Double Brackets to Triple Brackets

Teacher		**Class**	Year 8
Subject	Maths	**Topic**	Expanding brackets
Date		**Room**	
Lesson length	60 minutes	**Country**	United Kingdom

Students learn to expand products of two and three binomials. They practise four multiplications, collect like terms and build to a cubic.

Curriculum links

- expanding products of 2 or more binomials

Learning objectives

- Students will expand products of two binomials correctly and simplify answers.
- Students will expand products of three binomials in two clear stages with simplification.
- Students will collect like terms to give each answer in simplest form.

Success criteria

- I can make all four multiplications correctly for double brackets.
- I can expand three brackets by simplifying two brackets first.
- I can collect like terms to give a simplified answer.

What students already know

Quick check (2 minutes): ask students to expand 3(x + 4) on mini whiteboards and hold up answers.

Key words

expand	multiply out to remove brackets [2]
binomial	expression with two parts joined by + or - [1]
like terms	parts with same letters and powers that can be added [2]
simplify	collect together to make shorter and tidier [2]

Materials

- Slide deck 1-12 on screen with Video clip 1 and Video clip 2 tested
- Printed Worksheet Task B (page 2) and Task C (page 3), one copy per student
- Mini whiteboards, pens and wipers for whole class
- Paper and pens only for Triple Bracket Tower main task, no extra kit

Before the lesson

- Print Worksheet Task B and Task C, one copy per student plus spares
- Test Slide 6 Video clip 1 (0:00-1:53) and Slide 8 Video clip 2 (0:00-4:08) for sound and picture
- Set room for pairs then threes for the main tower task
- Prepare mini whiteboards and a writing frame with boxes: expand, simplify, multiply by last bracket

Lesson outline

0–8 min **Starter** 8 min · Whole class

Revisit single-bracket expansion and hook interest in double and triple brackets.

YOU DO

1. Show Slides 1-2 and share objectives: Expand products of two binomials, Expand products of three binomials.
2. Show Slide 3: Every term in the first bracket multiplies every term in the second.
3. Show Slide 5 mystery: This patio is (x + 2) long and (x + 3) wide. What is its area?
4. Introduce the main challenge and take quick answers on 3(x + 4).

STUDENTS DO

1. Listen to objectives and repeat the big idea in own words.
2. Study the patio image and suggest why the area is $x^2 + 5x + 6$, made from 4 smaller rectangles.
3. Write 3(x + 4) on mini whiteboards and hold up answers.

Say: Two brackets are easy now. Who dares to add a third? First, look at this patio. It is (x + 2) long and (x + 3) wide. What could its area be, and how many small rectangles can you see?

Worked example: 3(x + 4) = 3 times x + 3 times 4 = 3x + 12 [1]. The outside term multiplies each term inside [1].

Ask: What do we do when we expand 3(x + 4)? (Multiply 3 by x and by 4 to get 3x + 12.) · Why might (x + 2)(x + 3) need four small rectangles? (Each term in the first bracket multiplies each term in the second, giving four products [2].)

Check understanding: Hold-up of whiteboards for 3(x + 4). If many show 3x + 4, remodel that every term inside is multiplied [3].

Support: Show the single-bracket area model 3 by (x + 4) splitting into 3x and 12 [7]. **Stretch:** Ask what the four patio pieces would be for (x + 2)(x + 3): x^2, 3x, 2x and 6.

Use: Slides 1-5

8–20 min **Teach double brackets** 12 min · Whole class

Model how to make all four multiplications and collect like terms.

YOU DO

1. Show Slide 6 and play Video clip 1 (0:00-1:53): Count the four mini-products.
2. Model (x + 5)(x + 10) with a 2 by 2 grid, filling four cells then adding [2].
3. Show Slide 7 mindmap: FOIL order, Grid method, Four products, Mind the signs, Collect like terms.
4. Model signs with (x - 7)(x - 10) and collect middle terms.

STUDENTS DO

1. Watch the video and count the four products aloud.
2. Copy the grid for (x + 5)(x + 10) and the simplified answer.
3. Call out sign rules for negatives with teacher questioning.

