EDEXCEL FUNCTIONAL SKILLS PILOT

TEACHER'S NOTES

Maths Level 2

Chapter 4

Working with measures

Maths Level 2

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Chapter 4: Working with measures

Use these free pilot resources to help build your learners' skill base
We are delighted to continue to make available our free pilot learner resources and teacher notes, to help teach the skills learners need to pass Edexcel FS Mathematics, Level 2.

But use the accredited exam material and other resources to prepare them for the real assessment
We developed these materials for the pilot assessment and standards and have now matched them to the final specification in the table below. They'll be a useful interim measure to get you started but the assessment guidance should no longer be used and you should make sure you use the accredited assessments to prepare your learners for the actual assessment.

New resources available for further support
We're also making available new learner and teacher resources that are completely matched to the final specification and assessment – and also providing access to banks of the actual live papers as these become available. We recommend that you switch to using these as they become available.

Coverage of accredited specification and standards
The table below shows the match of the accredited specification to the unit of pilot resources. This table supersedes the pilot table within the teacher notes.

Coverage and Range	Exemplification	Learner Unit
Use, convert and calculate using metric and, where appropriate, imperial measures	• Including time, length, weight, capacity and temperature • Conversion graphs • Speed • Convert between metric units • Convert between imperial units • Convert between metric and imperial units	**G1** Time **G2** Temperature **G3** Length **G4** Weight **G5** Capacity **G6** Conversion between metric units **G7** Conversion between metric and imperial units **G8** Conversion factors Conversion graphs are covered in our new publishing (see below)
		G9 Remember what you have learned

Where to find the final specification, assessment and resource material
Visit our website **www.edexcel.com/fs** then:
- **for the specification and assessments:** under **Subjects**, click on **Mathematics (Levels 1–2)**
- **for information about resources:** under **Support**, click on **Published resources**.

Published by Pearson Education, Edinburgh Gate, Harlow CM20 2JE. First published 2008.

4 Measures

(pages 62–74 in the learner materials)

Performance	Coverage and Range	Unit Objectives
Learners can:	**Learners can:**	
■ understand routine and non-routine problems in a wide range of familiar and unfamiliar contexts and situations ■ identify the situation or problem and the mathematical methods needed to tackle it ■ select and apply a range of mathematics to find solutions ■ use appropriate checking procedures and evaluate their effectiveness at each stage ■ interpret and communicate solutions to practical problems in familiar and unfamiliar routine contexts and situations ■ draw conclusions and provide mathematical justifications	■ use, convert and calculate using metric and, where appropriate, imperial measures	**G1** Time **G2** Temperature **G3** Length **G4** Weight **G5** Capacity **G6** Conversion between metric units **G7** Conversion between metric and imperial units **G8** Conversion factors **G9** Remember what you have learned

Approach to learning

This section covers the skills necessary for students to be able to work efficiently with measures. Each unit focuses on the delivery of one particular aspect of units and scales and the questions set allow the learner to practice the full range of skills being taught. The table identifies the coverage and range from the functional skills standards: mathematics level 2 which are covered in this section.

G Working with units and scales

G1 *Time*

The main idea is to make sure students are fully familiar with the 24-hour clock and can work out the time taken, for example, for journeys. Encourage them to learn the connections between units of time and to work out the difference between two times using the counting on method. Ensure the students are familiar with the format of bus and train timetables by encouraging them to bring their own examples for class discussion. Discuss the different ways time can be measured, for example, in fractions of an hour and encourage students to learn the equivalence between commonly used fractions of an hour and the equivalent time in minutes.

Activities

Time game: Prepare a set of cards with questions based on time (e.g. I have an interview at 16:10 and my journey to the interview will take $1\frac{1}{2}$ hours. What time do I need to leave?). Each card should have the answer to the previous question at the top and the next question at the bottom, so the 'start' card will have the answer to the final question on it. Ask the student with the 'start' card to begin the activity by asking the class the first question. The student with the answer on their card responds and then asks their question, and so on.

Misconceptions

Students may make a mistake when subtracting to find the difference between two times where there seem to be insufficient minutes or seconds to subtract *from*. For example, in question 2 on page 61, they need to subtract 6 minutes 50 seconds from 33 minutes 7 seconds. The temptation is to subtract 50 from 107 instead of 67. Emphasise the use of counting on method for subtraction to avoid this particular error.

