MATHLETICS

Chance and Data

Name

Series E – Chance and Data

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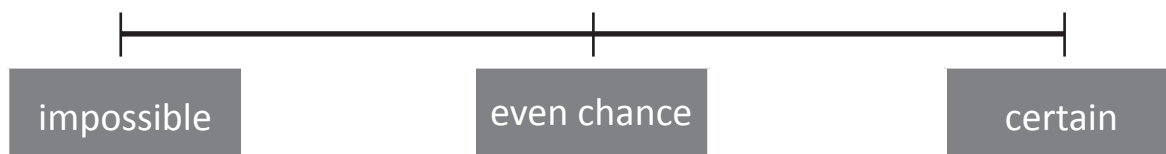
Series Author:

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Chance – ordering events

Chance is the likelihood of something happening.

If something will definitely happen, we say it is certain.

If something has an even chance of happening, it means that it is just as likely to happen as it is unlikely to happen.

If something can't happen it is impossible.

| impossible | even chance | certain |

1 **Read each statement and circle the chance of it happening:**

Event	Chance
a A baby is born a girl.	impossible / even / certain
b Christmas Day will fall on December 25 this year.	impossible / even / certain
c A coin is tossed and the result is a tail.	impossible / even / certain
d 6 red counters are placed in a bag and a yellow one is drawn.	impossible / even / certain

2 **Draw a line to match each spinner to the correct statement:**

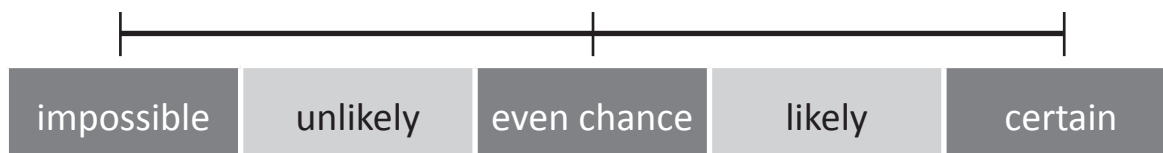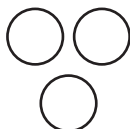| There is an even chance that this spinner will land on stripes. | It is certain that this spinner will land on stripes. |

Chance – ordering events

If something might happen, we say it is likely.

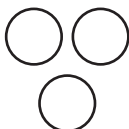If something might not happen, we say it is unlikely. These two zones fit between like this:

| impossible | unlikely | even chance | likely | certain |

3 **Poppy bought a box of sweets and tipped them out on her desk. Colour them in and answer the questions below:**
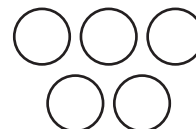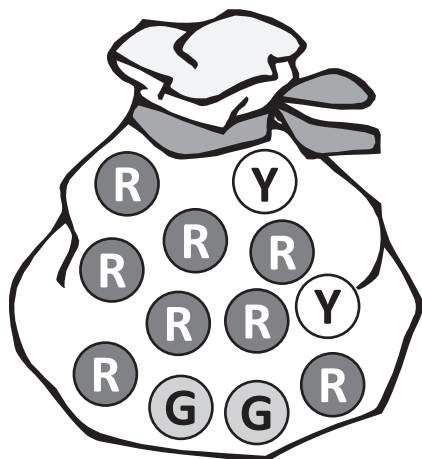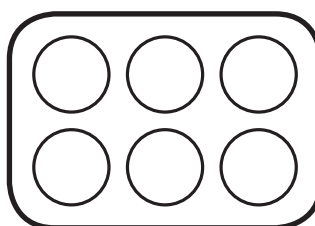
yellow   blue   red   green

a If she put them all into a bowl and took one without
   looking, which colour would she be most likely to pick? _____

b Which colour would be least likely to be picked? _____

c The 2 colours that have an even chance of
   being picked are: _____ and _____

4 **Sam and Charlie played a game of bingo. In this game, the players had to fill each space on their board with either R for red, G for green or Y for yellow.**
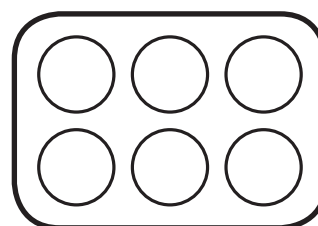
Next, coloured marbles were drawn out of the bag shown below and then replaced. If either player had the colour on their board, they could tick it. The winner was the player who got 6 ticks first. Charlie won the game. Show what each board could have looked like, before they started ticking.