Say: Writing two brackets next to each other means the brackets need to be multiplied together [2]. Every term in the first bracket has to be multiplied by every term in the second bracket [2]. We write all four products, keep every sign, then collect like terms.

Worked example: $(x + 5)(x + 10) = x^2 + 10x + 5x + 50 = x^2 + 15x + 50$ [1]. Four products first, then 10x + 5x makes 15x. $(x - 7)(x - 10) = x^2 - 10x - 7x + 70 = x^2 - 17x + 70$ [1].

Ask: How many multiplications do we need for (x + 5)(x + 10)? (Four, each term in the first bracket times each term in the second [1].) · What happens to -7 times -10? (+70, because negative times negative gives positive.) · What do we do with 10x + 5x? (Collect like terms to get 15x [2].)

Check understanding: Whiteboard hinge: expand (x + 2)(x + 4). Expect $x^2 + 6x + 8$. Reteach missed products if needed.

Support: Give a grid with row and column headings already written in, so students only do the four multiplications [2]. **Stretch:** Try the same grid layout with larger coefficients and minus signs in both brackets.

Use: Slides 6-7, Video clip 1 (0:00-1:53)

20–32 min **Practise double brackets** 12 min · Pairs

Practise expanding two binomials including squares and opposites.

YOU DO

1. Show Slide 9 Your task: Expand (x+2)(x+4), (x+5)(x-1) and (2x-3)(x+1).
2. Hand out Worksheet Task B and explain to expand each pair and collect like terms.
3. Circulate, marking for four products shown and signs kept.
4. Stop class to model (2x - 3)(x + 1) fully before they continue.

STUDENTS DO

1. Work in pairs on Slide 9 first bullet and Worksheet Task B.
2. Write four-term line before simplified answer for each question.
3. Check answers by comparing grids and discussing sign differences.

Say: Work in pairs. Write all four products first, then collect like terms. Talk about which pair gave each term. If you finish the first three, expand (x + 3) squared and (x + 3)(x - 3).

Worked example: (2x - 3)(x + 1) = $2x^2 + 2x - 3x - 3 = 2x^2 - x - 3$ [1]. Each term in the first bracket has multiplied each term in the second [1]. (x + 6)(x - 6) = $x^2 - 6x + 6x - 36 = x^2 - 36$ [1].

Ask: How do you expand (x + 3) squared? (Write as (x + 3)(x + 3) to give $x^2 + 6x + 9$ [13].) · Why does (x + 3)(x - 3) have no middle term? (Middle terms cancel: +3x - 3x = 0, leaving $x^2 - 9$ [13].)

Check understanding: Pairs hold up final answers for (x + 5)(x - 1). Expect $x^2 + 4x - 5$. Correct missing products as a class.

Support: Allow use of the grid method as a visual alternative, writing terms on the side and top [12]. **Stretch:** Predict (a + b)(a - b) without full working as $a^2 - b^2$, then check by expanding [18].

Use: Slide 9, Worksheet Task B

32–50 min **Triple Bracket Tower** 18 min · Groups

Expand products of three binomials by expanding two brackets at a time.

YOU DO

1. Show Slide 8 and play Video clip 2 (0:00-4:08): See why we expand two brackets first.
2. Show Slide 10 steps: Multiply each term in first bracket by each in second, then for three brackets simplify first.
3. Model (x - 2)(x + 6)(x - 3) in two stages on the board with no technology, only on paper.
4. Set Worksheet Task C and the Slide 9 challenge (x+1)(x+2)(x+3) in stages.

STUDENTS DO

1. Copy the two stages for (x - 2)(x + 6)(x - 3) step by step.
2. Work in threes on Worksheet Task C: expand two brackets, simplify, multiply by last bracket.
3. Attempt challenge (x+1)(x+2)(x+3) and compare order of pairs.

Say: To expand three brackets, first expand and simplify two of the brackets, then multiply the result by the remaining bracket [2]. If you have to expand more than two sets of brackets, just expand them two at a time [14]. Show two clear stages and collect like terms at each stage [2].