G2 *Temperature*

The main idea is to enable students to become familiar with everyday temperatures such as room temperature and body temperature. They should be aware that temperature is usually measured in degrees Celsius but that degrees Fahrenheit can also be used. Links should be made to the formula used in Chapter 3 for converting between degrees Celsius and degrees Fahrenheit. Remind students that they need to work out the scale on a thermometer to be able to read a temperature. Emphasise that they may need to apply

the rules for negative numbers to find the difference between two temperatures.

Activities

Temperature difference: Prepare a set of cards, each showing two temperatures marked on a temperature scale. Use different scales and degrees Celsius as well as Fahrenheit. Ask students to pick up a card, read off the two temperatures and work out the difference between them.

Misconceptions

Students have difficulty reading temperature scales. For example in question 1 on page 62 students may read the marked temperature as 3°C instead of 6°C if they have not read the scale correctly. Advise the students that the first step when reading quantities from a scale is to work out what each marked unit represents. Also, emphasise the use of the number line for negative numbers and the fact that numbers decrease as they go further to the left.

G3, G4 and G5 *Length, Weight and Capacity*

The main idea is to extend the concept of reading from a scale to length, weight and capacity. Students have already been introduced to the different aspects of measure in number. Encourage them to learn the connections between the metric units. Emphasise that the first step in reading scales is to work out what one unit corresponds to. Discuss the instruments used to measure each of length, weight and volume.

Activities

Matching card activity: Prepare cards with items such as 'your weight', 'your height', to cover the range of metric measurements, for students to match with cards labelled with units, 'kg', 'm'.
Discussion activity: What is the difference between capacity and volume? What units do you use to measure each of capacity and volume? What is the connection between the units?

Misconceptions

The main difficulty here is in reading the scales across each of the aspects of measure. Students make errors because they don't interpret the scale correctly. Again, advise the students that the first step when reading quantities from a scale is to work out what each marked unit represents.

G6, G7 and G8 *Conversion between metric and metric and imperial units and Conversion factors*

The main idea is to ensure students are aware of the difference between metric and imperial units and where they are commonly used; for example, pints of milk in the supermarket and miles on roads in the United Kingdom. Many students also know their height in feet and inches and their weight in stones and pounds. Discuss the relationship between metric and imperial units in common everyday use, for example, a kilogram is a bit more than 2 lbs, one lb is approximately 450 grams, a litre is less than 2 pints, a gallon is about 4.5 litres, a metre is a bit more than a yard, an inch is about 2.5 cm, a foot is about 30cm, 5 miles is about 8km. Ensure that students can use conversion tables to convert between metric and imperial units and emphasise the link between conversion tables and conversion factors. Remember to link in with the work done on converting currency in Chapter 1. Emphasise that conversion factors are either multiplied or divided and they should make sure they are clear which operation they should perform. Encourage students to make sure their answers make sense. You may also extend this section to looking at conversion graphs for currency, distance and temperature.

Activities

Prepare a series of cards showing a metric unit and its imperial equivalent, for example, gram and ounce, centimetre and inch, pint and litre. Ask students to put a < or > symbol between the units.
Construct a list of common items and ask students to estimate the length, weight or capacity in imperial and metric units. For example, use average male height, average female height, weight of a packet of crisps, amount of petrol in an average petrol tank. Students could be given two or three of these to work on, in pairs or small groups, as an (internet) research activity and the results could be put on posters.

Misconceptions

Students may become confused when the questions involve a two-stage activity for changing units. For example, in question 7 on page 67, many students will multiply by 2.2 instead of dividing. To avoid this sort of mistake they need to analyse the calculation carefully, if 1 kg ≈ 2.2 pounds the answer should be less in kg than in pounds. Emphasising they should always check that the answer makes sense can help address this mistake.

Apply the skills

The learners need to develop their Process Skills, which are:

Representing	Analysing	Interpreting
Making sense of situations and representing them	Processing and using the mathematics	Interpreting and communicating the results of the analysis

At level 2 the learners must decide on the methods used and identify the information they need for themselves. A suitable activity to practice these number skills would be to investigate the body mass index, BMI, calculation. Measures of height and weight are used to calculate BMI and the task can involve conversion between metric and imperial units. Published graphs and tables can then be used to determine the classification of BMI index. The BMI formula can also be used to determine an optimum weight for a given height. A practice task is given below:

Body Mass Index

A person's body mass index (BMI) can be calculated as a guide to whether their weight is within a recommended range for their height. Research has shown that people with a BMI within this range are generally healthier and have a longer life expectancy. However, the BMI should only be used as a guide to your overall health. There are other factors such as lifestyle, physical activity, smoking and blood pressure which also play an important role in your general health and well being.

