FACTORISE QUADRATIC EXPRESSIONS

BUILDING BLOCKS

NAME _____ CLASS _____ DATE _____

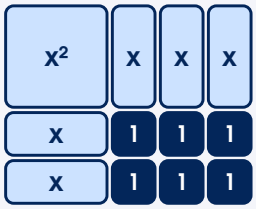
KEY IDEA

Find two numbers that multiply to make the top number and add to make the bottom number.

$3 \times 4 = 12$

$3 + 4 = 7$





$x^2 + 5x + 6$ tiles make a rectangle: $(x + 2)(x + 3)$

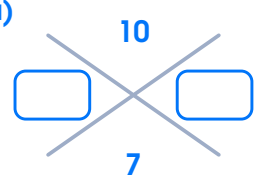
1 Write three different factor pairs for each number.

a) ☐ × ☐ = 12 ☐ × ☐ = 12 ☐ × ☐ = 12

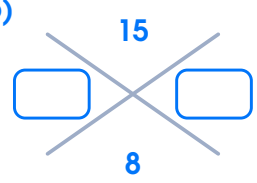
b) ☐ × ☐ = 20 ☐ × ☐ = 20 ☐ × ☐ = 20

2 Find the two missing numbers in each diagram.

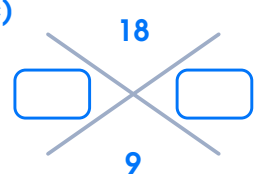
a)



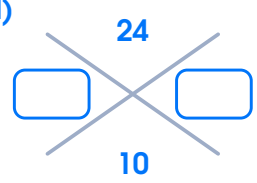
b)



c)



d)

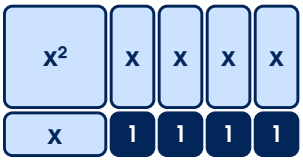


3 Warm up: complete the grid, then expand and simplify.

×	x	+ 8
x		
+ 5		

$(x + 5)(x + 8) =$ ☐

4 Factorising goes backwards: find the brackets from the tiles.



These tiles show $x^2 + 5x + 4$.

Count along the top and down the side.

$x^2 + 5x + 4 = (x +$ ☐ $)(x +$ ☐ $)$

FACTORISE QUADRATIC EXPRESSIONS

SUPPORT

NAME _____ CLASS _____ DATE _____

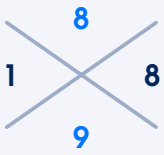
KEY IDEA

$x^2 + 9x + 8$

Which two numbers multiply to make 8 and add to make 9?

1 and 8, so $x^2 + 9x + 8 = (x + 1)(x + 8)$

Check by expanding.



1 Complete the table.

MULTIPLY TO MAKE	ADD TO MAKE	THE TWO NUMBERS
6	5	
14	9	
16	10	
20	12	

2 Factorise.

a) $x^2 + 12x + 11$ ____

b) $x^2 + 11x + 18$ ____

c) $x^2 + 12x + 20$ ____

d) $x^2 + 13x + 30$ ____

3 Complete the grid to factorise $x^2 + 12x + 27$.

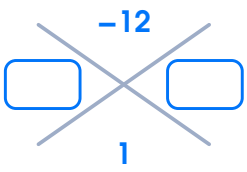
×	x	
x	x^2	
		27

Two numbers that multiply to 27 and add to 12.

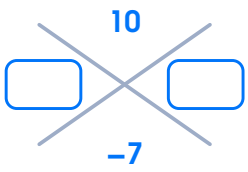
$x^2 + 12x + 27 =$ ____

4 Negative numbers: find the two missing numbers.

a)



b)



c) Factorise $x^2 + x - 12$.

____

FACTORISE QUADRATIC EXPRESSIONS

CORE

NAME _____ CLASS _____ DATE _____

KEY IDEA

For $x^2 + bx + c$, find two numbers with a product of c and a sum of b.

