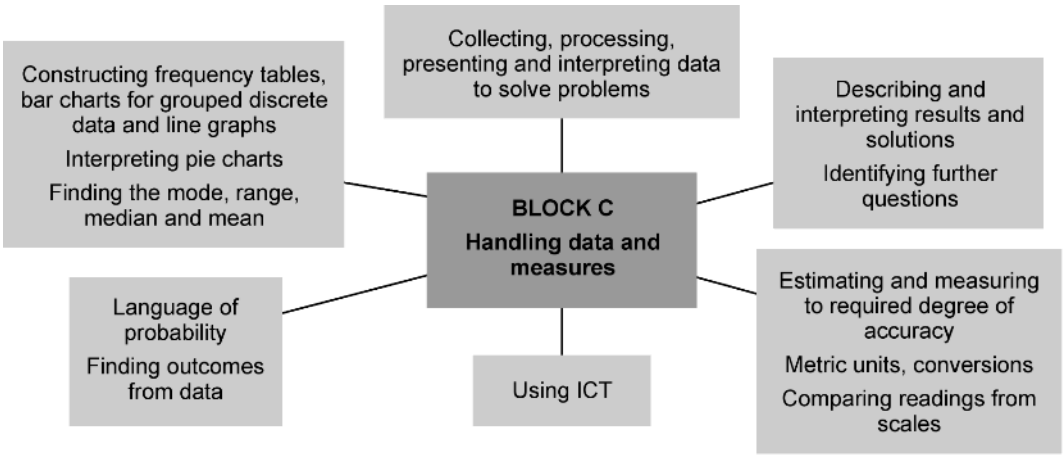
Year 6: Block C — Three 2-week units

Handling data and measures



Objectives	Units		
End-of-year expectations (key objectives) are highlighted	1	2	3
• Suggest, plan and develop lines of enquiry; collect, organise and represent information, interpret results and review methods; identify and answer related questions	✓		
• Solve problems by collecting, selecting, processing, presenting and interpreting data, using ICT where appropriate; draw conclusions and identify further questions to ask	✓	✓	✓
• Construct and interpret frequency tables, bar charts with grouped discrete data, and line graphs; interpret pie charts	✓	✓	✓
• Describe and interpret results and solutions to problems using the mode, range, median and mean	✓	✓	✓
• Describe and predict outcomes from data using the language of chance or likelihood		✓	✓
• Select and use standard metric units of measure and convert between units using decimals to two places (e.g. change 2.75 litres to 2750 ml, or vice versa)	✓	✓	✓
• Read and interpret scales on a range of measuring instruments, recognising that the measurement made is approximate and recording results to a required degree of accuracy; compare readings on different scales, for example when using different instruments	✓	✓	✓
• Use a calculator to solve problems involving multi-step calculations		✓	✓

Speaking and listening objectives for the block

Objectives	Units		
	1	2	3
• Make notes when listening for a sustained period and discuss how note-taking varies depending on context and purpose	✓		
• Use a range of oral techniques to present persuasive argument		✓	

Objectives	Units		
	1	2	3
• Participate in whole-class debate using the conventions and language of debate, including Standard English			✓

Opportunities to apply mathematics in science

Activities		Units		
		1	2	3
6f	How we see things: Measure shadows accurately; record results in tables and present in line graphs. Describe and explain patterns in results.	✓		
6e	Forces in action: Measure length of elastic band with weights added to draw out patterns in data. Represent data in line graphs. Use these to predict lengths for other weights added.		✓	
6c	More about dissolving: Dissolve sweeteners in water at different temperatures; repeat measurements at intervals. Record in line graphs, exploring effect of different scales. Discuss patterns and anomalies.			✓

Key aspects of learning: focus for the block

Enquiry	Problem solving	Reasoning	**Creative thinking**
Information processing	**Evaluation**	Self-awareness	Managing feeling
Social skills	**Communication**	Motivation	**Empathy**

