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GCSE Maths Intervention Pack

Expanding Triple Brackets

Grade 7

Teacher Notes

Question Sets

Set 1: Expanding brackets in the form $(ax + b)(cx + d)(ex + f)$

Write an expression for the product of three brackets containing two terms each by expanding and simplifying fully.

Key words: coefficient, constant, expand, expression, multiply, powers, simplify, terms, triple brackets

Set 2: Expanding brackets in the form $(ax + b)^2(cx + d)$ or $(ax + b)^3$

Write an expression for the product of three brackets, with one repeated bracket, containing two terms each, by expanding and simplifying fully.

Key words: coefficient, constant, expand, expression, multiply, powers, simplify, terms, triple brackets

Set 3: Expanding triple brackets in context

Write a fully simplified expression for the product of three expressions written in brackets, in real-life contexts.

Key words: coefficient, constant, expand, expression, multiply, powers, simplify, terms, triple brackets



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Gabriel Ogbeifun,
Head of Mathematics, Regent High School

Slide 1: Cover Slide

Teaching Prompts

- What has Sam done wrong? (He hasn't written the brackets out 3 times to expand them, instead he has just cubed the x and cubed the 2)
-

Teacher Reference Only

Training video

Common Misconceptions

- Many students may think that $(x + a)^2 = x^2 + a^2$ instead of the correct format $(x + a)(x + a)$
 - Students forget to multiply all terms.
 - Students get confused by operations with negative numbers.
 - Students confuse multiplying the terms by addition or subtraction due to the symbol that appears within the brackets.
 - Some student struggle with collecting like terms
 - Students mistake the correct power of ' x ' when multiplying terms
-

Terminology

- Expression: A combination of numbers and letters (variables) that are written together using the four operations (+ - \times and \div)
 - Expand: Multiplying an expression within a set of brackets by another expression, to remove the brackets.
-

Slide 2: Try this exam-style question...

Set 1: Expanding brackets in the form

$$(ax + b)(cx + d)(ex + f).$$

Teaching Prompts

- Can you try this question by yourself?
-

If Stuck

- Move on to the next slide.
-

Mark Scheme

Allow full marks for any other correct method that leads to final answer

- (1 mark) Three out of four terms correct in from any double bracket expansion $(x^2 - 3x + 2x - 6)$
 - (1 mark) Four out of 6 terms from expanding quadratic with remaining bracket
 - (1 mark) Correct expansion $2x^3 + 3x^2 - 17x - 30$.
-

Watch out for

- Students forget to multiply all terms.
- Students get confused by operations with negative numbers.
- Students confuse multiplying the terms by addition or subtraction due to the symbol that appears within the brackets.
- Some student struggle with collecting like terms
- Students mistake the correct power of 'x' when multiplying terms

Slide 3: Let's go through it together...

Set 1: Expanding brackets in the form $(ax+b)(cx+d)(ex+f)$.

Teaching Prompts

- Can you fill in the first multiplication grid multiplying the first two sets of brackets and collect the terms? $(x^2 - x - 6)$
- Can you fill in the second multiplication grid and get 6 terms?

Answers

1 Expand the first two brackets and simplify.

×	x	-3
x	x^2	$-3x$
$+2$	$+2x$	-6

$$= x^3 - 3x + 2x - 6$$

$$= x^2 - x - 6$$

2 Now multiply by the third bracket and simplify.

×	x^2	$-x$	-6
$2x$	$2x^3$	$-2x^2$	$-12x$
$+5$	$+5x^2$	$-5x$	-30

$$= 2x^3 - 2x^2 + 5x^2 - 12x - 5x - 30$$

$$= 2x^3 + 3x^2 - 17x - 30$$

Mark Scheme

Allow full marks for any other correct method that leads to final answer

- (1 mark) Three out of four terms correct in from any double bracket expansion.
- (1 mark) Four out of 6 terms from expanding quadratic with remaining bracket
- (1 mark) Correct expansion $2x^3 + 3x^2 - 17x - 30$.

