CENTRES FOR EXCELLENCE IN MATHS

FE centre resource

Pearson

Mastery Scheme of Work: Functional Skills Mathematics Level 2

NOTE: This scheme of work is intended as an exemplar and should be adapted to fit with the delivery context. In particular, adjustments need to be made to allow for retrieval practice, independent learning (supported and otherwise), progress reviews, revision and exam practice.

Introduction

This Scheme of Work has been written by the colleges involved in the CfEM programme. It was written by the sector, for the sector, based on CfEM's Five Key Principles of Teaching for Mastery in FE.

The intention is to provide an exemplar that can be adapted and used by maths teachers and managers in colleges across England, who are grappling with the issues of teaching Functional Skills maths over a relatively short timeframe, to learners who are frequently disengaged by previous negative experiences of the subject.

Our scheme of work is based on a 33 GLH model – comprising 22 lessons of 1.5-hour lessons. However, the scheme can be adapted to fit other delivery models. It contains links to 18 mastery lessons written by teachers during the programme, covering most, though not all of the scheme.

Overview

Although the scheme of work and lessons relating to it have been informed by all five Key Principles of Teaching for Mastery, the structure of the scheme of work presented here has been informed by one of the key principles in particular: **prioritise curriculum coherence and connections.** In terms of structuring the scheme of work, this means:

- sequencing to enable learners to see **links between mathematical concepts**
- consistent use of **familiar representations across different topics** to enhance understanding of mathematical structure.

The scheme of work has also taken account of issues of **learner engagement and resilience** – particularly in the early part of the academic year.

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Rationale

The Functional Skills curriculum is made up of a few big linked ideas and this scheme of work (SoW) has been designed to reduce students' cognitive load, supporting the demands on their working memory, whilst helping them to think deeply about the underlying mathematical concepts. This is in contrast to traditional teaching in FE maths classrooms where students are provided with isolated procedures or algorithms presented as disconnected topics that need to be remembered and cannot be readily applied to everyday life situations. A critical aim is to develop an improved number sense, and ability to apply maths flexibly in practical situations.

In sequencing this SoW, we have also reviewed different models and representations of mathematical concepts as well as the efficacy of using these mastery approaches from action research undertaken by CfEM colleges.

Our SoW commences with two lessons focusing on learner **engagement and resilience**, with the intention of addressing from the start the negative attitudes and fixed mindsets that learners frequently present. However, it is important that these key messages are reinforced regularly throughout the year. For more ideas about this, see the screencasts on engagement and resilience produced by CfEM centres and CfEM's Motivation and Engagement handbook.

The next two lessons focus on **handling data** – topics which can easily be made relevant and interesting to learners, so building on the theme of learner engagement. The second lesson, on the subject of averages, also provides an opportunity to identify and address any issues with basic number skills (adding, subtracting, multiplication and division), as these are not addressed directly in the level 2 scheme of work.

The next four lessons focus on **proportional reasoning** and related topics which again present opportunities to engage with familiar contexts. For direct proportion, we have chosen a **ratio table** as the initial model alongside its graphical representation as a straight line. CfEM research has shown that ratio tables help students to organise their thinking, make sense of proportion, and achieve a greater degree of flexibility in their approaches. For more ideas about using ratio tables and other visual representations, see the screencasts on visual models and representations.

Another key representation introduced is the **bar model**, which provides an invaluable way of helping learners make sense of **ratios** and **parts of a whole**, including equivalences between fractions, decimals and percentages, while **arrays** are used to support learners' understanding of **adding and subtracting fractions**. At this point, **probability** is also tackled, building on prior lessons about fractions, decimals and percentages.

Percentage increase and decrease is the next lesson, with links made to **multiplicative reasoning**. Ratio tables and bar models become less useful at this point, and the **double number line (DNL)** is introduced to provide a visual

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representation of percentage increase, decrease and reverse percentages – and their applications to compound interest and discounts. In traditional teaching, students are often confused about the different percentage situations and what algorithm they need. In this lesson we take them over the hundred and introduce a multiplier as a method which can be used for different percentages with a DNL whist keeping their existing methods so they are able to choose which one they prefer. The use of the DNL is then extended to converting between metric and imperial units.

The final section of the scheme of work focuses on **measures**, **shape and space**, though begins with a lesson on **substitution and formulae** to prepare them for when these arise in the context of areas, volumes and other practical contexts. Lessons follow on the concepts of **perimeter and area**, **circles**, **volume and surface area**, **angles and co-ordinates**, and finally **plans and elevation**.

The 22nd and final lesson is left open to focus on revision and exam preparation – though this will have been addressed throughout the scheme of work with the use of past paper questions.

