Spring Block 6

Statistics

Small steps

Step 1	Line graphs
Step 2	Dual bar charts
Step 3	Read and interpret pie charts
Step 4	Pie charts with percentages
Step 5	Draw pie charts
Step 6	The mean

Line graphs

Notes and guidance

In Year 5, children focused on drawing, reading and interpreting simple line graphs. In this small step, they revisit that learning and progress to looking at more complex graphs, including ones with more than one line.

Children start by looking at simple line graphs and the information that can be gathered from them. They should recognise that they can only read off approximate values for data that lies between two marked points, which is why a dashed line is used. They then draw line graphs using given information. When doing this, it is important to discuss what each axis will represent, drawing children's attention to the fact that time is usually shown on the horizontal axis. When they are drawing line graphs, support children in choosing appropriate scales based on the numbers given.

Children also answer problems involving line graphs. They should be able to infer what has happened in a given situation based on the information provided in the line graph.

Things to look out for

- When drawing their own line graphs, children may need support to choose appropriate scales.
- When there is more than one line on a graph, children may use the wrong line.

Key questions

- How do you read information from a line graph?
- What does each axis represent?
- What is the smallest value in the data? What is the greatest?
- What intervals would be appropriate for this line graph?
- What does this line graph tell you?
- What does the direction of the line tell you about what happened?
- How can two sets of data be recorded on the same line graph?

Possible sentence stems

- The horizontal axis shows _____

  The vertical axis shows _____

- At _____, the graph reads _____

  At _____, the graph reads _____

  The difference between the two points is _____

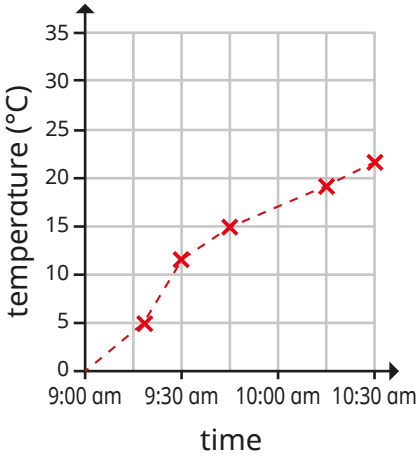
National Curriculum links

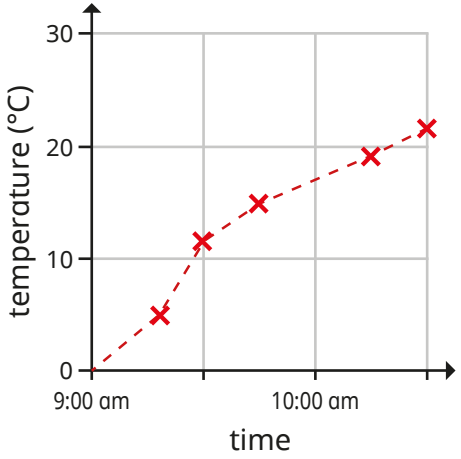
- Interpret and construct pie charts and line graphs and use these to solve problems

Line graphs

Key learning

- Discuss with a partner what is the same and what is different about the line graphs.





  - What is the temperature at 9:45 am?
  - At what time was the temperature approximately 12 °C?

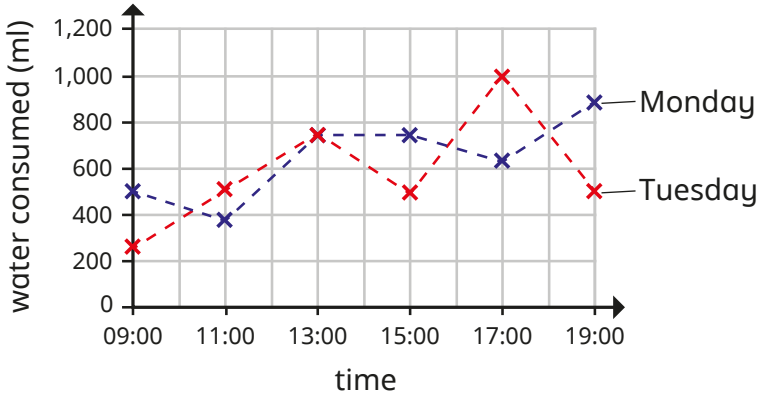
- The table shows the height a rocket reached between 0 and 60 seconds.

Time (seconds)	0	10	20	30	40	50	60
Height (metres)	0	8	15	25	37	50	70

Draw a line graph to represent the information.

- The graph shows water consumption over two days.

The water consumption was recorded every 2 hours.



  - At what times was the recorded amount of water consumed on Monday and Tuesday the same?
  - Was more water consumed at 5:00 pm on Monday or Tuesday?

