Chapter 10 Use and interpret data

Specification

FS coverage and range	Extract and interpret information from tables, diagrams, charts and graphs
	Find mean and range
FS exemplification	Namely:
	● Pie charts
	● Bar charts
	● Line graphs
	● Mileage charts
	Mean of discrete data
	Range of discrete data

GCSE

GCSE specification	**SP e**	Extract data from printed tables and lists
	SP h	Calculate median, mean, range, **quartiles and interquartile range**, mode and modal class
	SP i	Interpret a wide range of graphs and diagrams and draw conclusions
	SP l	Compare distributions and make inferences
Edexcel GCSE course	**Specification A:**	
	Foundation 3.2, 3.5, 12.1–12.6, 16.1–16.7, 25.1–25.2	
	Higher 6.6, 6.8, 11.1–11.3, 11.5–11.7, 18.2–18.10, 24.1–24.2	
	Specification B:	
	Foundation Unit 1: 1.2, 1.5, 2.1–2.6, 3.2, 3.4–3.9, 4.3–4.4	
	Higher Unit 1: 1.6, 1.8, 2.2, 2.4–2.5, 2.8–2.10, 3.1–3.10, 4.3–4.4	

Resources

General resources	Random number generator, pair of dice or a set of digit cards
	Large sheets of paper
	Marker pens
Resource sheets	10.1, 10.2
Links	http://www.bbc.co.uk/weather/world/city_guides/
	http://www.worldclimate.com/
	http://www.bbc.co.uk/education/mathsfile/shockwave/games/train.html
	http://www.censusatschool.org.uk/
ActiveTeach resources	Video
	ResultsPlus Knowledge Check
	ResultsPlus Problem Solving
	Question Audio

Lesson 1

Objectives

- Choose the correct values to find the range
- Understand simple tables and dials
- Find a mean and range from a set of data
- Make conclusions from calculations involving the mean or range

Starter

- Use a random number generator, a pair of dice or a set of digit cards to produce a set of five random numbers between 1 and 20. Ask students to identify the largest and smallest numbers in the set and to calculate the total of the set of numbers.
- Repeat with other sets of numbers – perhaps with larger numbers or a bigger set.

Main teaching and learning

- Ask students what they know about finding averages. Ask: *What is the mean? How is it calculated?* Emphasise that the mean evens out the data as if it has been shared equally.
- Refer to *Take a look*: The charity collection (p104).
- Now discuss the range. Ask: *What is the range? How is it calculated? What does it tell us?* Emphasise that range is a measure of spread. Stress that it is a single value so we need to calculate the greatest value minus the least value.
- Refer to *Take a look*: The range in Spain.
- Discuss how mean and range might be used to compare data (e.g. weekly sales, prices in different shops, heights of a group of students).
- Ask students to complete *Have a go* Q1–7.

Issues and misconceptions

- For Q1, students may forget to complete the calculation for the range, giving the answer as an interval instead of a single value.
- Students may confuse measures of average or think range is also a measure of average.

Support

- For Q6, ask:
  - *How hot is it on a nice summer's day where you live*?
  - *Is a large range good or bad*?
  - *How much do you think the temperature varies during the day in these resorts*?

Extension

- Give students the temperature graph on Resource sheet 10.1 and ask them to write a brief summary of the data. Ask:
  - *What is the range in temperatures for July? December*?
  - *What are the mean monthly maximum and minimum temperatures for the year?*

Plenary

- Tell students that the mean shoe size of ten customers in a shoe shop is a size 6. Ask them to make up a set of suitable shoe sizes and then calculate the range for their set of data. Share data so they can see sets with the same mean yet different ranges.

Formative assessment

- Mark students' answers to Q1–7, then discuss Q6 as a class.

Homework

- Give students the mileage chart and information on Resource sheet 10.2 and ask them to decide on the best city for Robert.

