Unit 14
Statistics

Mastery Expert tip! "My class really enjoyed it when we made cross-curricular links to other subjects, collecting our own data to analyse. This helped them make real connections between the data and its presentation; it was particularly effective when introducing them to continuous data and line graphs for the first time."

Don't forget to watch the Unit 14 video!

WHY THIS UNIT IS IMPORTANT

This unit exposes children to a range of ways in which information and data can be presented and interpreted. Children explore pictograms, bar charts and tables in more detail than they have before. Children begin exploring the use of a wider range of scales and interpreting quarter symbols in pictograms, as well as reading from bars which are a quarter of the way between two marked points on a bar chart.

Children are shown data presented in line graphs for the first time and are introduced to the distinction between continuous and discrete data. They are also exposed to a range of more complex, multi-step problems, which use information presented in a range of charts and tables.

WHERE THIS UNIT FITS

→ Unit 13: Time
→ **Unit 14: Statistics**
→ Unit 15: Geometry – angles and 2D shapes

In this unit, children build on the work from Year 3 on statistics, where they were introduced to basic pictograms, bar charts and tables. Children are encouraged to explore the range of information which they can get from the data that is presented to them. Children will explore how the structure of line graphs, and data presented within them, differs from bar charts. Children should then be able to apply this knowledge through the remaining units in Year 4.

Before they start this unit, it is expected that children:
• know how to interpret a basic pictogram and bar graph
• are confident in carrying out addition, subtraction, multiplication and division calculations
• can recall the 1–12 times-tables and related division facts.

ASSESSING MASTERY

Children who have mastered this unit can interpret data that is presented in a range of ways, including pictograms, bar charts, line graphs and tables. Children can use this data to answer a range of questions, including comparison, ordering and total questions. They can also make their own statements based on the data presented to them and are beginning to compare linked data which is presented across multiple sources. Children can answer more complex multi-step problems, which use information presented in a chart, table or graph.

COMMON MISCONCEPTIONS	STRENGTHENING UNDERSTANDING	GOING DEEPER
Children may miscount the number of pictogram symbols (and their value) or misread the value on the vertical axis when a point falls between two marked values on the axis.	Represent the pictogram and/or bar chart physically using counters, cubes or other objects. Encourage children to physically count each object, and to use the key in a pictogram, or vertical axis in a bar chart to work out the total value. You can also link the vertical axis to a vertical number line.	Encourage children to make their own increasingly complex statements based on data, including data presented across multiple types of charts and tables. Ask: *What else can you tell me based on this data? How do you know? What questions could you ask someone else based on this data?*
Children may identify the incorrect operation when answering questions and carrying out calculations based on the data presented to them.	Ask: *What is the question asking you to do? What operation could this involve?* Encourage children to consider the different steps they need to take to solve multi-step problems.	Encourage children to think about whether a statement is true or false in relation to the data being presented.

WAYS OF WORKING

Use these pages to introduce the unit focus to children. You can use the characters to explore how data can be presented.
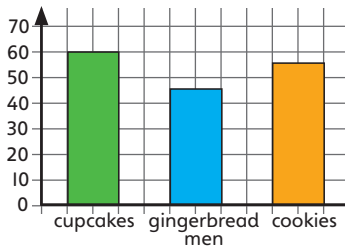
STRUCTURES AND REPRESENTATIONS

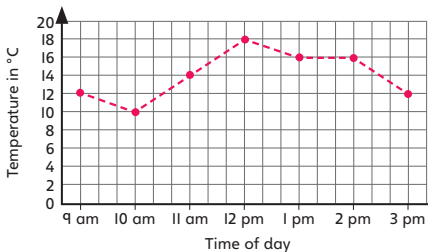Children are presented with a range of ways in which to represent data, including:

Pictograms:

	Number
cupcakes	⬤⬤⬤⬤⬤
gingerbread men	⬤⬤⬤⬤
cookies	⬤⬤⬤⬤◖

Each ⬤ represents 10 items.

Bar charts:

Line graphs:

Tables:

	Class 4T	Class 4A	Class 4S
Raisin	16	10	6
Chocolate	5	18	19
Rainbow	9	14	22

Children may also benefit from using the structures and representations introduced in Year 3 to support their calculations, including the number line.

KEY LANGUAGE

There is some key language that children will need to know as part of the learning in this unit.

➜ table, line graph, bar chart, pictogram

➜ discrete data, continuous data

➜ operation

➜ altogether, more than, greatest, smallest
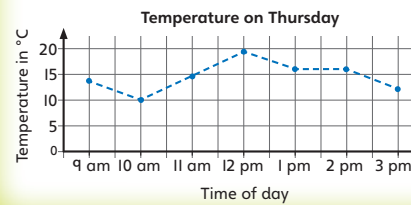
➜ compare

Unit 14
Statistics

In this unit we will …
⚡ Present data in pictograms, bar charts and tables
⚡ Explore line graphs
⚡ Solve problems based on data

We are going to meet this type of graph in this unit. What was the temperature at 10 am?

Temperature on Thursday

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We will need some maths words. Which ones have you seen before?

data line graph pictogram
bar chart table altogether
more than greatest smallest
continuous data compare

We need this too! How many people's favourite colour is yellow?

People's favourite colour
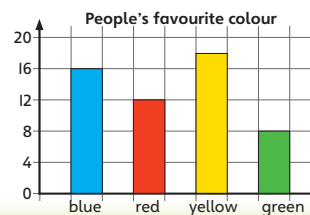
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Charts and tables ❶

Learning focus

In this lesson, children will extend their knowledge of bar charts, tables and pictograms to interpret data with larger numbers and a wider range of scales.

Small steps

➔ Previous step: Problem solving – units of time
➔ **This step: Charts and tables (1)**
➔ Next step: Charts and tables (2)

NATIONAL CURRICULUM LINKS

Year 4 Statistics

Interpret and present discrete and continuous data using appropriate graphical methods, including bar charts and time graphs.

ASSESSING MASTERY

Children can read data and values from a range of bar charts and pictograms which have various scales and symbol values, including half and quarter values. Children can interpret data from tables and use this to complete charts and pictograms, as well as answer simple comparison questions.

COMMON MISCONCEPTIONS

Children may misread the scales on a bar chart, assuming that each square always stands for one. Ask:
• *What do you notice about the scale on the vertical axis of this chart? What does it increase in?*

Children may also assume that each symbol in a pictogram has a value of 1. Draw children's attention to the key on a pictogram and ask:
• *What can you look at to identify the value of each symbol? Is this always the same for every pictogram?*

STRENGTHENING UNDERSTANDING

Strengthen understanding of bar charts by asking children to recreate the bars using multilink cubes. This will help children compare the heights of each bar.

GOING DEEPER

Encourage children to make statements based on the data presented to them in different charts. For example, ask: *What can you tell me based on this bar chart/pictogram?*

KEY LANGUAGE

In lesson: bar chart, half, between, **pictogram**, symbol, table, row, column, vertical, horizontal

Other language used by the teacher: most, altogether

STRUCTURES AND REPRESENTATIONS

number lines, bar chart, pictogram

RESOURCES

Mandatory: rulers

Optional: multilink cubes

In the eTextbook of this lesson, you will find interactive links to a selection of teaching tools.

Before you teach ⏸

• Are children confident finding numbers that lie half-way between two numbers?
• Can children interpret data given in tables?

Discover

WAYS OF WORKING Pair work

ASK

- Question **1**: *What types of chart are shown here?*
- Question **1**: *What can you tell from the charts?*
- Question **1** a): *What do you think half a symbol stands for?*

IN FOCUS This activity re-introduces children to pictograms and bar charts, which they last saw in Year 3. Children read a range of data, including where half values are used, and make simple comparisons.

PRACTICAL TIPS Use multilink cubes to interpret data on the bar chart and pictogram to check children can make connections between the data being presented in different ways. Use a number line to help with the understanding of scales.

ANSWERS

Question **1** a): Class 4T made 45 cookies. Class 4A made 55 cookies.

Question **1** b): Class 4A made more cupcakes than any other item. Class 4A made 60 cupcakes.
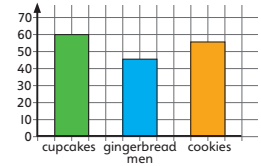
Charts and tables **1**

Discover

Number of items baked in Class 4T

	Number
cupcakes	🟡🟡🟡🟡🟡
gingerbread men	🟡🟡🟡🟡
cookies	🟡🟡🟡🟡◖

Each 🟡 represents 10 items.

Number of items baked in Class 4A

1 a) How many cookies did each class make?

b) Which item did Class 4A make the most of? How many did they make?

