EXPAND DOUBLE BRACKETS

BUILDING BLOCKS

NAME _____ CLASS _____ DATE _____

KEY IDEA

Split both numbers, then multiply every part by every part.

13 × 12

×	10	+ 3
10	100	30
+ 2	20	6

100 + 30 + 20 + 6 = 156

It works for algebra too:

$x \times x = x^2$ $2 \times x = 2x$

1 Use the grid to work out 14 × 13 and 21 × 15. Add the four parts.

a)

×	10	+ 3
10		
+ 4		

= ____

b)

×	10	+ 5
20		
+ 1		

= ____

2 Multiply.

a) x × x ____ b) 3 × x ____ c) x × 5 ____ d) 3 × 4 ____

3 These algebra tiles show (x + 2)(x + 1) in a grid.

×	x	+ 1
x	x^2	x
+ 1	x	1
+ 1	x	1

Each cell of the grid holds one part.

a) How many x^2 tiles? ____

b) How many x tiles? ____

c) How many 1 tiles? ____

d) (x + 2)(x + 1) = ____

4 Fill in the grid to expand (x + 4)(x + 9).

×	x	+ 9
x		
+ 4		

Add the four parts and collect the x terms:

$(x + 4)(x + 9) = x^2 +$ ____ $x +$ ____

EXPAND DOUBLE BRACKETS

SUPPORT

NAME _____ CLASS _____ DATE _____

KEY IDEA

Multiply every term in one bracket by every term in the other.

×	x	+ 10
x	x^2	+ 10x
+ 4	+ 4x	+ 40

$(x + 4)(x + 10)$
$= x^2 + 10x + 4x + 40$
$= x^2 + 14x + 40$

1 Complete each grid. Then expand and simplify.

a)

×	m	+ 6
m		
+ 2		

= _____

b)

×	y	+ 5
y		
+ 1		

= _____

c)

×	a	+ 1
a		
+ 7		

= _____

2 Now with negative numbers. Complete each grid, then expand and simplify.

a)

×	x	– 6
x		
+ 5		

= _____

b)

×	x	– 8
x		
– 4		

= _____

3 Draw a line to match each pair of brackets to its expansion.

$(y + 2)(y + 9)$ •	• $y^2 + 9y + 18$
$(y + 3)(y + 6)$ •	• $y^2 + 19y + 18$
$(y + 1)(y + 18)$ •	• $y^2 + 11y + 18$

4 Complete the grid to expand $(a + 3)^2$.

×	a	+ 3
a		
+ 3		

$(a + 3)^2$ means $(a + 3)(a + 3)$.

$(a + 3)^2$ = _____

EXPAND DOUBLE BRACKETS

CORE

NAME _____ CLASS _____ DATE _____

KEY IDEA

Multiply each term in the first bracket by each term in the second, then collect like terms.

$(x - 5)(x + 8) \equiv x^2 + 8x - 5x - 40 \equiv x^2 + 3x - 40$

FLUENCY

1 Expand and simplify.

a) $(x + 8)(x + 10)$

b) $(m - 6)(m + 2)$

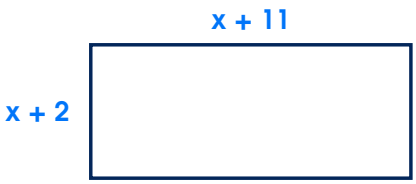
c) $(p - 5)(p - 7)$

d) $(4 + y)(y + 9)$

e) $(t - 1)^2$

f) $(k + 8)(k - 8)$

2 A rectangle measures $x + 11$ by $x + 2$.



a) Expand and simplify the area.

b) Find the area when $x = 2$.

REASONING

3 Fran says, "Expanding double brackets and simplifying always gives three terms." Show that Fran is wrong.

4 What is the same and what is different?

a) Expand $(x + 7)(x + 8)$.

b) Substitute $x = 10$ into your answer.

c) Explain how this links to 17×18.