Lesson 2

Objectives

- Choose appropriate measures to compare two sets of data
- Calculate the means and ranges of two sets of data
- Compare means and ranges; communicate the result of calculations

Starter

- Collect the shoe sizes for the boys and girls in the class and compile the results in a table (alternatively, divide students into two groups by age). Ask students to calculate the mean and range for the shoe size of the whole class and then for boys and girls separately.
- Discuss why we might want to find the mean and range separately for boys and girls.

Main teaching and learning

- Display the table from *Take a look*: The golf team (pp106–7). Provide students with a number of statements regarding who should be on the club team. These could be written on cards or on the board for students to read out to the class. For example:
  - *David is the worse player because he had the highest score (80).*
  - *David is the better player because he scored the lowest score (74).*
  - *Peter is the worse player because he always scored 76 or more.*
- Ask students how they could use mathematics to help them to decide more scientifically which of the two players is better.
- Split the class into two and ask one half to calculate the mean and range for David and the other half to calculate the mean and range for Peter. Display the results and discuss with students which of the two is the better player.
- Ask students to complete *Have a go* Q8–10.

Issues and misconceptions

- Students may find it difficult to solve these problems using mathematical tools; they may rely on idiosyncratic or semi-logical methods instead.
- Some students may have difficulty knowing how to start such questions or lack the confidence to do so; paired working may help in this case.

Support

- For Q11 (Homework), students may need to be reminded about the number of weeks in a year, and hence the number of weeks in six months.

Extension

- Ask students to use a spreadsheet to calculate the mean and range in Q9. If appropriate, they could also conduct a small survey (e.g. hand length or head circumference for boys and girls) and use their spreadsheets to analyse the results.

Plenary

- Divide students into pairs and allocate each pair one of Q8–10. Ask them to discuss their answers to the question that they have been allocated. Then ask several pairs to outline their solutions to the whole class. Focus questioning on drawing out the key features of a good answer.

Formative assessment

- Encourage students to peer-assess each other's answers during the Plenary.

Homework

- Ask students to complete Q11.

Lesson 3

Objectives

- Decide on the information to use in the question
- Compare means and ranges
- Make conclusions from calculations and communicate results

Starter

- Using www.bbc.co.uk/weather/world/city_guides (BBC weather world city guides), show students the data and graph for a city and ask them to write two sentences individually about the weather in the city. Then ask them to share their sentences in pairs and to write two better sentences. Pick some students to share their sentences with the whole class.

Main teaching and learning

- Discuss with students strategies and approaches that they can use to solve problems. You might use the data-handling process:
  - plan → collect data → process and represent → interpret and discuss

  or the more sophisticated problem-solving process:
  - simplify and represent → analyse and solve → interpret and evaluate → communicate and reflect → report.
- Students could make posters with the main stages and then add to these some specifics about the things they do at each stage, e.g. read the question, pick out key information, draw a table, check results, check the answer is sensible in the context of the problem.
- Use the problem-solving process to discuss the solution to *Take a look*: Maternity unit (pp109–10). Go through the worked example, recording on a diagram what has been done at each stage.
- Ask students to complete *Have a go* Q12–14.

Issues and misconceptions

- Students may have difficulty deciding which statistical technique to use.
- Many students find the open-ended nature of these questions difficult. They may need support in picking out key information, checking that answers make sense in the context of the original problem, and managing all the information effectively.

Support

- If students have difficulty with Q12–14, suggest they work through the specific suggestions of what to do at each stage raised during the discussion about the data-handling process earlier in the lesson.

Extension

- Ask students to write some similar questions of their own using data from the BBC weather. If working in pairs, they could then attempt to answer their partner's questions.

Plenary

- Ask one or two students to present to the class their solution to one of Q12–14. Ask: *Do other students agree with this answer? Did anyone tackle the question in a different way?* Discuss which question students found most difficult and why.

Formative assessment

- During the main part of the lesson, work with individual students, or small groups, and assess their work.

Homework

- Ask students to pick two cities and use the data from www.worldclimate.com/ to compare the weather in the two places.