Slide 4: Your turn...

Set 1: Expanding brackets in the form $(ax+b)(cx+d)(ex+f)$.

Teaching Prompts

- Can you draw grids to help you with this?
-

Answers

$$(x-2)(3x+1) = 3x^2 - 5x - 2$$

$$(3x^2 - 5x - 2)(2x - 3) = 6x^3 - 9x^2 - 10x^2 + 15x - 4x + 6 = 6x^3 - 19x^2 + 11x + 6$$

Mark Scheme

Allow full marks for any other correct method that leads to final answer

- (1 mark) three out of four terms correct in from any double bracket expansion.
- (1 mark) Four out of 6 terms from expanding quadratic with remaining bracket
- (1 mark) Correct expansion $6x^3 - 19x^2 + 11x + 6$.

Slide 5: Try this exam-style question...

Set 2: Expanding brackets in the form

$(ax + b)^2(cx + d)$ or $(ax + b)^3$.

Teaching Prompts

- Can you try this question by yourself?
-

If Stuck

- Move on to the next slide.
-

Mark Scheme

Allow full marks for any other correct method that leads to final answer

- (1 mark) Three out of four terms correct in from any double bracket expansion
 - (1 mark) Four out of 6 terms from expanding quadratic with remaining bracket
 - (1 mark) Correct expansion $12x^3 + 16x^2 - 33x - 45$.
-

Watch out for

- Many students may think that $(x + a)^2 = x^2 + a^2$ instead of the correct format $(x + a)(x + a)$
- Students forget to multiply all terms.
- Students get confused by operations with negative numbers.
- Students confuse multiplying the terms by addition or subtraction due to the symbol that appears within the brackets.
- Some student struggle with collecting like terms
- Students mistake the correct power of 'x' when multiplying terms

Slide 6: Let's go through it together...

Set 2: Expanding brackets in the form $(ax+b)^2(cx+d)$ or $(ax+b)^3$.

Teaching Prompts

- Can you use the grids to multiply the brackets?

Answers

- Rewrite the expression as a product without indices.

$$(2x + 3)^2(3x - 5) = (2x + 3)(2x + 3)(3x - 5)$$

- Rewrite the expression as a product without indices.

×	$2x$	$+3$
$2x$	$4x^2$	$+6x$
$+3$	$+6x$	$+9$

$$= 4x^2 + 6x + 6x + 9$$

$$= 4x^2 + 12x + 9$$

- Now multiply by the third bracket and simplify.

×	$4x^2$	$+12x$	$+9$
$3x$	$12x^3$	$+36x^2$	$+27x$
-5	$-20x^2$	$-60x$	-45

$$= 12x^3 + 36x^2 - 20x^2 + 27x - 60x - 45$$

$$= 12x^3 + 16x^2 - 33x - 45$$

Mark Scheme

Allow full marks for any other correct method that leads to final answer

- (1 mark) three out of four terms correct in from any double bracket expansion
- (1 mark) Four out of 6 terms from expanding quadratic with remaining bracket
- (1 mark) Correct expansion $12x^3 + 16x^2 - 33x - 45$.

Slide 7: Your turn...

Set 2: Expanding brackets in the form $(ax+b)^2(cx+d)$ or $(ax+b)^3$.

Teaching Prompts

- Can you use the grids to multiply the brackets?
-

If Stuck

- Write out 3 sets of brackets.
 - Expand the first 2 sets of brackets.
 - Multiply the quadratic by the last set of brackets.
-

Answers

$$(3x - 2)^3 = (3x - 2)(3x - 2)(3x - 2)$$

$$(9x^2 - 12x + 4)(3x - 2)$$

$$27x^3 - 54x^2 + 36x - 8$$

Mark Scheme

Allow full marks for any other correct method that leads to final answer

- (1 mark) Three out of four terms correct in from any double bracket expansion.
- (1 mark) Four out of 6 terms from expanding quadratic with remaining bracket
- (1 mark) Correct expansion $27x^3 - 54x^2 + 36x - 8$.

