WRITE ALGEBRAIC EXPRESSIONS

BUILDING BLOCKS

NAME _____ CLASS _____ DATE _____

KEY IDEA

A letter can stand for a number we do not know yet.

x 1 1 1 is x + 3 x x x is 3x (not 3 × x)

We leave out × and ÷. 2 × y = 2y $y \div 4 = \frac{y}{4}$

1 Work out the output of each function machine.

a) 6 → × 2 → + 3 → ☐ b) 10 → − 4 → × 3 → ☐

2 Write an expression for each set of tiles.

a) x 1 1 1 1 = ☐

b) x x x = ☐

c) x x 1 = ☐

d) x x x 1 1 = ☐

x = x 1 = 1

3 Draw a line to match each description to its expression.

5 more than n	n − 5
n multiplied by 5	$\frac{n}{5}$
5 less than n	n + 5
n divided by 5	5n

4 Now the input is a letter. Write the output as an expression.

a) y → × 4 → + 1 → ☐

b) a → − 3 → ☐ c) m → ÷ 2 → ☐

WRITE ALGEBRAIC EXPRESSIONS

SUPPORT

NAME _____ CLASS _____ DATE _____

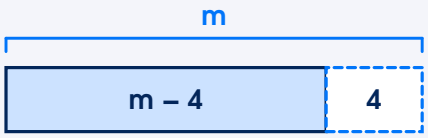
KEY IDEA

$3 \times a = 3a$ $b \div 3 = \frac{b}{3}$ $a \times a = a^2$

Order matters when you subtract:

"4 less than m" is m – 4

"m less than 4" is 4 – m



1 Write each of these in its simplest form.

a) 7 × p ____ b) q × 6 ____ c) m ÷ 2 ____

d) t × t ____ e) 3 × g × h ____ f) k × 4 × k ____

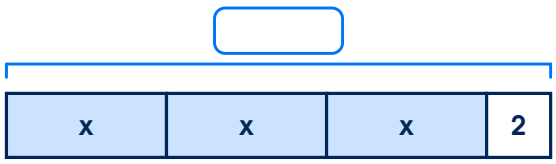
2 Write an expression for each description.

a) 8 more than w ____ b) 8 less than w ____

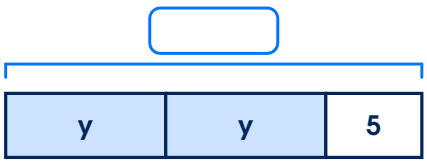
c) w less than 8 ____ d) w divided by 8 ____

3 Write an expression for the total length of each bar.

a)



b)



4 I think of a number, n. Write an expression for my answer.

a) I multiply my number by 4, then subtract 7. ____

b) I divide my number by 5, then add 1. ____

WRITE ALGEBRAIC EXPRESSIONS

CORE

NAME _____ CLASS _____ DATE _____

KEY IDEA

Numbers go before letters (5a, not a5) and we leave out × and ÷ signs. Repeated multiplication uses powers: $a \times a = a^2$. Order matters for subtraction and division: "p less than 8" is 8 – p, not p – 8.

FLUENCY

1 Write an expression for each description.

a) 9 less than d

b) d less than 9

c) the product of 6 and e

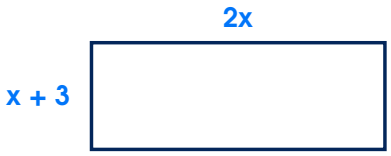
d) f squared, then add 4

e) g divided by 7, subtract 2

f) 3 lots of h, then add k

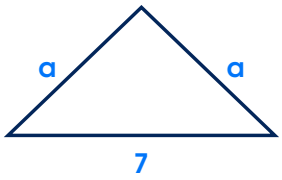
2 Write a simplified expression for the perimeter of each shape.

a)



Perimeter =

b)



Perimeter =

REASONING

3 Sam writes "g less than 10" as g – 10.

a) Explain Sam's mistake.

b) Is r + 7 the same as 7 + r? Is r – 7 the same as 7 – r? Explain.

4 Find two different two-step machines that turn x into 2x + 10. Fill in the operations.

x → ☐ → ☐ → 2x + 10

x → ☐ → ☐ → 2x + 10

WRITE ALGEBRAIC 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) $n + n$ has the same value as n^2. ALWAYS SOMETIMES NEVER

b) $a \times b$ can be written as ba. ALWAYS SOMETIMES NEVER

c) $x - 3$ is greater than $3 - x$. ALWAYS SOMETIMES NEVER

d) $5y$ is greater than y. ALWAYS SOMETIMES NEVER

PROBLEM SOLVING

2 Ali is a years old. Bea is 4 years older than Ali. Cal is twice as old as Bea. Write an expression for:

a) Bea's age ____ **b)** Cal's age ____

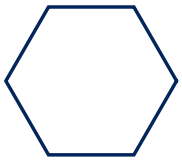
c) Write a simplified expression for the total of all three ages. ____

3 A regular hexagon has sides of length $2m + 1$.

a) Write a simplified expression for its perimeter. ____

b) An equilateral triangle has perimeter $6p + 9$.

Write an expression for the length of one side. ____



$2m + 1$

★ CHALLENGE FOR ALL

4 Think of a number, n. Do each step in turn and write an expression for your new number.

Then × 2 ____ **Then + 10** ____

Then ÷ 2 ____ **Then − n** ____

What do you notice? Explain why this always happens.

STEP 1 · WRITE ALGEBRAIC EXPRESSIONS

ANSWERS

BUILDING BLOCKS

1 a) 15 · b) 18

2 a) x + 4 · b) 3x · c) 2x + 1 · d) 3x + 2

3 5 more than n → n + 5 · n multiplied by 5 → 5n · 5 less than n → n – 5 · n divided by 5 → n/5

4 a) 4y + 1 · b) a – 3 · c) m/2

SUPPORT

1 a) 7p · b) 6q · c) m/2 · d) t^2 · e) 3gh · f) $4k^2$

2 a) w + 8 · b) w – 8 · c) 8 – w · d) w/8

3 a) 3x + 2 · b) 2y + 5

4 a) 4n – 7 · b) n/5 + 1

CORE

1 a) d – 9 · b) 9 – d · c) 6e · d) f^2 + 4 · e) g/7 – 2 · f) 3h + k

2 a) 6x + 6 · b) 2a + 7

3 a) "g less than 10" means start at 10 and take away g, so it is 10 – g. b) Yes, r + 7 ≡ 7 + r (addition can be done in any order). No: r – 7 and 7 – r are only equal when r = 7, e.g. r = 10 gives 3 and –3.

4 × 2 then + 10, and + 5 then × 2 (either order of these two machines)

GREATER DEPTH

1 a) Sometimes: true for n = 0 or n = 2; false for n = 3 (6 and 9). b) Always. c) Sometimes: true when x > 3 (x = 5: 2 > –2), false when x ≤ 3. d) Sometimes: true for positive y, false for y = 0 or negative y (y = –1: –5 < –1).

2 a) a + 4 · b) 2(a + 4) or 2a + 8 · c) 4a + 12

3 a) 12m + 6 · b) 2p + 3

4 2n · 2n + 10 · n + 5 · 5. The answer is always 5: doubling then halving cancels out, the 10 is halved to 5, and subtracting n removes the starting number.