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Share

WAYS OF WORKING Whole class teacher led

ASK

- Question **1** a): *How can you work out how many cookies were made from the pictogram?*
- Question **1** a): *How can you work out the value of a bar half-way between two points?*
- Question **1** a): *How can you make sure you read the correct value on the vertical axis of the bar chart?*
- Question **1** a): *Is there more than one way to work out the value for items on a pictogram?*
- Question **1** b): *Can you work out which is the most popular item without working out the value of each bar?*

IN FOCUS In this part of the lesson, children must interpret information from pictograms and bar charts, where there are half symbols in a pictogram and the bar is half-way between two marked values on a bar chart. When working out the total value of an item on a pictogram, draw children's attention to the two different ways of working (repeated addition and multiplication) and the link between the two.

Share

a) Each 🟡 in the **pictogram** represents 10 items.
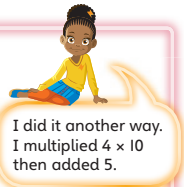
Each ◖ represents 5 items.

The row for cookies has 4 and a half 🟡.
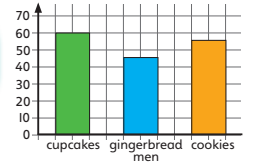
🟡 🟡 🟡 🟡 ◖

10 + 10 + 10 + 10 + 5 = 45

Class 4T made 45 cookies.

I did it another way. I multiplied 4 × 10 then added 5.

I am going to use a ruler to make sure I am reading the correct values.

Number of items baked in Class 4A

In the **bar chart**, the bar for cookies lines up half-way between 50 and 60 on the vertical axis.
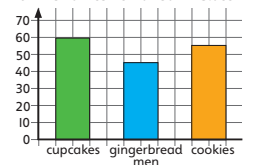
Class 4A made 55 cookies.

b) The highest bar in the bar chart is for cupcakes.

Class 4A made more cupcakes than any other item.

The top of the cupcake bar lines up with 60 on the vertical axis.

Class 4A made 60 cupcakes.

Number of items baked in Class 4A

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Think together

Whole class teacher led (I do, We do, You do)

ASK

- Question **1** a): *How can you work out how many cupcakes each class has sold?*
- Question **1** b): *How can you work out the value of the $\frac{1}{4}$ of a symbol?*
- Question **2**: *How can you fill in the missing information?*

IN FOCUS In question **1**, children are introduced to $\frac{1}{4}$ pictogram symbols for the first time, and so need to extend their knowledge of how to calculate the value of $\frac{1}{2}$ symbols to calculating the value of $\frac{1}{4}$ symbols.

STRENGTHEN To strengthen understanding of the value of quarter symbols, represent a pictogram symbol using a set of 4 interconnecting cubes (in a 2 by 2 arrangement). You can then discuss what each quarter of the symbol would be worth, physically splitting up the symbol.

DEEPEN Deepen understanding by encouraging children to justify their responses to each question within question **3**. As this is the first time children have come across quarters, ask: *How could you work out the value of the bar that is $\frac{1}{4}$ of a way between two marked values?*

ASSESSMENT CHECKPOINT Use question **1** to assess whether children can independently read values from a bar chart and pictogram, including where the height of the bar is in between two marked numbers on the vertical axis on a bar chart and when there are part symbols on a pictogram.

ANSWERS

Question **1** a): Class 5T sold 28 cupcakes.
Class 5A sold 45 cupcakes.

Question **1** b): Class 5T sold 26 gingerbread men.

Question **2**: Class 4C raised the most money (£36).

Question **3** a): £650

Question **3** b): Olivia is wrong, it should be 3 quarters of the way up between £600 and £700.
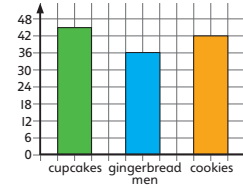
Question **3** c): £2,200

Think together

Number of items sold in Class 5T

	Number
cupcakes	◯◯◯◖
gingerbread men	◯◯◯◢
cookies	◯◯◯◯◯

Each ◯ represents 8 items.

Number of items sold in Class 5A

1 a) How many cupcakes did each class sell?

Each ◯ represents ☐.

Each ◖ represents ☐.

◯   ◯   ◯   ◖

☐ + ☐ + ☐ + ☐ = ☐

Class 5T sold ☐ cupcakes.

The bar for cupcakes is half-way between ☐ and ☐.

Class 5A sold ☐ cupcakes.

b) How many gingerbread men did Class 5T sell?

Class 5T sold ☐ gingerbread men.

I think ◢ must represent a quarter of a ◯.

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2 The table shows how many cupcakes and gingerbread men two more classes sold.

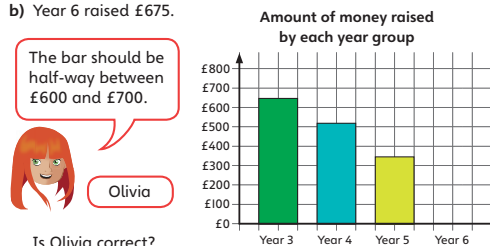|	Class 4B	Class 4C
cupcakes	8	15
gingerbread men	12	6

Cupcakes were sold for £2. Gingerbread men were sold for £1.

Which class raised the most money?

3 Some children are raising money for charity. The bar chart shows the amount each year group raised.

CHALLENGE

a) How much did Year 3 raise?

b) Year 6 raised £675.

The bar should be half-way between £600 and £700.

Olivia

Is Olivia correct?

Explain your answer.

Amount of money raised by each year group

c) How much did the year groups raise altogether?

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→ Practice book 4C p75

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Practice

WAYS OF WORKING Independent thinking

IN FOCUS In question **3**, children must construct a pictogram using the information provided in the table and in the key.

STRENGTHEN To support children with question **1**, encourage children to think carefully about the information provided in the key and how they can work out the value of a quarter symbol by halving and then halving again, or by dividing by 4.

DEEPEN Children should begin to solve more complex problems involving charts and tables including where they need to compare different sources of data in order to complete the chart, and where there are missing pieces of information. Question **5** encourages children to do this, and relies on children having a deep understanding of how each type of chart is constructed. Ask: *How can you work out what the scale on the vertical axis is? How can you work out what value each symbols has? What information can you use to help you?*

ASSESSMENT CHECKPOINT Use questions **2** and **3** to assess whether children can correctly interpret data from a table and transfer this to another way of presenting data (in this case a pictogram).

ANSWERS Answers for the **Practice** part of the lesson appear in the separate **Practice and Reflect answer guide**.

Reflect

WAYS OF WORKING Independent thinking

IN FOCUS This activity compares the benefits and similarities of each way of presenting data. Encourage children to discuss whether the type of data and values impact their choice.

ASSESSMENT CHECKPOINT Use this activity to assess whether children are able to identify the benefits of using each different type of representation.

ANSWERS Answers for the **Reflect** part of the lesson appear in the separate **Practice and Reflect answer guide**.

After the lesson ⏸

- Are children secure at reading data from bar charts, tables and pictograms?
- Can children confidently interpret $\frac{1}{2}$ and $\frac{1}{4}$ symbols in a pictogram?
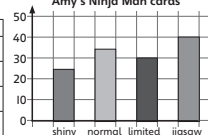

→ Textbook 4C p104

Charts and tables ①

① Kieron and Amy collect 'Ninja Man' collecting cards.

Each ⬜ represents 8 cards.

Kieron's Ninja Man cards

shiny	
normal	
limited edition	
jigsaw piece	

Amy's Ninja Man cards

a) How many jigsaw piece cards does Kieron have?

Each ⬜ represents ☐ . Each ▯ represents ☐ .

☐ + ☐ + ☐ = ☐

Kieron has ☐ jigsaw piece cards.

b) How many normal cards does Kieron have?

Each ▯ represents ☐ .

Kieron has ☐ normal cards.

c) How many shiny cards does Amy have?

Amy has ☐ shiny cards.

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② Complete these sentences.

Number of books read during Year 4

	Otis	Evie	Gracie
non-fiction	7	10	8
fiction	22	20	23
poetry	3	5	6
Total:	32	35	37

Evie read ☐ fiction books.

Gracie read ☐ non-fiction books.

Otis read ☐ poetry books.

Gracie read ☐ books in total.
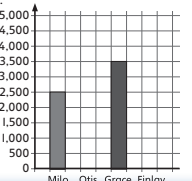
③ Use the information in the table to create a pictogram for the number of non-fiction books read.

Number of non-fiction books read

Each ■ represents 2 books.

	Number of books read
Otis	
Evie	
Gracie	

④ Complete the missing information.

Number of pages read in one term

Milo	
Otis	4,500
Grace	
Finlay	2,250

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⑤ Complete the pictogram and bar chart.

CHALLENGE

Number of class points earnt last term:
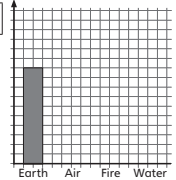
	Year 3	Year 4	Year 5	Year 6
Earth	275	225	300	200
Air	350	400	225	375
Fire	325	375	300	350
Water	450	450	300	350

Number of class points per team in Year 4

Each ● represents ☐ points.