Vocabulary

problem, solution, calculate, calculation, method, explain, reasoning, reason, predict, pattern, relationship, classify, represent, analyse, interpret

fair, unfair, risk, doubt, likely, unlikely, equally likely, likelihood, certain, uncertain, probable, possible, impossible, chance, good chance, poor chance, no chance, equal chance, even chance, outcome, biased, random

estimate, measure, standard metric units of measurement and their abbreviations

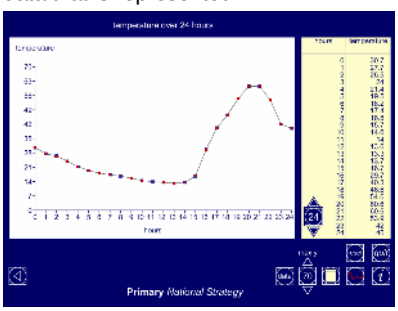
data, information, survey, questionnaire, graph, chart, table, scale, interval, division, horizontal axis, vertical axis, axes, label, title, pictogram, bar chart, bar-line chart, line graph, pie chart

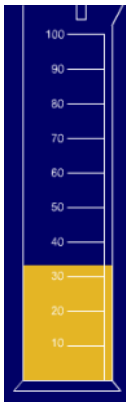
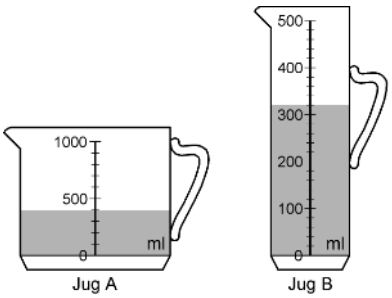
frequency, mode, maximum/minimum value, range, mean, average, median, statistics

Building on previous learning

Check that children can already:

- construct frequency tables, pictograms, bar charts and line graphs to represent the frequencies of events and changes over time
- collect, select and organise data to answer questions; draw conclusions and identify further questions to ask
- use ICT to collect, analyse, present and interpret information
- find and interpret the mode of a set of data
- describe the occurrence of familiar events using the language of chance or likelihood

Objectives *Children's learning outcomes in italic*	**Assessment for learning**
• Suggest, plan and develop lines of enquiry; collect, organise and represent information, interpret results and review methods; identify and answer related questions *I can suggest a line of enquiry and plan how to investigate it*	What information will you need to collect to pursue your enquiry? How will you collect it? What does this graph tell you? What makes the information in the graph easy or difficult to interpret? What were the advantages of using a computer? What does the data tell you about your original question? What further information could you collect to pursue your enquiry question more fully?
• Solve problems by collecting, selecting, processing, presenting and interpreting data, using ICT where appropriate; draw conclusions and identify further questions to ask *I can answer questions about the data I have represented*	What are you trying to find out? What information are you aiming to collect? How? What is your data telling you? Was there anything in your results that surprised you? What would you do differently if you carried out the enquiry again? What questions would you now like to investigate?
• Construct and interpret frequency tables, bar charts with grouped discrete data, and line graphs; interpret pie charts *I can represent data in different ways and understand its meaning*	What kind of graph or chart will you use to represent this data? What information is missing from this table, graph or chart? Why did you choose this type of table, graph or chart? How did you decide on the scale for this axis? Look at this line graph showing the temperature in a room over 24 hours. Make up three questions that can be answered using the data that is represented. 
• Describe and interpret results and solutions to problems using the mode, range, median and mean *I can work out different types of average*	What did you find out? What evidence do you have to support your conclusions? Are your results what you expected or were there any surprises? Rob runs 100 metres ten times. These are his times in seconds. 13.4 13.0 13.9 13.7 13.3 13.5 14.0 14.4 13.8 14.0 What is his mean (average) time? [Give children the test scores for two different classes.] Which class do you think has done the best overall? Give reasons for your answer.
• Select and use standard metric units of measure and convert between units using decimals to two places (e.g. change 2.75 litres to 2750 ml, or vice versa) *I can convert from one unit of measure to another*	Draw a flow chart to help someone convert between mm, cm, m and km. How else can we write 2300 g?

