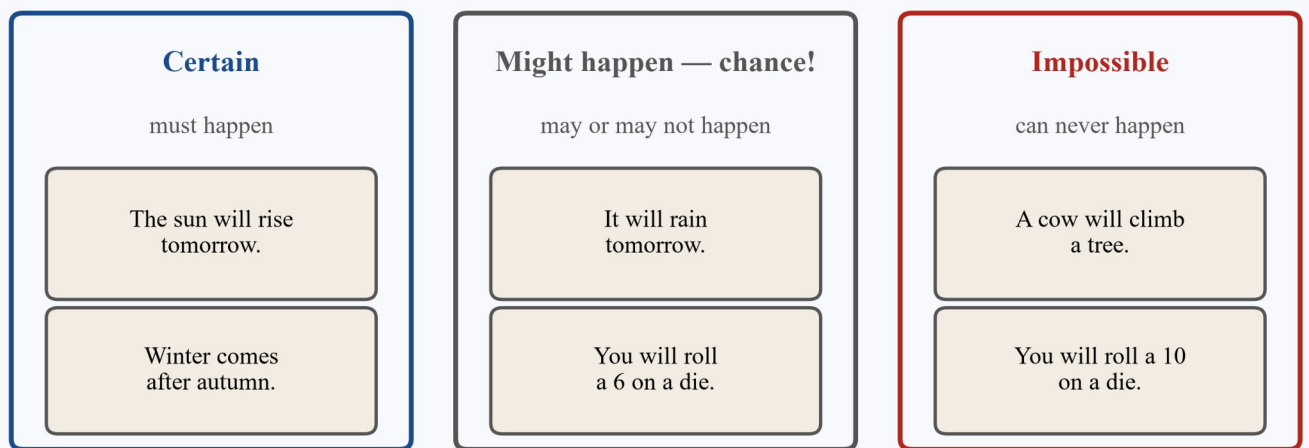
A line with an arrow at the right end and four marked points, labelled from left to right: *Impossible*, *Unlikely*, *Likely*, *Certain*. Under each word is an example event and a short meaning: *Impossible*, 'A dog will talk', can never happen; *Unlikely*, 'It will rain in Melbourne in summer', will not usually happen; *Likely*, 'It will rain in Melbourne in winter', will usually happen; *Certain*, 'The sun will rise tomorrow', must happen.

Impossible means it can never happen. **Certain** means it must happen, every time. **Unlikely** means it might happen but will not usually happen. **Likely** means it will usually happen.

Likely and unlikely events are not sure things. They may happen, or they may not — that is the chance part.

3. Certain, might happen, impossible

Every event fits into one of three groups.



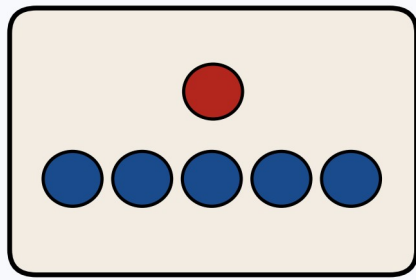
Sort every event: it must happen, it may or may not happen, or it can never happen

Three boxes for sorting event cards. The first box is headed 'Certain — must happen' and holds the cards 'The sun will rise tomorrow' and 'Winter comes after autumn'. The middle box is headed 'Might happen — chance!' and holds the cards 'It will rain tomorrow' and 'You will roll a 6 on a die'. The third box is headed 'Impossible — can never happen' and holds the cards 'A cow will climb a tree' and 'You will roll a 10 on a die'.

A **certain** event must always happen, so chance cannot change it. An **impossible** event can never happen, so chance cannot change it either. The events in the middle group — the ones that may or may not happen — are the ones affected by chance.

4. Likely and unlikely

A bag holds 5 blue counters and 1 red counter. One counter is picked without looking.



Picking blue is likely

Picking red is unlikely

Unlikely does not mean impossible — the red counter can still be picked!

A bag with 5 blue counters and 1 red counter at the top. An arrow points to the words 'Picking blue is likely', and another arrow points to the words 'Picking red is unlikely'. Under the bag: 'Unlikely does not mean impossible — the red counter can still be picked!'

Picking blue is **likely**, because there are more blue counters. Picking red is **unlikely**, because there is only 1 red counter. But unlikely does not mean impossible — the red counter can still be picked.

If a bag has no green counters, picking green is **impossible**. You cannot pick what is not there.

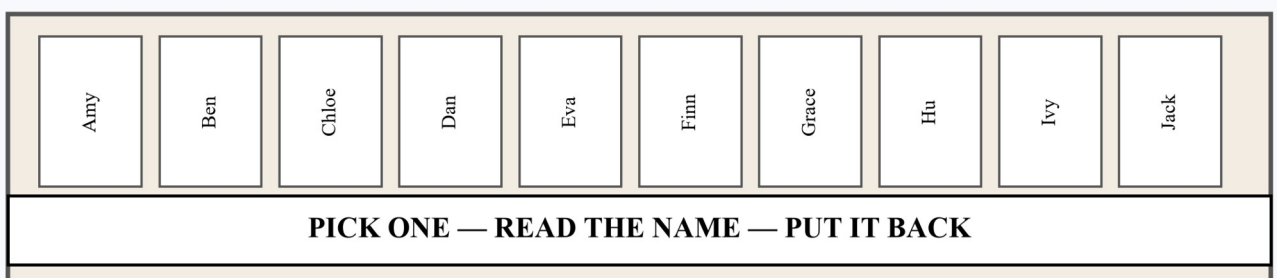
5. Say why — explain your reasoning

When you use a chance word, say why. A good reason looks at what is there, or at what we know about the world:

- “Picking blue is likely **because** there are 5 blue counters and only 1 red.”
- “Rolling a 10 is impossible **because** a die shows only 1, 2, 3, 4, 5 and 6.”
- “The sun rising is certain **because** it has happened every day, and it must happen again.”

6. Make a smart guess, then test it

Here are 10 name cards in a box. One card is picked, the name is read, and the card goes back in the box. Then the next card is picked.