Slide 8: Try this exam-style question...

Set 3: Expanding triple brackets in context.

Teaching Prompts

- Can you try this question by yourself?
-

If Stuck

- Move on to the next slide.
-

Mark Scheme

Allow full marks for any other correct method that leads to final answer

- (1 mark) Three out of four terms correct in from any double bracket expansion
- (1 mark) Four out of 6 terms from expanding quadratic with remaining bracket
- (1 mark) Correct expansion $6x^3 + 23x^2 - 5x - 4$

Slide 9: Let's go through it together...

Set 3: Expanding triple brackets in context.

Teaching Prompts

- Can you use the grids to multiply the brackets?

Answers

1. Write the product.

$$(2x - 1)(3x + 1)(x + 4)$$

2. Expand the first two brackets and simplify.

×	$3x$	$+1$
$2x$	$6x^2$	$+2x$
-1	$-3x$	-1

$$= 6x^2 + 2x - 3x - 1$$

$$= 6x^2 - x - 1$$

Slide 10: Let's go through it together...

Set 3: Expanding triple brackets in context.

Answers

3. Now multiply by the third bracket and simplify

\times	$6x^2$	$-x$	-1
x	$6x^3$	$-x^2$	$-x$
$+4$	$+24x^2$	$-4x$	-4

$$= 6x^3 - x^2 + 24x^2 - x - 4x - 4$$

$$= 6x^3 + 23x^2 - 5x - 4$$

Mark Scheme

Allow full marks for any other correct method that leads to final answer

- (1 mark) Three out of four terms correct in from any double bracket expansion
- (1 mark) Four out of 6 terms from expanding quadratic with remaining bracket
- (1 mark) Correct expansion $6x^3 + 23x^2 - 5x - 4$

Slide 11: Your turn...

Set 3: Expanding triple brackets in context.

Teaching Prompts

- How can you work out the volume of the triangular prism? (area of face x depth)
 - How do you find the area of the triangular face? ($0.5 \times \text{base} \times \text{height}$)
-

Answers

$$(x + 1)(2x - 4) = 2x^2 - 2x - 4$$

$$\text{Area of triangle} = x^2 - x - 2$$

$$\begin{aligned}\text{Volume} &= (x^2 - x - 2)(3x - 1) (\div 2) = 3x^3 - 3x^2 - x^2 - 6x + x + 2 \\ &= 3x^3 - 4x^2 - 5x + 2.\end{aligned}$$

Mark Scheme

Allow full marks for any other correct method that leads to final answer

- (1 mark) Three out of four terms correct in from any double bracket expansion
- (1 mark) Four out of 6 terms from expanding quadratic with remaining bracket
- (1 mark) Halving the expression for the volume of the prism.
- (1 mark) Correct expansion $3x^3 - 4x^2 - 5x + 2$.

Slide 12: Ready for a Challenge?

Teaching Prompts

- Can you try this question by yourself?
-

If Stuck

- Start by expanding the the first two pairs of brackets.
 - Now multiply this expression by the remaining brackets.
-

Answers

$$(x^2 + 2y)(2x - y)(3x + y^2)$$

$$(2x^3 - x^2y + 4xy - 2y^2)(3x + y^2)$$

$$6x^4 + 2x^3y^2 - 3x^3y - x^2y^3 + 12x^2y + 4xy^3 - 6xy^2 - 2y^4$$

Mark Scheme

Allow full marks for any other correct method that leads to final answer

- (1 mark) Expands pair of double bracket with 3 out of 4 terms correct
- (1 mark) Correct expansion for double brackets
- (1 mark) 6 out of 8 correct terms for triple brackets
- (1 mark) Fully correct answer $6x^4 + 2x^3y^2 - 3x^3y - x^2y^3 + 12x^2y + 4xy^3 - 6xy^2 - 2y^4$

Slide 13: What have we learnt?