BMI is a reliable indicator of total body fat, which is related to the risk of disease and death. The score is valid for both adult men and women but it does have some limits. The **limits** are:

- It may **overestimate** body fat in athletes and others who have a muscular build.
- It may **underestimate** body fat in older persons and others who have lost muscle mass.

The formula for BMI is:

$$\text{BMI} = \frac{\text{weight in kilograms}}{(\text{height in metres})^2}$$

If w = weight in kilograms and h = height in metres, this can be expressed more simply as $\text{BMI} = \frac{w}{h^2}$ (Remember $h^2 = h \times h$)

Example
Calculate the BMI of a person with a height of 170 centimetres and a weight of 65 kilograms.

First change the height to metres 170 cm = 1.7 m (dividing by 100)

$$\text{BMI} = \frac{65}{1.7^2} = \frac{65}{2.89} = 22.5 \text{ to one decimal place.}$$

The standard categories for the classification of the BMI are given in the following table:

BMI	Weight Status
Below 18.5	Underweight
18.5 – 24.9	Normal
25.0 – 29.9	Overweight
30.0 and above	Obese

Remember

This calculation is a rough guide and you should always be advised on your weight by your doctor.

This person would fall in the 'normal' category for weight status.

1. Use your height in centimetres and weight in kilograms to work out your own BMI to one decimal place and use the table to check your weight status.
Note: If asked to give your answer to one decimal place, your working should be to at least two decimal places.

2. Feet and inches are still used to measure height and stones and pounds to measure weight, particularly in the United States of America.

Use the imperial measures:

Height	Weight
12 inches = 1 foot	14 pounds = 1 stone

and the conversions between metric and imperial units:

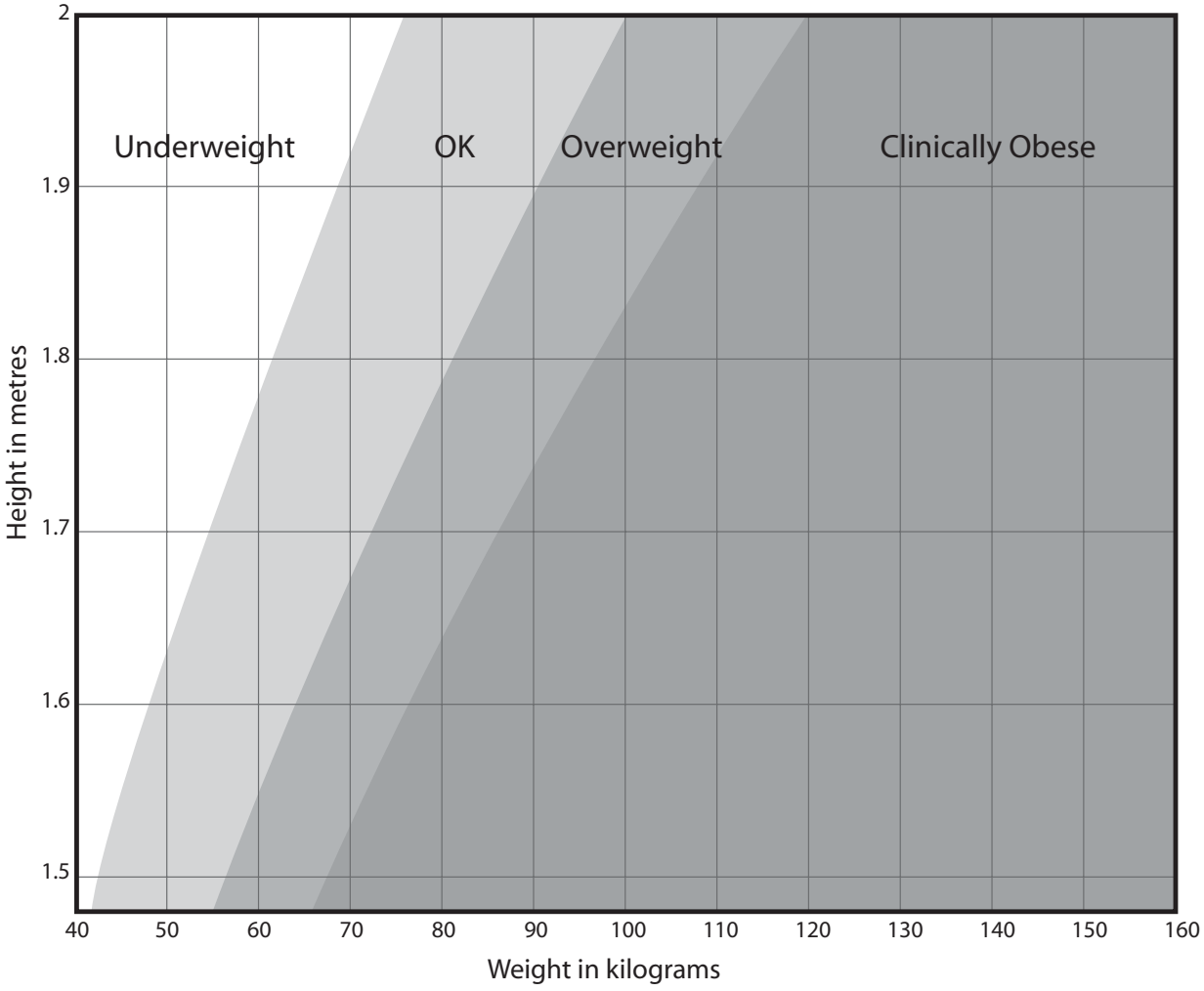
Height		Weight	
Metric	Imperial	Metric	Imperial
2.5 cm	1 inch	1 kg	2.2 pounds
30 cm	1 foot		