    Approximately how much more?

- The table shows the populations in the UK and Australia from 1995 to 2020

	1995	2000	2005	2010	2015	2020
UK	58,000,000	58,900,000	60,300,000	63,300,000	65,400,000	67,900,000
Australia	18,000,000	19,000,000	20,200,000	22,100,000	23,800,000	25,500,000

Draw a line graph to represent the information.

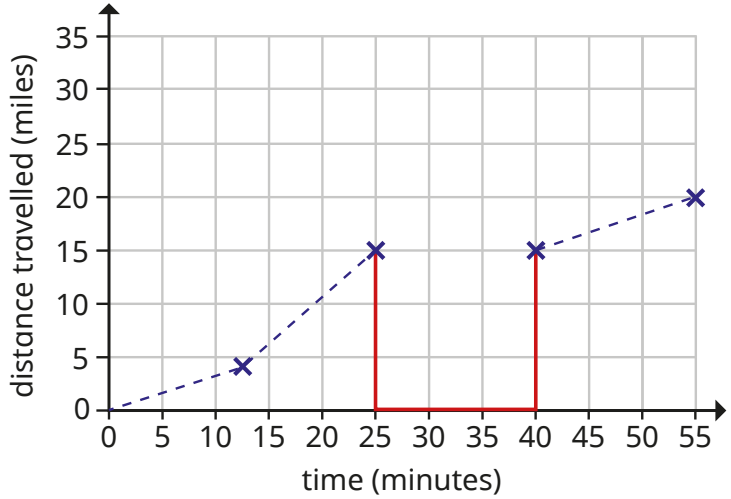
Line graphs

Reasoning and problem solving

This graph shows the distance travelled by a car.

The car stops between 25 and 40 minutes.

Tiny has added the red line to show the car stopped.

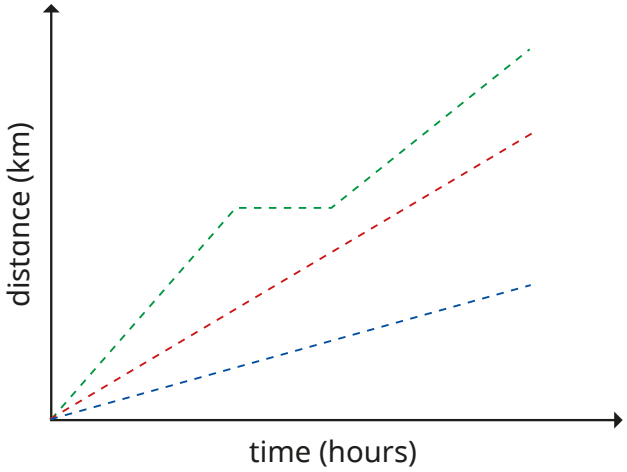


Do you agree with Tiny?

Explain your answer.

No

The graph shows some of Dr Lee's journeys.



What is the same and what is different about the journeys?

What might have happened during the green journey?

multiple possible answers, e.g.

All the journeys took the same length of time.

During the green journey, Dr Lee might have stopped for a rest.

Dual bar charts

Notes and guidance

In this small step, children build on learning from earlier in the key stage as they explore dual bar charts, looking at the different information that can be seen from them, and discussing the similarities and differences when compared to a single bar chart. In particular, children should recognise the importance of a key to ensure that the bar charts can be interpreted.

It is useful to begin with a simple dual bar chart showing discrete data with small whole numbers, allowing children to explore a range of questions such as the total and difference between various amounts. This is a good opportunity to revisit reading scales and estimating from number lines.

The focus of this step is interpretation, but children could also explore drawing dual bar charts.

Things to look out for

- Children may only read one of each of the pairs of bars.
- Children may combine the pairs of bars and find a total, rather than considering them separately.
- Support may be needed to estimate from scales.

Key questions

- How is a dual bar chart different from a single bar chart?
- What information does this dual bar chart give?
- What is different about what the two bars show?
- How do you know which bar shows which information?
- What questions can be asked about this chart?
- What is the difference between _____ and _____?
- How much is _____ and _____ in total?

