EQUATIONS AND INEQUALITIES WITH BRACKETS

BUILDING BLOCKS

NAME _____ CLASS _____ DATE _____

KEY IDEA

3(x + 2) means 3 lots of (x + 2).

3(x + 2)					
x	2	x	2	x	2

= x + x + x + 2 + 2 + 2 = 3x + 6

Multiply EVERYTHING inside the bracket by the number outside.

1 Use the bar model to expand the bracket.

a)

2(y + 5)			
y	5	y	5

2(y + 5) = ☐y + ☐

b)

4(m + 1)							
m	1	m	1	m	1	m	1

4(m + 1) = ☐m + ☐

2 Use the grid to expand the bracket. Multiply the number outside by each term.

a)

	x	+ 3
5	☐	☐

5(x + 3) = ☐

b)

	4p	– 1
2	☐	☐

2(4p – 1) = ☐

3 The bar model shows 2(x + 3) = 14. Find each part, then find x.

14	
x + 3	x + 3

Each part: x + 3 = ☐

So x = ☐

4 Divide by the number outside the bracket first. Fill in the boxes.

a)

3(x + 4) = 27

÷ 3

x + 4 = ☐ ☐

– 4

x = ☐ ☐

b)

2(x + 1) > 10

÷ 2

x + 1 > ☐ ☐

– 1

x > ☐ ☐

EQUATIONS AND INEQUALITIES WITH BRACKETS

SUPPORT

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KEY IDEA

Method A: expand first

$4(m + 2) = 28$ is $4m + 8 = 28$

$4m + 8 = 28$ (− 8, ÷ 4)

$4m = 20$ (− 8, ÷ 4)

$m = 5$

Method B: divide first

$4(m + 2) = 28$ (÷ 4, − 2)

$m + 2 = 7$ (÷ 4, − 2)

$m = 5$

1 Expand each bracket.

a) $3(x + 5)$ _____

b) $6(2y - 1)$ _____

c) $4(3 + 2k)$ _____

d) $7(2 - w)$ _____

2 Solve by doing the same to both sides. Fill in the boxes.

a) $5(x - 2) = 35$ (÷ 5, + 2)

$x - 2 =$ ☐

$x =$ ☐

b) $3(2y + 1) = 33$

$2y + 1 =$ ☐

$2y =$ ☐

$y =$ ☐

3 Solve $4(x + 3) < 32$

$4(x + 3) < 32$ (÷ 4, − 3)

$x + 3 <$ ☐

$x <$ ☐

a) Show your answer on the line.



b) Largest whole number x: ☐

4 Check by substituting. Circle YES or NO.

a) Is $x = 6$ a solution of $2(x + 4) = 20$?

$2(6 + 4) =$ ☐ YES NO

b) Is $n = 3$ a solution of $3(n - 1) > 6$?

$3(3 - 1) =$ ☐ YES NO

EQUATIONS AND INEQUALITIES WITH BRACKETS

CORE

NAME _____ CLASS _____ DATE _____

KEY IDEA

Either expand the bracket first, or divide both sides by the number outside the bracket. Keep the inequality sign in every line. A solution can be a fraction or a decimal: check it by substituting.

FLUENCY

1 Solve each equation. Give any non-integer answers as fractions or decimals.

a) $6(x - 4) = 42$ ☐

b) $3(2a + 5) = 24$ ☐

c) $40 = 8(p + 1.5)$ ☐

d) $7(3m - 2) = 28$ ☐

e) $4(2k + 1) = 18$ ☐

f) $2(x + 3) + 3x = 26$ ☐

2 Solve each inequality.

a) $3(x - 2) > 15$ ☐

b) $5(2y + 1) \leq 40$ ☐

c) $18 < 4(n + 2)$ ☐

d) $2(3x + 1) \geq 9$ ☐

REASONING

3 Tom solves $4(x + 5) = 36$. Here is his working.

$4x + 5 = 36$

$4x = 31$

$x = 7.75$

a) Explain Tom's mistake.

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b) Find the correct solution. ☐

4 Amir says, "To solve $3(x + 7) = 27$, you must expand the bracket first." Do you agree? Solve it in two different ways.

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EQUATIONS AND INEQUALITIES WITH 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) $2(x + 4)$ and $2x + 4$ have the same value. ALWAYS SOMETIMES NEVER

b) $4(x + 1) = k$ has a whole-number solution, if k is a whole number. ALWAYS SOMETIMES NEVER

c) If $3(x + 2) > 12$, then $x > 2$. ALWAYS SOMETIMES NEVER

PROBLEM SOLVING

2 A rectangle is 4 cm wide and $(x + 3)$ cm long.



a) The area is 34 cm². Find x. ☐

b) The area must be less than 50 cm².
Largest whole-number value of x: ☐

3 Find the missing numbers.

a) $3(x + \square) = 39$ has the solution $x = 6$.

b) $\square(2x - 1) = 45$, where x is a positive whole number.
Every possible number for the box: ☐

★ CHALLENGE FOR ALL

4 A compound inequality has two inequality signs.

a) Solve $\mathbf{6 \leq 3(x + 4) < 27}$ ☐

b) List all the integers that satisfy the inequality. ☐

c) How many integers satisfy both a) and $2(x + 1) > 3$? ☐

EQUATIONS AND INEQUALITIES WITH BRACKETS – ANSWERS

ANSWERS

BUILDING BLOCKS

1 a) 2y + 10 · b) 4m + 4

2 a) 5x and 15: 5x + 15 · b) 8p and –2: 8p – 2

3 each part 14 ÷ 2 = 7, so x + 3 = 7 and x = 4

4 a) x + 4 = 9 (÷ 3), x = 5 (– 4) · b) x + 1 > 5 (÷ 2), x > 4 (– 1)

SUPPORT

1 a) 3x + 15 · b) 12y – 6 · c) 12 + 8k · d) 14 – 7w

2 a) x – 2 = 7, x = 9 · b) ÷ 3: 2y + 1 = 11, – 1: 2y = 10, ÷ 2: y = 5

3 x + 3 < 8, x < 5 · a) open circle at 5, arrow to the left · b) 4

4 a) 2 × 10 = 20: YES · b) 3 × 2 = 6, and 6 > 6 is false: NO

CORE

1 a) x = 11 · b) a = 1.5 · c) p = 3.5 · d) m = 2 · e) k = 7/4 (1.75) · f) 5x + 6 = 26, x = 4

2 a) x > 7 · b) y ≤ 3.5 · c) n > 2.5 · d) x ≥ 7/6

3 a) He did not multiply the 5 by 4: 4(x + 5) = 4x + 20 · b) 4x = 16, x = 4

4 Disagree: dividing by 3 first gives x + 7 = 9, x = 2; expanding gives 3x + 21 = 27, 3x = 6, x = 2

GREATER DEPTH

1 a) never (2x + 8 is always 4 more than 2x + 4) · b) sometimes (k = 12 gives x = 2; k = 10 gives x = 1.5) · c) always

2 a) 4(x + 3) = 34, x = 5.5 · b) 4(x + 3) < 50, x < 9.5: x = 9

3 a) 6 + □ = 13, so 7 · b) 2x – 1 must be an odd factor of 45 (1, 3, 5, 9, 15, 45): the box is 45, 15, 9, 5, 3 or 1 (x = 1, 2, 3, 5, 8, 23)

4 a) 2 ≤ x + 4 < 9, so –2 ≤ x < 5 · b) –2, –1, 0, 1, 2, 3, 4 · c) 2(x + 1) > 3 gives x > 0.5: 1, 2, 3, 4, so 4 integers