Charlie's board   Sam's board

E SERIES   1 TOPIC

Chance and Data

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Chance – probability

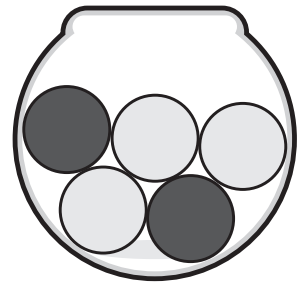Probability is the measure of how likely something is to happen.

Look at the bowl of balls.

The expected probability of choosing a black ball is 2 out of 5.

This is because out of 5 possible balls that could be chosen, 2 are black.

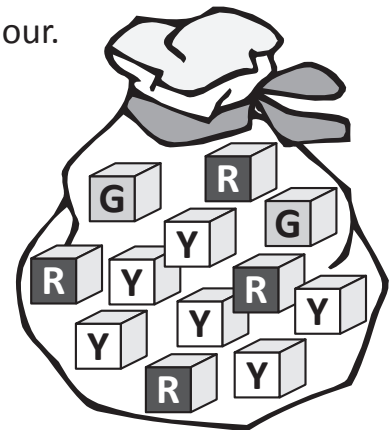However, expected results can be different to actual results. For instance if we chose a ball without looking 5 times and it was black each time, this would be surprising, but not impossible.

1 **Place the following cubes in a bag: 4 red, 6 yellow and 2 green.**

   a Record the expected probability of choosing each colour.

Colour	Probability
Red	4 out of 12
Yellow	
Green	

   b If I chose a cube 12 times and it was green each time, would this be surprising?   Yes / No

2 **Let's look at what actually happens. Use the cubes from question 1.**

   a Without looking, choose a cube and record its colour by placing a tick next to the colour in the table below. Repeat twelve times and record the result.

Colour	1	2	3	4	5	6	7	8	9	10	11	12
Red												
Yellow												
Green												

   b Was there much difference between what you expected to happen and what actually happened?

Chance – probability

3 **Spin it! This is an investigation where you are going to make two spinners and look at the chance of the arrow landing on certain colours.**
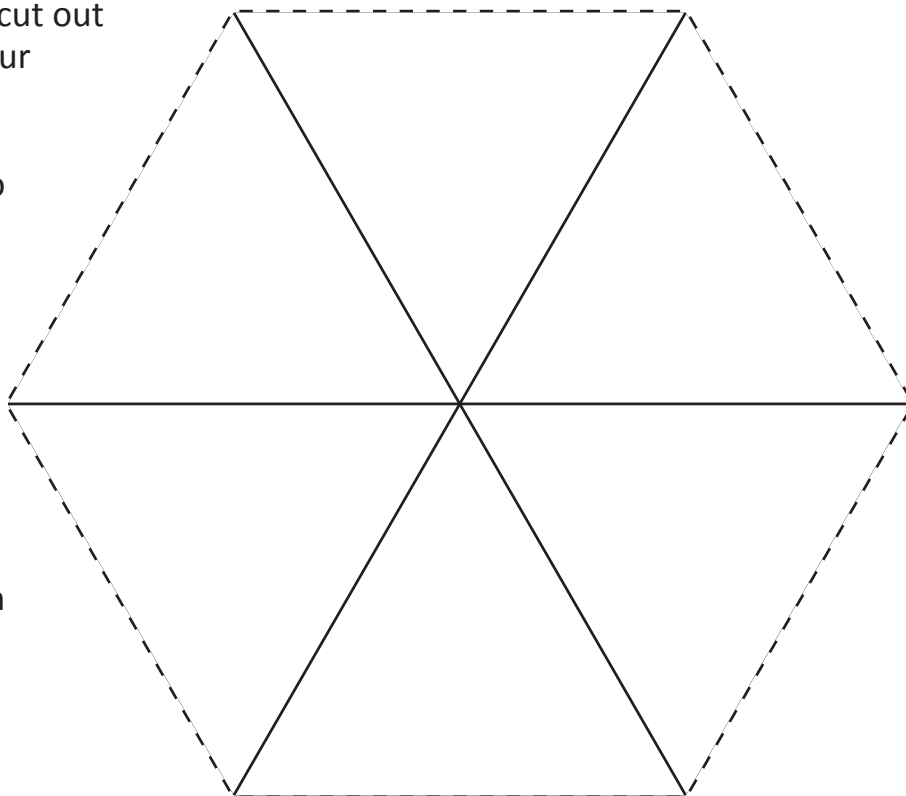
a For this activity you will need to copy this page and cut out the spinners. Make your spinners firmer than a regular piece of paper either by copying onto cardboard or pasting together several sheets of scrap paper.