Possible sentence stems

- The first bar represents _____
  The second bar represents _____
- The difference between _____ and _____ is _____
- The bar is closer to _____ than _____, so I estimate that the value is _____

National Curriculum links

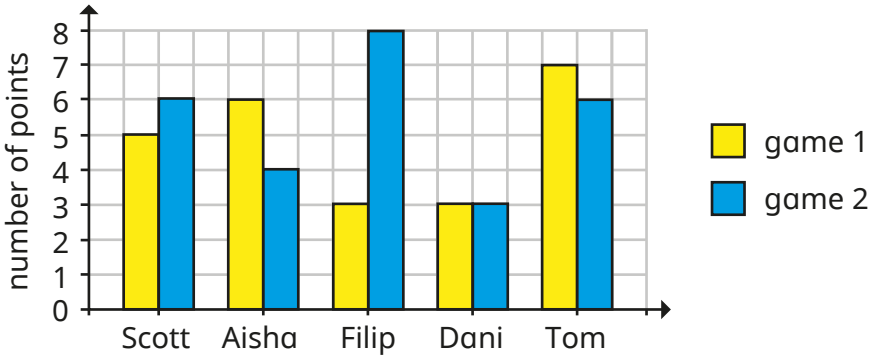
- Interpret and present discrete and continuous data using appropriate graphical methods, including bar charts and time graphs (Year 4)

Dual bar charts

Key learning

- Five children play two games.

  Their scores for each game are recorded on a dual bar chart.

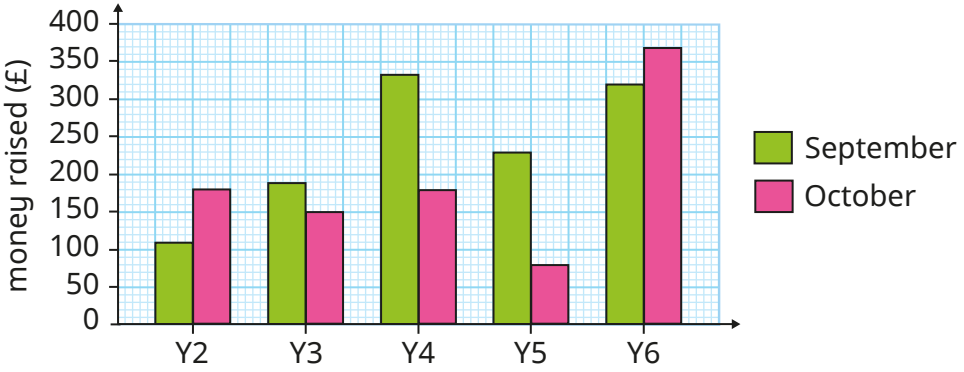


  - Who scored the most points in game 1?
  - Who scored the fewest points in game 2?
  - Who scored the most points altogether in both games?
  - How many children got a higher score on their second game?
  - Which child scored the same on their first and second games?
  - How many more points did Filip score on his second game than his first game?
  - What is the difference between the total points scored in games 1 and 2?

  What else can you find out?

- Years 2 to 6 are raising money for charity.

  The amount each year group raised in September and October is recorded in the dual bar chart.



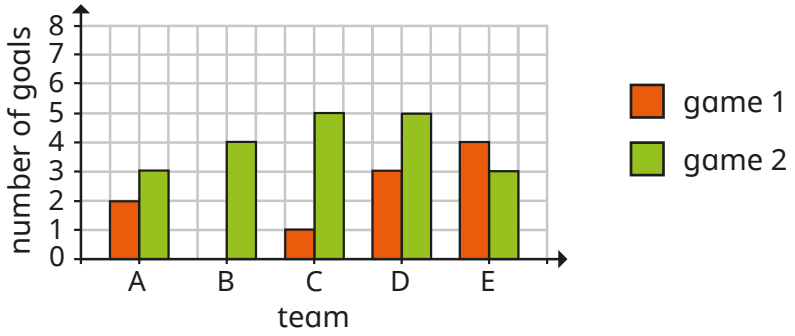
  - How much money was raised in September? How much was raised in October?
  - Estimate how much more money Year 4 raised than Year 5 in October.
  - Which year group has raised the most money so far?
  - How much money was raised altogether in September and October?
  - How much money in total have all five classes raised so far?

  What else can you find out?

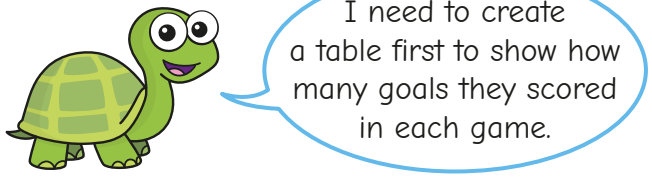
Dual bar charts

Reasoning and problem solving

The bar chart shows the number of goals scored by some teams in two games.