Teaching Prompts

- Can you see where the student has gone wrong? (the have not expanded the first two set of brackets correctly)
- What should they have done instead?

×	x	$+2$
x	x^2	$+2x$
$+1$	$+x$	$+2$

$$x^2 + 3x + 2$$

×	x^2	$+3x$	$+2$
x	x^3	$+3x^2$	$+2x$
-3	$+3x^2$	$+9x$	$+6$

$$x^3 + 6x^2 + 11x + 6$$

- Can you see where the student has gone wrong? (they have double the terms in the first bracket instead of squaring)
- What should they have done instead?

×	x	-2
x	x^2	$-2x$
-2	$-2x$	$+4$

$$x^2 - 4x + 4$$

×	x^2	$-4x$	$+4$
$3x$	$3x^3$	$-12x^2$	$+12x$
-4	$-4x^2$	$+16x$	-16

$$3x^3 - 16x^2 + 28x - 16$$

Expanding Triple Brackets

What is wrong with this answer?

Sam expanded $(x + 2)^3$ and got $x^3 + 8$.

What has he done wrong?

Try this exam-style question...

Expand and simplify $(x + 2)(x - 3)(2x + 5)$

Expand and simplify $(x + 2)(x - 3)(2x + 5)$

To expand triple brackets we first multiply the first two brackets together.
We then multiply every term in this new expression by every term in the third bracket.

1 Expand the first two brackets and simplify.

\times	x	$- 3$
x		
$+ 2$		

$=$

$=$

2 Now multiply by the third bracket and simplify.

\times			
$2x$			
$+ 5$			

$=$

$=$

.....

Your turn...

Expand and simplify $(x - 2)(3x + 1)(2x - 3)$

Try this exam-style question...

Expand and simplify $(2x + 3)^2(3x - 5)$

Expand and simplify $(2x + 3)^2(3x - 5)$

To expand brackets with indices, we need to rewrite them as a **product**.

1 Rewrite the expression as a product without indices.

$$(2x + 3)^2(3x - 5) = (\quad)(\quad)(\quad)$$

2 Rewrite the expression as a product without indices.

×		

=
.....

=
.....

3 Now multiply by the third bracket and simplify.

×			

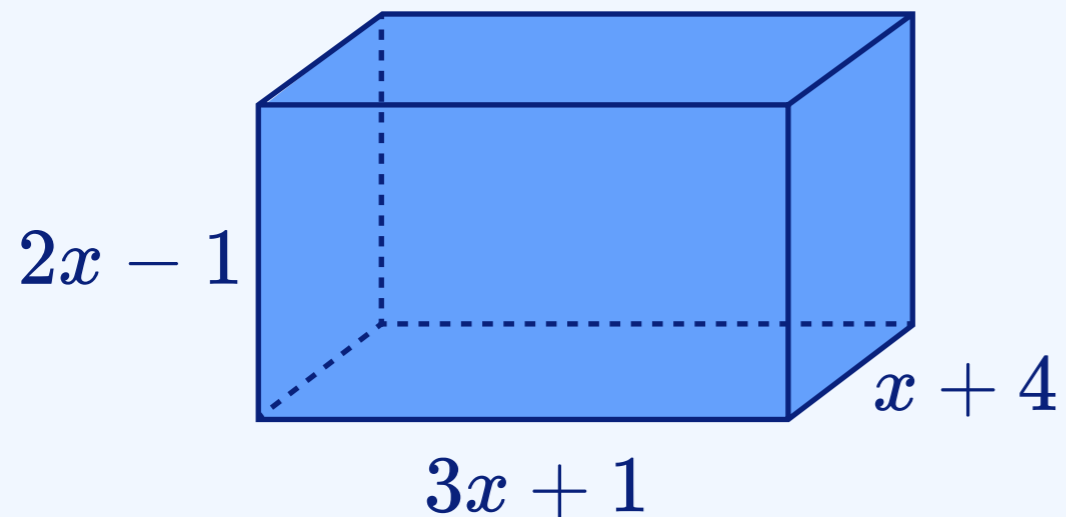
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Your turn...

