

<b>Key Stage 4</b>	<b>Name</b>
<b>Year 10 Group ___/H</b>	
<b>Autumn Term 1</b>	<b><u>Expanding brackets</u></b>
<b>Week 5</b>	

<b>Week</b>	<b>Lesson</b>	<b>Title</b>	<b>Progress</b>	<b>Attainment</b>	<b>Online Links</b>	
					<b>Presentation</b>	<b>YouTube Video</b>
5	13	Expanding double brackets			Slides 02 – 23	
5	14	Expanding triple brackets (1)			Slides 24 – 44	
5	15	Expanding triple brackets (2)			Slides 45 - 65	

## Expanding double brackets

Question	Method	Answer									
<p>1. Expand and simplify.</p> $(3x + 1)(2x + 3)$	<p>a.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td style="text-align: center;">2x</td> <td style="text-align: center;">+5</td> </tr> <tr> <td style="text-align: center;">4x</td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">+7</td> <td></td> <td></td> </tr> </table>		2x	+5	4x			+7			<p>A.</p> $15x^2 + 31x + 10$
	2x	+5									
4x											
+7											
<p>2. Expand and simplify.</p> $(4x + 3)(x + 5)$	<p>b.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> </tr> </table>										<p>B.</p> $6x^2 + 11x + 3$ ✓
<p>3. Expand and simplify.</p> $(2x + 5)(4x + 7)$	<p>c.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td style="text-align: center;">3x</td> <td style="text-align: center;">+1</td> </tr> <tr> <td style="text-align: center;">2x</td> <td style="text-align: center;"><math>6x^2</math></td> <td style="text-align: center;">2x</td> </tr> <tr> <td style="text-align: center;">+3</td> <td style="text-align: center;">9x</td> <td style="text-align: center;">3</td> </tr> </table>		3x	+1	2x	$6x^2$	2x	+3	9x	3	<p>C.</p>
	3x	+1									
2x	$6x^2$	2x									
+3	9x	3									
<p>4. Expand and simplify.</p> $(6x + 5)(x + 3)$	<p>d.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td style="text-align: center;"><math>15x^2</math></td> <td style="text-align: center;">6x</td> </tr> <tr> <td></td> <td style="text-align: center;">25x</td> <td style="text-align: center;">10</td> </tr> </table>					$15x^2$	6x		25x	10	<p>D.</p> $4x^2 + 23x + 15$
	$15x^2$	6x									
	25x	10									
<p>5. Expand and simplify.</p>	<p>e.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td style="text-align: center;">4x</td> <td style="text-align: center;">+3</td> </tr> <tr> <td style="text-align: center;">x</td> <td style="text-align: center;"><math>4x^2</math></td> <td style="text-align: center;">3x</td> </tr> <tr> <td style="text-align: center;">+5</td> <td style="text-align: center;">20x</td> <td style="text-align: center;">15</td> </tr> </table>		4x	+3	x	$4x^2$	3x	+5	20x	15	<p>E.</p> $6x^2 + 23x + 15$
	4x	+3									
x	$4x^2$	3x									
+5	20x	15									

" It's all a bit of a mix up... "

## Expanding double brackets

Example 2a.

Expand and simplify.

$$(3x - 5)(5x - 3)$$

Example 2b.

Expand and simplify.

$$(2x - 3)(4x - 5)$$

Example 2c.

Expand and simplify.

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

Example 3a.

Expand and simplify.

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

## Expanding double brackets

2a. Expand and simplify.

$$(4x - 1)(5x - 3)$$

2b. Expand and simplify.

$$(2x - 7)(3x - 4)$$

3a. Expand and simplify.

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

3b. Expand and simplify.

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

4a. Expand and simplify.

$$(4x - 3)^2 + 2x(3x + 5)$$

4b. Expand and simplify.

$$(3x - 2)(3x + 2) + (2x + 7)(x - 1)$$

## Expanding double brackets

2c. Expand and simplify.

$$(2x - 7)^2$$

2d. Expand and simplify.

$$(9 - 5x)(2x - 1)$$

3c. Expand and simplify.

$$(4x + 5)(4x - 5)$$

3d. Expand and simplify.

