Lesson plan
Using Ratios

1. Lesson objectives

- Use the difference between ratio parts to solve problems using bar models
- Write equivalent ratios including in the form 1:n or n:1

2. GCSE curriculum

Number
R5 apply ratio to real contexts and problems:

3. Lesson plan

This is an overview of the lesson. More notes can be found in the notes in the lesson slides.

Activity	Purpose of this activity	Time (min)	Guidance	Materials
Introduction	Introduce the use discrete bar models to solve problems	15	Tim says, you add the parts of the ratio together. Divide the quantity (165) by the sum of the parts (12). Tim is not correct. Why? Learners often use the same rule for all ratio questions. Encourage learners to read the question carefully. What is it asking? Can learners draw a picture or bar model to show this?	Slide 2 Mini whiteboards
Model	Introduce discrete bar models to draw a picture of the question.	10	Model the answer using the bar model. Pay attention to the bar models and braces. Show them how to use question marks to highlight what they need to find. Pay particular attention to the brace that highlights the difference between Jack and Ann as £165.	Slide 3
Explore 1	Collaborative exploration to develop the use of bar models by matching bar models to the question	20	Introduce the context of collecting milk bottle tops for recycling. You may also mention that supermarkets are now switching to clear plastic tops because they are more easily recyclable. Ask learners to work in pairs to draw bar models in the empty cells to match to question. Only then should they complete the calculations. The focus of this task is drawing bar models for the first time. For less confident learners, a separate handout can be used to provide pre-drawn bar models to match as required.	Slide 4 Handout 1

Activity	Purpose of this activity	Time (min)	Guidance	Materials
Discuss 1	The discussion aims to deepen learners' understanding using bar models to solve ratio problems with differences.	10	Ask learners for feedback on using the diagrams to explore learner thinking and reasoning. Look for any misunderstanding of the questions. Emphasise the language of 'more' and 'less' within the context how the bar models relate to the question.	Slides 5–8
Explore 2	Carry out a think, pair share activity on writing equivalent ratios on a spider diagram.	5	Independently at first, and then in pairs, ask students to find many equivalent ratios as possible. Learners are also encouraged to write a ratio in the form of 1 : *n* and *n* : 1. Allow learners to try and understand what this means by themselves, without prompting, so that they are able to construct meaning.	Slide 9 'How many ratios' handout
Discuss 2	Deepen learners' understanding of equivalence and 1 : *n* and *n* : 1	10	Tutors write answers the learners give them. How did they do? What was difficult and why? Were they able to work out 1 : *n* and *n* : 1 i.e. **1** : 8 and 0.125 : **1**? Tutor models this on the board.	Slide 10
Explore 3	Reiterate the concept of ratio equivalence and highlight common misconceptions.	10	Ask learners to complete this task in pairs. Depending on confidence and competence, ask learners to find just one group of four ratios that are equivalent. If there is time, learners can try and find other groups of equivalent ratios. There are also two blank cards for learners to write their own equivalent ratios.	Slide 11 'Card sort' handout

Activity	Purpose of this activity	Time (min)	Guidance	Materials
Discuss 3	Deepen learners' understanding using equivalent ratios	10	**Optional extension:** Learners present their answers and a consensus is agreed before sharing the answer slide. Ask learners to explain their thinking. Demonstrate the multiplicative relationships between equivalent ratios.	Slide 12 'Equivalent ratios – extension' handout
Explore 4	Provide learners with an extension task to understand combining ratio using the bar model	Included in the 10 mins of Explore 3	Use these slides to help learners to understand links between equivalent ratios and how these can be used to solve a more in-depth question, when combined with a second ratio. Explain the link between the two ratios.	Slides 13–14
Practice questions	Learners check and consolidate their understanding by answering exam questions.	5	Ask learners to work independently. Depending on time and learners' ability, you may choose only one of the two questions for the class. Ask learners if they used a different approach to the one used prior to the lesson. How has their thinking changed? What have they learned about ratios? When might they use this approach again in the future?	Slides 15–16 'Practice questions' handout

Activity	Purpose of this activity	Time (min)	Guidance	Materials
Review	To summarise learning, capture ways of thinking.	5	Summarise the learning. • Emphasise the importance of reading and understanding what ratio questions are asking for. • Clarify the concept of equivalence of ratios including 1: *n* and *n* : 1 • Capture the ways of thinking for answering ratio problems. Draw on the examples from the earlier slides on the main whiteboard. Ask learners, would they use bar models in the future? It is important to make sense and capture learners' ways of thinking – not to prescribe a best method. The lesson should have helped learners understand why adding the parts of the ratio together and dividing the quantity by the sum of the parts does not work for all ratio questions. The purpose of this lesson is to give learners new ways of thinking and use their deeper understanding of ratio to answer ratio questions under the pressure of an exam.	Slide 17