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Lesson	Section	Lesson topic	Lesson objectives	Model or representation
1	**Engagement and resilience**	**Attitudes to maths and getting unstuck**	• Get to know your learners • Recognise previous experiences of maths learners • Equip learners with strategies to progress in their maths • Promote a safe, positive learning environment	Ratio table
2		**Mindsets, resilience and number sense**	• Categorise attitudes into fixed or growth mindsets • Recognise that progress is maximised when in the growth zone • Use ratio tables to answer proportion questions • State characteristics of mathematical resilience	
3	**Handling data 1**	**Scatter graphs**	• Draw and interpret scatter diagrams including lines of best fit • Recognise positive and negative correlation	
4		**Averages**	• Understand the difference between mean, mode and median • Use the appropriate average for different purposes • Understand that range is the data spread and not an average • Use appropriate checking procedures and evaluate their effectiveness at each stage	

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Lesson	Section	Lesson topic	Lesson objectives	Model or representation
5	**Proportional reasoning 1**	**Direct proportion**	• Identify when two quantities vary in direct proportion to each other • Understand the multiplicative relationship between two quantities • Solve simple proportional problems using efficient methods with ratio tables and double number lines	Ratio table
6		**Scales, maps and scale drawings**	• Convert metric units of measurement • Use a scale to find lengths • Represent a proportional situation in a ratio table	
7		Speed and compound units	• Solve problems that involve distance, time and speed • Calculate using other compound measures, including density and rates of pay	
8		**Using ratio**	• Understand how ratios correspond with real-world situations • Simplify ratios • Use ratio reasoning to solve whole-to-part and part-to-part simple problems • Use bar model representations to provide insights into solving problems • Understand the importance of using reverse calculations to check answers	Bar model
9	**Parts of wholes**	**Basic fractions**	• Understand what a fraction is and be able to link this to proportion • Find a fraction of an amount	100 square Bar model
10		**Work with equivalent fractions, decimals and percentages and finding percentages of an amount**	• Working with equivalent fractions, decimals and percentages using multiple representations • Calculate benchmark percentages and apply bar models to solve percentage of an amount problems (non-calculator)	
11		**Adding and subtrating fractions**	• Adding and subtracting fractions with common denominators • Adding and subtracting fractions with different denominators using array representations • Recognising equivalent fractions using array representations • Simplifying fractions	Array

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Lesson	Section	Lesson topic	Lesson objectives	Model or representation
12	**Handling data 2**	**Probability**	• Understand the likelihood of events using a probability scale • Calculate simple probability as a fraction, decimal or percentage, including from a table • Work out the probability of combined events including the use of diagrams and tables, including two-way tables • Identify and correct common misconceptions	
13	**Proportional reasoning 2**	**Percentages with a calculator**	• Work out how to increase and decrease a quantity with a calculator, using a multiplier • Solve a range of percentage questions using a multiplier (percentage of an amount, percentage increase/decrease, an amount as a percentage, reverse percentages) • Use a double number line to see the common mathematical structure across a range of percentage questions	Double number line
14		**Compound interest and financial calculations**	• Calculate a percentage change without a calculator • Understand the difference between simple and compound interest • Calculate a repeated percentage change using multipliers • Use a double number line to see the common mathematical structure of percentage questions	
15		**Converting between metric and imperial units**	• Use graphs and ratio tables to convert between units of measure • Understand how to use double number lines to provide insight into solving conversion problems • Use approximation to check conversion calculations	
16	**Using formulae**	**Substitution and formulae**	• Revise order of operations • Use formulae in words and symbols • Substitute positive and negative numbers in formulae	

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Lesson	Section	Lesson topic	Lesson objectives	Model or representation
17	**Measures, shape and space**	**Area and perimeter**	• Explore the area and perimeter of squares, rectangles, triangles and compound shapes • Understand the concepts of area and perimeter and use them in a range of problem-solving situations	
18		**Circles**	• Calculate the area and perimeter of circles, semicircles and quadrants (in terms of π or to an appropriate degree of accuracy) • Explore problems involving the area or perimeter of compound shapes that include circles, semicircles or quadrants • Apply knowledge learned to exam-style questions	
19		**Surface area and volume**	• Identify properties of common 3D shapes • Through exploration, calculate volume and surface area of common 3D shapes • Use knowledge of volume and surface area for problem solving questions	
20		Angles and co-ordinates	• Use co-ordinates in 2D, positive and negative, to specify the positions of points • Calculate values of angles and/or co-ordinates with 2D and 3D shapes	
21		Plans and elevations	• Understand and use common 2D representations of 3D objects • Draw 3D shapes to include plans and elevations	
22	*Revision and exam preparation*			

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