$x^2 - x - 42$: $-7 \times 6 = -42$ and $-7 + 6 = -1$, so $x^2 - x - 42 \equiv (x - 7)(x + 6)$

FLUENCY

1 Factorise.

a) $x^2 + 13x + 42$ ☐

b) $x^2 - 13x + 40$ ☐

c) $x^2 + 5x - 24$ ☐

d) $x^2 - 2x - 35$ ☐

e) $k^2 - 10k + 25$ ☐

f) $w^2 - 100$ ☐

2 Write + or – in each box.

a) $x^2 - 14x + 48 \equiv (x \square 8)(x \square 6)$

b) $x^2 + 4x - 45 \equiv (x \square 9)(x \square 5)$

c) $x^2 - 4x - 45 \equiv (x \square 9)(x \square 5)$

REASONING

3 Kim says, "$x^2 + 3x - 28 \equiv (x + 4)(x - 7)$."

a) Explain her mistake. .....

b) Factorise $x^2 + 3x - 28$ correctly. ☐

4 Can $x^2 + 5x + 8$ be factorised using whole numbers? Explain how you know.

.....

.....

FACTORISE QUADRATIC EXPRESSIONS

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) If c is positive, the signs in both brackets are the same. ALWAYS SOMETIMES NEVER

b) If c is negative, the signs in the brackets are different. ALWAYS SOMETIMES NEVER

c) $x^2 + bx + 16$ can be factorised using whole numbers. ALWAYS SOMETIMES NEVER

d) $x^2 + 9 \equiv (x + 3)(x - 3)$ ALWAYS SOMETIMES NEVER

PROBLEM SOLVING

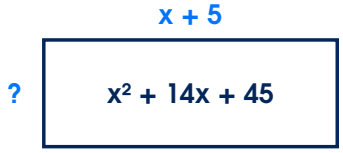
2 $x^2 + bx + 12$ can be factorised into two brackets with whole numbers.

Find every whole-number value of b. Write each factorised expression.

3 This rectangle has area $x^2 + 14x + 45$.

a) Find the missing side length.

b) Find the perimeter. Simplify.



★ CHALLENGE FOR ALL

4 Going further.

a) Factorise fully $2x^2 + 14x + 24$.

Hint: take out a common factor first.

b) Use $(a + b)(a - b) \equiv a^2 - b^2$ to work out $53^2 - 47^2$ without a calculator.

STEP 10 · FACTORISE QUADRATIC EXPRESSIONS

ANSWERS

BUILDING BLOCKS

1. a) 1 × 12, 2 × 6, 3 × 4 · b) 1 × 20, 2 × 10, 4 × 5 (any order)
2. a) 2 and 5 · b) 3 and 5 · c) 3 and 6 · d) 4 and 6
3. x^2, 8x, 5x, 40, so $x^2 + 13x + 40$
4. $(x + 1)(x + 4)$

SUPPORT

1. 2 and 3 · 2 and 7 · 2 and 8 · 2 and 10
2. a) $(x + 1)(x + 11)$ · b) $(x + 2)(x + 9)$ · c) $(x + 2)(x + 10)$ · d) $(x + 3)(x + 10)$
3. Headers + 3 and + 9 (either way round); cells 3x and 9x; so $(x + 3)(x + 9)$
4. a) 4 and –3 · b) –2 and –5 · c) $(x + 4)(x – 3)$

CORE

1. a) $(x + 6)(x + 7)$ · b) $(x – 5)(x – 8)$ · c) $(x + 8)(x – 3)$ · d) $(x – 7)(x + 5)$ · e) $(k – 5)(k – 5)$ or $(k – 5)^2$ · f) $(w + 10)(w – 10)$
2. a) –, – · b) +, – · c) –, +
3. a) $(x + 4)(x – 7)$ expands to $x^2 – 3x – 28$: the signs are the wrong way round, so the x term is –3x instead of +3x · b) $(x + 7)(x – 4)$
4. No: the factor pairs of 8 are 1 and 8 (sum 9) and 2 and 4 (sum 6), and the negative pairs give negative sums, so no pair adds to 5

GREATER DEPTH

1. a) Always · b) Always · c) Sometimes: b = 8 gives $(x + 4)^2$, b = 9 cannot be factorised · d) Never: $(x + 3)(x – 3) \equiv x^2 – 9$
2. b = 7: $(x + 3)(x + 4)$ · b = 8: $(x + 2)(x + 6)$ · b = 13: $(x + 1)(x + 12)$ · b = –7: $(x – 3)(x – 4)$ · b = –8: $(x – 2)(x – 6)$ · b = –13: $(x – 1)(x – 12)$
3. a) x + 9 · b) $2(x + 5) + 2(x + 9) = 4x + 28$
4. a) $2(x + 3)(x + 4)$ · b) $(53 + 47)(53 – 47) = 100 \times 6 = 600$