Worked example: (x - 2)(x + 6) = x^2 + 6x - 2x - 12, collect to x^2 + 4x - 12 [2]. Then multiply every term by (x - 3): (x^2 + 4x - 12)(x - 3) = x^3 - 3x^2 + 4x^2 - 12x - 12x + 36 = x^3 + x^2 - 24x + 36. Look for the x cubed term.

Ask: What is the first step for three brackets? (Expand and simplify two brackets first, then multiply by the last bracket [2].) · After (x - 2)(x + 6) gives x^2 + 4x - 12, what next? (Multiply every term in x^2 + 4x - 12 by every term in (x - 3).)

Check understanding: Check strips show simplified quadratic from first two brackets, then final cubic. If stage two is missing terms, remodel multiplying each term.

Support: Give the expanded quadratic from the first two brackets so students only have to do the final single-bracket style multiplication of each term [2]. **Stretch:** Try changing the order and check you still get the same final answer, expanding a different pair first.

Use: Slide 8, Video clip 2 (0:00-4:08), Slide 10, Worksheet Task C

50–60 min **Plenary** 10 min · Whole class

Check key patterns and errors for double and triple brackets.

YOU DO

1. Show Slide 12 True or false?: (x+2)(x+3) = x² + 5x + 6, (x+3)² = x² + 9, (x+3)(x-3) = x² - 9.
2. Ask pairs to vote true or false and explain with full working.
3. Confirm (x+3)² must be expanded as (x+3)(x+3) to get x² + 6x + 9 [13].
4. Set exit ticket and preview next lesson on factorising.

STUDENTS DO

1. Vote true or false and give reasons with four-term working.
2. Correct the false statement (x+3)² = x² + 9 on whiteboards.
3. Answer three exit questions on paper.

Say: Decide in pairs. True or false? Show me the four products to prove it. Remember, 2x + 3x makes 5x. Middle terms cancel when we have +3x - 3x = 0.

Worked example: (x + 3)(x - 3) = x² - 3x + 3x - 9 = x² - 9. The pattern is (a + b)(a - b) = a² - b² [18].

Ask: Is (x + 2)(x + 3) = x² + 5x + 6 true? (True, four products give x² + 2x + 3x + 6.) · Is (x + 3)² = x² + 9 true? (False, expand (x+3)(x+3) to get x² + 6x + 9 [13].)

Check understanding: Whiteboard vote on all three statements. If (x+3)² error remains, re-model FOIL for squares.

Support: Show the four-term line before simplifying, so students can see -6x + 6x cancelling [1]. **Stretch:** Ask students to invent a tricky but plausible wrong answer for a partner to correct.

Use: Slide 12

Common mistakes

Mistake	How to spot it	How to fix it
Squaring each term: (x + 3)² = x² + 9	Missing middle term 6x in answer	Always expand as (x + 3)(x + 3) to get x² + 6x + 9 [13].
Only making two products: (x + 2)(x + 5) = x² + 10	Answer has no x term and only one number part	Multiply every term in first bracket by every term in second to get x² + 7x + 10 [13].
Sign slip with negatives, e.g. -2(x - 5) = -2x - 10	Second sign stays negative after multiplying by negative	Remember negative times negative is positive, so -2(x - 5) = -2x + 10 [3].

Support

- Give the expanded quadratic from the first two brackets so students only have to do the final single-bracket style multiplication of each term [2].
- Provide a 2 by 2 grid with headings filled so students only do four multiplications before collecting like terms [2].

Stretch

- Try changing the order and check you still get the same final answer, expanding a different pair first.
- Predict answers for (x + a)(x - a) as x² - a² then check by full expansion [18].

For the LSE or teaching assistant

Stay with target pairs in stages 3-4. Prompt four products with arrows, check signs, provide pre-filled grid and pre-simplified quadratic for triple task.

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Check for understanding

Question	Answer
Expand and simplify (x + 4)(x + 7).	$x^2 + 11x + 28$
Expand and simplify $(x + 3)^2$.	$x^2 + 6x + 9$
Show first stage of (x + 1)(x + 2)(x + 3).	(x + 1)(x + 2) = $x^2 + 3x + 2$, then multiply by (x + 3).

Homework

Expand (x + 5)(x + 3) and (x + 2)(x + 3)(x + 1), showing two clear stages.

Sources

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