b Colour Spinner 1 so:
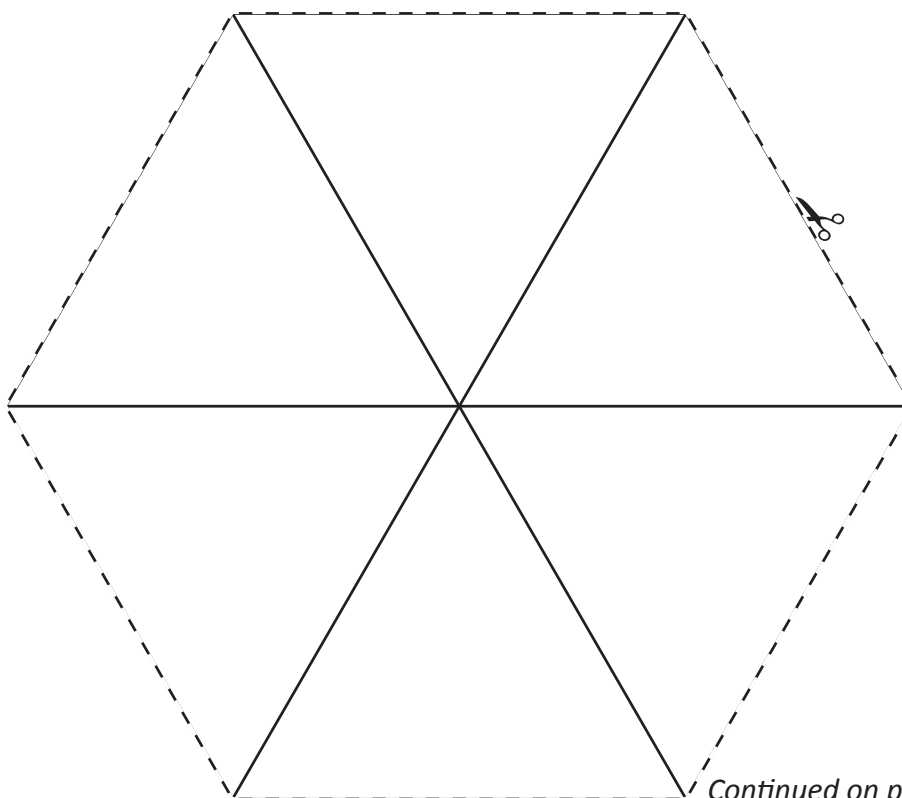- 2 sections are red
- 4 sections are blue.

c Colour Spinner 2 so:
- 2 sections are green
- 1 section is red
- 3 sections are blue.

d Push a pencil through the middle so you can spin the spinner.

Spinner 1

Spinner 2

E **1**

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Chance and Data

Chance – probability

e Now you can begin the investigation. First, let's make some predictions based upon the expected probability.

Spinner 1	
Colour	**Probability**
red	*2 out of 6*
blue	
Most likely colour is _____	
Least likely colour is _____	

Spinner 2	
Colour	**Probability**
green	*2 out of 6*
red	
blue	
Most likely colour is _____	
Least likely colour is _____	

f Now spin each spinner 12 times and tick to record the colour each spinner landed on:

Results for Spinner 1

	1	2	3	4	5	6	7	8	9	10	11	12
red												
blue												

Results for Spinner 2

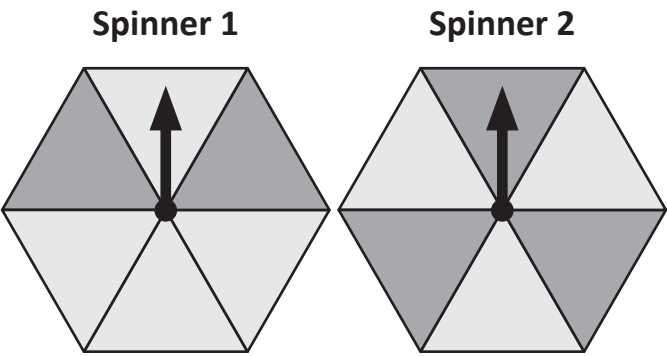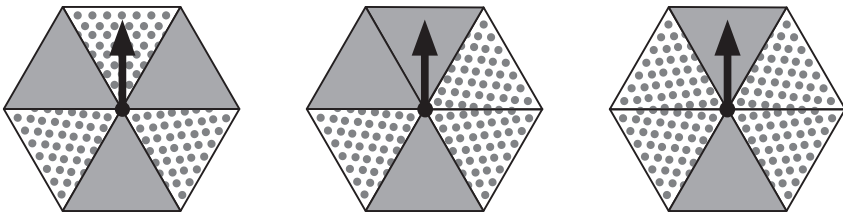|	1	2	3	4	5	6	7	8	9	10	11	12
green												
red												
blue												

g What was expected about your results?

h What was surprising about your results?