After each pick the card goes back, so the same name could come up again

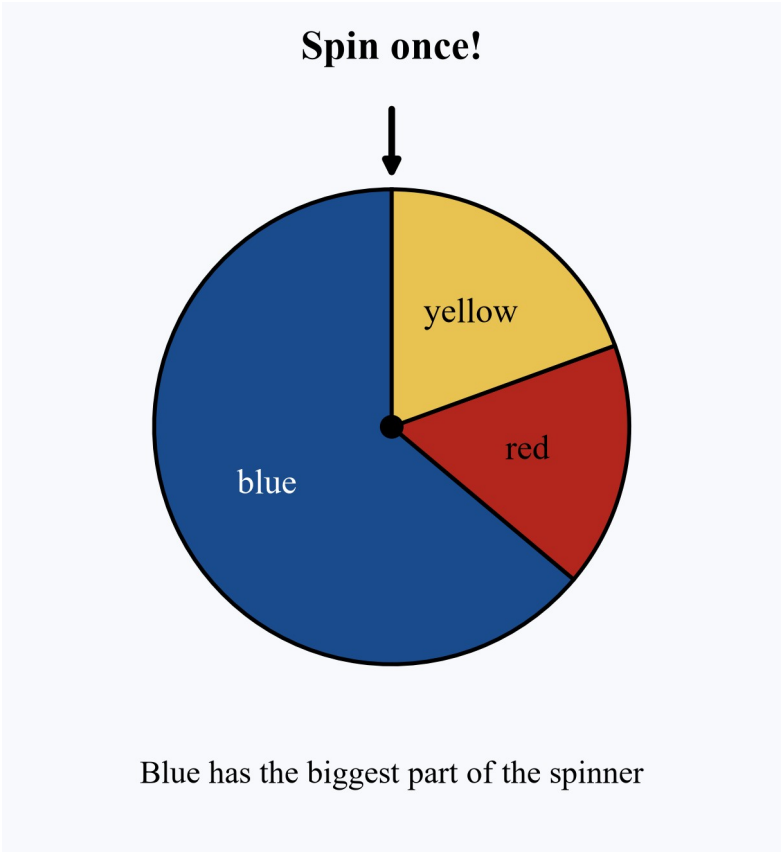
Ten name cards standing in a box: Amy, Ben, Chloe, Dan, Eva, Finn, Grace, Hu, Ivy and Jack. Across the box: 'PICK ONE — READ THE NAME — PUT IT BACK'. Under the box: 'After each pick the card goes back, so the same name could come up again'.

Before you start, make a **smart guess** about what will happen. Might one name come up more than once? Is it certain that all 10 names will come up? Because the card goes back each time, the same name can come up again, so it is not certain that every name comes up. Try it with your class and see!

Worked examples

Example 1 — with help

This spinner is spun once. Is landing on blue likely, unlikely, certain or impossible? What about red, and yellow? What about green? Explain.



A spinner with three parts of different sizes: a big blue part, a small red part and a small yellow part, with a black arrow at the top. Under the spinner: ‘Blue has the biggest part of the spinner’.

Working	What we did
The outcomes are blue, red and yellow.	Listed what can happen.
Blue has the biggest part of the spinner.	Looked at the sizes of the parts.
Landing on blue is likely.	The biggest part will usually win.
Landing on red is unlikely. Landing on yellow is unlikely too.	Small parts will not usually win.
Landing on green is impossible.	There is no green on the spinner, so it can never happen.

Example 2 — with help

Sort these four event cards into the certain group, the might-happen group and the impossible group. Say why each card goes where it goes.

Sort these event cards

The sun will rise tomorrow.	It will rain in Melbourne this week.	A dog will talk.	Winter comes after autumn.
(a)	(b)	(c)	(d)

Put each card in the certain group, the impossible group, or the might-happen group

Four event cards: (a) ‘The sun will rise tomorrow.’ (b) ‘It will rain in Melbourne this week.’ (c) ‘A dog will talk.’ (d) ‘Winter comes after autumn.’

Card	Group	Why
(a) The sun will rise tomorrow.	Certain	It must happen, every day.
(b) It will rain in Melbourne this week.	Might happen	It may rain, or it may not — chance decides.
(c) A dog will talk.	Impossible	Dogs cannot talk, so it can never happen.
(d) Winter comes after autumn.	Certain	The seasons always come in the same order.

Example 3 — on your own

A bag holds 6 yellow counters and 2 green counters. One counter is picked without looking.

- (a) What are the possible outcomes?
- (b) Which outcome is likely, and which is unlikely? Explain.
- (c) Is picking red possible? Explain.

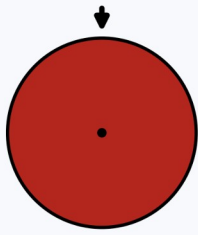
The outcomes are yellow and green. Picking yellow is likely, because 6 of the 8 counters are yellow. Picking green is unlikely, because only 2 of the 8 are green — but it can still happen. Picking red is impossible, because the bag has no red counters.

Practice questions

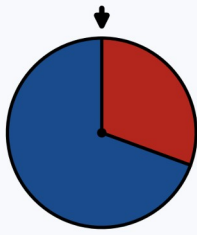
With help

Q1. For each spinner, the spinner is spun once. Write whether the event “the spinner lands on red” is certain, likely, unlikely or impossible.

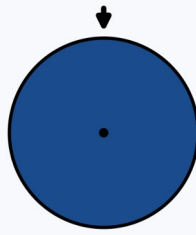
For each spinner: the spinner lands on red — certain, likely, unlikely or impossible?



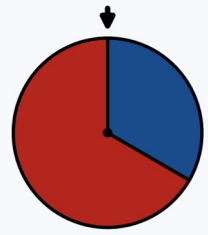
(a)



(b)



(c)



(d)

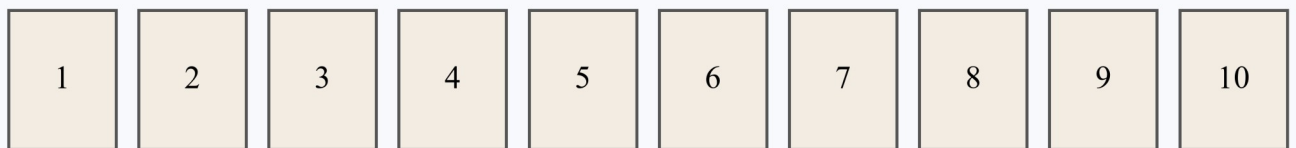
Four spinners, each with a black arrow at the top, labelled (a) to (d). Spinner (a) is all red. Spinner (b) is blue with a small red part. Spinner (c) is all blue. Spinner (d) is red with a small blue part.

Q2. A bag holds 6 yellow counters and 1 green counter. One counter is picked without looking. Write likely, unlikely or impossible for each event. (a) Picking yellow. (b) Picking green. (c) Picking blue.

Q3. Write certain or impossible for each event. (a) The sun will rise tomorrow. (b) A pig will fly. (c) A dropped ball falls down. (d) You roll a 7 on a die.

Q4. Number cards 1–10 go into a hat. One card is picked without looking. Write certain, impossible or might happen for each event.