Objectives *Children's learning outcomes in italic*	Assessment for learning
• Read and interpret scales on a range of measuring instruments, recognising that the measurement made is approximate and recording results to a required degree of accuracy; compare readings on different scales, for example when using different instruments *I can read scales and give my answers as accurately as the question asks*	Give me a measurement that would lie between these points on this scale (e.g. between 4.6 kg and 4.7 kg). How much liquid do you think is represented on this scale? What divisions would help you if we could add them to the scale?  The diagram shows the volume of water in two measuring jugs.  Which jug contains more water, A or B? How much more does it contain?
• Make notes when listening for a sustained period and discuss how note-taking varies depending on context and purpose *I can take notes when I am gathering information*	You will be making observations of visits to the bird table. You may want to make a tally or to annotate a diagram. How will you sample and record information? How will you note the information accurately? How will you convert your notes into a form that can be used in your enquiry?

Learning overview

Children **pose questions**, **plan and develop** lines of enquiry, interpreting data and reviewing the methods used. They investigate questions such as:

Which are the wettest places in different locations around the world?

On average, how many litres of liquid does the class drink per week?

Children **read scales accurately** and record results. For example, they read and record the amount of liquid that they drink from a calibrated measuring jug. They pour amounts from one jug to another in order to take readings from different scales. They justify their estimates of amounts that fall between divisions, and read scales labelled in intervals other than 1 and 10. They convert between units when, for example, they are adding the capacities of cans or bottles of fruit juice.

Children set up an experiment to collect local rainfall and compare this with other cities, ensuring that they convert all measures to millimetres for comparison. They **collect data from primary and secondary sources**. For example, they collect data on the amount of rainfall in one week (primary

data) and the average rainfall in cities from the Internet or atlases (secondary data). They organise and represent their information in a variety of ways.

Children choose appropriate data collection methods such as simple counts in the classroom, observation of events or experiments, surveys or from the Internet. They use **frequency tables** to record their data and represent it in a variety of ways, including by using ICT. They construct and interpret line graphs, and consider whether intermediate points have meaning. For example, they plot temperatures at midday over a week.

Children use **bar charts** in a variety of contexts, making decisions and drawing conclusions from their results. For example, they decide whether it will be necessary to bring a heavy outside coat to next week's school visit based on the temperatures over the last week. They apply their strategies for reading scales to interpreting axes, and selecting the appropriate scale to use when constructing their own bar charts. They use ICT to compare the effect of using different scales.

Children begin to **group discrete data**. For example, they draw a bar chart of marks scored in a mental mathematics test, grouping the data in intervals of 5 marks (1 –5, 6–10, 11–15, …).

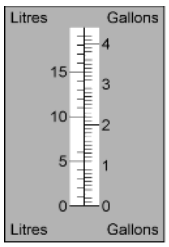
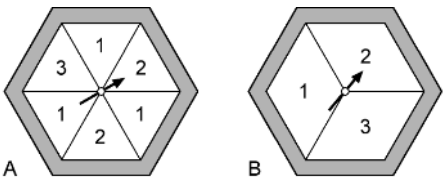
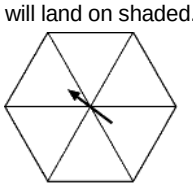
Children interpret simple **pie charts**, responding to questions such as:

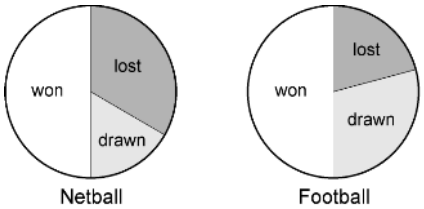
What fraction of the people living in Ham village are between 16 and 60 years of age?

If there are 2484 people living in the village, how many people does that represent?

Children find modal values and begin to use the **median** and **range**. They begin to consider the **mean** and discuss the meaning and use of 'averages' in a variety of contexts. For example, they work out the range, mode, mean and median of the temperatures that they have recorded at midday over a given fortnight, or of their scores in a mental mathematics test.