	Items
Earth	
Air	
Fire	
Water	●●●●●

Total number of class points earnt last term

Reflect

Which is the best way to display data? Discuss with a partner and write your answers.

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Charts and tables ❷

Learning focus

In this lesson, children will use their knowledge of bar charts, tables and pictograms to answer increasingly complex problems, including those which involve differences and totals.

Small steps

→ Previous step: Charts and tables (1)
→ **This step: Charts and tables (2)**
→ Next step: Line graphs (1)

NATIONAL CURRICULUM LINKS

Year 4 Statistics

Solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and other graphs.

ASSESSING MASTERY

Children can read data and values from different bar charts and pictograms which have a range of scales and symbol values, and use these to calculate sums and differences. Children can also make direct comparisons between data and draw conclusions from data presented in different ways.

COMMON MISCONCEPTIONS

Children may choose the wrong operation when finding the total or difference. Ask:
• *What is the question asking you to find? Is this an addition or subtraction question?*

STRENGTHENING UNDERSTANDING

Help children interpret the scales on a bar chart where the bar is part-way between marked values. Link the scale on the vertical axis to a number line. Rotate the bar chart to help children see this connection. Ask: *What does this look like? How is it similar or different to a number line?* Help children identify the difference between each marked section, before writing what $\frac{1}{4}$, $\frac{1}{2}$ and $\frac{3}{4}$ of this difference is.

GOING DEEPER

Encourage children to draw their own conclusions based on the data that is presented to them. For example, ask: *Why do you think people spend more on chocolate in April than January?*

KEY LANGUAGE

In lesson: total, sum, difference, altogether, bar chart, half, between, pictogram, symbol, table, row, column, vertical, horizontal

Other language used by the teacher: most, quarter

STRUCTURES AND REPRESENTATIONS

number lines, bar charts, pictograms

RESOURCES

Mandatory: rulers

Optional: multilink cubes

In the eTextbook of this lesson, you will find interactive links to a selection of teaching tools.

Before you teach ⏸

• Are children confident interpreting bar charts, pictogram and tables?
• Can children find $\frac{1}{4}$ and $\frac{1}{2}$ values on a number line?

Discover

Charts and tables ②

Discover

WAYS OF WORKING Pair work

ASK

- Question ❶: *What are these charts called?*
- Question ❶: *What operations do you need to use to solve these problems?*
- Question ❶ a): *How can you work out the difference in the number of tickets?*
- Question ❶ b): *What operation do you need to use to work out the total number of tickets sold?*

IN FOCUS This activity extends the learning from Lesson ❶ and encourages children to find a difference and total, using information drawn from two different representations of data.

PRACTICAL TIPS Use a number line or ruler to help find values along the vertical axis on the bar chart. Use multilink cubes to help children visualise multiples of 12 as well as half and quarter values of 12.

ANSWERS

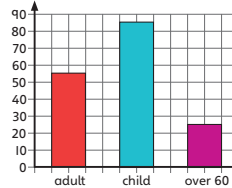Question ❶ a): The farm sold 19 more child tickets on Saturday.

Question ❶ b): The farm sold 109 adult tickets altogether over the weekend.

Number of tickets sold on Saturday

Number of tickets sold on Sunday

	Number
adult	
child	
over 60	

Each ▢ represents 12 tickets.

❶ a) How many more child tickets did the farm sell on Saturday?

b) How many adult (under 60) tickets did the farm sell altogether over the weekend?

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PUPIL TEXTBOOK 4C PAGE 108

Share

WAYS OF WORKING Whole class teacher led

ASK

- Question ❶: *How did you know how much each symbol represents on the pictogram?*
- Question ❶: *How can you make sure you read the correct value on the vertical axis of the bar chart?*
- Question ❶: *How can you work out the value of the bar if it is in between two numbers on the vertical axis?*
- Question ❶: *Is there more than one way to work out the value for items on a pictogram?*

IN FOCUS In this part of the lesson, children identify the information they need from each chart and the operation they need to calculate the difference and total. Discuss the choice of operation with children, encouraging them to justify and explain their decisions.

Share

Number of tickets sold on Saturday

a) The bar for child tickets is half-way between 80 and 90. 85 child tickets were sold on Saturday.

child | ▢▢▢▢▢◖

Each ▢ represents 12 people.
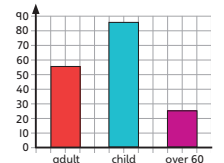Each ◖ represents 6 people.

$5 \times 12 = 60$
$60 + 6 = 66$

The farm sold 66 child tickets on Sunday.

$85 - 66 = 19$

The farm sold 19 more child tickets on Saturday.

I did this another way. I added 12 + 12 + 12 + 12 + 12 + 6 to get the answer.

b) The farm sold 55 adult tickets on Saturday.

There are four and a half symbols for adult tickets on the pictogram.

$4 \times 12 = 48$
$48 + 6 = 54$

The farm sold 54 adult tickets on Sunday.

$55 + 54 = 109$

The farm sold 109 adult tickets altogether over the weekend.

I need to add a value from the bar chart to a value on the pictogram.

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PUPIL TEXTBOOK 4C PAGE 109

Think together

Whole class teacher led (I do, We do, You do)

ASK

- Question **1** a): *How can you work out if more children or adults fed the lambs?*
- Question **1** b): *What operation do you need to use to find out how many people fed the foals altogether?*
- Question **2**: *How do you know which row and column you need to look at to answer the question?*
- Question **3** a): *How can you use the information we have to complete the table?*

IN FOCUS In question **1** a), children are asked to complete a direct comparison between two values first, refreshing their knowledge of the less than (<) sign.

STRENGTHEN Use a bar model to represent the structure of both sum and difference problems. This will help children identify the correct operation to use in order to solve each problem.

DEEPEN Children should be able to extend their learning and begin to draw their own conclusions based on the data that is presented to them. For example, in question **3**, children should be able to make a range of statements comparing single values, finding the totals and comparing sets of values. They can then be invited to draw conclusions from these statements. For example, ask: *Do people generally like their visit to the farm? How do you know?*

ASSESSMENT CHECKPOINT Use question **1** b) and questions **2** a) and b) to assess whether children can identify the correct operations needed to answer sum and difference questions.
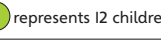
ANSWERS

Question **1** a): 16 more children than adults fed the lambs.

Question **1** b): 75 people fed the foals altogether.

Question **2** a): On Sunday, the café made £600 from hot meals.

Question **2** b): The café made £75 more from cold children's meals on Saturday than Sunday.

Question **3** a): 33 more visitors rated the farm OK on Saturday (69) than Sunday (36).

Question **3** b): More people rated the farm on Saturday (148) than on Sunday (134).
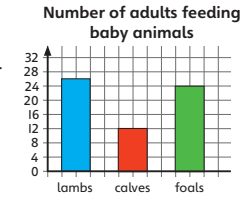

Think together

1 a) How many more children than adults fed the lambs?

Each ⬤ represents ▢ children.

Each ◗ represents ▢ children.

▢ × ▢ = ▢

▢ + ▢ = ▢

The lambs bar for adults is half-way between ▢ and ▢ .

▢ adults fed the lambs.

▢ − ▢ = ▢

▢ more children than adults fed the lambs.

b) How many people fed the foals altogether?

▢ children fed the foals.

▢ adults fed the foals.

▢ + ▢ = ▢

▢ people fed the foals altogether.

Number of children feeding baby animals

	Number
lambs	⬤⬤⬤◗
calves	⬤⬤◗
foals	⬤⬤⬤⬤◢

Each ⬤ represents 12 children.

Number of adults feeding baby animals

110

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2 The pictograms show the amount of money made at a café on Saturday and Sunday.

Money made from meals sold on Saturday

	Number
adult hot	⬤⬤◗
adult cold	⬤◖
child hot	⬤⬤◢
child cold	⬤⬤⬤

Each ⬤ represents £100.

Money made from meals sold on Sunday

	Number
adult hot	⬤⬤◢
adult cold	⬤◗
child hot	⬤⬤⬤◖
child cold	⬤⬤◢

Each ⬤ represents £100.

a) How much money did the café make from hot meals on Sunday?

b) How much more money did the café make from cold children's meals on Saturday compared to Sunday?

3 The bar chart shows the opinion of visitors to the farm on Saturday and Sunday.

a) How many more visitors rated the farm ok on Saturday than Sunday?

b) Did more people rate the farm on Saturday or Sunday?

🟥 represents Saturday.
🟨 represents Sunday.