Number cards 1–10 go into a hat



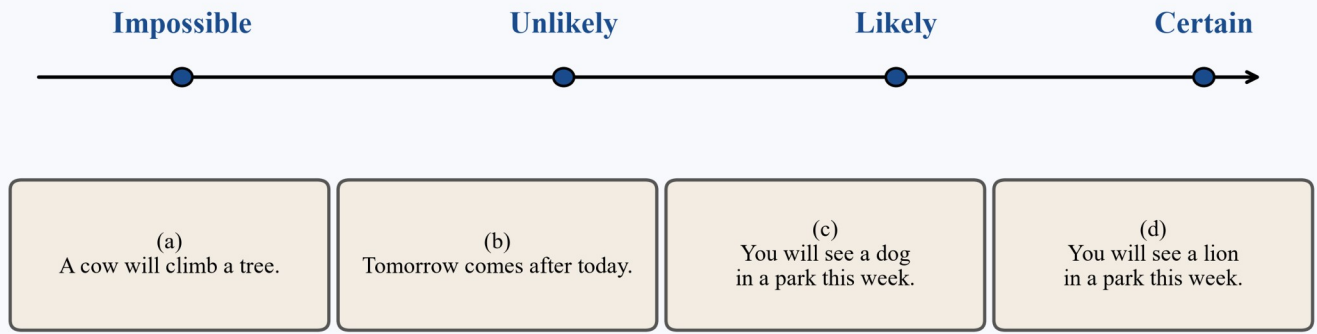
One card is picked without looking

Ten number cards in a row, showing the numbers 1 to 10. Under the cards: 'One card is picked without looking'.

(a) The card shows a number less than 11. (b) The card shows 12. (c) The card shows 5. (d) The card shows a number more than 0.

Q5. Match each event to the word it goes best with: certain, likely, unlikely or impossible.

Match each event to a word on the scale



A line with an arrow at the right end and four marked points, labelled *Impossible*, *Unlikely*, *Likely*, *Certain*. Below are four event cards: (a) 'A cow will climb a tree.' (b) 'Tomorrow comes after today.' (c) 'You will see a dog in a park this week.' (d) 'You will see a lion in a park this week.'

Q6. Fill in each gap with certain, likely, unlikely or impossible. (a) An event that can never happen is . (b) An event that must happen is . (c) An event that will usually happen is . (d) An event that will not usually happen is .

Q7. Zoe's bag holds 5 red counters and 2 blue counters. One counter is picked without looking. (a) Which colour is likely? (b) Which colour is unlikely? (c) Is picking yellow possible?

Q8. The 10 name cards from the box above are used. A card is picked, read, and put back. This is done 10 times.

True or false: after 10 picks, every name must have been picked once. Explain.

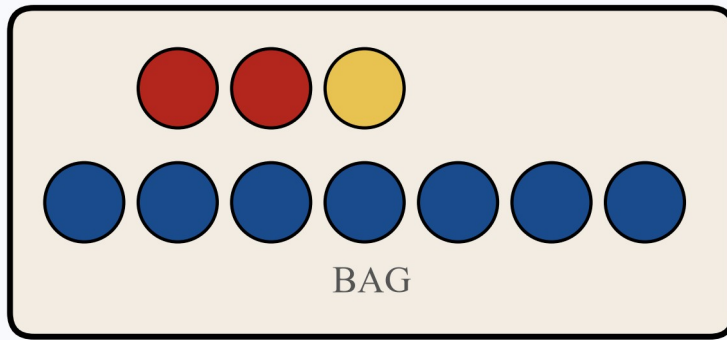
On your own

Q9. Write certain, likely, unlikely or impossible for each event. (a) It will be hot in Melbourne in January. (b) It will rain in Melbourne in January. (c) A shark will swim in your school pool. (d) Tomorrow comes after today.

Q10. A spinner has a big green part and a small blue part. It is spun once. Which colour is likely? Which is unlikely? Explain.

Q11. A bag holds 7 blue, 2 red and 1 yellow marble. One marble is picked without looking. (a) Which colour is likely? (b) Which colours are unlikely? (c) Is picking purple possible? Explain.

A bag holds 7 blue, 2 red and 1 yellow marble



One marble is picked without looking

A bag holding 10 marbles: 7 blue, 2 red and 1 yellow. Under the bag: 'One marble is picked without looking'.

Q12. Leo says, "It rained today, so it is certain to rain tomorrow." Is Leo right? Explain.

Q13. True or false? (a) An impossible event can happen if you try hard. (b) A certain event must happen. (c) An unlikely event can still happen.

Q14. Sort these events into three groups: certain, might happen, impossible. (a) Winter comes after autumn. (b) You roll a 10 on a die. (c) You see a bird outside this week. (d) The moon turns into cheese. (e) You roll a 2 on a die. (f) The sun rises tomorrow.

Q15. The 10 name cards are in the box. A card is picked and put back each time. Amy's name comes up 5 times in a row. Is it impossible that Amy comes up again? Explain.

Q16. Write your own event for each word. (a) Certain. (b) Impossible. (c) Likely. (d) Unlikely.

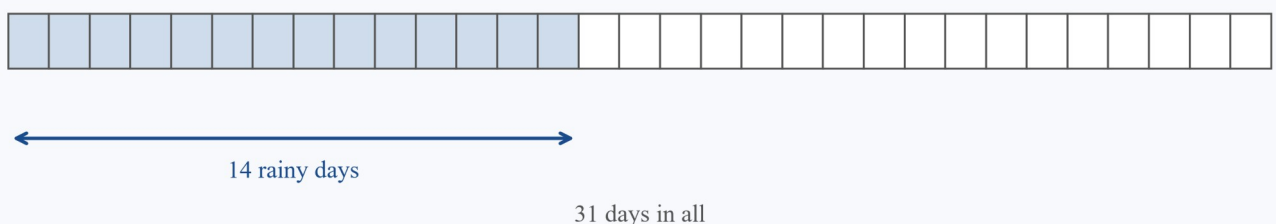
Q17. A die is rolled once. Write certain, impossible or might happen for each event. (a) The die shows a number less than 7. (b) The die shows 10. (c) The die shows 3.

Q18. Bag A holds 8 red counters and 2 blue counters. Bag B holds 2 red counters and 8 blue counters. One counter is picked from each bag without looking. From which bag is picking red likely? From which bag is picking red unlikely? Explain.

Q19. Mia lives in Melbourne. In July, Melbourne has 31 days, and it usually rains on about 14 of them.

Source: Wikipedia, *Climate of Melbourne*, retrieved 2026-08-20.

The 31 days of July in Melbourne



Thirty-one small squares in a row, one for each day of July. The first 14 squares are shaded blue to show rainy days, and the rest are white dry days. Marks show '14 rainy days' and '31 days in all'.

Write likely, unlikely, certain or impossible for each of Mia's claims, and give a reason for each.