Chance – fair and unfair

When everyone has the same chance of winning a game, it is fair. When there is not the same chance for everyone to win, the game is unfair. Look at these spinners. If landing on black scores 1 point, then these spinners are unfair because there is a greater chance of landing on black with Spinner 2 than there is with Spinner 1.

Spinner 1

Spinner 2

1 **Bec and Drew are about to play a game where if their spinner lands on dots, they score 1 point.**

a Put a ring around the 2 spinners they should use for this game so it is fair.

b Cross out the unfair spinner.

c Why is the spinner that you crossed out unfair?

2 **For this activity, you will need to look at a die.**

a Complete this table to show the chance of rolling certain numbers:

Number rolled	Probability
A 2	1 out of 6
An odd number	
An even number	
A number greater than 4	

b Tom invents a game where if a die lands on an odd number you win a point and if the die lands on a number greater than 4 you win a point. Is this game fair? Why or why not?

Chance – coin investigation

If we toss 2 coins, we can expect 4 possible outcomes.

Coin 1

		H	T
Coin 2	**H**	HH	HT
	T	TH	TT

If we use a table to show the possible outcomes of tossing 2 coins 4 times, we would expect it to look like this:

Would it be possible for the coins to land on HH 4 times? Yes it would, however, it would be a surprising result.

Possible outcomes

Toss	TT	TH	HH	HT
4				
3				
2				
1	✓	✓	✓	✓

1 **Complete these experiments:**

a Toss 2 coins 8 times and show the results on this table:

Possible outcomes

Toss	TT	TH	HH	HT
8				
7				
6				
5				
4				
3				
2				
1				

b Repeat this experiment again, and show the results on this table:

Possible outcomes

Toss	TT	TH	HH	HT
8				
7				
6				
5				
4				
3				
2				
1				

c Were your results in question **a** and **b** surprising? Why or why not?
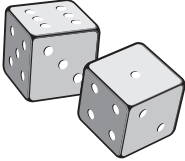
Chance – two dice investigation

We can work out all the possible outcomes of an event.
When we looked at what we could expect to happen when we tossed two coins, we saw that there are four possible outcomes.

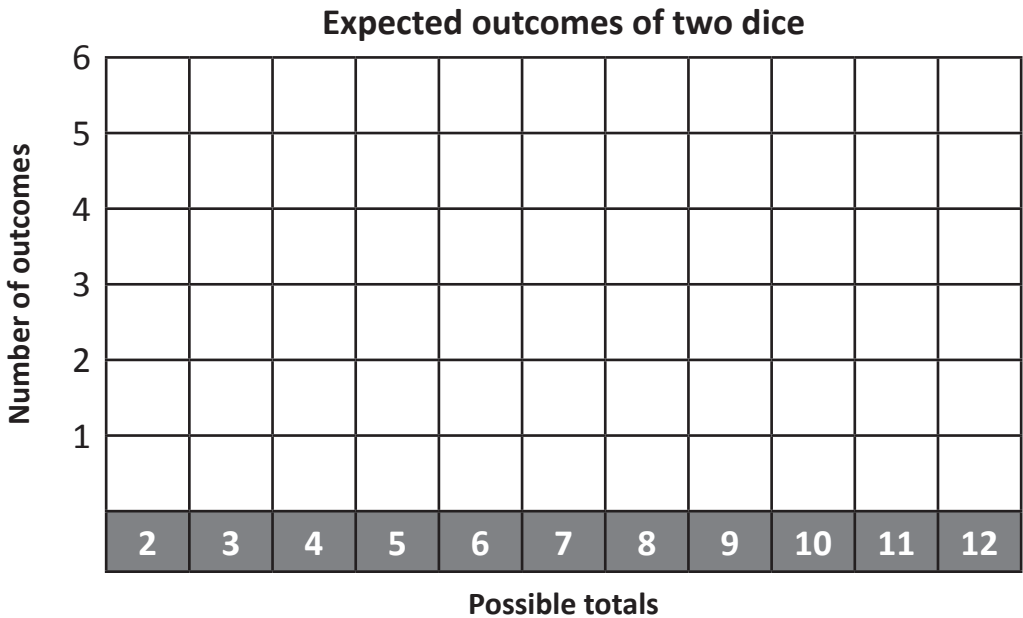What can we expect to happen when we roll two dice and add the numbers?

1 **Fill in this table to show the possible outcomes when two dice are rolled and added together.**

a How many possible outcomes are there?

+	1	2	3	4	5	6
1	2					
2		4				
3						
4						
5						
6						

b Graph the expected outcomes in the grid below:

Expected outcomes of two dice

Number of outcomes

	2	3	4	5	6	7	8	9	10	11	12

Possible totals

c The chance of rolling a 7 is _____ out of 36.

d The chance of rolling a 2 is _____ out of 36.