Opinion of farm visit

CHALLENGE

111
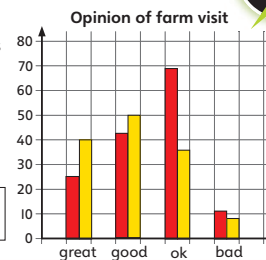
→ Practice book 4C p78

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Practice

WAYS OF WORKING Independent thinking

IN FOCUS In question **3**, children's reasoning skills are developed further, as they are asked to interpret the information given in order to calculate the missing pieces of information from a table and then use this to populate a bar chart.

STRENGTHEN To support children with question **3** it may be useful to break down the task further. Encourage children to consider the relationships between the values in the table and the information given; for example, ask: *How many points did Tom score on Vault Explorer? We know that Mark scored 450 more than Tom, so how do we work out Mark's score?* Once children have correctly filled in the missing information from the table, look at the features of a bar chart. Review the scale provided, identifying what half and a quarter of 100 are, before inviting children to mark the values on the chart.

DEEPEN Children should begin to solve more complex logic-style questions that involve charts, tables and pictograms. Question **4** provides children with the opportunity to develop these skills. Challenge children to create their own logic-style clues for other charts and tables, including those presented elsewhere in this lesson.

ASSESSMENT CHECKPOINT Use question **2** to assess whether children can use the relationship between individual pieces of data and the total; for example, can they work out the value of one piece of data if they know the total and the other data values?

ANSWERS Answers for the **Practice** part of the lesson appear in the separate **Practice and Reflect answer guide**.

Reflect

WAYS OF WORKING Independent thinking
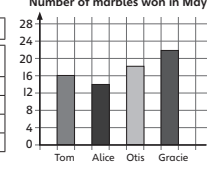
IN FOCUS In this part of the lesson, children reflect on the different types of graph that they know.

ASSESSMENT CHECKPOINT Use this activity to assess whether children are able to describe different ways of presenting and identifying data and to provide coherent reasoning as to which method they prefer over others.

ANSWERS Answers for the **Reflect** part of the lesson appear in the separate **Practice and Reflect answer guide**.

After the lesson ⏸

- Are children secure at interpreting data from bar charts, table and pictograms?
- How can you provide opportunities for children to further use and develop these skills during day-to-day school life?

Charts and tables ②

1 Each ◠ represents 6 marbles.

Number of marbles won in December

Tom	◠ ◠
Alice	◠ ◠ ◠ ◐
Otis	◠ ◠ ◠
Gracie	◠ ◐

Number of marbles won in May

a) How many marbles did Alice win in December and May altogether?

☐ + ☐ = ☐

Alice won ☐ marbles in December and May.

b) How many more marbles did Otis win in May compared to Alice?

Otis won ☐ marbles in May.

Alice won ☐ marbles in May.

☐ − ☐ = ☐

Otis won ☐ more marbles in May than Alice.

c) How many marbles did the children win in May altogether?

The children won ☐ marbles in May.

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2 This table shows the number of visitors to the History Museum and the Science Museum over three days.

Complete the table.

Number of visitors

	History Museum	Science Museum	Total
Saturday	625		1,425
Sunday	745	725	
Monday		390	780
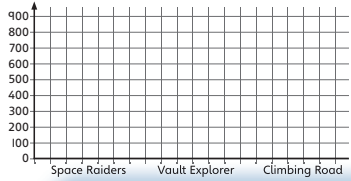
3 Tom and Sarah are playing video games. Use the information below to complete the table, then complete a bar chart showing the scores for Sarah.

Sarah scored 450 more on Vault Explorer than Tom.

Tom scored 250 more on Climbing Road than he did on Space Raiders.

Number of points earned

	Space Raiders	Vault Explorer	Climbing Road
Sarah	700		850
Tom	550	200	

Number of points scored by Sarah

79

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4 The bar chart shows the number of children who have a packed lunch and a hot lunch each day.

Each child has to have a packed lunch or a hot lunch.

(legend: ■ hot lunch, ▨ packed lunch)

a) There are 160 children in the school.

How many children were off school on Friday? ☐

b) Which day was there the greatest difference between the number of children who had a hot lunch and those that had a packed lunch? _____ What was the difference? ☐

Reflect

What types of graph do you know? Which do you prefer? Why?

80

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Line graphs ①

Learning focus

In this lesson, children will read values from a line graph.

Small steps

→ Previous step: Charts and tables (2)
→ **This step: Line graphs (1)**
→ Next step: Line graphs (2)

NATIONAL CURRICULUM LINKS

Year 4 Statistics

Interpret and present discrete and continuous data using appropriate graphical methods, including bar charts and time graphs.

ASSESSING MASTERY

Children can read data from line graphs, including where values lie in between two marked points on an axis. Children can identify which axis to read the data from and read the value from any point on the line. They can make simple statements about the values.

COMMON MISCONCEPTIONS

Children may think they can only read data from the marked points on the *x*-axis. Draw children's attention to the type of data displayed. Discuss how this is continuous and that the line graphs help us to estimate values in between two marked points. Ask:

• *What do you notice about the type of data shown in this graph? How is it the same as or different from the types of data we were looking at in our last lesson?*

STRENGTHENING UNDERSTANDING

To help children interpret the continuous scales on a line graph link the scales on both axes to a number line, rotating the chart so that the vertical axis is horizontal to help make the connection.

Children may also benefit from recording data and re-creating a line graph so that they are able to understand the connection between the marked points and the continuous sets of data. Consider linking data collection to a real-life context. Discuss how the measurement is still changing in between marked values.

GOING DEEPER

Encourage children to begin to consider the benefits of a line graph over other ways of presenting data. Ask: *Why is the line graph better at presenting this data compared to a bar graph, pictogram, or table?*

KEY LANGUAGE

In lesson: line graph, axis, vertical, horizontal

Other language to be used by teacher: most, least, longest, shortest, continuous data, bar chart

STRUCTURES AND REPRESENTATIONS

line graphs

RESOURCES

Mandatory: rulers

Optional: number lines, squared paper

In the eTextbook of this lesson, you will find interactive links to a selection of teaching tools.

Before you teach ⏸

• Are children confident at reading values from the vertical axis of bar charts, including when the bar height is in between two marked values?
• Have children been exposed to continuous data before in other subject areas?

Discover

WAYS OF WORKING Pair work

ASK

- Question ① : *How is this chart the same as / different from the charts you have seen so far?*
- Question ① a): *How can you find out what the temperature was at a given time?*

IN FOCUS This is the first time children have been exposed to line graphs so encourage them to explore the graph, including the title and axes. Discuss how this graph is different from other graphs they have explored in previous lessons.

PRACTICAL TIPS Use rulers to interpret continuous values on a line graph, reading across from both the horizontal and vertical axes. Use a number line to help understanding of in between values on a continuous scale.
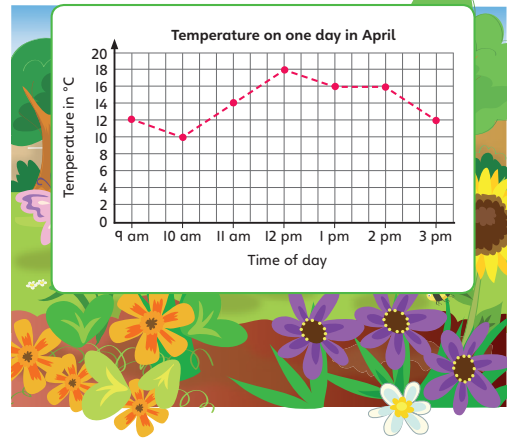
ANSWERS

Question ① a): The temperature at 11 am is 14 °C.

Question ① b): The temperature decreases by 5 °C between 12:30 pm and 3 pm (from 17 °C to 12 °C).

Temperature on one day in April

① a) What is the temperature at 11 am?
   b) How much does the temperature decrease by between 12:30 pm and 3 pm?

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Share

WAYS OF WORKING Whole class teacher led

ASK

- Question ① : *How is the data shown here different to the data shown on bar charts?*
- Question ① a): *Where can we find 11 am on the graph? How can you work out the temperature at 11 am?*
- Question ① a): *What could you use to help you read the times and temperatures accurately?*
- Question ① b): *Is 12:30 pm marked on the horizontal axis? Where do you think 12:30 pm would be?*
- Question ① b): *How can you work out a value that falls in between two marked points on the vertical axis?*

IN FOCUS In this part of the lesson, children read information from a line graph, starting from a given value for the horizontal axis and then reading the corresponding value from the vertical axis. Ensure children understand that a line graph shows continuous data, which means that you can read values that are in between marked values on the horizontal axis and use the line to find the approximate corresponding value on the vertical axis. In comparison, bar charts and pictograms show categorical, discrete data.

a) Find 11 am on the horizontal axis of the **line graph**.

Then move up to the line.

Read along to see which temperature this corresponds to.