to work out the BMI for the celebrities below and classify their weight status:

Name	Height	Weight
Victoria Beckham	5 feet 6 inches	108 pounds
Kate Moss	5 feet 7 inches	105 pounds
Madonna	5 feet 4 inches	120 pounds
Keira Knightley	5 feet 7 inches	110 pounds
Johnny Depp	5 feet 10 inches	155 pounds
Tom Cruise	5 feet 9 inches	170 pounds
Arnold Schwarzenegger	6 feet 2 inches	235 pounds
David Duchovny	6 feet	212 pounds

3. Check your results on the BMI graph below.

Calculate your body mass index



4. Discuss your celebrity BMI findings.

5. What is the maximum recommended weight in kilograms for an adult who is 1.75 metres tall, in order for their weight status to be 'normal'? Give your answer to the nearest 0.1 kilogram.

6. What is the maximum height in metres for an adult who weighs 66.7 kilograms, to have a recommended 'normal' weight status? Give your answer to the nearest centimetre.

7. Set up an Excel spreadsheet using formulae and the 'fill down' facility to calculate a person's BMI.

Useful websites

National Heart Lung and Blood Institute
http://www.nhlbi.nih.gov/

Answers

G Working with units and scales

G1 Time – *page 62*

1. 06.47
2. 26 minutes 17 seconds
3. 3 hours 35 minutes
4. 2 years 8 months
5. 1500

G2 Temperature – *page 64*

1. 6°C
2. 0.6 degrees

G3 Length – *page 65*

1. 4.25 m
2. 3.9 cm

G4 Weight – *page 66*

1. 330 grams
2. 9.1 kg
3. 2.75 kg

G5 Capacity – *page 67*

1. 140 ml
2. 25 litres
3. 72 litres

G6 Conversion between metric units – *page 68*

1. 7 glasses
2. 7575 cases, 181 800 cans
3. 2 001 solar lights

G7 Conversion between metric and imperial units – *page 69*

1. 800g
2. 11.362kg
3. 5 feet 8 inches
4. 47.25 litres
5. 26.37 miles
6. 46.8 miles per gallon
7. 262.192 km
8. 4.57 litres
9. 122.182 tonnes

G8 Conversion factors – *page 71*

1. 2 hours 18 minutes
2. 55 cm
3. 19.8 metres
4. 27 metres
5. 65p
6. 200 g
7. 45 kg
8. 210 ml
9. 57 ml

G9 Remember what you have learned – *page 73*

1. B
2. D
3. B
4. C
5. B
6. D
7. C
8. A

Apply the skills

1. Own BMI calculation

2.

Name	Height in metres	Weight in kg	BMI	Weight Status
Victoria Beckham	1.65	49.09	18.0	Underweight
Kate Moss	1.675	47.73	17.0	Underweight
Madonna	1.6	54.55	21.3	Normal
Keira Knightley	1.675	50	17.8	Underweight
Johnny Depp	1.75	70.45	23.0	Normal
Tom Cruise	1.725	77.27	26.0	Overweight
Arnold Schwarzenegger	1.85	106.82	31.2	Obese
David Duchovny	1.8	84.8	26.2	Overweight

3. Check answers using graph
4. Two models are underweight. Madonna and Johnny Depp are 'normal'. Two male actors classed as overweight and Arnie is obese!
5. 74.5 kilograms
6. 1.90 metres
7. Use of spreadsheet