Children support their calculations by using a calculator to, for example, calculate the mean temperature over a fortnight or the missing score in a test, given the mean and nine out of the ten scores.

Objectives *Children's learning outcomes in italic*	**Assessment for learning**
• Solve problems by collecting, selecting, processing, presenting and interpreting data, using ICT where appropriate; draw conclusions and identify further questions to ask *I can use data to solve problems*	What are you trying to find out? What information are you aiming to collect? How? What other questions could you ask now that you have finished your enquiry? What would you do differently if you carried out the enquiry again?
• Select and use standard metric units of measure and convert between units using decimals to two places (e.g. change 2.75 litres to 2750 ml, or vice versa) *I can convert measures between units including decimals*	What unit of measurement will you use, and why, to measure: the 'span' of different flower heads? the lengths of long jumps of children in the class? What will you need to do so that you can compare the amounts?
• Read and interpret scales on a range of measuring instruments, recognising that the measurement made is approximate and recording results to a required degree of accuracy; compare readings on different scales, for example when using different instruments *I can read and answer questions about scales and write down my answer as accurately as the question requires* *I can compare readings from different scales*	What is the value of each interval on this scale? What information did you read on the scale to help you? What calculations did you do? Which measuring cylinder do you want to use for this experiment? Why? [Give children three different scales on which to record the same number.] Where would you put 246 mm on each scale? Here is a scale for converting litres and gallons.  Approximately how many litres are there in 3 gallons? Give your answer to the nearest litre. Approximately how many gallons are there in 7 litres? Give your answer to one decimal place.
• Describe and predict outcomes from data using the language of chance or likelihood *I can use data to work out problems about chance*	Give me an example of an event that is impossible. And an event that is certain. Where would you place this event on a scale from certain to impossible? If you have to score a 3 to win the game, which of these two spinners would you rather have? Why?  Shade this spinner so that there is a 50% chance that the arrow will land on shaded. 

Objectives *Children's learning outcomes in italic*	**Assessment for learning**
• Construct and interpret frequency tables, bar charts with grouped discrete data, and line graphs; interpret pie charts *I can represent data in different ways and understand its meaning*	How will you display your data? Why did you choose this type of table, graph or chart? How did you decide on the scale for this axis? What does the data tell you about your original question? What did you find out? What evidence do you have to support your conclusions? Are your results what you expected or were there any surprises? These pie charts show the results of a school's netball and football matches. The netball team played 30 games. The football team played 24 games.  David says: 'The two teams won the same number of games'. Is he correct? Explain how you know. [Give children two grouped frequency bar charts representing the same information, one with 5 groups and one with 10 groups.] Rebuild the original frequency table from this graph. What information might you have lost? Which graph gives you a more accurate picture of the original data?
• Describe and interpret results and solutions to problems using the mode, range, median and mean *I can solve problems using mode, range, median and mean*	Would you use the mode, median or mean to describe these test scores? Explain your answer. Look at this data set. Work out the mode, range, median and mean. One more item of data is added to the data set [e.g. a temperature of 24 °C when the rest of the temperatures were all between 8 °C and 14 °C]. Which average do you think will be most affected by this extra result? Which gives the most sensible average now?
• Use a calculator to solve problems involving multi-step calculations *I can use a calculator to solve problems involving more than one step*	How could you check the calculation that you have done on your calculator? John was calculating using hours and minutes. What does this display represent?  Carol counts the matches in 10 boxes. She works out that the mean number of matches in a box is 51. Here are her results for 9 boxes. Number of matches in a box 48 | 49 | 50 | 51 | 52 | 53 | 54 ✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔ Calculate how many matches are in the 10th box.
• Use a range of oral techniques to present persuasive argument *I can present a persuasive argument to others*	Which graphs and charts did you show to illustrate the health benefits of one type of meal over another? Did your arguments persuade others of the benefits?

Learning overview

Children plan and develop **lines of enquiry, posing and investigating hypotheses** linked to a theme of keeping fit and healthy such as:

The average amount of sleep per night of the children in our class is over 8 hours.

