SOLVE 2-STEP EQUATIONS

BUILDING BLOCKS

NAME _____ CLASS _____ DATE _____

KEY IDEA

A two-step function machine:

4 → × 3 → 12 → + 5 → 17

Work backwards with inverses:

17 → − 5 → 12 → ÷ 3 → 4

1 Find the missing outputs.

a) 6 → × 2 → ☐ → + 7 → ☐

b) 9 → − 4 → ☐ → × 5 → ☐

2 Work backwards to find the missing numbers.

a) ☐ → × 4 → ☐ → + 3 → 31

b) ☐ → + 6 → ☐ → × 2 → 30

3 Solve each equation.

a) $a + 8 = 20$ a = ☐

b) $5b = 45$ b = ☐

c) $c - 11 = 4$ c = ☐

d) $\frac{d}{2} = 13$ d = ☐

4 Solve these number puzzles.

a) I think of a number. I multiply it by 3, then add 4. The answer is 25. What is my number? ☐

b) I think of a number. I subtract 5, then double it. The answer is 18. What is my number? ☐

SOLVE 2-STEP EQUATIONS

SUPPORT

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KEY IDEA

To solve 3x + 4 = 25, undo each step in reverse order.

3x + 4 = 25	
3x = 21	– 4 from both sides
x = 7	÷ 3 on both sides

x → × 3 → + 4 → 25

1 Each cup holds x counters. Use the cups and counters to find x.

a) x x + ○○○ = ○○○○○ ○○○○○

2x + 3 = 11 x = ☐

b) x x x + ○○ = ○○○○○ ○○○○○ ○○○○○

3x + 2 = 17 x = ☐

2 Write an equation for each function machine. Then solve it.

a) x → × 4 → + 7 → 39 Equation: ..... x = ☐

b) y → × 2 → – 5 → 13 Equation: ..... y = ☐

3 Solve each equation. Do the first step, then the second.

a) **5a + 4 = 29**

5a = ☐

a = ☐

b) **6b – 3 = 33**

6b = ☐

b = ☐

c) **2c + 9 = 21**

2c = ☐

c = ☐

4 Substitute to check. Circle yes or no.

a) Is x = 6 the solution of 4x – 7 = 17? YES NO

b) Is y = 3 the solution of 5y + 2 = 20? YES NO

SOLVE 2-STEP EQUATIONS

CORE

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KEY IDEA

Undo the operations in reverse order. Watch where the division is: in $(k + 1) \div 2 = 9$ multiply by 2 first, but in $k \div 2 + 1 = 9$ subtract 1 first.

FLUENCY

1 Solve each equation.

a) $7x + 12 = 61$ $x =$ ☐

b) $9y - 14 = 58$ $y =$ ☐

c) $4m + 2.5 = 18.5$ $m =$ ☐

d) $50 = 3n + 11$ $n =$ ☐

e) $\frac{p}{4} + 6 = 15$ $p =$ ☐

f) $\frac{q - 3}{5} = 7$ $q =$ ☐

2 Form and solve an equation for each problem.

a) An isosceles triangle has a perimeter of 50 cm and a base of 14 cm. Find a.

Equation: ..... $a =$ ☐



b) A taxi costs £3 plus £2 per mile. A journey costs £19. How many miles was it?

Equation: ..... miles = ☐

REASONING

3 Spot the mistake.

Zara solves $\frac{t}{3} + 4 = 10$ and writes $t = 10 \times 3 - 4 = 26$.

a) Explain Zara's mistake. .....

b) What is the correct solution? ☐

4 Solve both equations.

a) $4x + 8 = 40$ $x =$ ☐

b) $4x - 8 = 40$ $x =$ ☐

What is the same and what is different? .....

SOLVE 2-STEP EQUATIONS

GREATER DEPTH

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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) You should add or subtract first in a 2-step equation. ALWAYS SOMETIMES NEVER

b) $y \div 2 + 5$ and $(y + 5) \div 2$ have the same value. ALWAYS SOMETIMES NEVER

c) If $a, b, c > 0$, the solution of $ax + b = c$ is positive. ALWAYS SOMETIMES NEVER

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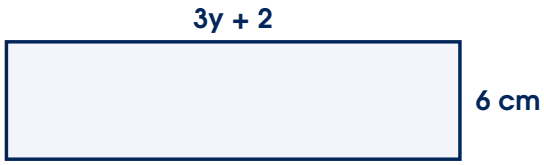
PROBLEM SOLVING

2 Form and solve equations to answer these.

a) Asha divides a number by 4, then subtracts 3. She gets 2.5. Find her number. ☐

b) Ben subtracts 3, then divides by 4. He also gets 2.5. Find his number. ☐

3 Find the value of y.



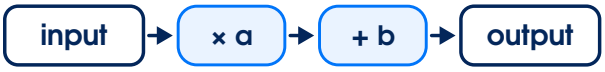
Perimeter = 46 cm

Equation: .....

y = ☐

★ CHALLENGE FOR ALL

4 This function machine multiplies by a, then adds b.



An input of 4 gives an output of 23.
An input of 7 gives an output of 38.

a = ☐ b = ☐ Which input gives an output of 63? ☐

SOLVE 2-STEP EQUATIONS

ANSWERS

BUILDING BLOCKS

1 a) 12, 19 · b) 5, 25
2 a) 7 (middle 28) · b) 9 (middle 15)
3 a) 12 · b) 9 · c) 15 · d) 26
4 a) 7 · b) 14

SUPPORT

1 a) $x = 4$ · b) $x = 5$
2 a) $4x + 7 = 39$, $x = 8$ · b) $2y - 5 = 13$, $y = 9$
3 a) $5a = 25$, $a = 5$ · b) $6b = 36$, $b = 6$ · c) $2c = 12$, $c = 6$
4 a) yes ($24 - 7 = 17$) · b) no ($15 + 2 = 17$, not 20)

CORE

1 a) $x = 7$ · b) $y = 8$ · c) $m = 4$ · d) $n = 13$ · e) $p = 36$ · f) $q = 38$
2 a) $2a + 14 = 50$, $a = 18$ · b) $2m + 3 = 19$, $m = 8$ miles
3 a) she undid the operations in the wrong order: subtract 4 first, then multiply by 3 · b) $t = 18$
4 a) $x = 8$ · b) $x = 12$ · same: both divide by 4 at the end; different: the first step is -8 in a and $+8$ in b

GREATER DEPTH

1 a) sometimes (for $(x + 3) \div 2 = 5$, multiply by 2 first) · b) never ($y \div 2 + 5$ is always 2.5 more) · c) sometimes ($2x + 9 = 5$ gives $x = -2$)
2 a) $n \div 4 - 3 = 2.5$, $n = 22$ · b) $(n - 3) \div 4 = 2.5$, $n = 13$
3 $2(3y + 2) + 12 = 46$, so $6y + 16 = 46$ and $y = 5$
4 $4a + b = 23$ and $7a + b = 38$, so $3a = 15$: $a = 5$, $b = 3$ · input 12 ($5 \times 12 + 3 = 63$)