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

4c. Expand and simplify.

$$(4x + 1)(x - 5) - 3x(x - 5)$$

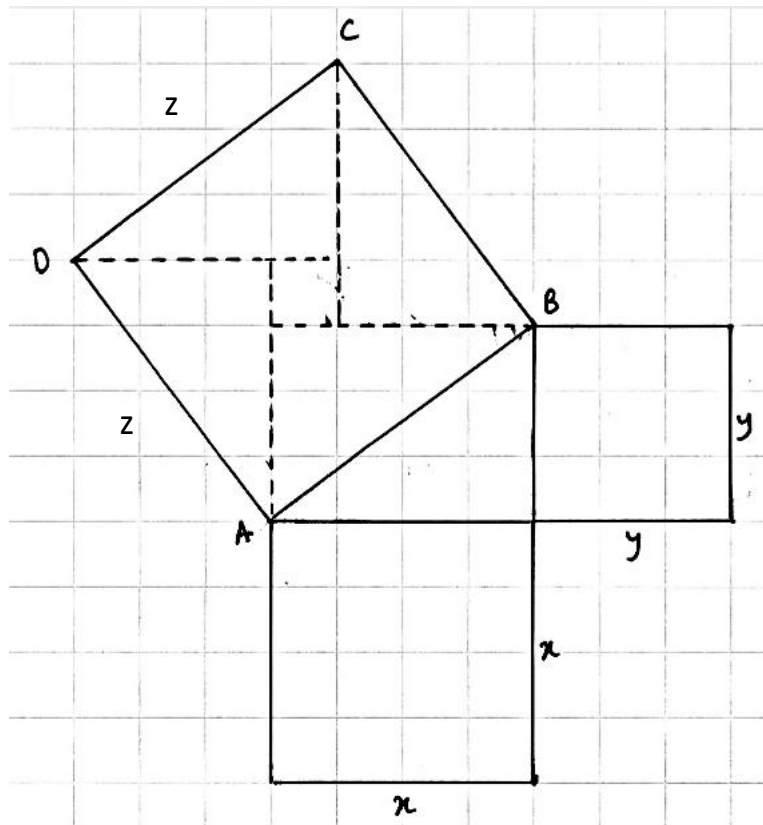
4d. Expand and simplify.

$$(2x - 5)(4x + 3) - (2x - 3)^2$$

## Expanding double brackets

Extension.

Prove Pythagoras' Theorem!



Hint: Form an expression in  $x$  and  $y$  for the area of  $ABCD$  and then expand and simplify the double brackets.

## LESSON 13: Expanding double brackets

1. Expand and simplify.

$$(4x + 3)(3x + 7)$$

2. Expand and simplify.

$$(5x - 3)(2x - 3)$$

3. Expand and simplify.

$$(2x - 5)(2x + 5)$$

4. Expand and simplify.

$$(5x - 4)^2 - 4x(3x - 2)$$

## Expanding triple brackets (1)

Question	Method	Answer	" The dog ate my homework..." "												
1. Expand and simplify.  $(x + 3)(x^2 + 4x + 2)$	a. <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <tr> <td></td> <td><math>x^2</math></td> <td><math>4x</math></td> <td><math>2</math></td> </tr> <tr> <td><math>x</math></td> <td><math>x^3</math></td> <td><math>4x^2</math></td> <td><math>2x</math></td> </tr> <tr> <td><math>3</math></td> <td><math>3x^2</math></td> <td><math>12x</math></td> <td><math>6</math></td> </tr> </table>			$x^2$	$4x$	$2$	$x$	$x^3$	$4x^2$	$2x$	$3$	$3x^2$	$12x$	$6$	A.  $x^3 + 7x^2 + 14x + 6$  
	$x^2$	$4x$		$2$											
$x$	$x^3$	$4x^2$		$2x$											
$3$	$3x^2$	$12x$		$6$											
2. Expand and simplify.  $(x + 5)(x^2 + 3x + 4)$	b. <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <tr> <td></td> <td><math>x^2</math></td> <td><math>3x</math></td> <td><math>4</math></td> </tr> <tr> <td><math>x</math></td> <td><math>x^3</math></td> <td><math>3x^2</math></td> <td><math>4x</math></td> </tr> <tr> <td><math>5</math></td> <td><math>5x^2</math></td> <td><math>15x</math></td> <td><math>20</math></td> </tr> </table>		$x^2$	$3x$	$4$	$x$	$x^3$	$3x^2$	$4x$	$5$	$5x^2$	$15x$	$20$		
	$x^2$	$3x$	$4$												
$x$	$x^3$	$3x^2$	$4x$												
$5$	$5x^2$	$15x$	$20$												
3. Expand and simplify.  $(x + 1)(x^2 + 5x + 3)$		$x^3 + 6x^2 + 8x + 3$													
4. Expand and simplify.  $(x + 2)(x^2 + 1x + 4)$															
	e. <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <tr> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td><math>x^3</math></td> <td><math>2x^2</math></td> <td><math>5x</math></td> </tr> <tr> <td></td> <td><math>4x^2</math></td> <td><math>8x</math></td> <td><math>20</math></td> </tr> </table>						$x^3$	$2x^2$	$5x$		$4x^2$	$8x$	$20$	E.  $x^3 + 6x^2 + 13x + 20$	
	$x^3$	$2x^2$	$5x$												
	$4x^2$	$8x$	$20$												



