Lesson 2-3: Solving Multi-Step Equations

EXERCISE 1

a. Solve for y: $4y - 3 = 5y - 8$

Get the y's together

$-4y \quad -4y$

$-3 = y - 8$

$+8 \quad +8$

$5 = y$

b. Solve for s: $s^2 + 5 = 30$

$-5 \quad -5$

$s^2 = 25 \rightarrow \sqrt{s^2} = \sqrt{25} \rightarrow s = 5$

c. Solve for r: $\frac{3}{2r} = \frac{1}{4}$ → proportion → cross multiply

$2r \cdot 1 = 3 \cdot 4$

$\frac{2r}{2} = \frac{12}{2} \rightarrow r = 6$

ch. $\frac{3}{2 \cdot 6} = \frac{1}{4}$ $\quad \frac{3}{12} = \frac{1}{4}$ $\quad 3 \cdot 4 = 1 \cdot 12$ ✓

EXERCISE 2

Does it matter which step happens first? Let's see what happens with the following example.

Consider the equation **3x + 4 = 8x – 16**. Solve for x using the given starting point.

GROUP 1	GROUP 2	GROUP 3	GROUP 4
Subtract 3x from both sides.	Subtract 4 from both sides.	Subtract 8x from both sides.	Add 16 to both sides.
$3x+4=8x-16$ $-3x \quad -3x$ $4 = 5x - 16$ $+16 \quad +16$ $20 = 5x$ $\frac{20}{5} = \frac{5x}{5}$ $4 = x$	$3x+4=8x-16$ $-4 \quad -4$ $3x = 8x - 20$ $-8x \quad -8x$ $-5x = -20$ $\frac{-5x}{-5} = \frac{-20}{-5}$ $x = 4$	$3x+4=8x-16$ $-8x \quad -8x$ $-5x + 4 = -16$ $-4 \quad -4$ $-5x = -20$ $\frac{-5x}{-5} = \frac{-20}{-5}$ $x = 4$	$3x+4=8x-16$ $+16 \quad +16$ $3x + 20 = 8x$ $-3x \quad -3x$ $20 = 5x$ $\frac{20}{5} = \frac{5x}{5}$ $4 = x$

Therefore, according to this exercise, does it matter which step happens first? Why or why not?

No, because we always get

EXERCISE 3

Determine which of the following equations have the same solution set by recognizing properties, rather than solving. Explain which properties are recognized for each pair.

(a) $2x + 3 = 13 - 5x$ (b) $\frac{6}{10} + \frac{4x}{10} = \frac{-10x}{10} + \frac{26}{10}$

$-3 \quad -3$

$2x = 10 - 5x$

(c) $6x + 9 = \frac{13}{5} - x$ (d) $.6 + .4x = -x + 2.6$

$-1x$

(e) $3(2x + 3) = \frac{13}{5} - x$ (f) $4x = -10x + 20$

$6x + 9$

(g) $15(2x + 3) = 13 - 5x$ (h) $15(2x + 3) + 97 = 110 - 5x$

$+97 \quad +97$

$15(2x+3)+97 = 110-5x$

Answers:

g and h ⇒ addition property

c and e ⇒ distributive property

b and d ⇒ division property

a and f ⇒ subtraction, multiplication, commutative.

addition property: undo — by adding +

subtraction property: undo + by subtracting −

multiplication property: undo ÷ by multiplying ·

division property: undo · by dividing ÷

EXERCISE 4

Solve each equation. Check your solution.

a. $5x + 16 = 51$

$-16 \quad -16$

$\frac{5x}{5} = \frac{35}{5}$

$x = 7$

b. $0.6x - 1.5 = 1.8$

$+1.5 \quad +1.5$

$\frac{0.6x}{0.6} = \frac{3.3}{0.6}$

$x = 5.5$

c. $14 \cdot 16 = \frac{d-12}{14} \cdot 14$

$224 = d - 12$

$+12 \quad +12$

$236 = d$

d. $8 + \frac{3n}{12} = 13$

$-8 \quad -8$

$12 \cdot \frac{3n}{12} = 5 \cdot 12$

$\frac{3n}{3} = \frac{60}{3}$

$n = 20$

EXERCISE 5

Write an equation and solve.

a. Eight is subtracted from a number, and then the difference is multiplied by 2. The result is 24. Find the number.

n = number

$2(n-8) = 24$ ← equation

$2n - 16 = 24$

$+16 \quad +16$

$\frac{2n}{2} = \frac{40}{2}$

$n = 20$

b. CAR RENTAL Angela rented a car for $29.99 a day plus a one-time insurance cost of $5.00. Her bill was $124.96. For how many days did she rent the car?

x = days

equation

$29.99x + 5 = 124.96$

$-5 \quad -5.00$

$\frac{29.99x}{29.99} = \frac{119.96}{29.99}$

$x = 4$ days