- (a) "It will rain on every day of July this year."
 - (b) "It will rain on some days of July this year."
 - (c) "July this year will have 40 days."
 - (d) "The sun will rise over Melbourne tomorrow."
-

Answers

Q1. (a) certain (b) unlikely (c) impossible (d) likely. **Q2.** (a) likely (b) unlikely (c) impossible. **Q3.** (a) certain (b) impossible (c) certain (d) impossible. **Q4.** (a) certain (b) impossible (c) might happen (d) certain. **Q5.** (a) impossible (b) certain (c) likely (d) unlikely. **Q6.** (a) impossible (b) certain (c) likely (d) unlikely. **Q7.** (a) red (b) blue (c) no — impossible. **Q8.** False. **Q9.** (a) likely (b) unlikely (c) impossible (d) certain. **Q10.** Green likely, blue unlikely. **Q11.** (a) blue (b) red and yellow (c) no — impossible. **Q12.** No. **Q13.** (a) false (b) true (c) true. **Q14.** Certain: (a), (f). Might happen: (c), (e). Impossible: (b), (d). **Q15.** No — not impossible. **Q16.** Many different answers are right. **Q17.** (a) certain (b) impossible (c) might happen. **Q18.** Likely from bag A, unlikely from bag B. **Q19.** (a) unlikely (b) likely (c) impossible (d) certain.

Worked answers

Q1. (a) The spinner is all red, so landing on red must happen: certain. (b) Red is only a small part, so unlikely. (c) There is no red at all, so impossible. (d) Red is the biggest part, so likely.

Q2. (a) 6 of the 7 counters are yellow, so likely. (b) Only 1 of the 7 is green, so unlikely. (c) There is no blue in the bag, so impossible.

Q3. (a) The sun must rise: certain. (b) Pigs cannot fly: impossible. (c) A dropped ball always falls: certain. (d) A die shows only 1 to 6, never 7: impossible.

Q4. (a) Every card shows 1 to 10, all less than 11: certain. (b) There is no 12 card: impossible. (c) The 5 is one of the cards, but it may or may not be picked: might happen. (d) Every card shows 1 or more: certain.

Q5. (a) Cows cannot climb trees: impossible. (b) Tomorrow always comes after today: certain. (c) Dogs are common in parks, so you will usually see one in a week: likely. (d) Lions do not live in parks, so you will not usually see one: unlikely. (If you said impossible, because no lions live in parks, that is fine with a reason.)

Q6. (a) impossible (b) certain (c) likely (d) unlikely.

Q7. (a) There are 5 red and 2 blue, so red is likely. (b) Blue is unlikely. (c) The bag has no yellow, so picking yellow is impossible.

Q8. False. A card goes back after each pick, so the same name can come up more than once. Some names might come up twice while other names never come up.

Q9. (a) January is summer in Melbourne and summer days are usually hot: likely. (b) Summer is the dry time of year in Melbourne, so rain will not usually happen: unlikely. (c) Sharks live in the sea, not in pools: impossible. (d) The days always come in order: certain.

Q10. Green has the big part, so green is likely. Blue has the small part, so blue is unlikely.

Q11. (a) 7 of the 10 marbles are blue, so blue is likely. (b) Only 2 are red and only 1 is yellow, so red and yellow are unlikely. (c) There is no purple marble, so impossible.

Q12. No. Rain tomorrow is not fixed by rain today. It might rain tomorrow, or it might not, so it is not certain — it is in the might-happen group.

Q13. (a) False — an impossible event can never happen, no matter how hard you try. (b) True — certain means it must happen. (c) True — unlikely things do sometimes happen.

Q14. Certain: (a) winter always follows autumn, and (f) the sun always rises. Might happen: (c) you may or may not see a bird, and (e) a 2 may or may not come up. Impossible: (b) a die never shows 10, and (d) the moon cannot turn into cheese.

Q15. No. Amy's card went back in the box after each pick, so it is still there — coming up again is not impossible. It is not certain either: each pick is affected by chance, and any of the 10 names can come up. It might happen, or it might not.

Q16. Check your events against the meanings: a certain event must happen, an impossible event can never happen, a likely event will usually happen, an unlikely event will not usually happen.

Q17. (a) Every face shows 1 to 6, all less than 7: certain. (b) A die has no 10: impossible. (c) The 3 may or may not come up: might happen.

Q18. Bag A has 8 red of 10, so picking red from bag A is likely. Bag B has only 2 red of 10, so picking red from bag B is unlikely.

Q19. (a) Unlikely — it usually rains on only about 14 of the 31 days, so most days are dry; raining on all 31 will not usually happen. (b) Likely — it usually rains on about 14 days, so some rainy days will usually happen. (c) Impossible — July always has 31 days, never 40. (d) Certain — the sun must rise, every day.

Repeated chance experiments and the variation in results

Code: VC2M3P02 (.E01, .E02)

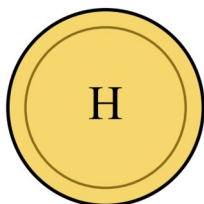
In 7A you learned the words of chance: likely, unlikely, certain and impossible. Now you will do chance experiments yourself, again and again. You will record what happens, and you will look at how the results vary. **Variation** means the results are not always the same.

You will need: a coin, a die, a spinner, a bag, 3 red balls and 1 blue ball (or counters), paper and a pencil.

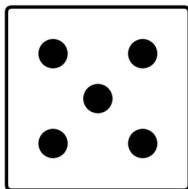
Do it again and again

1. What is a chance experiment?

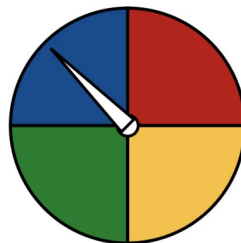
A **chance experiment** is something you do where chance decides the result. You toss a coin, roll a die or spin a spinner, and then you see what happens.



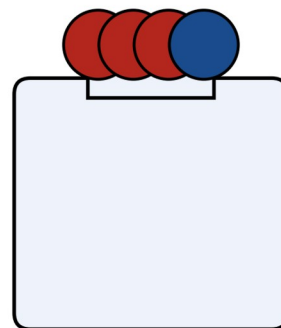
a coin



a die



a spinner



a bag of balls

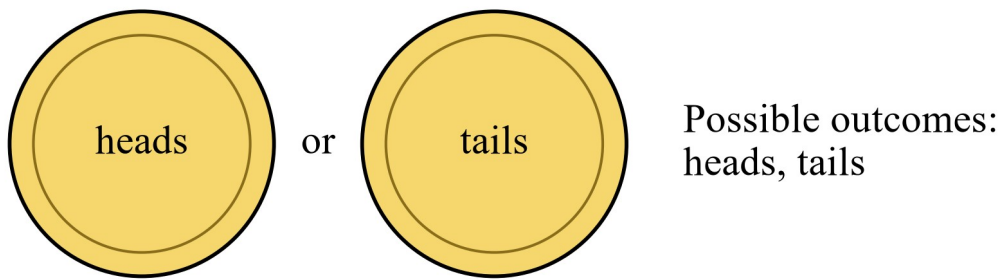
Four things used for chance experiments: a gold coin with the letter H, a die showing 5 dots, a spinner with four equal parts in red, blue, green and yellow, and a bag with 3 red balls and 1 blue ball at the top. Labels under each: a coin, a die, a spinner, a bag of balls.