## Expanding triple brackets (1)

Example 2a.  
Expand and simplify.

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

Example 2b.  
Expand and simplify.

$$(x - 4)(x^2 + x + 5)$$

Example 2c.  
Expand and simplify.

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

Example 3a.  
Expand and simplify.

$$(x - 5)(x^2 - 2x + 4)$$

## Expanding triple brackets (1)

2a. Expand and simplify.

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

2b. Expand and simplify.

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

3a. Expand and simplify.

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

3b. Expand and simplify.

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

4a. Find the missing values.

$$(x - 4)(x^2 + px + q) = x^3 - 6x^2 + rx - 12$$

4b. Find the missing values.

$$(x + 2)(x - 1)(x + p) = x^3 + qx^2 + rx + 10$$

## Expanding triple brackets (1)

2c. Expand and simplify.

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

2d. Expand and simplify.

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

3c. Expand and simplify.

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

3d. Expand and simplify.

$$(x - 2)^3$$

4c. Find the missing values.

$$(x - 3)(x + p)^2 = x^3 + qx^2 + rx - 48$$

4d. Find the missing values.

$$(x + p)^3 = x^3 + qx^2 + rx + 27$$

## Expanding triple brackets (1)

Extension.

Linear, quadratic and cubic expressions are also known as polynomials of order 1, 2 and 3 respectively. The order refers to the term with the highest power of  $x$  in the expression.

Expand and simplify.

	Final answer
$(x + a)^0$	
$(x + a)^1$	
$(x + a)^2$	
$(x + a)^3$	

Find a pattern that links the coefficients of (or “numbers before”) each term.  
Hence explain how to predict  $(x + a)^4$  without having to expand and simplify.