Tiny wants to work out whether each team scored more goals in game 1 or game 2

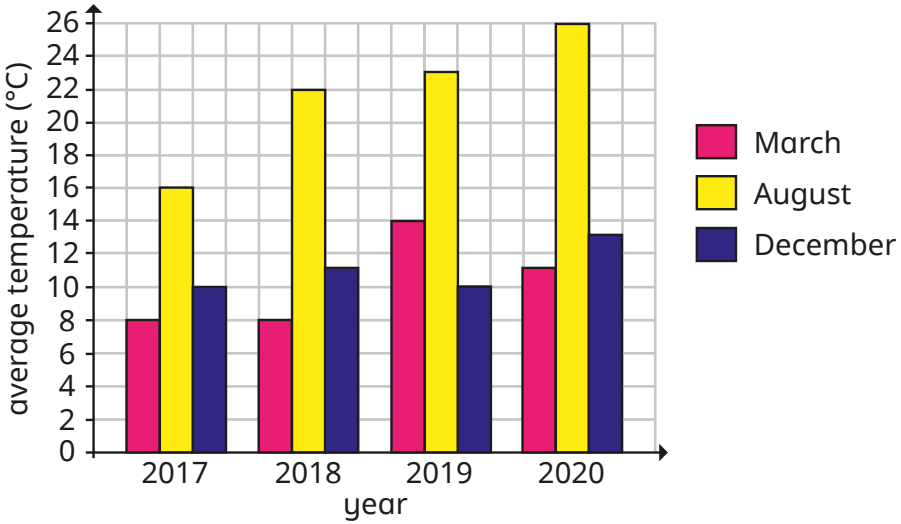


Do you agree with Tiny?

Explain your answer.

No

The bar chart shows the average temperature in a UK city.



Summarise what the chart tells you.

What questions could you ask a partner about this chart?

Compare answers as a class.

Read and interpret pie charts

Notes and guidance

In this small step, children are introduced to pie charts for the first time. Discuss with children why a pie chart is a useful way to represent data. They should realise that a pie chart quickly and easily shows information as part of the whole. Discuss the fact that bar charts may show the numbers of most/least popular items quickly, whereas pie charts show something as more/less than a half/quarter etc. of the total.

Children first look at simple pie charts to identify the greatest/least amounts. They then move on to using the total number represented by a pie chart to work out what each equal part is worth. Finally, given the value of one part, children work out the total and/or the values of other parts of the pie chart.

Things to look out for

- Children may need a reminder of how to work out fractions of amounts.
- Children may confuse the total number with the value of one part.
- Children may think that because a sector is larger in one pie chart than another that it must represent a greater amount.

Key questions

- What does the pie chart show?
- What does each section of the pie chart show?
- Which of the choices was the most popular? How do you know?
- If you know the total, how can you work out the value of one part?
- If you know the value of one part, how can you work out the total number?
- How is a pie chart different from a bar chart?

Possible sentence stems

- There are _____ equal parts altogether.
  The total is _____, so each equal part is worth _____
- One part is worth _____
  There are _____ equal parts altogether, so the total is equal to _____

National Curriculum links

- Interpret and construct pie charts and line graphs and use these to solve problems

Read and interpret pie charts

Key learning

- Some children in a class were asked to name their favourite sport.

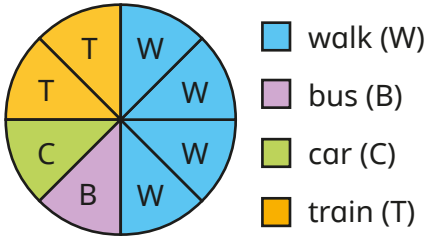
  The results are shown in the pie chart.

  Write **more** or **less** to complete the sentences.

  - _____ than half of the class have cricket as their favourite sport.
  - _____ than a quarter of the class have football as their favourite sport.

  Discuss with a partner what other sentences you can write about the information in the pie chart.

- The pie chart shows how 600 children travel to school.



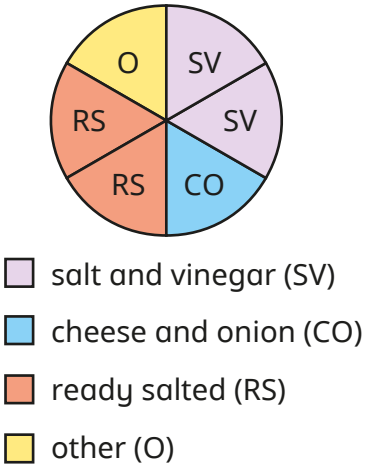
  Work out how many children use each method to travel to school.

- Mo asked 180 people to name their favourite flavour of crisps.

  The results are shown in the pie chart.

  - How many people chose ready salted?
  - How many people chose a flavour other than salt and vinegar?
  - How many more people chose salt and vinegar than cheese and onion?

  What other questions can you ask?