These four things are used a lot in this topic: a **coin**, a **die**, a **spinner** and a **bag of balls**.

2. The possible outcomes

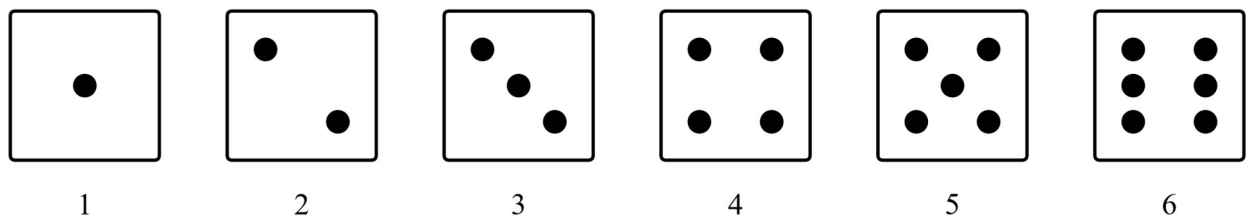
Before you start a chance experiment, list what can happen. These are the **possible outcomes**.

Toss a coin: the possible outcomes are heads or tails.



Two gold coins, one marked heads and one marked tails, with the word or between them. Words at the side: Possible outcomes: heads, tails.

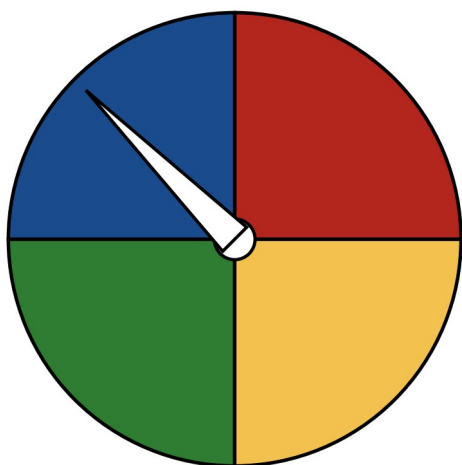
Roll a die: the possible outcomes are 1, 2, 3, 4, 5 or 6.



Possible outcomes: 1, 2, 3, 4, 5 or 6

Six dice faces in a row showing 1, 2, 3, 4, 5 and 6 dots, with the numbers 1 to 6 written under the faces. Words under the row: Possible outcomes: 1, 2, 3, 4, 5 or 6.

Spin this spinner: the possible outcomes are red, blue, green or yellow. The spinner has four equal parts.

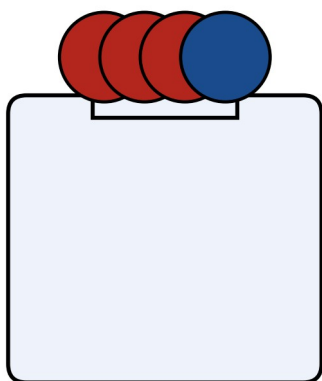


4 equal parts:
red, blue, green, yellow

The arrow has stopped on blue.

*A spinner with four equal parts in red, blue, green and yellow, and a white arrow. The arrow has stopped on blue.
Words at the side: 4 equal parts: red, blue, green, yellow. Words under it: The arrow has stopped on blue.*

Pick a ball from this bag without looking: the possible outcomes are red or blue.



Inside the bag:
3 red balls
1 blue ball

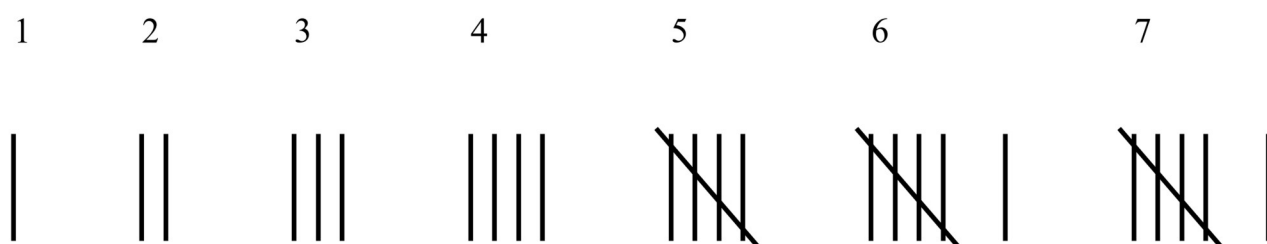
A bag with 3 red balls and 1 blue ball at the top. Words at the side: Inside the bag: 3 red balls, 1 blue ball.

3. One try is not enough

One toss can land any way. To see what happens when you keep going, you **repeat** the chance experiment: you do it again and again. Each try is called a **trial**. Ten tosses of a coin is ten trials.

4. Record the results with a tally chart

A **tally chart** is a quick way to record results. It has one row for each thing that can happen. Each time a result happens, you add one mark. Five is written as four marks with one mark across.



A group of five is four marks with one mark across.

Count the groups of five first, then count on.

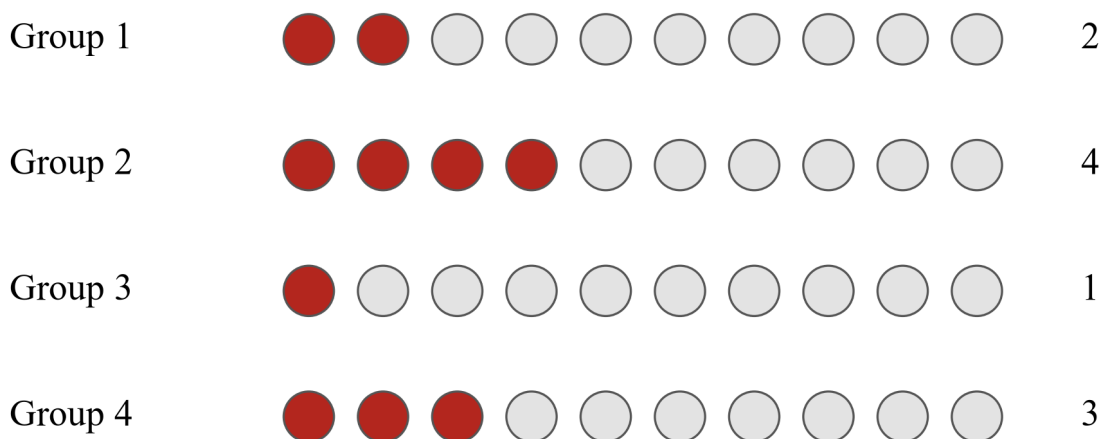
Tally marks showing the counts 1, 2, 3, 4, 5, 6 and 7. The tally for 5 is four marks with one mark across. Words at the bottom: A group of five is four marks with one mark across. Count the groups of five first, then count on.