## LESSON 14: Expanding triple brackets (1)

1. Expand and simplify.

$$(x + 5)(x^2 + 2x + 5)$$

2. Expand and simplify.

$$(x - 5)(x + 3)(x + 1)$$

3. Expand and simplify.

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

4. Find the missing values.

$$(x + p)(x^2 + qx + 4) = x^3 + x^2 + rx + 12$$

## Expanding triple brackets (2)

Question	Method	Answer	“ Mr Hankins is having a bad day...”												
1. Expand and simplify.  $(2x + 5)(x^2 + 5x + 2)$	a. <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <tr> <td></td> <td style="text-align: center;"><math>x^2</math></td> <td style="text-align: center;"><math>5x</math></td> <td style="text-align: center;"><math>2</math></td> </tr> <tr> <td style="text-align: center;"><math>2x</math></td> <td style="text-align: center;"><math>2x^3</math></td> <td style="text-align: center;"><math>10x^2</math></td> <td style="text-align: center;"><math>4x</math></td> </tr> <tr> <td style="text-align: center;"><math>5</math></td> <td style="text-align: center;"><math>5x^2</math></td> <td style="text-align: center;"><math>25x</math></td> <td style="text-align: center;"><math>10</math></td> </tr> </table>			$x^2$	$5x$	$2$	$2x$	$2x^3$	$10x^2$	$4x$	$5$	$5x^2$	$25x$	$10$	A.  $2x^3 + 15x^2 + 29x + 10$  
	$x^2$	$5x$		$2$											
$2x$	$2x^3$	$10x^2$		$4x$											
$5$	$5x^2$	$25x$		$10$											
2. Expand and simplify.  $(x + 3)(5x^2 + x + 4)$	b. <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <tr> <td></td> <td style="text-align: center;"><math>5x^2</math></td> <td style="text-align: center;"><math>x</math></td> <td style="text-align: center;"><math>4</math></td> </tr> <tr> <td style="text-align: center;"><math>x</math></td> <td style="text-align: center;"><math>5x^3</math></td> <td style="text-align: center;"><math>x^2</math></td> <td style="text-align: center;"><math>4x</math></td> </tr> <tr> <td style="text-align: center;"><math>3</math></td> <td style="text-align: center;"><math>15x^2</math></td> <td style="text-align: center;"><math>3x</math></td> <td style="text-align: center;"><math>12</math></td> </tr> </table>			$5x^2$	$x$	$4$	$x$	$5x^3$	$x^2$	$4x$	$3$	$15x^2$	$3x$	$12$	B.  $5x^3 + \underline{\hspace{2cm}}$
	$5x^2$	$x$	$4$												
$x$	$5x^3$	$x^2$	$4x$												
$3$	$15x^2$	$3x$	$12$												
3. Expand and simplify.  $(4x + 1)(3x^2 + 2x + 5)$	c. <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <tr> <td></td> <td style="text-align: center;"><math>3x^2</math></td> <td style="text-align: center;"><math>2x</math></td> <td style="text-align: center;"><math>5</math></td> </tr> <tr> <td style="text-align: center;"><math>4x</math></td> <td style="text-align: center;"><math>7x^3</math></td> <td style="text-align: center;"><math>6x^2</math></td> <td style="text-align: center;"><math>9x</math></td> </tr> <tr> <td style="text-align: center;"><math>1</math></td> <td></td> <td></td> <td></td> </tr> </table>		$3x^2$	$2x$	$5$	$4x$	$7x^3$	$6x^2$	$9x$	$1$				C. ???	
	$3x^2$	$2x$	$5$												
$4x$	$7x^3$	$6x^2$	$9x$												
$1$															
4. Expand and simplify.  $(5x + 2)(4x^2 + 3x + 3)$	d. ???	D. ???													
5. Expand and simplify.  $(3x + 4)\underline{\hspace{2cm}}$	e. <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <tr> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> </table>													E.  $6x^3 + 17x^2 + 18x + 8$	

## Expanding triple brackets (2)

Example 2a.

Expand and simplify.

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

Example 2b.

Expand and simplify.

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

Example 2c.

Expand and simplify.

$$(4x - 3)(x + 4)(5x + 3)$$

Example 3a.

Expand and simplify.

$$(5x - 4)(2x^2 - 2x + 3)$$

## Expanding triple brackets (2)

2a. Expand and simplify.

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

2b. Expand and simplify.

$$(4x - 3)(3x^2 + 5x + 2)$$

3a. Expand and simplify.

$$(3x - 5)(2x^2 + 4x - 3)$$

3b. Expand and simplify.

$$(5x - 1)(3x^2 - 2x - 6)$$

4a. Find the missing values.

$$(px - 5)(2x^2 - x + q) = 6x^3 - 13x^2 + rx - 20$$

4b. Find the missing values.

$$(px - 3)(3x + q)(x - 1) = 12x^3 + rx^2 - 5x + 6$$



## Expanding triple brackets (2)

2c. Expand and simplify.

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

2d. Expand and simplify.

$$(x - 4)(2x + 5)^2$$

3c. Expand and simplify.

$$(4x - 5)(3x - 1)^2$$

3d. Expand and simplify.

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

4c. Find the missing values.

$$(qx - 2)(2x + p)^2 = 20x^3 + 52x^2 + rx - 18$$

4d. Find the missing values.

$$(3x + p)^3 = qx^3 + rx^2 + 36x - 8$$

## Expanding triple brackets (2)

Extension.

Linear, quadratic and cubic expressions are also known as polynomials of order 1, 2 and 3 respectively. The order refers to the term with the highest power of  $x$  in the expression.

Expand and simplify.

	Final answer
$(ax + b)^0$	
$(ax + b)^1$	
$(ax + b)^2$	
$(ax + b)^3$	

Find a pattern that links the coefficients of (or “numbers before”) each term.

Hence explain how to predict  $(ax + b)^4$  without having to expand and simplify.

## LESSON 15: Expanding triple brackets (2)

1. Expand and simplify.

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

2. Expand and simplify.

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

3. Expand and simplify.

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

4. Find the missing values.

$$(px + 5)(2x^2 - x + q) = 8x^3 + rx^2 - 17x - 15$$