The temperature at 11 am is 14 °C.
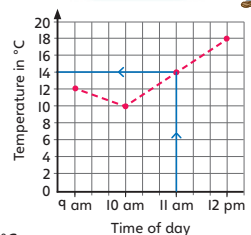
I am going to use a ruler to help me.

b) The temperature at 12:30 pm is 17 °C.

The temperature at 3 pm is 12 °C.

17 − 12 = 5

The temperature decreases by 5 °C between 12:30 pm and 3 pm.

Temperature on one day in April
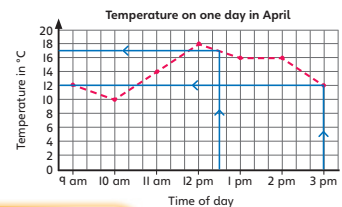
I read off the values from 12:30 pm and 3 pm and found the difference.

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Think together

WAYS OF WORKING   Whole class teacher led (I do, We do, You do)

ASK

- Question **1** a): *How can you work out the temperature at a given time?*
- Question **1** c): *2:30 pm is not marked on the horizontal axis. How can you find the temperature at 2:30 pm?*
- Question **1** d): *How can you use the shape of the line to help you find out when it was warmest inside?*
- Question **3**: *Which axis do you need to read from in order to complete each of these sentences?*

IN FOCUS   In this part of the lesson, children are introduced to reading values from a line graph from both the horizontal and vertical axes. Discuss how the continuous nature of the graph makes it possible to read values from either axis, including from points which lie in between marked values. In question **1** d), children determine the highest values by looking at the highest points of the line graph and begin to make statements based on the graph.

STRENGTHEN   To help children read accurately from the horizontal or vertical axis, encourage them to use a ruler to draw a horizontal or vertical line from a given point on the axis to the line. They can then draw a horizontal or vertical line from this point to the other axis and read the required value.

DEEPEN   Children should be able to extend their learning to interpret more complex line graphs, including where multiple sets of data are plotted as two or more lines. Question **3** provides an opportunity for children to explore this. Ask children to explain why they think there may be two lines on the same graph. They should begin to consider how they can use this to help them compare the two sets of data. Ask: *How can you use this line graph to help you compare the data for October and December?*

ASSESSMENT CHECKPOINT   Use question **1** to assess whether children are able to accurately read values from a line graph, when they have to read values for a given point on the horizontal axis.

ANSWERS

Question **1** a): The temperature was 24 °C at 11 am.

Question **1** b): The temperature was 25 °C at 1 pm.

Question **1** c): The temperature was 25 °C at 2:30 pm.

Question **1** d): It was warmest at 2 pm.

Question **1** e): The temperature was 21 °C at 10:15 am.

Question **2** : It is above 24 °C for approximately $2\frac{1}{2}$ hours (from 12:30 pm to 3 pm).

Question **3** a): The temperature was 11 °C.

Question **3** b): The difference is 2 °C.

Question **3** c): For example:
Same: It was warmest at 12 pm on both days.
Different: It was warmer at 8 am than it was at 2 pm on 1 October, but the opposite is true of 1 December (warmer at 2 pm than at 8 am).

Think together

This line graph shows the temperature inside Emily's house on Tuesday.

Temperature inside
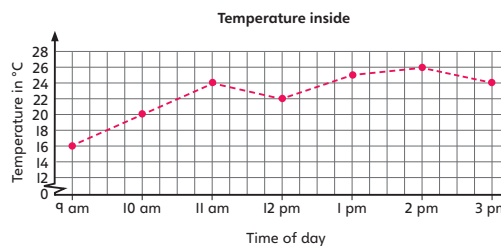
1 a) What was the temperature at 11 am?
   b) What was the temperature at 1 pm?
   c) What was the temperature at 2:30 pm?
   d) At what time was it the warmest inside Emily's house?
   e) At what time was the temperature 21 °C?

2 For how long is the temperature above 24 °C in Emily's house?

I am going to start by going across from the temperature on the vertical axis.

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3 The temperature in a small town was measured on the first day of October and the first of December.

CHALLENGE

The results are shown on the line graph below.
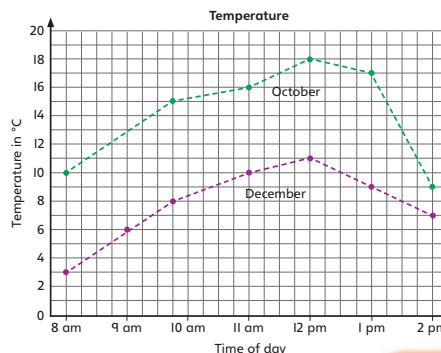
Temperature

a) What was the temperature at midday on 1 December?

b) What is the difference in the temperature at 2 pm on 1 December and 2 pm on 1 October?

c) What is the same and what is different about the temperature on 1 October and 1 December?

Line graphs can show more than one set of data. Each set of data has its own line.

→ Practice book 4C p81

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Practice

Line graphs ①

WAYS OF WORKING Independent thinking

IN FOCUS Questions ❶, ❷ and ❸ help children practise reading from both the horizontal and vertical axis of a line graph. In question ❸, children make simple statements based on the line graph. For example, they must work out when the shadow is shortest and longest by looking at the height of the line at various points.

STRENGTHEN To support children in correctly identifying which axis to read from, ask children to consider which piece of information they 'know'. For example, in question ❸, ask: *Do you know the time or the length of the shadow?* Encourage children to ask themselves this question every time they are reading information from a line graph.

DEEPEN Children should begin to explore how line graphs can be developed and used to show more complex sets of information. Question ❺ exposes children to line graphs which have more than one set of data. Ask children about the benefits of presenting data this way. Ask: *Why could it be useful to show the results for both these cars on one graph, rather than on two separate graphs?*

ASSESSMENT CHECKPOINT Use questions ❸ and ❹ to assess whether children can correctly interpret data from a line graph and transfer this to another way of presenting data, such as in a table.

ANSWERS Answers for the **Practice** part of the lesson appear in the separate **Practice and Reflect answer guide**.


① Holly's car journey
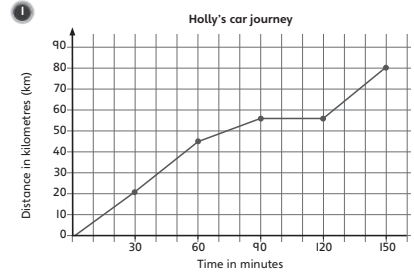
a) How many kilometres has Holly travelled after 30 minutes?
   Holly has travelled ☐ kilometres after 30 minutes.

b) How many kilometres has she travelled after 90 minutes?
   Holly has travelled ☐ kilometres after 90 minutes.

c) How long did it take Holly to travel 45 kilometres?
   It took Holly ☐ minutes to travel 45 kilometres.

d) The total length of the journey was 80 kilometres.
   It took Holly ☐ minutes to complete the journey.

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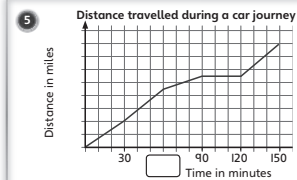**② Length of shadow from a 50 cm stick**
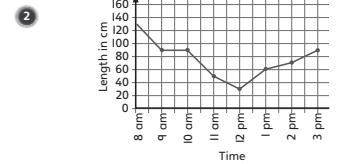
a) What was the length of the shadow at 8:30 am?
   The shadow was ☐ cm at 8:30 am.

b) When was the shadow 30 cm?
   The shadow was 30 cm at _____ .

③ Complete the sentences.
The shadow was the longest at _____ . It was ☐ cm long.
The shadow was the shortest at _____ . It was ☐ cm long.
The shadow was the same length at both _____ and _____ .

④ Would a line graph be a good way to present this data? Explain your answer.

People's favourite colour

blue	12
yellow	10
green	16
red	8

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Reflect

WAYS OF WORKING Independent thinking

IN FOCUS Children reflect on when it is appropriate to use a line graph.

ASSESSMENT CHECKPOINT Use this activity to assess whether children are able to identify the key feature of a line graph, and when a bar chart would be the more efficient option.

ANSWERS Answers for the **Reflect** part of the lesson appear in the separate **Practice and Reflect answer guide**.

After the lesson ⏸

- Are all children secure at reading continuous data from a line graph?
- Are children able to make connections when looking at the same data presented differently?

⑤ Distance travelled during a car journey CHALLENGE

Car journey

| Time | 30 minutes | | 90 minutes | 120 minutes | 150 minutes |
| Distance | | 45 miles | | | |

a) Complete the table and the axes on the line graph.

b) When was the car stuck in a traffic jam? Explain your answer.

Reflect

When would you use a line graph instead of a bar chart?

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Line graphs ❷

Learning focus

In this lesson, children will continue to explore line graphs, and will make statements and comparisons based on data presented in line graphs.

Small steps

→ Previous step: Line graphs (1)
→ **This step: Line graphs (2)**
→ Next step: Problem solving – graphs

NATIONAL CURRICULUM LINKS

Year 4 Statistics

Solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and other graphs.

