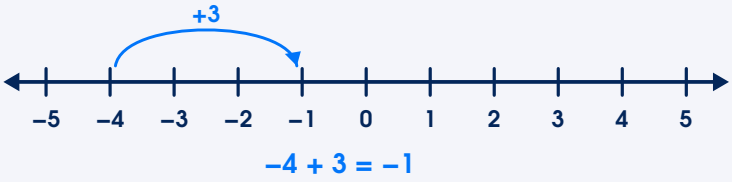
ALGEBRA WITH NEGATIVE NUMBERS

BUILDING BLOCKS

NAME _____ CLASS _____ DATE _____

KEY IDEA

Adding moves right on the number line. Subtracting moves left.



−4 + 3 = −1

Multiplying or dividing:

same signs → positive

−2 × −3 = 6

different signs → negative

−2 × 3 = −6

1 Use the number line to work out each answer.

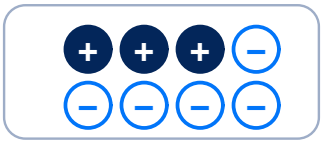


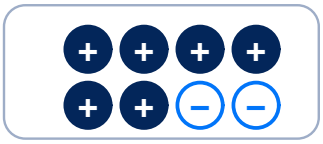
a) −2 + 5 ☐ **b)** 3 − 7 ☐ **c)** −1 − 4 ☐ **d)** −6 + 6 ☐

2 Cross out the zero pairs. Write the value of each set of counters.

A + and a − counter make a zero pair.

Example:  **= 2**

a)  = ☐

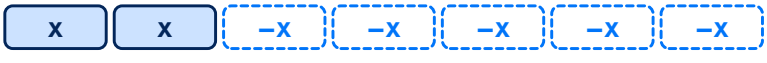
b)  = ☐

3 Multiply and divide.

a)  3 lots of −2: 3 × −2 = ☐

b) **−4 × 2** ☐ **c)** **−3 × −5** ☐ **d)** **−12 ÷ 3** ☐

4 Cross out zero pairs of tiles to simplify.

a) **2x − 5x**  =

b) **−3x + 4x**  =

ALGEBRA WITH NEGATIVE NUMBERS

SUPPORT

NAME _____ CLASS _____ DATE _____

KEY IDEA

$-4x - 2x = -6x$

$-4x - -2x = -4x + 2x = -2x$

$-2 \times 3x = -6x$

$-2x \times -3x = 6x^2$

Subtracting a negative is the same as adding. Same signs multiply to give a positive.

1 Simplify.

a) $3y - 8y$ ☐

b) $-5y + 2y$ ☐

c) $-4y - 3y$ ☐

d) $2y - -6y$ ☐

2 Simplify.

a) $-3 \times 4a$ ☐

b) $-5 \times -2b$ ☐

c) $-20c \div 4$ ☐

d) $-18d \div -6$ ☐

3 Solve each equation.

a) $x + 9 = 4$ ☐

b) $y - 3 = -10$ ☐

c) $4m = -20$ ☐

d) $\frac{n}{2} = -6$ ☐

4 Draw a line to match each expression to its simplified form.

$3x - 5x$	$-5x$
$-x - 4x$	$4x$
$-2 \times 3x$	$-2x$
$-4 \times -x$	$-6x$

ALGEBRA WITH NEGATIVE NUMBERS

CORE

NAME _____ CLASS _____ DATE _____

KEY IDEA

The rules for directed number work with algebra too: $-3x - -5x \equiv 2x$ and $-4a \times -2b \equiv 8ab$. To solve an equation, use inverse operations on both sides, taking care with the signs.

FLUENCY

1 Simplify.

a) $-7a + 3b - 2a - 5b$ ☐

b) $-6x \times 3y$ ☐

c) $-4p \times -p$ ☐

d) $15q \div -3$ ☐

e) $5k - -2k - 9k$ ☐

f) $\frac{-24mn}{-8n}$ ☐

2 Solve.

a) $5x + 12 = -8$ ☐

b) $2y - 1.5 = -6.5$ ☐

c) $\frac{w}{3} + 4 = -2$ ☐

d) $\frac{z + 2}{4} = -3$ ☐

REASONING

3 Here is Mo's working.

$3x - 2.4 = -8.4$

$3x = -10.8$

$x = -3.6$

a) Explain Mo's mistake.

.....

b) Solve the equation correctly. $x =$ ☐

4 Is the phrase "two minuses make a plus" always correct? Explain.

Use $-4 + -3$ and -4×-3 in your answer.

.....

.....

ALGEBRA WITH NEGATIVE NUMBERS

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) $y \times y \times y$ is negative. ALWAYS SOMETIMES NEVER

b) $-a$ is negative. ALWAYS SOMETIMES NEVER

c) $x - -y \equiv x + y$ ALWAYS SOMETIMES NEVER

d) A negative term divided by a negative term is negative. ALWAYS SOMETIMES NEVER

PROBLEM SOLVING

2 Circle every expression that is equivalent to $-6x$.

$-5x - x$ $2x - -4x$ $3x \times -2$ $-12x \div -2$ $-x - 5x$ $2x - 8x$

3 Form and solve an equation for each problem.

a) I think of a number, multiply it by -3, then add 7. My answer is 22.

Write an equation and solve it. My number is ☐

b) The mean of $2x$, -5 and $x - 1$ is -4. Find x. ☐

★ CHALLENGE FOR ALL

4 In this magic square every row, column and diagonal has the same total.

$-3x$	☐	x
☐	0	☐
☐	$-2x$	$3x$

a) Complete the square.

b) What is the magic total? ☐

c) 2 is added to every cell.

New magic total: ☐

STEP 4 · ALGEBRA WITH NEGATIVE NUMBERS

ANSWERS

BUILDING BLOCKS

1 a) 3 · b) −4 · c) −5 · d) 0
2 a) −2 · b) 4
3 a) −6 · b) −8 · c) 15 · d) −4
4 a) −3x · b) x

SUPPORT

1 a) −5y · b) −3y · c) −7y · d) 8y
2 a) −12a · b) 10b · c) −5c · d) 3d
3 a) x = −5 · b) y = −7 · c) m = −5 · d) n = −12
4 3x − 5x → −2x · −x − 4x → −5x · −2 × 3x → −6x · −4 × −x → 4x

CORE

1 a) −9a − 2b · b) −18xy · c) $4p^2$ · d) −5q · e) −2k · f) 3m
2 a) x = −4 · b) y = −2.5 · c) w = −18 · d) z = −14
3 a) −8.4 + 2.4 = −6, not −10.8 (Mo subtracted instead of adding) · b) 3x = −6, x = −2
4 Not always: −4 × −3 = 12 (positive) but −4 + −3 = −7 (negative). It works for multiplying and dividing two negatives, and for subtracting a negative.

GREATER DEPTH

1 a) Sometimes: true for negative y (−2 gives −8), false for y = 2 or y = 0 · b) Sometimes: −a is negative when a is positive, positive when a is negative · c) Always · d) Never
2 Equivalent to −6x: −5x − x, 3x × −2, −x − 5x, 2x − 8x (not 2x − −4x = 6x or −12x ÷ −2 = 6x)
3 a) −3n + 7 = 22, n = −5 · b) (3x − 6) ÷ 3 = −4, 3x − 6 = −12, x = −2
4 a) Top row: −3x, 2x, x · middle row: 4x, 0, −4x · bottom row: −x, −2x, 3x · b) 0 · c) 6