Chance – two dice investigation

Continued from page 8.

e Now see what happens in real life. Work with a partner. Roll two dice 36 times. When an actual total comes up, tick the column.

Actual outcomes of two dice

2	3	4	5	6	7	8	9	10	11	12

Number of outcomes (vertical axis)

Actual totals

> Probability is the measure of how likely something is to happen but things don't always turn out exactly as we would expect.
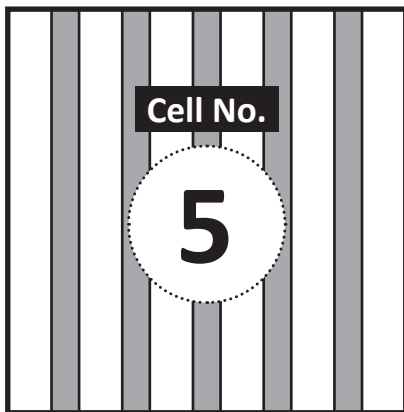
f Look at the difference between the 'Expected outcomes' graph (on page 8) and the 'Actual outcomes' graph (above).

What happened? Were the actual outcomes surprising?

---

2 **Three kids were playing a bingo game where if you rolled two dice and added the numbers, you can cross out a number if it's on the bingo card. Put a ring around the card that you would expect to win.**

2	4
3	5

9	10
12	11

7	5
6	8

Roll and release

Getting ready

This is a game for two players. Each player will need two dice, 12 counters and a copy of pages 10 and 11.

C copy

What to do

The object of this game is to be the first player to release all of the prisoners. Each player places all 12 counters (these are the prisoners) in the prison cells numbered 2–12. There can be any amount of prisoners in a cell.

Player 1 rolls the dice, adds the numbers and removes the prisoners from that cell. They must record the dice total they rolled by ticking the column on the recording grid after each turn.

Player 2 repeats this process. The winner is the player who releases all of their prisoners first.

Recording grid

2	3	4	5	6	7	8	9	10	11	12

Total of dice

What to do next

Play this game several times. Look at the numbers that have the most ticks. How can this help you place your counters better next time so that you have more chance of winning? Or is there a better way to find out expected outcomes for the total of the dice?

E 1

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Chance and Data

Cell No.

2

Cell No.

3

Cell No.

4

Cell No.

5

Cell No.

6

Cell No.

7

Cell No.

8

Cell No.

9

Cell No.

10

Cell No.

11

Cell No.

12

Data – asking questions and collecting data

Data is information. We collect data to help us find out about the world. Data can be in the form of numbers, words or pictures. We organise and record data so that we can look at it easily and learn more.

1 The type of question you ask guides the data results, so it's important to ask the right questions. Imagine that you are planning a birthday party and your mum says that you can serve either hot dogs or pizza. You decide to survey your guests before the party. Which question will get you the data that you need? Underline it.

What is your favourite food?   Do you prefer hot dogs or pizza?

2 For their end of season celebration, Adele's netball coach has said that the team can either go to the water slide park or go to the movies. Adele has to email her team mates to find out the most popular choice. She is about to email this question, 'What would you like to do for our end of season party?'

a What is wrong with asking this question?

_____

_____

b Write a better question for her to ask:

_____

_____

3 Here are four kids who are about the same age as you. Look at their answers. What questions were asked to get this data?

	Question	Jo	Jess	Max
a		spaghetti	hamburgers	chocolate
b		blue	pink	yellow
c		March	November	January

Chance and Data

Data – asking questions and collecting data

4 **Did you know that most peoples' eyes are either blue, brown or green?**
In this table, 4B collected data on the different coloured eyes in their class.

How many pairs of each eye colour are in 4B?	
Blue	6
Brown	15
Green	4

What are some other questions that you can answer with this data? Think of two:

1. _____

   _____

2. _____

   _____

5 **Now collect data on the different coloured eyes in your class and compare the data to 4B.**

a Write a question above the data table as the heading.

Blue	
Brown	
Green	

b What is one statement you can make about the two data sets?

_____

_____

Data – tallies

The tally method is where we count in 5s. We put a stroke for each number and the fifth one is a line that goes diagonally through. ||||

1 **Find the total of each tally amount:**

a |||| |||| |||| ☐

b |||| |||| |||| |||| |||| ☐

c |||| |||| ||| ☐

d |||| |||| |||| || ☐

2 **Molly is keeping a training diary where she records the laps she runs around the field near her house. Redo this data using the tally method.**

Molly's training	
Monday	|||||||||
Wednesday	|||||||||||
Friday	||||||||

Molly's training	
Monday	
Wednesday	
Friday	

3 **A movie theatre collected data on the number of kids and adults that attended a recent movie screening. A kid's ticket is all ages up to 15 and an adult's ticket is 16 and above.**

Ages of ticket buyers										
40	12	19	42	36	25	9	12	12	40	14
8	21	30	10	14	28	30	15	7	27	10
9	25	5	32	15	8	16	19	36	12	18

a Count how many kids' tickets and how many adults' tickets were sold using the tally method in this table:

Type of ticket	Amount sold
Kids	
Adults	

b Why do you think they conducted this survey?