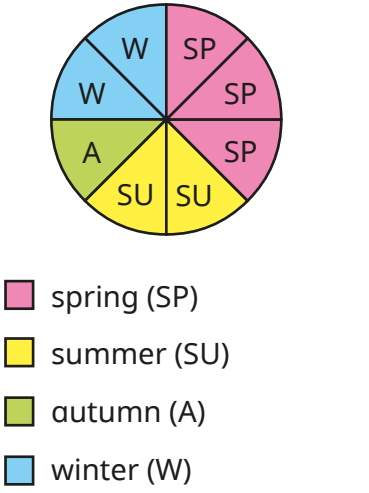


- In a survey, people were asked to name their favourite season of the year.

  The results are shown in the pie chart.

  48 people said that summer was their favourite season.

  - How many people took part in the survey?
  - How many people said that spring was their favourite season?

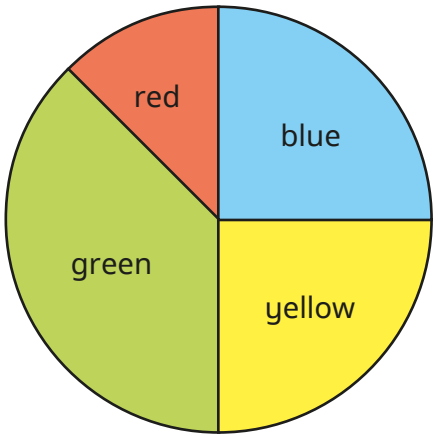


Read and interpret pie charts

Reasoning and problem solving

200 people were asked to name their favourite colour.

The pie chart shows the results.

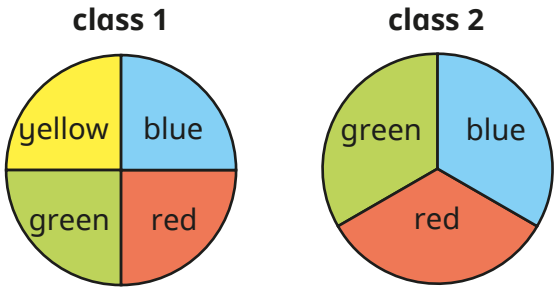


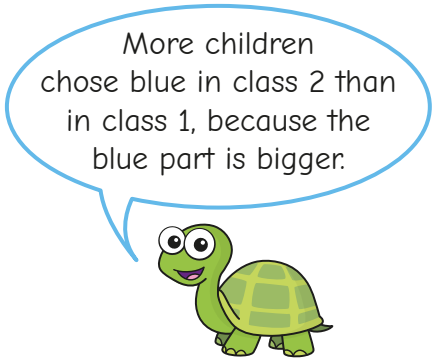
Approximately how many more people chose green as their favourite colour than chose red?

How did you work it out?

50

The pie charts show the favourite colours of the children in two classes.





Do you agree with Tiny?

Explain your answer.

No

Pie charts with percentages

Notes and guidance

This small step revises children's understanding of percentages, in the context of pie charts.

Children need to know that a whole pie chart represents 100% of the data, so one half represents 50%, one quarter represents 25% and so on. It may also be useful to revisit efficient strategies for finding multiples of 10%, 20% and 25%.

Children look at pie charts where the total number is not given, and they need to work out the total from a given percentage. They can then work out the value of the remaining sections, using either the total or proportional reasoning (for example, knowing 40% must be 8 times the size of 5%).

Things to look out for

- Children may not use the most efficient strategy for working out the percentage of an amount.
- Children may assume two pie charts alongside each other represent the same amount.
- When given a part and asked to find the whole, children may not work backwards and instead continue to find a percentage of the amount given.

Key questions

- What percentage does the whole pie chart represent?
- What percentage does half/quarter of the pie chart represent?
- What percentages of an amount can you work out easily?
- How do you work out 10% of an amount? How does this help you to work out other percentages?
- If you know 10%/20%/25%, how can you work out the total?

Possible sentence stems

- If _____% is worth _____, then I can multiply/divide it by_____ to find _____%.
- If the total is _____, then the part representing _____% is worth _____
- If the part representing _____% is worth _____, then the total is _____

National Curriculum links

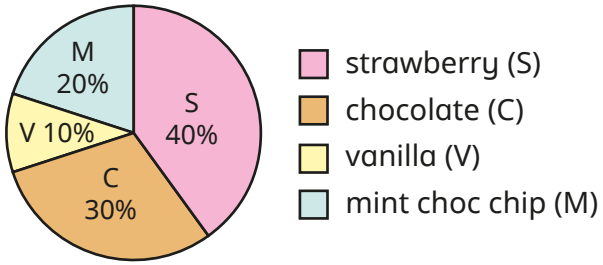
- Interpret and construct pie charts and line graphs and use these to solve problems

Pie charts with percentages

Key learning

- 150 children were asked to name their favourite flavour of ice cream.