We think our local football team scored more than two goals in a fifth of their matches last season.

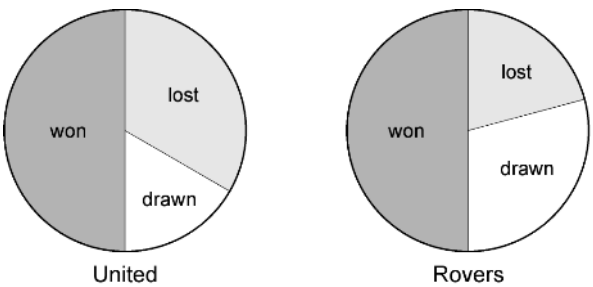
Children **read scales accurately** in a variety of contexts. They decide on the degree of accuracy required when reading a clinical temperature reached or when measuring out the amount of liquid used to make a high energy drink. They interpret the information recorded by a data logger, recognising that the measurements taken are approximate.

Children convert between units using decimals to two places. They compare the data about long-jump results given in millimetres, centimetres and metres. They decide on the most sensible unit to use and **convert** accordingly, working out how to rank the jumps in order of length. They read **metric and imperial** units from measuring scales that show both units or from **conversion graphs**; for example, they convert distances in metres in long-distance track events to distances in miles.

Children construct and interpret **frequency tables, bar charts** including the use of **grouped data**, and line graphs, on paper and **using ICT**. For example, they consider bed-times and the average daily amount of sleep of an 11-year-old, investigating possible differences between boys and girls. They draw conclusions and report them, using a word processor and illustrating their report with graphs and charts. They suggest further questions to ask, such as: *On average, does an 11-year-old who is the oldest child in their family go to bed earlier than an 11-year-old who is not the oldest child in their family?*

Children decide when and how to **group the data** that they have collected. For example, after a sponsored swim, they record the lengths swum by each child and record these on a bar chart. They **interpret pie charts** and draw conclusions. For example, they compare the nutritional information for 100 g of various breakfast cereals and answer questions such as: *From the pie chart, approximately what fraction/percentage of the cereal is fibre?*

Children compare the results shown on two pie charts related to the same topic but based on different totals. For example, these pie charts show the results of football matches of two teams. United played 30 games and Rovers played 24 games.

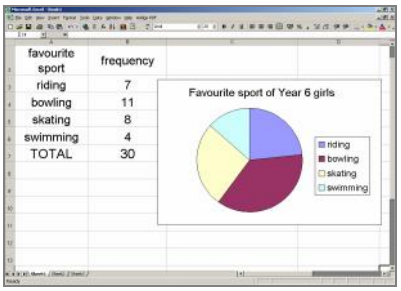
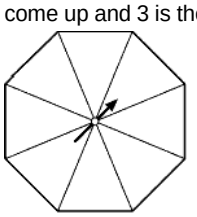
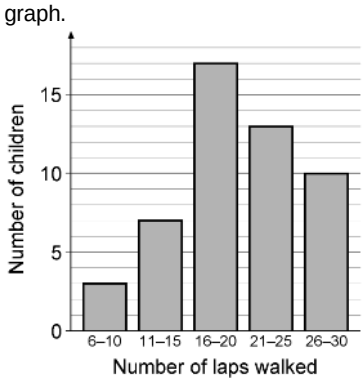


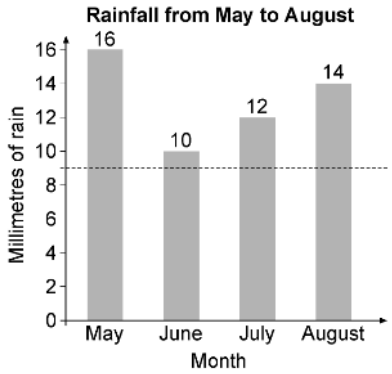
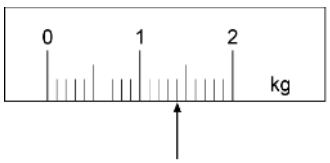
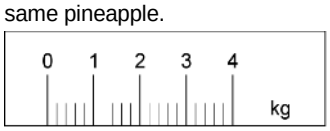
Children estimate proportions, such as the number of games that United lost. They consider statements such as 'The two teams won the same number of games' and explain why this is incorrect.