To read a tally chart, count the groups of five first, then count on.

5. The results vary

Four groups all use the same spinner, the one with four equal parts. Each group spins 10 times and counts the red spins.

Red spins out of 10 spins — the same spinner for every group



Four rows of dots, one row for each group, with 10 dots in each row showing red spins out of 10 spins. Group 1 has 2 red dots, Group 2 has 4, Group 3 has 1 and Group 4 has 3. The other dots are grey. Words at the top: Red spins out of 10 spins — the same spinner for every group.

Group 1 got 2 red spins. Group 2 got 4. Group 3 got 1. Group 4 got 3. The same spinner, 10 spins each time, but the results are not all the same. This is **variation**. The results of a chance experiment can be different each time you do it. Different results do not mean someone did it wrong. That is how chance works.

Worked examples

Example 1 — with help

The spinner with four equal parts is spun 10 times. The results are: red, blue, red, green, yellow, blue, red, blue, green, red.

- (a) What are the possible outcomes?
- (b) Complete the tally chart and check the total is 10 spins.
- (c) Which colour came up most?

Spinner results — 10 spins

Colour	Tally
Red	
Blue	
Green	
Yellow	

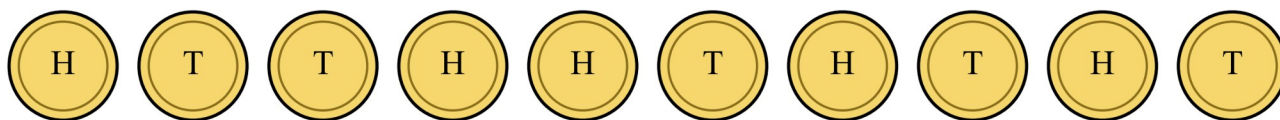
A tally chart titled *Spinner results — 10 spins*, with a row for each colour. Red has 4 tally marks, Blue has 3, Green has 2 and Yellow has 1.

Working	What we did
The possible outcomes are red, blue, green and yellow.	Listed what can happen.
Red 4, blue 3, green 2, yellow 1.	One mark for each spin.
$4 + 3 + 2 + 1 = 10$.	Checked the total is 10 spins.
Red came up most.	Looked at the tally marks together.

Example 2 — with help

Mia’s group tossed a coin 10 times. The results are shown in the picture. Another group tossed a coin 10 times too, and got 7 heads. Mia says, “They must have done it wrong. A coin gives 5 heads and 5 tails.” Is Mia right?

Mia's group tossed the coin 10 times.



Heads: 5

Tails: 5



heads



tails

Ten gold coins in a row. The words above: Mia's group tossed the coin 10 times. The coins show H, T, T, H, H, T, H, T, H, T. Words under it: Heads: 5, Tails: 5, with a tally of 5 marks for heads and a tally of 5 marks for tails.

Working

What we did

Mia's group: 5 heads and 5 tails.

Counted each side.

The other group: 7 heads and 3 tails.

Same coin, 10 tosses each, different results.

Mia is not right.

Results can vary. The other group did nothing wrong.

Example 3 — on your own

A bag holds 3 red balls and 1 blue ball. A ball is picked without looking, the colour is recorded, and the ball goes back. This is done 8 times. The results are: red, red, blue, red, red, red, blue, red.

- How many times was red picked? How many times was blue picked?
- Does this mean the next pick must be blue? Explain.
- If you do 8 picks again, must you get the same results? Explain.

Red was picked 6 times and blue was picked 2 times, and $6 + 2 = 8$. No to (b): the next pick can be red or blue, and chance decides each time. No to (c): the results can vary, so a new set of 8 picks can come out different.

Practice questions

With help

Q1. List the possible outcomes for each chance experiment. (a) Tossing a coin. (b) Rolling a die. (c) Spinning the spinner with four equal parts from above. (d) Picking a ball from a bag that holds 1 red ball and 1 blue ball.

Q2. The spinner with four equal parts is spun 12 times. The tally chart shows the results.

Spinner results — 12 spins

Colour	Tally
Red	
Blue	
Green	
Yellow	

A tally chart titled *Spinner results — 12 spins*, with a row for each colour. Red has 3 tally marks, Blue has 5, Green has 2 and Yellow has 2.

- How many times did the spinner land on blue?
- Which colour came up most?
- Add the four counts. Is the total 12 spins?

Q3. Toss a coin 10 times. Record each toss in the tally chart as it happens.

Tally chart for 10 coin tosses

Side	Tally
Heads	
Tails	

A blank tally chart titled *Tally chart for 10 coin tosses*, with a row for Heads and a row for Tails. Each row has an empty box for tally marks.

- How many heads did you get?
- How many tails did you get?
- Do your two counts add up to 10? Why must they?

Q4. The bag from above holds 3 red balls and 1 blue ball. Pick a ball without looking, record the colour, and put the ball back. Do this 10 times.

- (a) What are the possible outcomes?
- (b) Before you start, which colour do you think will come up more?
- (c) Do your results match your thinking?

Q5. True or false?

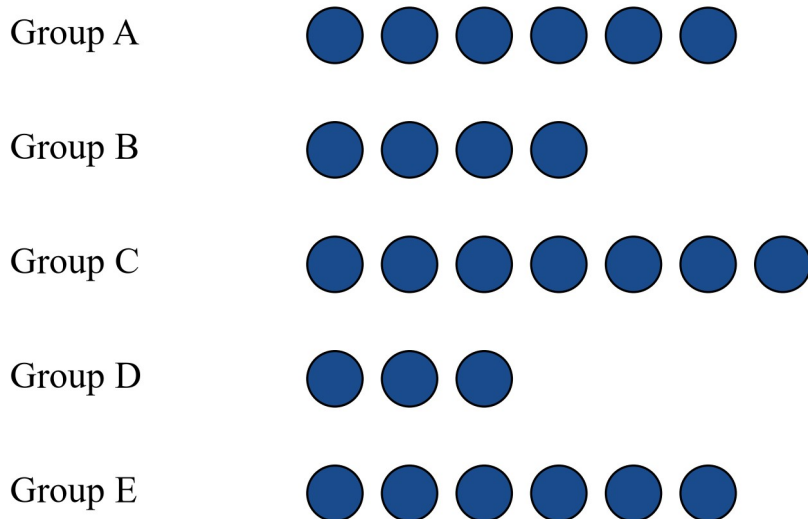
- (a) If you toss a coin 10 times, you must get 5 heads and 5 tails.
- (b) Two groups doing the same chance experiment can get different results.
- (c) Different results mean someone did it wrong.
- (d) Tally marks help you count the results.