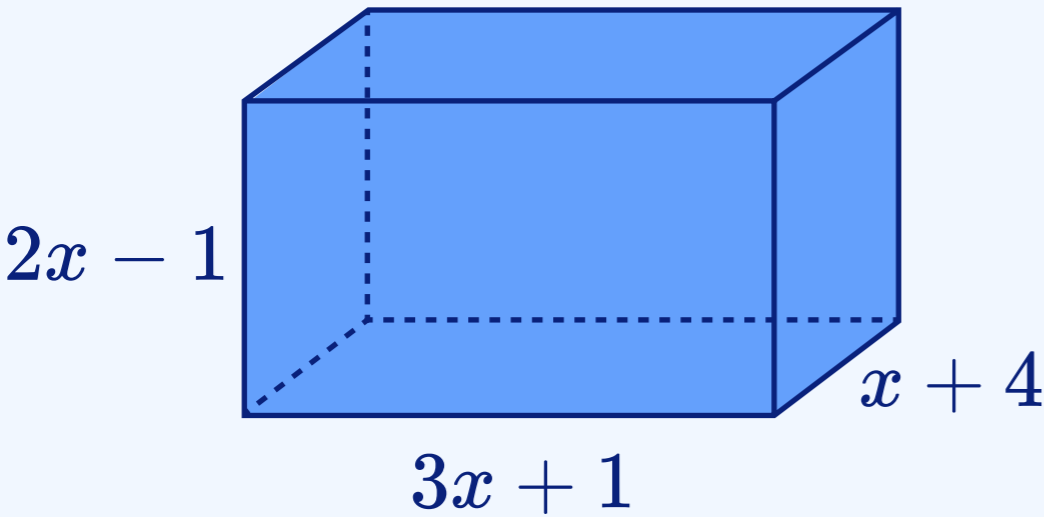
Expand and simplify $(3x - 2)^3$

A cuboid has the dimensions shown in the diagram.



Find an expression for the volume of the cuboid.

A cuboid has the dimensions shown in the diagram.



Find an expression for the volume of the cuboid.

We may need to expand brackets in context.
The volume of a cuboid is the product of its length, width and height.

1 Write the product.

$(\quad)(\quad)(\quad)$
.....

2 Expand the first two brackets and simplify.

×		

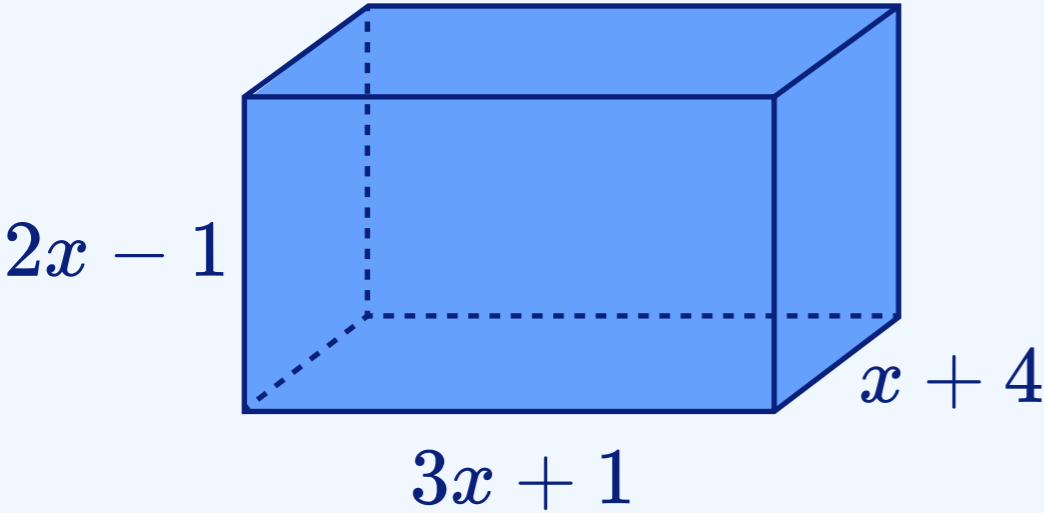
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Let's go through it together...