ASSESSING MASTERY

Children can read and compare data from both axes on a line graph, including where values lie in between two marked points on an axis, and use this to make comparisons and find the difference between two points. They can also use the shape and structure of a line graph to make statements about the rate of change and the highest and lowest values.

COMMON MISCONCEPTIONS

Children may think that the highest and lowest values are always the first and last points of a graph. Ask:
• *Where would you find the highest and lowest value on the vertical axis? Which point of the graph is at the highest and lowest point?*

STRENGTHENING UNDERSTANDING

To help children make statements about the rate of change, encourage them to collect data and create their own graph. Ask: *What does the steepness of the line between each set of points say about the rate of change?*

GOING DEEPER

Encourage children to make deeper and more hypothetical statements based on data presented to them in line graphs. For example, if presented with the timings of a race, encourage children to consider which athlete they think is the best and why.

KEY LANGUAGE

In lesson: line graph, **continuous data,** axis, vertical, horizontal, comparison

Other language to be used by the teacher: most, least, longest, shortest

STRUCTURES AND REPRESENTATIONS

line graph

RESOURCES

Mandatory: rulers

Optional: number lines, squared paper

In the eTextbook of this lesson, you will find interactive links to a selection of teaching tools.

Before you teach ⏸

• Are children confident reading line graphs?
• How could children collect data as part of your wider curriculum coverage?

Discover

WAYS OF WORKING Pair work

ASK

- Question **1** a): *How can you work out how far Sofia travelled between two different times?*
- Question **1** b): *How can you work out how long it took Sofia to travel a certain distance?*

IN FOCUS In this part of the lesson, children are expected to apply their knowledge of how to read information from line graphs, which they have developed in the previous lesson, to answer comparison questions based on information presented in a line graph.

PRACTICAL TIPS Use a ruler to draw lines up from the horizontal axis to the graph line to find the corresponding vertical axis value. Remind children of the subtraction method to find out the difference between two values.

ANSWERS

Question **1** a): Sofia cycled 25 km between 11 am and 12 pm.

Question **1** b): It took Sofia 1 hour and 15 minutes to travel the next 40 km.

Line graphs 2

Discover
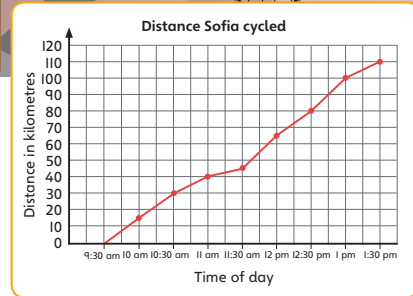
1 a) How far did Sofia cycle between 11 am and 12 pm?

b) How long did it take Sofia to travel the next 40 km after 12 pm?

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Share

WAYS OF WORKING Whole class teacher led

ASK

Question **1** b): *Which axis should you look at first?*

IN FOCUS In part b), children read first from the vertical axis and build on the skill of identifying which axis to read from, which was developed in the previous lesson.

Share

I am going to work out the distance Sofia had travelled at 11 am and at 12 pm and then find the difference.

a) At 11 am Sofia had cycled 40 km.

At 12 pm Sofia had cycled 65 km.

65 − 40 = 25

Sofia cycled 25 km between 11 am and 12 pm.
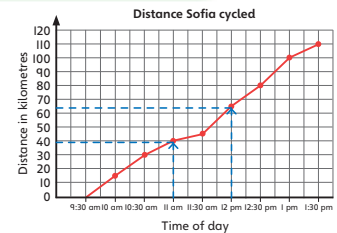
b) Sofia had cycled 65 km by 12 pm.

65 + 40 = 105 km

Sofia had travelled 105 km by 1:15 pm.

It took Sofia 1 hour and 15 minutes to travel the next 40 km.
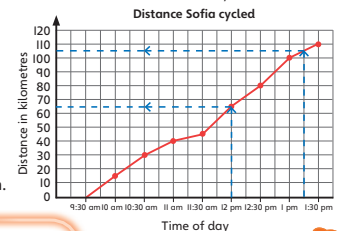
The data is **continuous** so at any point on the graph it shows how far Sofia has cycled.

I need to start by looking for the distances on the vertical axis.

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Think together

WAYS OF WORKING   Whole class teacher led (I do, We do, You do)

ASK

- Question **1** b): *11:15 am is not marked on the horizontal axis. How can you work out the distance at 11:15 am?*
- Question **2**: *Which axis do you need to start to read from to solve this question?*
- Question **3** a): *How can you use the two lines to help you make comparisons between the athletes?*
- Question **3** a): *How does the shape of the two lines and their relationship to each other help you work out when both athletes had run the same distance?*

IN FOCUS   In question **2**, children read first from the vertical axis, and build on the skill of identifying which axis to read from, which was developed in the previous lesson of this unit.

STRENGTHEN   In question **3**, to help children differentiate between the two different sets of data shown on one graph, encourage them to focus on one set of data at a time. Break the questions down into narrower ones based on each data set. For example, ask: *Which line shows how far Ian has run? How far has Ian run after 60 minutes?*

DEEPEN   Children should be able to use line graphs in order to make their own statements. They should also be able to extend this to drawing more detailed conclusions or hypotheses, giving reasons to support their ideas. For example, in question **3**, ask: *Who do you think is the best athlete?* and ask children to use the graph to help justify their answers.

ASSESSMENT CHECKPOINT   Use question **1** to assess whether children can accurately answer simple comparison questions based on information presented in a line graph. Question **3** assesses whether children can make simple statements about data.

ANSWERS

Question **1** a): Toshi travelled 25 km between 12:30 pm and 1:30 pm.

Question **1** b): Toshi travelled 50 km between 11:15 am and 12:45 pm.

Question **1** c): The race started at 9:30 am.

Question **1** d): This could be the same race that Sofia took part in as they both cycled the same distance, and started and ended at the same times.

Question **2**: Toshi took $1\frac{1}{2}$ hours to travel between 20 km and 70 km.

Question **3** a): After 60 minutes, Ian had run 16 km and Jo had run 14 km.
It took Jo 140 minutes and Ian 130 minutes to run 34 km.
Before the end of the race, Ian and Jo had both run exactly the same distance after 100 minutes.
The length of the running race was 42 km.

Question **3** b): Any statements that are correct based on the graph presented in this question.

Think together

Toshi takes part in a cycle race. The graph shows Toshi's journey.

Distance Toshi cycled
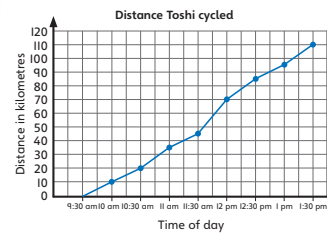
1 a) How far did Toshi travel between 12:30 pm and 1:30 pm?

Toshi had travelled ☐ km by 12:30 pm.

Toshi had travelled ☐ km by 1:30 pm

☐ – ☐ = ☐

Toshi travelled ☐ km between 12:30 pm and 1:30 pm.

b) How far did Toshi travel between 11:15 am and 12:45 pm?

c) What time do you think the race started?

d) Do you think it is the same race that Sofia took part in?

2 How long did it take Toshi to travel from 20 km to 70 km?

Toshi had travelled 20 km at ☐ .

Toshi had travelled 70 km at ☐ .

Toshi took ☐ hours to travel between 20 km to 70 km.

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3 This graph shows the progress of two athletes in a running race.

CHALLENGE

Ian

Jo
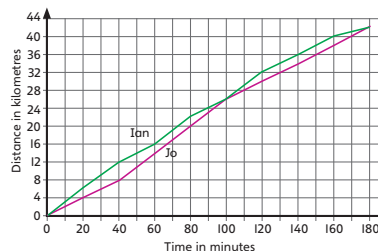
I am going to be careful and look at the correct line for each person.

a) Complete these sentences.

After 60 minutes Ian had run ☐ km and Jo had run ☐ km.

It took Jo ☐ minutes and Ian ☐ minutes to run 34 km.

Before the end of a race, Ian and Jo had both run exactly the same distance after ☐ minutes.

The length of the running race was ☐ km.

b) Write five more things that you can tell from the graph.
Use some of the words below to help you.

most, compared to, least, fastest, slowest, further, more, less

→ Practice book 4C p84

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PUPIL TEXTBOOK 4C PAGE 119

Practice

WAYS OF WORKING Independent thinking

IN FOCUS For question **1** c), ensure children understand that the period during which it did not rain at all will be the period when the depth of water in the container does not change. It is important for children to make the link between the horizontal line and no change in the data.