Q6. A die is rolled 10 times. The results are: 4, 2, 4, 6, 1, 4, 3, 2, 4, 6.

- (a) How many times did 4 come up?
- (b) Which number came up most?
- (c) Which number did not come up at all?

Q7. Five groups each tossed a coin 10 times. The dot chart shows how many heads each group got.

Heads in 10 tosses



Key: one dot = 1 head

A dot chart titled Heads in 10 tosses, with a row of blue dots for each group. Group A has 6 dots, Group B has 4, Group C has 7, Group D has 3 and Group E has 6. Words at the bottom: Key: one dot = 1 head.

- (a) Which group got the most heads?
- (b) How many heads did Group B get?
- (c) Group C got 7 heads. How many tails did Group C get?
- (d) Did all five groups get the same number of heads?

Q8. Eva spins a spinner 15 times. It lands on red 6 times. How many times did it not land on red?

On your own

Q9. Ben tosses a coin 5 times. It comes up heads every time. Ben says, “The next toss must be tails.” Is Ben right? Explain.

Q10. A spinner has two equal parts, red and blue. When Lily spins it 10 times, it lands on red 8 times. Is this possible? Explain.

Q11. Jack spins a spinner 10 times and gets green 3 times. He spins the same spinner 10 more times and gets green 5 times.

- (a) How many times did green come up in all 20 spins?
- (b) Did Jack get the same number of greens in each set of 10 spins?

Q12. A bag holds 2 red balls and 2 blue balls. Ava says, “If I pick 4 times, I must get 2 red and 2 blue.” Is Ava right? Explain.

Q13. Roll a die 20 times. Before you start, guess how many times you will roll a 6. Then do the 20 rolls and record them with tally marks. Were you close to your guess? Would your friend get the same count as you? Explain.

Q14. Make your own spinner with 3 colours. Spin it 10 times and make a tally chart. If you spin it 10 more times, must the results be the same? Explain.

Q15. Zoe rolls a die. She gets a 6, then a 6, then a 6 — three 6s in a row! Is it impossible that the next roll is a 6? Explain.

Q16. Four friends each roll a die 10 times and count how many times they roll a 5. Sam gets 1 five, Priya gets 3, Noah gets 0 and Ivy gets 2.

- (a) Who got the most fives?
- (b) Did all four friends get the same count?
- (c) Is anyone’s result wrong? Explain.

Q17. Fill in each gap with *outcomes*, *trial*, *tally* or *vary*.

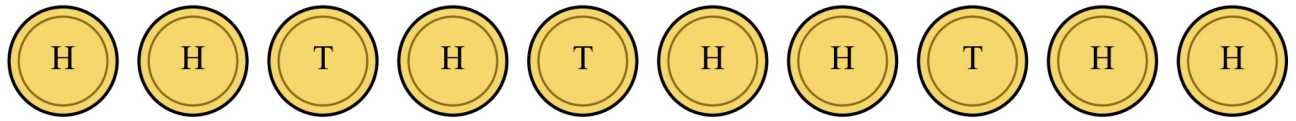
- (a) All the results that can happen are the possible ____.
- (b) Each try in a chance experiment is one ____.
- (c) We use a ____ chart to record results.
- (d) When the results are different each time, we say they ____.

Q18. A coin is tossed 20 times and comes up 12 heads and 8 tails. Tom says, “The next 20 tosses must give 8 heads and 12 tails, to even things up.” Is Tom right? Explain.

Q19. Noah lives in Melbourne. He tosses an Australian 20-cent coin 10 times. An Australian 20-cent coin shows a platypus on one side.

Source: Wikipedia, *Australian twenty-cent coin*, retrieved 2026-08-20.

Noah tossed the 20-cent coin 10 times.



Heads: 7 Tails: 3



heads



tails

Ten gold coins in a row. The words above: Noah tossed the 20-cent coin 10 times. The coins show H, H, T, H, T, H, H, T, H, H. Words under it: Heads: 7, Tails: 3, with a tally of 7 marks for heads and a tally of 3 marks for tails.

The results are: heads, heads, tails, heads, tails, heads, heads, tails, heads, heads.

- (a) What are the two possible outcomes of each toss?
 - (b) How many heads did Noah get? How many tails?
 - (c) Zoe says, “A coin has 2 sides, so you must get 5 heads and 5 tails in every 10 tosses.” Is Zoe right? Explain.
 - (d) Noah tosses the coin 10 more times. Must he get 5 heads? Explain.
-

Answers

Q1. (a) heads, tails. (b) 1, 2, 3, 4, 5, 6. (c) red, blue, green, yellow. (d) red, blue. **Q2.** (a) 5. (b) blue. (c) $3 + 5 + 2 + 2 = 12$, yes. **Q3.** Answers will vary; the two counts must add up to 10, because every toss is heads or tails. **Q4.** (a) red, blue. (b) red. (c) Answers will vary. **Q5.** (a) false. (b) true. (c) false. (d) true. **Q6.** (a) 4 times. (b) 4. (c) 5. **Q7.** (a) Group C. (b) 4. (c) 3. (d) no. **Q8.** $15 - 6 = 9$ times. **Q9.** No. **Q10.** Yes. **Q11.** (a) 8. (b) no. **Q12.** No. **Q13.** Answers will vary. **Q14.** No. **Q15.** No. **Q16.** (a) Priya. (b) no. (c) no. **Q17.** (a) outcomes. (b) trial. (c) tally. (d) vary. **Q18.** No. **Q19.** (a) heads, tails. (b) 7 heads, 3 tails. (c) no. (d) no.

Worked answers

Q1. List what can happen. (a) A coin can land heads or tails. (b) A die can show 1, 2, 3, 4, 5 or 6. (c) The spinner can stop on red, blue, green or yellow. (d) The ball picked can be red or blue.

Q2. (a) The tally for blue is a group of five, so 5 times. (b) Blue, with 5. (c) $3 + 5 + 2 + 2 = 12$, which matches the 12 spins.

Q3. Your own tosses give your own results, so answers vary. But each toss lands heads or tails, so the two counts must add up to 10.

Q4. (a) The ball picked is red or blue. (b) Red, because there are 3 red balls and only 1 blue. (c) Your results may or may not match — results can vary.

Q5. (a) False — the results can vary, so 10 tosses can give any mix of heads and tails. (b) True — that is variation. (c) False — different results are how chance works. (d) True — one mark for each result makes counting quick.

Q6. (a) The list shows 4 four times. (b) 4 came up most, with 4 times. (c) 5 did not come up at all, even though 5 is one of the possible outcomes of a die roll.

