EQUAL OR EQUIVALENT?

BUILDING BLOCKS

NAME _____ CLASS _____ DATE _____

KEY IDEA

The equals sign = means "is equal to".
Both sides are worth the same amount.

6 + 4 = 7 + 3 both sides are worth 10

1 Work out each calculation.

a) 9 + 6 = ☐

b) 4 × 5 = ☐

c) 30 – 12 = ☐

d) 36 ÷ 3 = ☐

2 Write the missing number so that both sides are equal.

a) 8 + 5 = ☐ + 6

b) 15 – 4 = 20 – ☐

c) 3 × 4 = ☐ × 2

d) ☐ = 7 + 2

3 Is each statement true or false? Circle your answer.

a) **7 + 2 = 9 + 0** TRUE FALSE

b) **12 – 5 = 5 – 12** TRUE FALSE

c) **6 × 3 = 3 × 6** TRUE FALSE

d) **20 ÷ 4 = 4 ÷ 20** TRUE FALSE

4 Draw lines to join calculations that are equal.

11 + 7 •	• **31 – 11**
40 ÷ 2 •	• **4 × 4**
25 – 9 •	• **2 × 9**

EQUAL OR EQUIVALENT?

SUPPORT

NAME _____ CLASS _____ DATE _____

KEY IDEA

An equation shows that two things are equal: 4 + 5 = 3 + 6. Two expressions are equivalent if they are equal for every value of the letter. We use the symbol ≡ for equivalent.

a + a ≡ 2a because it is true whatever a is.

1 Circle every calculation that is equal to 12.

7 + 5 | 3 × 4 | 20 – 8 | 15 – 2 | 24 ÷ 2 | 6 + 7

2 Write the missing number so that both sides are equal.

a) 9 + 3 = 10 + ☐

b) 18 – ☐ = 10 + 2

c) 5 × ☐ = 40 ÷ 2

d) ☐ ÷ 3 = 2 × 4

3 Compare the expressions x + 4 and 3x.

a) Complete the table.

	x = 1	x = 2	x = 5
x + 4			
3x			

b) For which value of x are the two expressions equal? ☐

c) Are x + 4 and 3x equivalent? Explain how you know.

4 Check whether a + a + a and 3a are equivalent.

a) When a = 3, work out a + a + a ☐ and 3a ☐

b) When a = 10, work out a + a + a ☐ and 3a ☐

c) Fill in = or ≠ or ≡ : a + a + a ☐ 3a

EQUAL OR EQUIVALENT?

CORE

NAME _____ CLASS _____ DATE _____

KEY IDEA

Equal (=): both sides have the same value. Equivalent (≡): two expressions are equal for EVERY value of the letter. To test, substitute several values — one value is never enough. Addition and multiplication can be done in any order (commutative); subtraction and division cannot.

FLUENCY

1 Write = or ≠ in each box.

a) 15 + 9 ☐ 30 – 6

b) 7 × 8 ☐ 60 – 5

c) 48 ÷ 4 ☐ 4 ÷ 48

d) 2.5 + 1.5 ☐ 8 ÷ 2

2 Complete the table by substituting each value of m.

	m = 1	m = 4	m = 10
5m			
2m + 3m			
m + 4			

a) Which two expressions are equivalent?

b) Ravi tests m = 1 and says 5m ≡ m + 4. Explain why he is wrong.

REASONING

3 Sam says, "b – 4 and 4 – b are equivalent because you can swap the order."

a) Work out b – 4 and 4 – b when b = 10.

b) Explain why Sam is wrong.

4 Write three different expressions that are equivalent to 10t.

Explain how you know one of your expressions is equivalent to 10t.

EQUAL OR EQUIVALENT?

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) $x + 6$ and $6 + x$ have the same value. ALWAYS SOMETIMES NEVER

b) $2p$ and p^2 have the same value. ALWAYS SOMETIMES NEVER

c) $n - 3$ and $3 - n$ have the same value. ALWAYS SOMETIMES NEVER

d) $a + 1$ and a have the same value. ALWAYS SOMETIMES NEVER

.....

PROBLEM SOLVING

2 Find the value of the letter that makes each pair equal. Part c has two values.

a) $3k$ and $k + 10$ ☐ **b)** $4w$ and $30 - w$ ☐ **c)** g^2 and $6g$ ☐

3 Fill in the missing numbers so that both sides are equal.

a) $17 + 26 = 20 +$ ☐

Explain without working out $17 + 26$: .....

b) $48 + 35 = 50 +$ ☐ **c)** $91 - 38 = 93 -$ ☐

★ CHALLENGE FOR ALL

4 Here are eight expression cards.

$2n + 2n$	$n + 4$	$4n$	$n \times 4$	n^2	$8n - 4n$	$4 + n$	$n \times n$

a) Sort the cards into groups of equivalent expressions.

.....

.....

b) Find a value of n that makes $n + 4$ equal to $4n$. ☐

EQUAL OR EQUIVALENT?

ANSWERS

BUILDING BLOCKS

1 a) 15 · b) 20 · c) 18 · d) 12

2 a) 7 · b) 9 · c) 6 · d) 9

3 a) true · b) false · c) true · d) false

4 11 + 7 → 2 × 9 (18) · 40 ÷ 2 → 31 − 11 (20) · 25 − 9 → 4 × 4 (16)

SUPPORT

1 7 + 5, 3 × 4, 20 − 8, 24 ÷ 2 (15 − 2 = 13 and 6 + 7 = 13 are not)

2 a) 2 · b) 6 · c) 4 · d) 24

3 a) x + 4: 5, 6, 9 · 3x: 3, 6, 15 · b) x = 2 · c) No — they are only equal when x = 2, not for every value

4 a) 9 and 9 · b) 30 and 30 · c) ≡ (equivalent: equal for every value of a)

CORE

1 a) = (24 and 24) · b) ≠ (56 and 55) · c) ≠ (12 and 1/12) · d) = (4 and 4)

2 5m: 5, 20, 50 · 2m + 3m: 5, 20, 50 · m + 4: 5, 8, 14 · a) 5m and 2m + 3m · b) they are only equal when m = 1 (e.g. m = 4 gives 20 and 8); equivalent expressions must be equal for every value

3 a) 6 and −6 · b) subtraction is not commutative; the values are different, so they are not equivalent (they are only equal when b = 4)

4 e.g. 4t + 6t, 2 × 5t, 12t − 2t, 5t + 5t · explanation: it simplifies to 10t, or substituting several values always gives the same result

GREATER DEPTH

1 a) always · b) sometimes (equal when p = 0 or p = 2, e.g. not when p = 3) · c) sometimes (only when n = 3) · d) never

2 a) k = 5 · b) w = 6 · c) g = 0 and g = 6

3 a) 23 — 20 is 3 more than 17, so the other number must be 3 less than 26 · b) 33 · c) 40

4 a) 2n + 2n ≡ 4n ≡ n × 4 ≡ 8n − 4n · n + 4 ≡ 4 + n · n^2 ≡ n × n · b) n = 4/3 = 1 1/3 (check: both sides are 5 1/3)