_____

Chance and Data

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Data – column graphs

Column graphs are a clear way of showing and comparing data. There is a horizontal line that has the different categories and a vertical line that has the numbers, also known as the scale. There should always be a heading at the top so it is easy to see what the data is about.

1 **Answer the questions about the data in the column graph. The scale goes up in 5s.**

Birthday months at our school

a How many birthdays are there in the first 3 months of the year?

b How many kids are born in May, June or July?

c September has 10 more birthdays than which month?

2 **Sometimes column graphs go vertically. This time the horizontal line has the scale and the vertical line has the different categories. This graph shows how many of each sweet treat was brought in for the school fete.**

Notice how the scale goes up in 2s.

Number of treats brought in for the fete

Write something that this graph shows you:

_____

_____

Data – column graphs

3 **Jo from Jo-Jo's Cafe recorded the desserts that customers ordered over the weekend.**

a Show the total of each dessert that was ordered in this table:

Dessert	Tally	Total
Rasberry ripple	|||| |||| ||||	
Lemon pie	|||| |||| |||| |||| |||| |||	
Banana split	|||| ||||	
Caramel swirl	|||| |||| |||| ||	
Cookie crunch	|||| |||| |||| |||| |||| ||||	

b Show this data on the column graph below. Complete the scale and all the labels. Give the graph a heading.

Desserts																	

Raspberry ripple

Lemon pie

2 4 6

Number of desserts

c The most popular dessert was _____.

d Cookie crunch was twice as popular as _____.

e Jo wants to remove a dessert from the menu. Which one should she remove and why?

Chance and Data

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Data – picture graphs

Picture graphs use pictures to show how many items are in each category. The have a title that tells us the data that has been collected. A key tells us the value of the symbol. In the first picture graph below, we can see that one whole cupcake stands for 2 actual cupcakes. Half a cupcake stands for 1.

1 **This picture graph shows the amount of cupcakes sold in each flavour:**

Cupcakes sold in a day   Key: = 2 cupcakes

Strawberry	
Lemon	
Vanilla	
Choc-chip	

a How many lemon cupcakes were sold?

b How many choc-chip cupcakes were sold?

c How many were sold altogether?

2 **This picture graph shows the number of tickets sold each day in the week leading up to the Friday night school concert. Answer the questions that follow:**

Tickets sold   Key: TICKET = 10 tickets

Monday	TICKET TICKET TICKET TICKET TICKET TICKET TICKET TICKET TICKET
Tuesday	TICKET TICKET TICKET TICKET TICKET
Wednesday	TICKET TICKET TICKET TICKET TICKET TICKET TICKET TICKET
Thursday	

a How many tickets were sold on Monday night?

b How many fewer tickets were sold on Tuesday night compared to Wednesday night?

c 65 tickets were sold Thursday night, add this to the graph.

Data – picture graphs

3 Alexis and Xavier went to the zoo and counted the different animals that they saw. They saw 20 penguins, 16 chimpanzees, 24 flamingoes and 6 lions. Show this data in the picture graph below. Use ● for 4 animals. Add a heading.

_____   Key: ● = _____

Penguins	
Chimpanzees	
Flamingoes	
Lions	

....

4 Here are the results of a charity drive where a group of kids worked together to sell cookies to raise money for the homeless. Help them turn the tally data into a picture graph to present in assembly. Use ⬜ for 4 boxes of cookies. Add a heading.

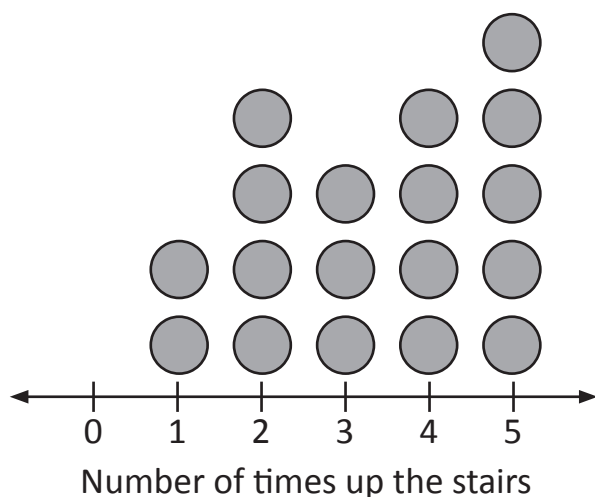|	
Max	ⅲℍ ⅲℍ ⅲℍ |
Harley	ⅲℍ ⅲℍ ⅲℍ ⅲℍ
Sara	ⅲℍ ⅲℍ ⅲℍ ⅲℍ ||||
Christie	ⅲℍ |||