Q7. (a) Group C, with 7 heads. (b) 4 heads. (c) $10 - 7 = 3$ tails, because each toss is heads or tails. (d) No — the counts were 6, 4, 7, 3 and 6. The results vary from group to group.

Q8. Each spin is red or not red. $15 - 6 = 9$ times it did not land on red.

Q9. No. The coin does not remember the first 5 tosses. The next toss can be heads or tails, so tails is not certain.

Q10. Yes. The two parts are the same size, but results can vary. In a short set of 10 spins, one colour can come up many more times than the other.

Q11. (a) $3 + 5 = 8$ greens in all 20 spins. (b) No — 3 greens the first time and 5 the second. The results were different each time.

Q12. No. Ava may get 2 red and 2 blue, or she may get 3 red and 1 blue, or any other mix. Chance decides each pick, so the results can vary.

Q13. Your guess and your count are your own, so answers vary. The count of 6s can be different for your friend too — that is variation.

Q14. No. Each spin is a new trial, and results can vary, so the second set of 10 spins can come out different.

Q15. No — not impossible. A 6 is still one of the possible outcomes, so the next roll can be a 6 again. Chance does not stop a 6 just because three came in a row.

Q16. (a) Priya, with 3 fives. (b) No — the counts were 1, 3, 0 and 2. (c) No — everyone used the same die, and results vary from friend to friend. No count is wrong.

Q17. (a) outcomes. (b) trial. (c) tally. (d) vary.

Q18. No. The coin does not even things up. The next 20 tosses can give any mix of heads and tails — 10 and 10, 12 and 8, or something else.

Q19. (a) Heads or tails. (b) 7 heads and 3 tails, and $7 + 3 = 10$. (c) No — the results can vary. Noah got 7 heads and 3 tails, which is not 5 and 5, and nobody did anything wrong. (d) No — the next 10 tosses can give any mix of heads and tails.

Test

Test T7 · Chapter 7 — Probability

Mathematics Level 3 (Year 3) · Victorian Curriculum 2.0

Codes assessed: VC2M3P01 · VC2M3P02

Name: _____ Date: _____

Total marks	10
Guidance duration	20 minutes
Timing	This is a classroom check, not an exam. There is no strict time limit. Your teacher will let you finish.
Equipment	You may use a coin, a die, counters and a pencil.
Calculators	The content descriptions for this chapter do not say “without a calculator”, so a calculator is allowed, but you do not need one for any question.

Attempt every question. Show your working where the question asks for it.

Question 1 — The language of chance (5 marks)

(a) Which chance word describes an event that can never happen? (1 mark)

- A. Likely
- B. Unlikely
- C. Certain
- D. Impossible

(b) A bag holds 5 red counters and 1 blue counter. One counter is picked without looking.

red: ● ● ● ● ●
blue: ●

Is picking red likely, unlikely, certain or impossible? Give a reason. (2 marks)

(c) Sort these two events. Write *certain*, *might happen* or *impossible* for each. (2 marks)

(d) The sun will rise tomorrow.

(ii) You will roll a 10 on a die.

Question 2 — A repeated chance experiment (5 marks)

Noah tosses an Australian 20-cent coin 10 times. An Australian 20-cent coin shows a platypus on one side.

Source: Wikipedia, *Australian twenty-cent coin*, retrieved 2026-08-20.

(a) What are the two possible outcomes of each toss? (1 mark)

(b) Noah’s results are shown below. H means heads and T means tails.

H T H H T H T H H T

How many heads did Noah get? How many tails did Noah get? (2 marks)

(c) Zoe says, “A coin has 2 sides, so 10 tosses must give 5 heads and 5 tails.” Is Zoe right? Use Noah’s results to explain. (2 marks)

Total: 10 marks

Solutions

Teacher-facing. Test T7 is a classroom check, not an exam: untimed in principle with a 20-minute guidance duration, equipment permitted, and no question needs a calculator — VC2M3P01 and VC2M3P02 do not say “without a calculator”, so per D7 neither CD is calculator-free. The verb in VC2M3P02 is *conduct*: students carry out repeated chance experiments in Task K3, and Question 2 is the written evidence for VC2M3P02, reading results that have already been recorded, so a student absent for the task is not left with an unassessed CD (per §7).

Coverage and mark map

CD	Subtopic	Questions	Marks
VC2M3P01	7A The language of chance: likely, unlikely, certain, impossible	Q1	5
VC2M3P02	7B Repeated chance experiments and the variation in results	Q2	5
Total			10

Every CD contributes at least 3 separately scored marks, as §7 requires. Multiple choice is 1 mark of 10 (10%), inside the one-quarter cap: Q1(a), four options A–D.

The marking language follows each CD’s achievement-standard extract from the authority file: for VC2M3P01, *Students use practical activities, observation or experiment to identify and describe outcomes and the likelihood of everyday events explaining reasoning*; for VC2M3P02, *Students conduct repeated chance experiments and discuss variation in results*.

Answer key

Q	Part	Answer	Marks
1	(a)	D (Impossible)	1
1	(b)	Likely; reason refers to the 5 red counters	2
1	(c)	(i) certain, (ii) impossible	2
2	(a)	Heads or tails	1
2	(b)	6 heads, 4 tails	2
2	(c)	No — the results can vary	2

Worked solutions

Q1. (a) *Likely* and *unlikely* describe events that may or may not happen. *Certain* means it must happen, every time. *Impossible* means it can never happen. The answer is **D**.

(b) There are 6 counters in the bag, and 5 of the 6 are red. There are more red counters than blue counters, so picking red will usually happen. **Picking red is likely.**

Marks: 1 for “likely”; 1 for a reason that refers to there being 5 red counters, or more red than blue. Accept any correct wording of the reason.

(c)

(i) The sun rises every day, so it must happen: **certain**. (ii) A die shows only 1, 2, 3, 4, 5 and 6 — there is no 10, so rolling a 10 can never happen: **impossible**.

Marks: 1 for each correct sort. Reasons are not needed here but accept them if given.

Q2. (a) Each toss lands one way or the other. The two possible outcomes are **heads and tails**.

(b) Count the Hs: tosses 1, 3, 4, 6, 8 and 9 show H, so **6 heads**. Count the Ts: tosses 2, 5, 7 and 10 show T, so **4 tails**. Check: $6 + 4 = 10$ tosses.

Marks: 1 for 6 heads; 1 for 4 tails.

(c) **Zoe is not right.** Noah got 6 heads and 4 tails, not 5 and 5, and he did nothing wrong. Each toss is decided by chance, so the results can vary — 10 tosses can give any mix of heads and tails. 5 heads and 5 tails can happen, but it does not have to happen.

Marks: 1 for the judgement “no”; 1 for an explanation that says the results can vary, or that chance decides each toss. Accept any correct wording, including one that points only to Noah’s 6 and 4 as the reason 5 and 5 is not a must.