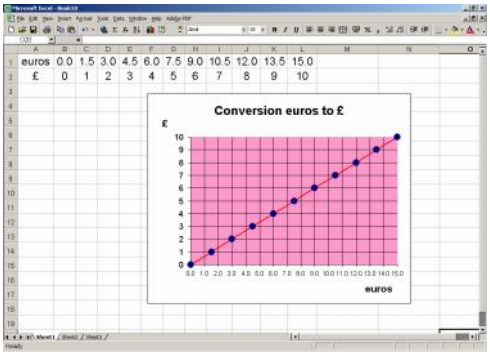
Children use the **mode**, **range**, **mean** and **median** to solve problems and interpret results. They begin to understand why different types of average have most meaning in a specific context. For example, they discuss whether the mode is the most appropriate average to apply when working out goal averages over a football season.

Children describe and predict outcomes from data using the **language of chance or likelihood**. They consider which of two events is more likely, picking a red card from a pack of playing cards or

picking an ace, explaining their reasoning. They make and justify **decisions** based on likelihood. For example, they shuffle a set of 0 to 9 digit cards and place them face down. They turn over the top card on the table, then predict whether the next card to be turned over will be higher or lower. They appreciate that using their knowledge of the cards that have already been turned over improves their chance of a correct prediction.

Objectives *Children's learning outcomes in italic*	**Assessment for learning**
• Solve problems by collecting, selecting, processing, presenting and interpreting data, using ICT where appropriate; draw conclusions and identify further questions to ask *I can collect and present data in a variety of ways and use my results to solve problems*	Give children some statements to consider: It is hotter now than it was 30 years ago. The local high street should be made pedestrian only. The tombola makes the most money at the summer fete. Turn these statements into questions that you could investigate. Suggest a plan for finding out whether the statements are true or false. This graph shows the favourite sport of 30 Year 6 girls. Suggest three questions you could ask about the data in the graph.  Suggest two further enquiries you could make linked to the data in this graph.
• Describe and predict outcomes from data using the language of chance or likelihood *I can use the language of chance to solve problems*	Here is a spinner which is a regular octagon. Write 1, 2 or 3 in each section of the spinner so that 1 and 2 are equally likely to come up and 3 is the least likely to come up. 
• Construct and interpret frequency tables, bar charts with grouped discrete data, and line graphs; interpret pie charts *I can represent data in a variety of ways and answer questions about the data, including interpreting pie charts*	[Show graphs with the title, labels on the axes and intervals hidden.] What could this graph represent? If so, what would these labels be? How would this scale be numbered? State three conclusions you can draw from the information in this graph.  Give me one fact and one opinion based on this graph. Does the fact change if we use a different scale? Does the opinion? When would you use a pie chart?

Objectives *Children's learning outcomes in italic*	**Assessment for learning**
• Describe and interpret results and solutions to problems using the mode, range, median and mean *I can use the different averages to solve problems*	Here is a bar chart showing rainfall. Kim says: 'The dotted line on the chart shows the mean rainfall for the four months.' Use the chart to explain why Kim cannot be correct.  What is the mean rainfall for the four months? Write a different number in each of these boxes so that the mean of the three numbers is 9. ☐ ☐ ☐ Write a number in each of these boxes so that the mode of the five numbers is 11. ☐ ☐ ☐ ☐ ☐
• Select and use standard metric units of measure and convert between units using decimals to two places (e.g. change 2.75 litres to 2750 ml, or vice versa) *I can convert measures between units including decimals*	Solve this problem: A bottle holds 1 litre of lemonade. Rachel fills 5 glasses with lemonade. She puts 150 millilitres in each glass. How much lemonade is left in the bottle? Now write a question of your own that would involve converting units. This graph converts miles to kilometres. Use it to estimate a distance of 95 miles in kilometres.
• Read and interpret scales on a range of measuring instruments, recognising that the measurement made is approximate and recording results to a required degree of accuracy; compare readings on different scales, for example when using different instruments *I can read and answer questions about scales and write down my answer as accurately as the question requires* *I can compare readings from different scales*	Give me an example of when: you would need an accurate measure of length; you would be able to use a less-accurate recording. What is the most accurate measure of length you can make with the equipment in our classroom? Explain why. On this scale, the arrow shows the weight of a pineapple.  Here is a different scale. Mark with an arrow the weight of the same pineapple. 