_____   Key: ⬜ = _____

Max	
Harley	
Sara	
Christie	

Chance and Data

Data – dot plots

A dot plot uses a number line where the numbers are the categories. The dots show the amount in each category.

1 Two groups competed to see how many times they could run up and down a flight of stairs. Here are the results for Group 2. Answer the questions below:

Group 2 stairs results

Number of times up the stairs

a How many people ran up the stairs twice?

b How many people ran up the stairs four times?

c How many people ran up the stairs more than three times?

d How many people are in group 2?

....

2 Ellie kept a record of the number of weekly table points her group scored over the term. Present this data as a dot plot.

| 2 | 5 | 3 | 5 | 5 | 5 | 3 | 4 | 2 | 2 | 5 |

Table points for Ellie's group

Number of table points

a In this class, if a table earns 5 points in a week they get extra play time. How many times did Ellie's group get extra play time over the term?

b How many weeks are there in the school term that this data is for?

Data – two-way tables

A two-way table can show a lot of information in a small space.
Look at this two-way table that organises information about shapes.

	Is symmetrical	Is not symmetrical
Has 4 sides		
Does not have 4 sides		

1 **Two families went on holiday to Dream Land. Organise this information in the two-way table below:**

- Mel went on the mega drop twice but did not go on the dodgem cars.
- Lily screamed the loudest on the mega drop and shared the dodgem car ride with her brother.
- Harley was too short to go on the mega drop but loved the dodgem cars.
- Tash was persuaded by her friend Bec to go with her on both the mega drop and the dodgems.
- Ben was sick so he had to stay home with his Gran.

	Did not go on mega drop	Went on mega drop
Went on dodgem cars		
Did not go on dodgem cars		

2 **Sort this data in the two-way table below. You will need to label the columns and the rows. One column is labelled for you.**

- 15 people like strawberries but not bananas.
- 26 people like both strawberries and bananas.
- 18 people like bananas but not strawberries.
- 8 people like neither strawberries or bananas.

	Like strawberries	

Chance and Data

Data – two-way tables

3 **Sort the data in the two-way tables below:**

a   53   100   28   25   36   80   33   60   75   81

	Multiple of 4	Not multiple of 4
Less than 50		
Not less than 50		

b   40   6   54   25   12   60   29   32   50   24

	Divisible by 6	Not divisible by 6
Greater than 36		
Not greater than 36		

Data – Venn diagrams

A Venn diagram also shows lots of information in a small space.

This Venn diagram shows what 4S eat at playtime.

Fruit   **Muesli bars**

15   4   6   3

This shows us that:
- 15 kids just eat fruit
- 6 kids just eat muesli bars
- 4 kids eat both fruit and muesli bars
- 3 kids eat neither fruit or muesli bars
- there are 28 kids in 4S.

1   **Use the clues listed to complete the Venn diagram:**

Gymnastics   **Little athletics**

Clues:

30 kids were surveyed about which after-school activity they would prefer, gymnastics or little athletics.

- 10 kids want to do both

- 5 kids don't want to do either sport

- 8 kids want to do gymnastics.

We haven't said how many just wanted to do little athletics but you can work it out from the clues.

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Data – Venn diagrams

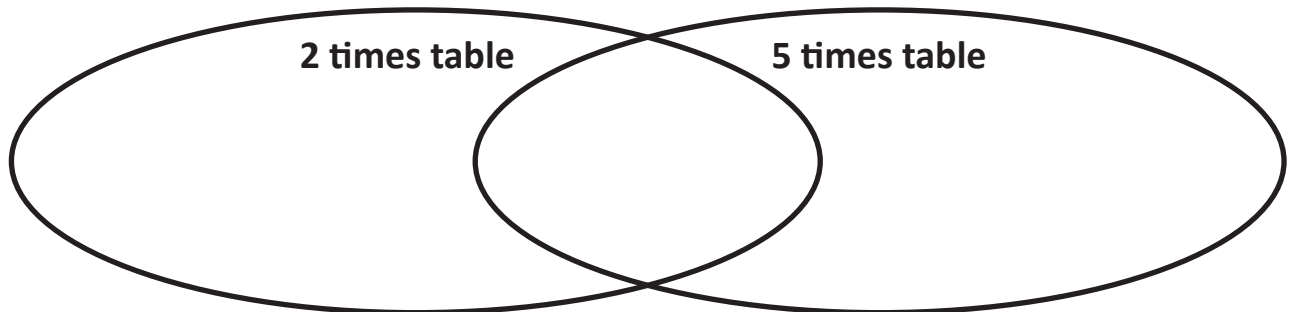**2** **Place these numbers in the Venn diagram:**

25   16   30   4   40   8   10   15   20

2 times table   **5 times table**

....