STRENGTHEN To support children in making their own statements as part of question **4**, discuss the sentence structures as a group and ask questions together to decide on the information needed. For example, ask: *Between which times does the graph change the most? Could you use these times as the period you are comparing against?*

DEEPEN Encourage children to make comparison statements between multiple sets of data presented on the same line graph. Question **4** provides the ideal stimulus for this; you could ask: *What statements could you make that compare the temperatures in July and December?* Challenge children to create stories around data to demonstrate a deeper understanding of what the data is telling us.

THINK DIFFERENTLY Question **3** encourages children to make their own statements based on the line graph. Scaffolding is gradually reduced so that the final sentence structures are more open ended. This will help to develop children's reasoning skills and their knowledge of the different features and structures of a line graph. Children are also expected to deduce that the steeper the line between two points, the greater the rate of change between those points.

ASSESSMENT CHECKPOINT Use question **3** to assess whether children understand the structure of a line graph and can use it to make statements about the data presented.

ANSWERS Answers for the **Practice** part of the lesson appear in the separate **Practice and Reflect answer guide**.

Reflect

WAYS OF WORKING Independent thinking

IN FOCUS This activity encourages children to consider the type of data that can be represented with a line graph. Discussion about the difference between line and bar graphs should lead children to think about discrete and continuous data.

ASSESSMENT CHECKPOINT Use this activity to assess if children are able to verbalise the importance of line graphs. Do they understand continuous data?

ANSWERS Answers for the **Reflect** part of the lesson appear in the separate **Practice and Reflect answer guide**.

After the lesson ⏸

• Are children secure at interpreting data and making comparisons from a line graph?
• Can children answer questions about data using inference and deduction?

→ Textbook 4C p116

Line graphs 2

1 An open container was put out in the rain.

a) How much more water was in the container at 11 am than at 10 am?

Amount of rainwater in container

There was ☐ mm more water in the container at 11 am.

b) Complete the sentence.

It took ☐ hours for the water level to increase from 22 mm to 32 mm.

Explain why it took this long.

How do you know?

84

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2 a) How many steps did Evie take during the day?

Evie took ☐ steps during the day.

b) How many steps did Evie take between 12 pm and 3 pm?

c) How long did Evie take to go from 500 to 1,500 steps?

Number of steps taken by Evie during a day

3 Max hits a golf ball. 💡
The graph shows the height of the ball off the ground at different times.

What is the greatest height the ball reaches?

How do you know?

85

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4 Write five statements about the graph. Use the words below to help you.

CHALLENGE

warmest, coldest, difference, same, different, more than, less than

Temperature in Spain

July
December

Reflect

Write some reflections on this lesson.

○ One important thing I am going to remember when looking at line graph data is

86

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Problem solving – graphs

Learning focus

In this lesson, children will apply their data interpretation and analysis skills, developed over the past four lessons, to a range of increasingly challenging problems.

Small steps

→ Previous step: Line graphs (2)
→ **This step: Problem solving – graphs**
→ Next step: Identifying angles

NATIONAL CURRICULUM LINKS

Year 4 Statistics

Solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and other graphs.

ASSESSING MASTERY

Children can read data from line graphs, bar charts, pictograms and tables, and use this data to solve a range of complex problems involving multiple steps and different operations. Children can analyse what other information is available from the data, as well as the benefits and drawbacks of how the data is presented.

COMMON MISCONCEPTIONS

Children may incorrectly identify the number of steps needed to solve a problem, and therefore leave a problem incomplete. Ask:
• *Can you answer this question using information just from the graph/chart? What else do you need to do to the information in order to answer the question?*

STRENGTHENING UNDERSTANDING

To help children solve more complex problems, it can be helpful to break down a problem into steps. Steps could be provided in 'help envelopes' when children need support.

GOING DEEPER

Encourage children to create their own more complex questions for others based on data presented in a range of different ways.

KEY LANGUAGE

In lesson: line graph, bar chart, pictogram, table, axis, vertical, horizontal, comparison

Other language to be used by the teacher: operations, steps, addition, subtraction, multiplication, division

STRUCTURES AND REPRESENTATIONS

line graphs, pictograms, bar charts

RESOURCES

Mandatory: rulers

Optional: number lines, squared paper, help envelopes

In the eTextbook of this lesson, you will find interactive links to a selection of teaching tools.

Before you teach ⏸

• Are children confident answering simple questions about data which is presented in different ways?
• Do children have any weaknesses in calculation methods that need support?

Discover

WAYS OF WORKING   Pair work

ASK

- Question ❶ a): *How can you work out the difference between Year 3 and 4 compared to Year 5 and Year 6?*
- Question ❶ b): *How can you use the information you have to help you work out how many cards Year 4 sold? Is there more than one way?*

IN FOCUS   In this activity, children apply their knowledge of bar charts to answer more complex questions which involve comparisons across groups of data and carrying out further calculations. These skills will continue to be developed, using a range of data presentation, throughout this lesson.

PRACTICAL TIPS   Remind children of the division method to find out how many cards Year 4 used. Use a number line to demonstrate the division method for numbers divisible by 2.
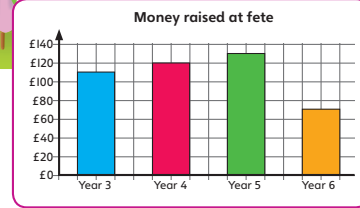
ANSWERS

Question ❶ a): Years 3 and 4 raised £30 more than Years 5 and 6.

Question ❶ b): Year 4 sold 60 cards in total.

Problem solving – graphs

Discover

❶ a) How much more money did Years 3 and 4 raise in total compared to Years 5 and 6?

b) Year 4 raised money by selling cards for £2 each.

How many cards did they sell in total?

120

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Share

WAYS OF WORKING   Whole class teacher led

ASK

- Question ❶ a): *How did you work out the difference between Years 3 and 4 compared to Years 5 and 6?*
- Question ❶ a): *How many steps did you have to take in order to solve this problem? What operations did you have to use?*
- Question ❶ b): *How did you work out how many cards Year 4 sold? What information did you use from the graph?*
- Question ❶ b): *What operation did you need to use to help you work out how many cards were sold? How could you check your answer?*

IN FOCUS   The focus in this part of the lesson is on children using the data presented in the bar chart to answer more complex, multi-step problems. The skill of reading from a bar chart is not covered in this section, as this should be a secure skill from work earlier on in the unit. Instead, the focus is on how the data can be used to find out a wider range of information.

Share

I need to work out how much Years 3 and 4 raised altogether first.

a) Year 3 raised £110.

Year 4 raised £120.

£120 + £110 = £230

Years 3 and 4 raised £230 altogether.

Year 5 raised £130.

Year 6 raised £70.

£130 + £70 = £200

Years 5 and 6 raised £200 altogether.

£230 − £200 = £30

Years 3 and 4 raised £30 more than Years 5 and 6.
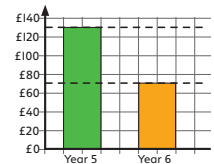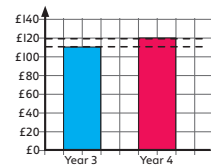
b) Year 4 raised £120.

£120 ÷ £2 = 60

Year 4 sold 60 cards in total.

I can work out how many cards Year 4 sold by using division.

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Think together

Whole class teacher led (I do, We do, You do)

ASK

- Question ➊ a): *Will you need to use more than one operation?*
- Question ➊ b): *How can you work out the total amount raised?*
- Question ➊ c): *How can you use the fact that each child raised £5 to help you work out how many children there are?*
- Question ➋ a): *Is there more than one way to solve this problem?*
- Question ➋ b): *How many calculations do you need to carry out to solve this problem?*
- Question ➌ a): *How can you use the clues to help you complete the table?*

IN FOCUS In this part of the lesson, children are provided with further opportunity to develop their skills at answering more complex problems, using data presented in bar charts, tables and pictograms. Most questions require multiple steps, using different operations to solve problems.

STRENGTHEN Help children identify the different operations needed to solve a multi-step problem. Ask: *What data do you need to read from the graph/pictogram/table? What do you need to do next to this information in order to solve the problem?*

DEEPEN Encourage children to create their own two-step problem using a table or graph to set for their partner. This will help them consider how two parts of a question are related.

ASSESSMENT CHECKPOINT Use question ➊ to assess whether children are able to accurately answer total and comparison questions based on a bar chart.

ANSWERS

Question ➊ : Maple and Ash classes raised £60 more than Oak and Willow classes.

Question ➊ a): The classes raised £420 altogether.

Question ➊ b): There are 23 children in Oak class.

Question ➋ a): Lions and owls.

Question ➋ b): Lions and dogs made £100 for Year 3.

Question ➌ :

Maple	£24
Ash	£36
Oak	£42
Willow	£30

In total Year 5 raised £132.

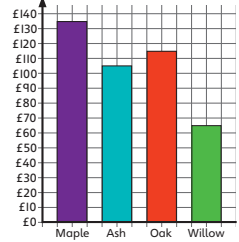
➊ This graph shows how much money was raised by each class.