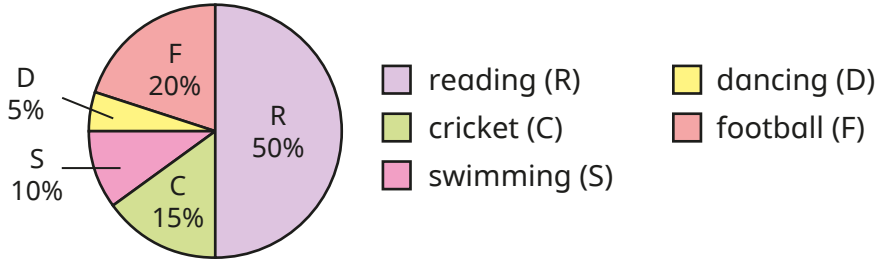
  The results are shown in the pie chart.



  How many children chose each flavour of ice cream?

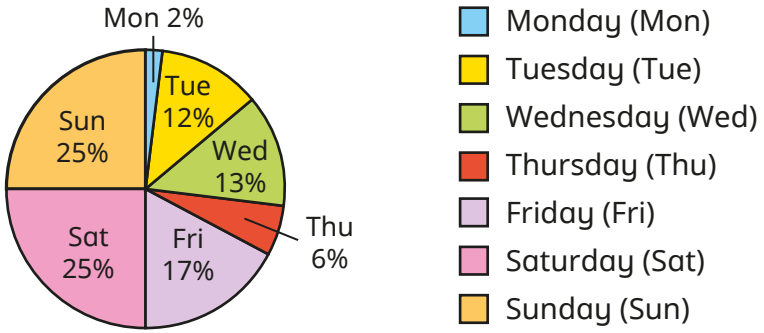
- 200 children in Key Stage 2 chose an after-school activity.

  The pie chart shows the results.



  - How many children chose each activity?
  - How many more children chose football than dancing?

- 1,200 people were asked to name their favourite day of the week.

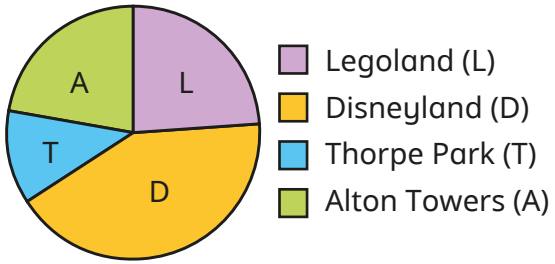


  Use the pie chart to create a table showing how many people chose each day of the week.

- 50 people were asked to name their favourite destination.

  The results were recorded in this table and a pie chart was drawn.

Destination	People
Legoland	12
Disneyland	21
Thorpe Park	6
Alton Towers	11



  Use the table to help you write the percentages on the pie chart.

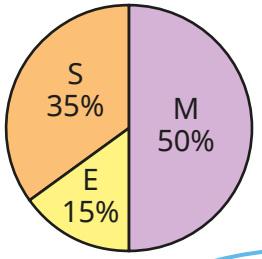
Pie charts with percentages

Reasoning and problem solving

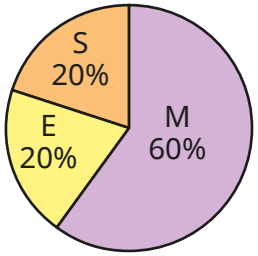
120 boys and 100 girls were asked to name their favourite subject.

The results are shown in the pie charts.

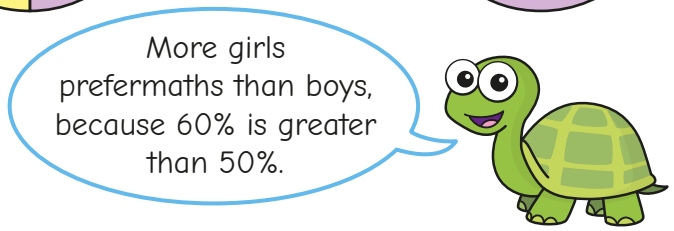
boys' favourite subjects



girls' favourite subjects



Maths (M)
English (E)
Science (S)



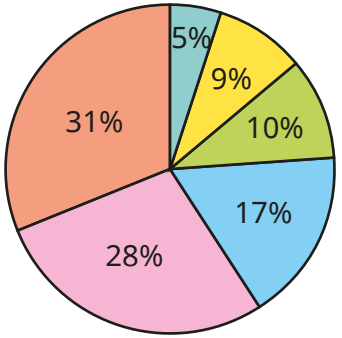
Do you agree with Tiny?

