CENTRES FOR EXCELLENCE IN MATHS

FE centre resource

Pearson

Lesson plan

Expand and factorise

1. Lesson objectives

- Simplify algebraic expressions to maintain equivalence by multiplying a single term over a bracket
- Simplify algebraic expressions to maintain equivalence by multiplying a single term over a bracket and collecting like terms
- Simplify algebraic expressions to maintain equivalence by taking out common factors.

2. GCSE curriculum

Number

A4 simplify and manipulate algebraic expressions by:

- collecting like terms
- multiplying a single term over a bracket
- taking out common factors

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	Introduction to the concept of expanding a bracket	5	The language of mathematics and the term ‘expand’ often is memorised as a set of rules rather than from meaning. The question exposes a common learner error that they do not multiply the second term by the number outside the bracket. Alicia says that the answer is $3x + 4$ and learners are asked to provide an explanation why she is not correct.	Slide 2 Mini whiteboards
Model	It aims to introduce a representation of dividing by a fraction using concrete or pictorial approaches	10	The tutor models what $3(x + 4)$ looks like. Algebra tiles are introduced here and follow on from a previous lesson on collecting like terms. The learner ‘sees’ 3 rows of x (one green bar) plus 4 (yellow squares) so there are 12 yellow squares in total. Explain to them that this is why the rule works: that you multiply each term inside the bracket by the term outside the bracket. The tutor can use the PowerPoint slide. Tutor opens online manipulative https://mathsbot.com/manipulatives/tiles and then introduce how to drag and drop, delete and tidy algebra tiles on the screen for the next activity. Alternatively, if you have a class set of algebra tiles these physical manipulatives may be used.	Slide 2

Activity	Purpose of this activity	Time (min)	Guidance	Materials
Explore 1	Collaborative exploration to develop the use of algebra tiles to explain the distributive properties of single brackets	15	Whether using the dynamic algebra tiles online or physical algebra tiles, you must ensure that the learners are first comfortable with them e.g. online the click and drag of positive and negative algebra tiles and the use of zero pairs on the screen before starting the task. Ideally, learners will already have completed the previous algebra lesson collecting like terms. In pairs, learners will use the algebra tiles to create the expressions provided. This activity is an important building block for the construction of knowledge of the distributive properties when using of brackets in algebra. Encourage learners who want to complete the questions in the abstract using the 'rule' to explain their answers using algebra tiles, 'because there are … of algebra tiles'.	Slides 3–5 Handout Using Algebra titles
Discuss 1	Exploration of problem-solving approaches using algebra tiles	10	Groups feedback on the algebra tiles expressions they constructed and confirm their answers of their expanded form. The answers on Slides 5–8 can be used by the tutor or the tutor may invite a learner to demonstrate their answers using mathbot on an interactive whiteboard.	Slides 5–9
Explore 2	Collaborative exploration to develop the use of algebra tiles to show the equivalence of the expanded and factorised form of an expression	20	In pairs, learners use the diagrams to identify the factorised and expanded forms of the expression. Students use the cards to match equivalent expressions and diagrams into sets of four, using the blank cards to fill in any that are missing.	Slide 10 Handout Using Algebra titles 2

Activity	Purpose of this activity	Time (min)	Guidance	Materials
Discuss 2	The discussion aims to deepen learners' understanding by using algebra tiles to solve algebraic equivalence problems	5	Tutor asks for feedback using the diagrams to explore learner thinking and reasoning. Look for misconceptions with negative numbers, that the x must always come first in an expression, the use of the divide line (vinculum) and not fully factorising.	Slides 11–20
Explore 3	Think, pair, share a set of questions without using algebra tiles and using procedural variation	10	Independently at first, and then in pairs they share and compare answers. Learners are introduced to other letter variables as they might be tested on in the exam, e.g. 'a'. Learners work their way up to a set a double set of double brackets where they must expand and also simplify. For learners who still need the algebra tiles, please make them available.	Slide 21 Handout Expanding single brackets
Discuss	The discussion aims to deepen learners' understanding of algebraic equivalence problems	5	Tutors share the answer sheet and asks for feedback from learners. How did they do? What questions were difficult and why?	Slide 22

Activity	Purpose of this activity	Time (min)	Guidance	Materials
Exam Practice	Exam practice	5	Learners will work independently. Depending on time and ability of learners in the group, you may choose only one or two questions for the class. When completed, ask learners whether they have used a different approach to that used prior to the lesson. How has their thinking changed? What have they learned about expanding and factorising? Would or when might they use this approach again in the future?	Slides 23–26 Handout Exam Practice
Review	Summarise learning, to capture ways of thinking and to clarify the concept of expanding and factorising	5	Summarise the learning. • Clarify the concept of maintaining equivalence by multiplying a single term over a bracket or factorising an expression by taking out common factors • Capture the ways of thinking for each of expanding and factorising. Draw the examples from the slide on the main whiteboard. 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 the rules taught to them previously work and given them a way of thinking to be able to answer these sorts of questions under the pressure of an exam even if they cannot remember the abstract rules of expanding and factorising algebraic expressions.	Slide 27