3 **Show where these numbers go in the Venn diagram by listing them next to the matching symbol:**

16   2   20   8   3   12   10   4   40   6   24   1

Even numbers   **Factors of 24**

Data – surveys

1 **A group of your friends are keen to start training for the sports carnival at lunch times. You would like to start a club where you can share healthy eating plans and training tips. If you get enough interest, Mr Gain has said he will let you have the assembly hall on Wednesdays. However, he wants you to show him carefully presented data such as how many kids are interested and what grade they are in.**

Use a software program to prepare a survey and present your results.

a   Design a question.
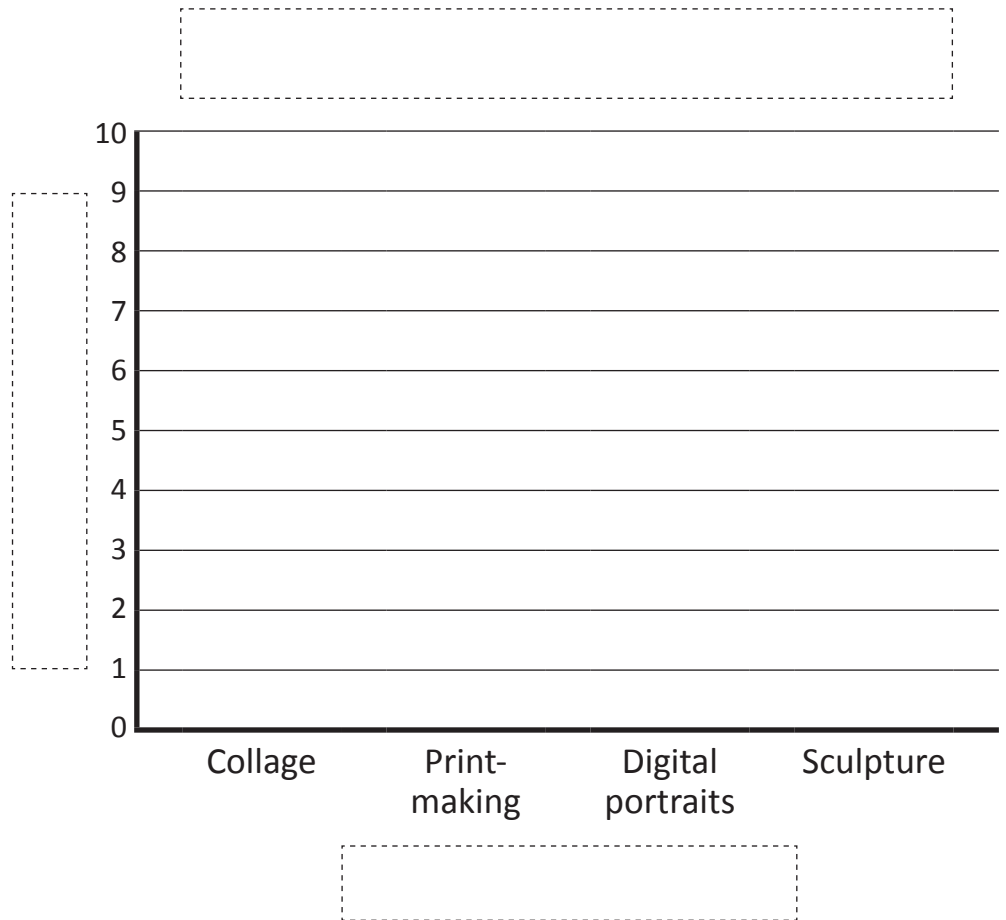
Question _____

_____

b   Collect the data.

c   Present your findings in a column graph.

Mystery graph

Getting ready

4B made a column graph of their favourite art lessons for the term.

```
10
 9
 8
 7
 6
 5
 4
 3
 2
 1
 0
     Collage    Print-     Digital    Sculpture
                making    portraits
```

What to do

Use the clues to complete this column graph and label it.

- 5 kids chose collage as their favourite art activity.
- Double the number of kids preferred print-making to sculpture.
- 4 more kids chose digital portraits than collage.
- 1 less kid chose print-making than digital portraits.