Explain your answer.

No

The pie chart shows the results of a survey about how many siblings people have.

15 people in the survey have no siblings.



no siblings
1 sibling
2 siblings
3 siblings
4 siblings
5 siblings

Draw a table to show how many people each sector of the pie chart represents.

How many people took part in the survey?

No siblings: 15

1 sibling: 27

2 siblings: 30

3 siblings: 51

4 siblings: 84

5 siblings: 93

300

Draw pie charts

Notes and guidance

In this small step, children complete their exploration of pie charts by drawing them.

Children recap what a pie chart represents, with the whole being worth 100%. They start by drawing simple pie charts, with each part being worth 50% or 25%, where they can easily see one half and one quarter of the chart. They then move on to constructing pie charts where guidelines are provided, firstly in 10% intervals and then at 1% intervals. Children need to use their conversion skills to work out what percentages are needed.

Finally, children construct pie charts using a protractor. They use division to work out how many degrees represent each item of data, and then multiplication to find the angle for each sector.

Things to look out for

- Children may confuse the angle with the percentage or the number that a sector represents.
- Children may need reminding how to use a protractor.
- When drawing a pie chart using a protractor, children may use the frequency as the size of the angle rather than working out what the angle should be.

Key questions

- What percentage does the whole pie chart represent?
- How can I show _____% of a pie chart?
- How many degrees are there in a full turn?
- If there are _____ in total and a part is _____, what fraction is the part of the whole?
- How can you work out the percentage/angle that represents each sector?
- How do you use a protractor? How do you know which scale to use?

Possible sentence stems

- The fraction/percentage of _____ is _____
- The whole pie chart is _____°

  This represents _____ items of data.

  Each item of data is represented by _____ ÷ _____ = _____°

National Curriculum links

- Interpret and construct pie charts and line graphs and use these to solve problems

Draw pie charts

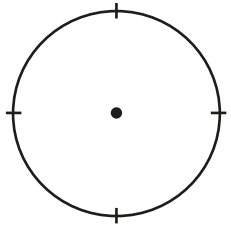
Key learning

- 20 cars drove past a school one morning.

  The table shows the colours of the cars.

  Complete the table and show the information on the pie chart.

Colour	Number	Fraction of total	% of total
Red	5		
Blue	5		
Black	10		

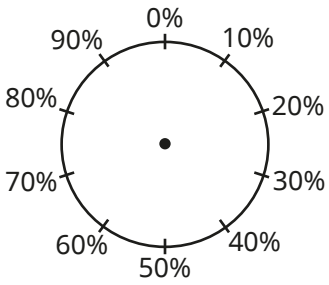


- 100 people were asked to name their favourite ice cream.

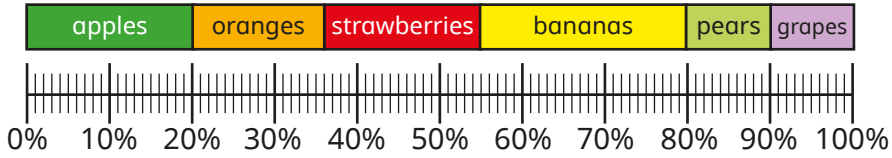
  The table shows the results.

  Use the information to draw a pie chart.

Flavour	Number	Fraction of total	% of total
Chocolate	10	$\frac{1}{10}$	10%
Vanilla	30		
Strawberry	20		
Mint	40		



- Draw a pie chart using the data shown in the percentage bar model.



  What is the same and what is different about the two diagrams?

- The table shows how 36 children travel to school.

Type of transport	Number of children	Angle
Car	12	12 × 10 = 120°
Bike	7	
Walk	8	
Bus	5	
Scooter	4	
Total	**36**	**360°**

  Complete the table.

  Use a protractor to help you draw a pie chart to show the data.

Draw pie charts

Reasoning and problem solving

Rosie asked the children in Year 6 to name their favourite sport.

The table shows the results.

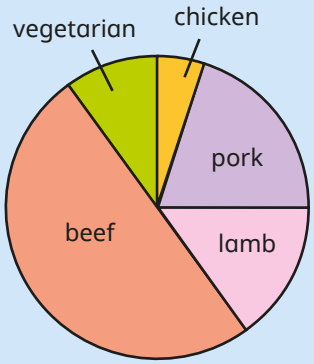
Complete the table and draw a pie chart to show the information.

Sport	Total	Angle
Football	10	
Tennis	18	
Rugby		_____ × 6 = 90°
Swimming	6	6 × 6 = 36°
Cricket		_____ × 6 = 42°
Golf	4	4 × 6 = 24°
Total	**60**	**360°**

The owner of a restaurant is working out which Sunday dinner is most popular.