A cuboid has the dimensions shown in the diagram.



Find an expression for the volume of the cuboid.

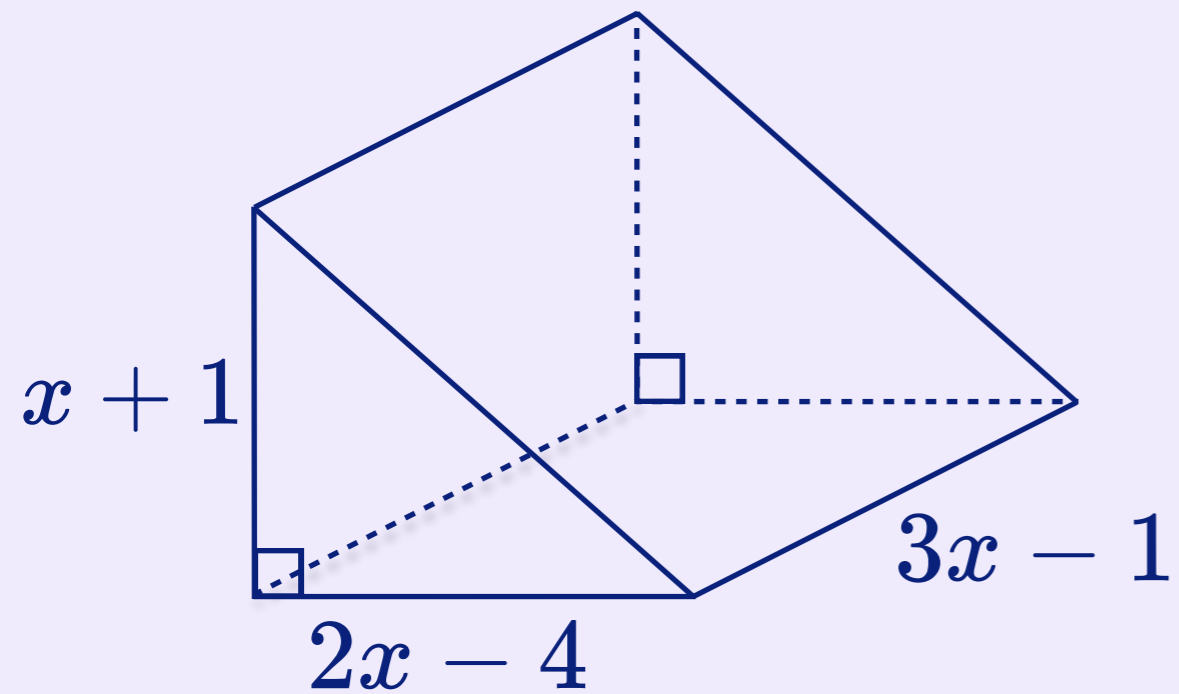
3 Now multiply by the third bracket and simplify.

×			

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A triangular prism has the dimensions shown in the diagram.



Find an expression for the volume of the triangular prism.

Expand and simplify $(x^2 + 2y)(2x - y)(3x + y^2)$

Can you correct the answers to the questions below?

Expand and simplify

$$(x + 1)(x + 2)(x + 3)$$

$$(x^2 + 2)(x + 3)$$

$$x^3 + 3x^2 + 2x + 6$$

Expand and simplify

$$(x - 2)^2(3x - 4)$$

$$(2x - 4)(3x - 4)$$

$$6x^2 - 8x - 12x + 16$$

$$6x^2 - 20x + 16$$

Where to go next?

For more diagnostic questions, and GCSE maths revision resources and worksheets to support students in fixing any misconceptions take a look at the free Third Space Learning [GCSE maths revision](#) pages.

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