How much more money did Maple and Ash classes raise in total compared to Oak and Willow classes in total?

☐ + ☐ = ☐

☐ + ☐ = ☐

☐ – ☐ = ☐

Amount of money raised by class

Maple and Ash classes raised £☐ more than Oak and Willow classes.

a) How much money did the four classes raise altogether?

The classes raised £☐ altogether.

b) Each child in Oak class raised £5. How many children are in Oak class?

£☐ ÷ £☐ = ☐

There are ☐ children in Oak class.

> I can use some of my working from part a) to help me work out part b).

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➋ The pictogram shows the number of soft toys Year 3 sold at a summer fair.

a) Which soft toys did Year 3 sell more than 10 of?

b) Each soft toy sold for £5.

How much money did selling lions and dogs make?

Lions and dogs made £☐ for Year 3.

Type of soft toy sold by Year 3

	Number
lions	●●●●●●●
dogs	●●●
cats	●◖
owls	●●●●●◖

Each ● represents 2 soft toys.

➌ Year 5 raised money by selling CDs of a class concert. Oak class sold 7 CDs. Each class sold CDs for the same amount.

Use the clues below to complete the table and work out how much money they raised in total.

Maple	£☐
Ash	£☐
Oak	£42
Willow	£☐

> I am going to work out how much Oak charged for each CD first.

Willow collected £12 less than Oak.

Maple collected $\frac{8}{10}$ of the amount Willow collected.

Ash collected $\frac{1}{2}$ more than Maple's total amount.

123

→ Practice book 4C p87

PUPIL TEXTBOOK 4C PAGE 123

Practice

WAYS OF WORKING Independent thinking

IN FOCUS Children are expected to solve problems based on all the ways of presenting data they have met so far: tables, pictograms, bar charts and line graphs. Question **3** allows children to identify and carry out all the steps needed to solve a complex problem. These questions continue to represent the style seen in summative assessments.

STRENGTHEN Provide scaffolding for children to complete which shows the operation needed for the different stages of a calculation, such as those provided in in the earlier stages of this section. Children could then gradually create their own frames, based on the operations that are needed to solve a problem.

DEEPEN Children should be able to make increasingly complex statements based on a chart or graph, and the charts provided in question **4** provide children with an opportunity to do this. Ask: *What other information can you tell from these charts?* Children could then be asked to create their own questions based on the information they have found.

ASSESSMENT CHECKPOINT Use question **3** d) to assess whether children can independently identify the multiple steps needed to solve a more complex problem. If children have not been successful with this question, ensure that you distinguish between calculation errors (but with a complete method) and an incomplete method.

ANSWERS Answers for the **Practice** part of the lesson appear in the separate **Practice and Reflect answer guide**.

Reflect

WAYS OF WORKING Independent thinking

IN FOCUS In this activity, children must interpret the information given on a pictogram and a bar chart in order to devise two questions for a partner, based on the data provided.

ASSESSMENT CHECKPOINT Do children refer to both the bar chart and the pictogram in their questions?

ANSWERS Answers for the **Reflect** part of the lesson appear in the separate **Practice and Reflect answer guide**.

After the lesson ⏸

- Are children secure at interpreting information and answering more complex questions based on various different types of data presentation?
- Are children stronger or weaker at analysing a particular way of presenting data?

→ Textbook 4C p120   Unit 14: Statistics, Lesson 5

Problem solving – graphs

1 a) How many more steps did Lily and Maisie take compared to Tom and Kieron?

Number of steps taken on one day

Lily and Maisie took ⬚ more steps than Tom and Kieron.

b) Gracie walked 1,500 more steps than Maisie. How many steps did Gracie walk?

Gracie walked ⬚ steps.

2 Temperatures in June

	Highest temperature	Lowest temperature
London	23 °C	12 °C
Cardiff	19 °C	12 °C
Belfast	30 °C	15 °C
Edinburgh	28 °C	12 °C

a) What is the difference between the highest and lowest temperature in Cardiff? ⬚ °C

b) Which city's highest temperature is double its lowest temperature? _____

c) Which city has the largest difference between its highest and lowest temperature? _____

87

PUPIL PRACTICE BOOK 4C PAGE 87

Unit 14: Statistics, Lesson 5

3 Otis went on a sponsored walk. He took two breaks.

Distance walked

a) Write 'first' or 'last' to make this sentence correct.

Otis walked furthest in the

_____ 2 hours of his walk.

b) Explain your answer.

_____
_____
_____
_____

c) Otis raised £6 per kilometre that he walked. How much money did Otis raise in total for charity between 12 pm and 3 pm?

Otis rasied £ ⬚ for charity between 12 pm and 3 pm.

88

PUPIL PRACTICE BOOK 4C PAGE 88

Unit 14: Statistics, Lesson 5

4 Estimate the difference between the population of Glastonbury and Overton. **CHALLENGE**

Each ⬤ represents 2,000 people.

Population

Population of different towns in the UK	
Windermere	⬤⬤◖
Twyford	⬤⬤⬤◔
Glastonbury	⬤⬤⬤◢
Battle	⬤⬤⬤

Reflect

Look at the pictogram and bar chart in question 4.

Write two questions for a partner to answer based on these graphs.

- _____
- _____
- _____

89

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End of unit check

Don't forget the *Power Maths* unit assessment grid on p26.

Group work adult led

IN FOCUS The questions in the end of unit check focus on data presented in pictograms, bar charts, line graphs and tables. Through this, children's ability to interpret data is also assessed: care needs to be taken to distinguish between a data interpretation error and a calculation error.
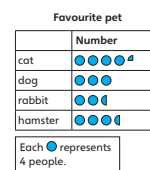
ANSWERS AND COMMENTARY

Children who have mastered this unit can interpret data that is presented in a range of ways, including pictograms, bar charts, line graphs and tables. Children can use this data to answer a range of questions, including comparison, ordering and total questions. They can also make their own statements based on the data presented to them and are beginning to compare linked data which is presented across multiple sources, for example using linked data presented in a bar chart and table to answer and formulate their own questions. Children can answer more complex multi-step problems, which use information presented in a chart, graph or table.

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PUPIL TEXTBOOK 4C PAGE 125

Q	A	WRONG ANSWERS AND MISCONCEPTIONS	STRENGTHENING UNDERSTANDING
1	B	Choosing A suggests that the child is interpreting each symbol as representing 1 person.	Encourage children to use the key in the pictogram. To help children with accurately reading from the vertical axis, link the vertical axis to a number line. Draw children's attention to the structure of the question and ask: • *What is the question asking you to do?* • *What operation could this involve?* For multi-step problems, encourage children to consider the different steps they need to take to solve the problem before they start to solve it.
2	D	Choosing A and B indicates that the child is unfamiliar with the basic structure of a pictogram.	
3	C	An incorrect answer suggests the child has carried out the wrong calculation.	
4	C	Choosing A, B or D indicates that the child is unsure of how to read a half value on the scale.	
5	D	A and B both suggest that children have not interpreted the steps needed to solve the problem.	
6	**The difference between the highest and lowest temperature was 9 °C.**	Children must understood that a subtraction is required once the data has been read.	

My journal

WAYS OF WORKING Independent thinking

ANSWERS AND COMMENTARY

Support children to create their own statements by providing them with sentence structures to use; for example, you could provide them with the structures:
• Between _____ and _____ the value of the car increased by _____.
• The value of the car doubled between _____ and ____.
• The car increased in value by _____ between _____ and ____.

Power check

WAYS OF WORKING Independent thinking

ASK

• *What do you know now that you didn't know at the start of this unit?*
• *How confident do you feel about interpreting data in bar charts, pictograms, line graphs and tables?*

Power puzzle

WAYS OF WORKING Pair work

IN FOCUS Use this Power puzzle to identify whether children can use logic clues in order to complete a bar chart. Encourage children to work through the clues step by step, identifying which bar could refer to which child.

This Power puzzle also helps you identify if children understand the structure of a bar chart and how the different parts are related to each other.

ANSWERS AND COMMENTARY If children can complete the first part of the Power puzzle, it suggests they can logically follow clues to aid their interpretation of a chart. If they are not able to complete this, support them by asking specific questions about each clue; for example, ask:
• *We know Masie was 130 cm tall in January. Which bar is Masie?*
• *We know that Raj was 10 cm shorter than Finlay in December? What does that mean Raj's height was in December? Can you draw the bar for Raj in December to show this?*

After the unit ⏸

• How can you continue to expose children to a range of statistical representations through your day-to-day classroom activities?
• What cross-curricular links can you make?

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PUPIL PRACTICE BOOK 4C PAGE 91

PUPIL PRACTICE BOOK 4C PAGE 92

Strengthen and **Deepen** activities for this unit can be found in the *Power Maths* online subscription.