Chapter 5 Measures

Specification

FS coverage and range	Solve problems requiring calculation, with common measures including money, length, weight, capacity and temperature
	Convert units of measure in the same system
FS exemplification	Use addition, subtraction, multiplication and division in context
	Convert between metric measures (length, weight, capacity)

GCSE

GCSE specification	**GM o**	Interpret scales on a range of measuring instruments and recognise the inaccuracy of measurements
	GM p	Convert measurements from one unit to another
Edexcel GCSE course	**Specification A:**	
	Foundation 11.1–11.6, 20.7	
	Higher Chapter 7, 23.3, 23.7	
	Specification B:	
	Foundation Unit 1: 1.2, 1.5; **Unit 2:** 17.1–17.6; **Unit 3:** 9.5	
	Higher Unit 1: 1.1, 1.4; **Unit 2:** 9.8, Chapter 12; **Unit 3:** 10.4, 11.5	

Resources

General resources	Rulers, tape measures
	Weighing scales
	Objects to be measured
	Objects to be weighed
	Show-me boards
	Mileage charts
	Photo of a house
Resource sheets	5.1, 5.2
Links	http://www.myguidebritain.com/distance-chart
	http://pictures.traveladventures.org/images/doubledecker01
	http://www.dailymail.co.uk/news/article-474765
	http://thinkmetric.org.uk
	http://www.simetric.co.uk
ActiveTeach resources	Video
	ResultsPlus Knowledge Check
	ResultsPlus Problem Solving
	Question Audio
	Animations

Lesson 1

Objectives

- Read and use scales
- Use scales to estimate, measure and compare length, distance, weight, capacity and temperature
- Convert units of measure within the same system

Starter

- Ask students to write down as many different units for measuring length as they can remember. Collate information on the board, asking students to add to the list and sort between the metric and imperial systems.

Main teaching and learning

- Provide students with a number of different objects for them to measure, working in pairs, with a ruler or tape measure. Once all students have measured the objects, discuss the results and their accuracy. Ask: *What units did you use – centimetres or millimetres or a combination?* Remind students of the fact that there are 10 mm in 1 cm.
- If possible, give each pair of students a set of weighing scales and objects to weigh. When they have finished, compare results and discuss reasons for any discrepancies. If scales are not available, give students the cards from Resource sheet 5.1. Relate this activity to *Take a look*: Using scales (p56). Discuss the scale shown on the thermometer.
- Ask students to complete *Have a go* Q1–7.
- Remind students of the different conversions as shown in the Know Zone (p55).
- Give each pair of students a set of cards from Resource sheet 5.2. These have different lengths marked on them. Ask students to order the cards and then decide if any of the cards show the same length.
- Relate this activity to *Take a look*: Working with capacity (p58).
- Ask students to begin working on *Have a go* Q8–13.

Issues and misconceptions

- Ensure that students use the correct conversions in the metric system. Emphasise that there will be fewer of a 'larger' unit and more of a 'smaller' unit when converting between them.

Support

- Help students work out what each division is worth in Q1–7.

Extension

- Confident students could begin to consider conversions between the metric and imperial systems and investigate the conversions needed. Imperial systems need to be available for students to use.

Plenary

- Ask students various metric conversions, such as: *What is 5 kg in grams?* Ask them to write their answers on show-me boards.

Formative assessment

- Discuss ways of finding a possible solution to Q13. *Ask: What would be the difference between final answers if one student assumed all the glasses held 150 ml and another 200 ml? What would be a sensible estimate for the capacity of a glass? Why?*

Homework

- Ask students to complete Q8–13.

