Lesson plan

Arithmetic sequences

1. Lesson objectives

- Understand the concept of arithmetic sequences
- Derive the nth term of sequences generated from a context
- Apply nth term formula in both theoretical and practical contexts

2. GCSE curriculum

Sequences
A23 and A25 understand the features of an arithmetic sequence
A24 recognise and describe arithmetic sequences

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	To set the scene and to explain learning objectives	5	Briefly introduce the context of the lesson and the objectives. Explain that the activities will enable learners to draw on prior knowledge of sequences, using a realistic, practical context, to build confidence and understanding.	Slide 1
Discuss 1	To provide an opportunity for learners to intelligently practise their understanding of a concept (rather than just using mechanical repetition), to focus on relationships – not just the procedure – and make connections	10	Introduce the context of two learners in the catering field, working in a local café. Ask learners to work in pairs (this will promote dialogic learning). Slide 2 shows a sequence of tables and chairs. Learners discuss the pattern and answer questions such as: How many chairs would they need for 8 tables? How many would they need for 12 tables? Using this arrangement, how many tables would they need for 37 chairs?	Slide 2 Mini whiteboards

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Explore 1	To model a realistic context for building a sequence	10	Practical task to enable learners to use 'concrete' everyday resources to visualise the building of the first three terms of a sequence. Learners can record their findings in the form of a diagram.	Slide 3 Tables and chairs Mini whiteboards
Discuss 2	To enable learners to spot patterns and rules to generate an arithmetic sequence To enable learners to learn the correct mathematical language when describing sequences	10	Nominate a learner to be a scribe in order to display the results of the group on the whiteboard – the number of chairs required when using 1, 2 and 3 tables. Allow the scribe flexibilty to use vertical or horizontal format. Discuss the effect of each orientation (if any). Tutor to support learners in identifying the number of tables as 'n' by asking scaffolding questions. **Point out that 'n' is also the position in the sequence.** Ask learners to work out the number of chairs required for 4, 5 and 6 tables, for the scribe to record on the whiteboard. Ask learners to consider trying to work out how many chairs for 10 tables. Tutor to introduce the following terminology: terms of the sequence, first term and nth term, if learners have not done so already.	Slide 4

Activity	Purpose of this activity	Time (min)	Guidance	Materials
Explore 2	To enable learners to understand the underlying mathematical structure of an arithmetic sequence Bar models used as a strong visual representation to support learner understanding Card sort/match activity designed to provoke cognitive conflict and reveal/resolve common misconceptions Variation theory employed in choice of sequences to enable learners to notice impact and predict effect of changes to the nth term expression	30	Introduce the context of the cost of employing a plumber who charges an hourly rate and a call-out fee. Learners work in pairs and take turns to match a set of cards to a sequence on the template. There are 6 cards in the set, and 8 gaps on the template. Learners explain their reasoning to their partner. Issue the template and the first set of cards (labelled 'N_'), the nth term of an expression/formula, to each pair of learners. Move around the room, asking individuals to identify which card they placed, and why. Point out to learners that they must complete the nth term for two missing cards. Ask questions relating to the context: 'What is the hourly rate for this sequence?' 'How do you know that the call-out fee is £x?' Introduce the second set of cards, showing bar models of cost structure (labelled 'B_'). Note that learners might match each card to any other card and not check that all pairings make sense. The visual representation may provoke cognitive conflict. Again, point out to learners that they need to create bar models for the two missing cards. Issue the third set of cards with the value of the eighth term (labelled 'E_'). Note that one of the cards has a value that is double the value of the fourth term of a different sequence to illustrate a common misconception. Issue the final set of word cards, referring to context (labelled 'W_'). Two of the sequences have two word cards that match.	Slide 5 Explore 2 handout (cards shuffled) Explore 2 template Explore 2 handout answers Mini whiteboards Cuisenaire rods (optional)

Activity	Purpose of this activity	Time (min)	Guidance	Materials
Review	To elicit common misconceptions, reinforce correct mathematical language and enable learners to make sense of the nth term with reference to a realistic context	10	Ask learners for key learning points and reinforce correct mathematical language (see *NCETM KS3 guidance notes on language*). Using the two bar models on slide 6, ask learners to describe the nth term formula for each model. Ask learners 'How do you know which part of the diagram represents the call-out fee?' Use slide 7 to introduce zero position. Use slides 8 and 9 as practice for the class and more class discussion. Ask learners 'What would the total cost be if the plumber did not charge for labour?' 'How would the nth term formula change if, due to an increase in fuel prices, the plumber decided to increase his call-out charge to £50?' 'How would the nth term formula change if the plumber decided to increase his labour charge to £40 per hour?'	Slides 6–9 Possible use of slide animation with colour coding to show growing pattern and reveal the underlying mathematical structure.
Practice question	To apply the learning to an exam question	10	Ask learners to answer an exam question and after a few minutes discuss their thinking.	Slides 10–15 Exam questions handout
Review	To review the lesson and recap what has been covered	5	Ask learners to identify what has been discussed during the lesson.	Slide 16