Objectives *Children's learning outcomes in italic*	Assessment for learning
• Use a calculator to solve problems involving multi-step calculations *I can solve problems involving more than one step*	Use the information in the graph below and a calculator to work out how many pounds (£) you would get for 24.80 euros. 
• Participate in whole-class debate using the conventions and language of debate, including Standard English *I can take part in a debate, listening to and building upon the ideas of others*	What evidence have you drawn on to illustrate your points? How strong is your evidence? Explain your answer. How confident are you that your results are correct? Give your reasons. Could your evidence be unreliable or biased in any way? Explain why.

Learning overview

Children **plan how to develop a line of enquiry**. They use **frequency tables, pictograms, bar-line charts and line graphs** to solve problems, using **calculators and computers** where appropriate. For example, in establishing how much children in their school spend on fizzy drinks in a year, they:

research the costs of different drinks;

take a sample to decide what sizes of drinks they will use as their basic unit;

decide whether the mean, median or modal cost of one drink is the best average to use;

decide on a sensible sample size;

scale up their results to reflect the possible results in the whole school;

represent their results for different audiences;

discuss the accuracy of their results, such as how likely they are to be within 10% of the actual amount spent;

consider the consequences of the assumptions they have made, such as how their results would have been affected had they taken the mean amount spent per drink, rat her than the mode;

evaluate the method they have used.

Children **read and interpret scales** accurately. They mark the liquid contents of a bottle on a scale labelled in multiples of 25 ml after reading it from a scale marked in 10 ml divisions. They read the scales on graphs, for example, a conversion graph to convert litres to gallons.

Children **interpret pie charts** using fractions and percentages. For example:

From the pie chart we estimate that 60% of our class spend more than £50 per year on fizzy drinks. How many would that be in a school of 435 children?

They explore the effect on a pie chart of making a change:

What would this pie chart look like if we include data from other Year 6 classes?

Who might be interested in each pie chart?

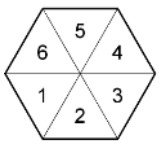
Would the pie chart for every school in the country look similar? Why or why not?

Children find the **range, mode, median and mean**, using a calculator where appropriate. They suggest a set of numbers such that the mode or mean will be a given number, for example giving 8, 12, 14, 9 and 7 as a set of five numbers with a mean of 10. They discuss what the statistics tell them about their enquiry. For example, when comparing the population figures for different villages, towns or cities, they estimate the area of the location by counting squares on a transparent grid placed over a map. They use their calculators to calculate average population density, finding out how many people live in an area of one square kilometre in each location. They discuss possible reasons for their findings.

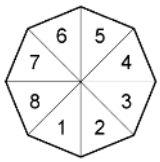
Children describe and predict outcomes from data using the **language of chance or likelihood**. They discuss why some events cannot be predicted with certainty and what they would define as a 'good chance' or 'even chance' in different situations. For example, using a six-sided spinner marked 1, 2, 2, 2, 4 and 5, they give the likelihood that they will get a 2 as fifty-fifty or an even chance, an even number as a good chance, a number that is 1 or more as certain and a number 6 as impossible. They compare the likelihood of getting particular scores on different spinners and on dice marked in different ways. For example:

Here are two spinners.

Jill's spinner



Peter's spinner



Jill says: 'I am more likely than Peter to spin a 3.' Give a reason why she is correct.

Peter says: 'We are both equally likely to spin an even number.' Give a reason why he is correct.