Complete the table and draw a pie chart to show the information.

Dinner	Total	Angle
Chicken	2	
Pork	8	
Lamb	6	
Beef	20	180°
Vegetarian	4	
Total		



Write some questions about your pie chart for a partner to answer.

The mean

Notes and guidance

In the final small step in this block, children calculate and interpret the mean as an average.

Children may be familiar with the word "average", but are less likely to have heard of the mean. Begin by discussing what an average is and why averages are useful to summarise sets of data. Explain that the most commonly used average is the mean and show how it is calculated, recapping addition and division skills if necessary. Using simple data in familiar contexts will help children to understand the concept. Using concrete representations to model sharing out items can help children to make sense of the formula: mean = total number ÷ number of items.

When children are confident in finding the mean, they can be challenged to find missing data values if the mean is known. Children need to recognise that the first thing they need to do is to multiply to find the total.

Things to look out for

- Children may make calculation errors in the addition or division.
- Children may need support to realise they can "work backwards" to find the total when the mean is known.

Key questions

- How can you calculate the total number of _____?
- What operation do you use to share equally?
- How can you use the total to calculate the mean?
- Why would you want to find the mean of a set of data?
- For what sets of data would it be useful to calculate the mean?
- How can you use the mean to work out missing information?

Possible sentence stems

- The mean is the size of each part when the whole is shared _____
- The total is _____

  There are _____ numbers.

  Mean = _____ ÷ _____

National Curriculum links

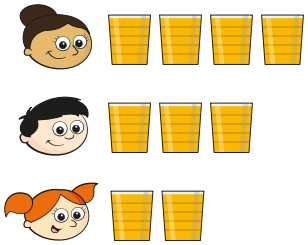
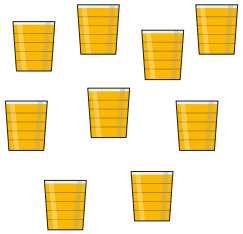
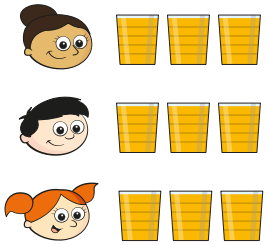
- Calculate and interpret the mean as an average

The mean

Key learning

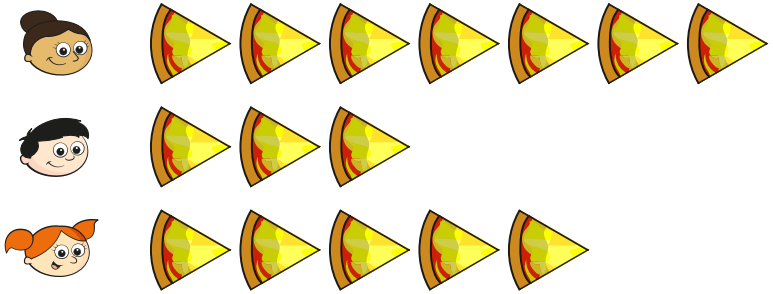
- Three children each drink some glasses of juice.

  The table shows a method to find the mean number of glasses of juice that each child had to drink.

Number of glasses per child	Total number of glasses	If each child had the same number of glasses
		

  How does the table show that the mean number of glasses that each child had is 3?

- Work out the mean number of slices of pizza eaten by each child.



- Here are the number of runs Jack scored in seven cricket matches.

134, 60, 17, 63, 38, 84, 10

  Calculate the mean number of runs Jack scored in a match.

- The amount of money raised for charity by five children is shown in the table.

Child	Amount raised
Aisha	£24.55
Sam	£29.60
Tommy	£40
Filip	£21.20
Scott	£19.65

  What is the mean amount of money raised by the children?

- Calculate the mean of the numbers.

0.145	0.05	0.28	0.205

The mean

Reasoning and problem solving

The mean number of goals scored in six football matches was 4

Use this information to work out how many goals were scored in the 6th match.

Match	Number of goals
1	8
2	4
3	6
4	2
5	1
6	

3

Rosie takes 5 spelling tests.

Her mean score is 7

What scores might Rosie have got in each spelling test?

Compare answers with a partner

any set of 5 numbers that totals 35

- Mum is 48 years old.
- Scott is 4 years older than James.
- James is 7 years older than Esme.

The average age of pairs of family members are shown.

Mum, Dad — mean age of 50

Scott, James — mean age of 13

Anna, Esme — mean age of 6

Work out the age of each member of the family.

Work out the mean age of the whole family.

Mum: 48 years

Dad: 52 years

Scott: 15 years

James: 11 years

Anna: 8 years

Esme: 4 years

23 years