EXPAND DOUBLE BRACKETS

GREATER DEPTH

NAME _____ CLASS _____ DATE _____

REASONING

1 Is each statement always, sometimes or never true? Circle your answer.

If it is sometimes true, give an example of when it is true and when it is not.

a) $(x + 3)^2 \equiv x^2 + 9$ — ALWAYS / SOMETIMES / NEVER

b) $(x + a)(x + b)$ has a number term of ab. — ALWAYS / SOMETIMES / NEVER

c) $(x + 5)(x - 5)$ has an x term. — ALWAYS / SOMETIMES / NEVER

d) In $(x + a)(x + b)$, the x coefficient is less than ab. — ALWAYS / SOMETIMES / NEVER

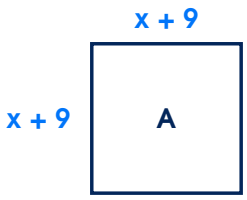
PROBLEM SOLVING

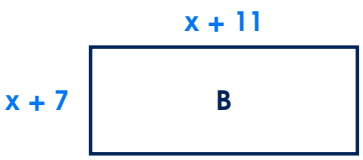
2 Fill in the missing terms. Check by expanding.

a) $(x + \square)(x + \square) \equiv x^2 + 15x + 36$

b) $(x + 9)(x + \square) \equiv x^2 + x - 72$

3 Compare the areas of square A and rectangle B.





a) Area A = _____

b) Area B = _____

c) Which shape has the larger area? By how much? Does it depend on x?

★ CHALLENGE FOR ALL

4 Three consecutive numbers are $n - 1$, n and $n + 1$.

a) Expand and simplify $(n - 1)(n + 1)$. _____

b) Use your answer to work out 29×31 without a calculator. _____

Show your method: _____

STEP 9 · EXPAND DOUBLE BRACKETS

ANSWERS

BUILDING BLOCKS

1 a) 100, 30, 40, 12, so 182 · b) 200, 100, 10, 5, so 315

2 a) x^2 · b) $3x$ · c) $5x$ · d) 12

3 a) 1 · b) 3 · c) 2 · d) $x^2 + 3x + 2$

4 x^2, $9x$, $4x$, 36, so $x^2 + 13x + 36$

SUPPORT

1 a) $m^2 + 8m + 12$ · b) $y^2 + 6y + 5$ · c) $a^2 + 8a + 7$

2 a) x^2, $-6x$, $5x$, -30, so $x^2 - x - 30$ · b) x^2, $-8x$, $-4x$, $+32$, so $x^2 - 12x + 32$

3 $(y + 2)(y + 9) \rightarrow y^2 + 11y + 18$ · $(y + 3)(y + 6) \rightarrow y^2 + 9y + 18$ · $(y + 1)(y + 18) \rightarrow y^2 + 19y + 18$

4 a^2, $3a$, $3a$, 9, so $a^2 + 6a + 9$

CORE

1 a) $x^2 + 18x + 80$ · b) $m^2 - 4m - 12$ · c) $p^2 - 12p + 35$ · d) $y^2 + 13y + 36$ · e) $t^2 - 2t + 1$ · f) $k^2 - 64$

2 a) $x^2 + 13x + 22$ · b) 52

3 e.g. $(k + 8)(k - 8) \equiv k^2 - 64$ has two terms, because $+8k$ and $-8k$ cancel

4 a) $x^2 + 15x + 56$ · b) $100 + 150 + 56 = 306$ · c) When $x = 10$, $x + 7 = 17$ and $x + 8 = 18$, so $(x + 7)(x + 8)$ is $17 \times 18 = 306$

GREATER DEPTH

1 a) Never: $(x + 3)^2 \equiv x^2 + 6x + 9$ · b) Always · c) Never: $+5x$ and $-5x$ cancel · d) Sometimes: $(x + 2)(x + 3) \equiv x^2 + 5x + 6$ (true), $(x + 1)(x + 2) \equiv x^2 + 3x + 2$ (false)

2 a) 3 and 12 (either order) · b) -8

3 a) $x^2 + 18x + 81$ · b) $x^2 + 18x + 77$ · c) A is larger by 4, for every value of x

4 a) $n^2 - 1$ · b) $n = 30$: $29 \times 31 = 30^2 - 1 = 900 - 1 = 899$