Lesson 2

Objectives

- Use a mileage chart

Starter

- On the board write the description of a measurement. For example, the weight of an egg, height of a man, distance from London to New York, length of a pencil, amount of petrol in a petrol tank. Ask students to suggest an example of both a metric unit and an imperial unit that could be used to provide the appropriate measure. Ask:
  - *Which is further – one mile or one kilometre?*
  - *Which measure do we use in this country? In Europe?*

Main teaching and learning

- Display a mileage chart on the board or hand out individual charts to students (for example, http://www.myguidebritain.com/distance-chart or a mileage chart from a road atlas). Ask students if they can explain what this sort of chart is used for. Ask: *How do you use a mileage chart?*
- Name two of the towns on the mileage chart and ask students to find the distance between them. Ask: *How did you use the mileage chart? How easy are mileage charts to use? Why do some larger mileage charts use alternating colours between the rows?*
- Give students a journey (e.g. London to Manchester via Birmingham) and ask them to work out the distance of the journey. Compare students' results, and then repeat with different journeys and charts. Students could set questions for a partner and then agree the answers together.
- Relate this to *Take a Look*: Using mileage charts (p59).
- Ask students to complete *Have a go* Q14–18.

Issues and misconceptions

- Students often find it difficult to read mileage charts correctly. Encourage them to go across from one town and down from the other when using the charts.

Support

- Ensure that students understand the mileage chart given prior to tackling Q14; ask some additional straightforward questions before students start working through the *Have a go* questions to check understanding.

Extension

- Students could rewrite the mileage chart on p60, converting all the distances into kilometres. Alternatively, they could use the internet to research the distances between a number of different cities in, for example, the United States. They could then use this information to construct their own mileage charts.

Plenary

- Display a different mileage chart on the board and encourage students to ask and then answer questions based on this chart.

Formative assessment

- Mark numerical answers to Q14–18. Discuss any wrong answers and ensure students realise why their answers are wrong where appropriate.

Homework

- Ask students to complete Q19.

Lesson 3

Objectives

- Estimate measures
- Use measures to find solutions to problems
- Use measures to make judgements

Starter

- Ask students to estimate their height, the width of the classroom, the length of a text book. They should measure the objects and compare the results with their estimates.

Main teaching and learning

- If possible, take groups of students outside and ask them to estimate the height of a tree and/or a building. Ask each group to share their method with the rest of the class.
- Display the photo of Peter Pan in *Take a look*: Estimating length (p61). Ask: *How could we estimate the statue's height?* Ensure students know the average height of a man.
- Once the total height of the statue has been estimated, ask students to estimate the height of just the Peter Pan figure.
- Provide students with a photograph of a house and ask them, in pairs, to estimate the height of the house. Share answers and methods with the rest of the class.
- Ask students to estimate the height of a double-decker bus. Use pictures of buses with people alongside (e.g. http://pictures.traveladventures.org/images/doubledecker01).
- Ask students, in pairs, to discuss how they could estimate the size of Big Ben's clock face, the length of the hands and/or the height of a number on the face (using a picture showing workmen on the clock face, e.g. http://www.dailymail.co.uk/news/article-474765).
- Ask students to complete *Have a go* Q20–22.

Issues and misconceptions

- Students often incorrectly use the conversion factors when converting between metric units (multiplying rather than dividing, and vice versa). Recap that, when changing to a smaller unit, the answer will be larger than the number started with, and vice versa.

Support

- In Q21 students may need reminding that their initial answer will be a large number of centimetres. They may also then need help converting their answer to metres.
- In Q22 students may need to be reminded how to take readings from a mileage chart.

Extension

- Students could estimate the size of their sports hall or school hall using the method outlined in Q21. They may need reminding to measure the length of their own step first. Once they have estimated the size, they could draw a scale plan.

Plenary

- Ask students to give their estimates for the size of the clock face of Big Ben (the actual diameter is 7 metres). Compare and discuss different strategies used by students. Ask: *What assumptions did you have to make? None of the men shown is standing at full height – did you make allowance for this?*

Formative assessment

- Mark numerical answers to the questions completed from Q20–22. Discuss any wrong answers and ensure students realise why their answers are wrong where appropriate.

Homework

- Ask students to complete Q23 and Q24.