Lesson 3.1/3.2 Solving Algebraic Equations

Wednesday, October 30, 2024 11:35 PM

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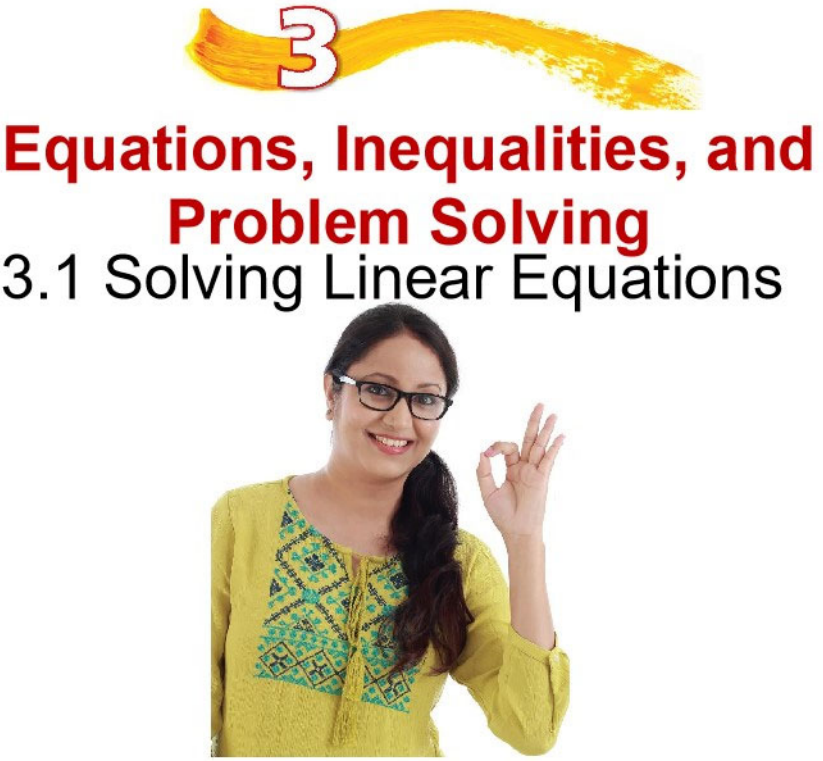
Lesson 3.1 Solving Eq...



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What You Will Learn

- Solve a linear equation in standard form.
- Solve a linear equation in nonstandard form.
- Solve linear equations containing symbols of grouping.
- Solve linear equations involving fractions.

- Solve linear equations involving fractions.
- Solve linear equations involving decimals.

Solving Linear Equations in Standard Form 2

- Remember that to *solve* an equation involving x means to find all values of x that satisfy the equatio

a. $2x + 18 = 0$

$-18 \quad -18$

$\frac{2x}{2} = \frac{-18}{2}$

$x = -9$

b. $5x - 12 = 0$

$+12 \quad +12$

$\frac{5x}{5} = \frac{12}{5}$

$x = 2.4$

c. $\frac{x}{3} + 3 = 0$

$-3 \quad -3$

$3\left(\frac{x}{3}\right) = -3)3$

$x = -9$

Example 3 – Solving a Linear Equation in Nonstandard Form

$3y + 8 - 5y = 4$ Original equation

$-2y + 8 = 4$

$-8 \quad -8$

$-2y = -4$

$-2y = -4$

$\frac{-2y}{-2} = \frac{-4}{-2}$

$y = 2$

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Example 4 – Solving Linear Equations: Special Cases

a. $2x + 3 = 2(x + 4)$ Original equation

$2x + 3 = 2x + 8$

$-3 \quad -3$

$2x = 2x + 5$

$-2x \quad -2x$

$0 = 5$

$0 \neq 5$

False No Solution

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Example 4 – Solving Linear Equations: Special Cases cont'd

b. $4(x + 3) = 4x + 12$ Original equation

$4x + 12 = 4x + 12$

$-4x \quad -4x$

$\emptyset$ same Equations

all Real #'s

$-4x - 4x$

$12 = 12$

True

all Real #'s infinite

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Example 5 – Geometry: Finding Dimensions

perimeter (add all sides

You have 96 feet of fencing to enclose a rectangular exercise area for your Border Collie. The exercise area is to be three times as long as it is wide. Find the dimensions of the exercise area.

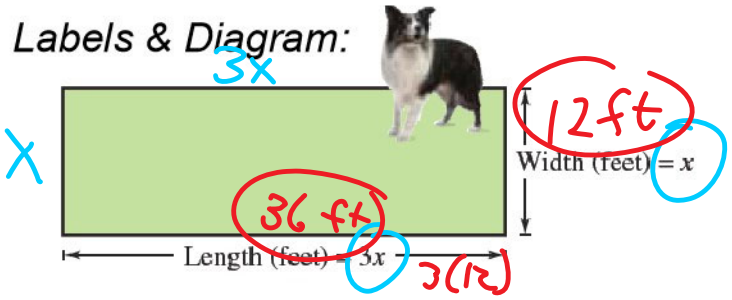
$3x + 3x + x + x = 96$

$\frac{8x}{8} = \frac{96}{8}$

$x = 12$

Begin by drawing and labeling a diagram.

Labels & Diagram:



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Example 7 – Finding Your Gross Pay per Paycheck

You have accepted a job offer at an annual salary of $40,830. This salary includes a year-end bonus of $750. You are paid twice a month. What will your

$40,830. This salary includes a year-end bonus of $750. You are paid twice a month. What will your gross pay be for each paycheck? 24x

Write an algebraic equation that represents the problem above. Then solve the equation and answer the question.

$24x + 750 = 40,830$

$-750 \quad -750$

$\frac{24x}{24} = \frac{40,080}{24}$

$x = 1,670$

Example 1 – Solving Linear Equations Involving Parentheses

a. $4(x - 3) = 8$ Original equation

$4x - 12 = 8$

$+12 \quad +12$

$\frac{4x}{4} = \frac{20}{4}$

$x = 5$

Example 1 – Solving Linear Equations Involving Parentheses cont'd

b. $3(2x - 1) + x = 11$ Original equation

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$6x - 3 + x = 11$

$7x - 3 = 11$

$+3 \quad +3$

$\frac{7x}{7} = \frac{14}{7}$ $x = 2$

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Example 2 – Equations Involving Symbols of Grouping 3

c. $5x - 2[4x + 3(x - 1)] = 8 - 3x$ Original equation

$5x - 2[4x + 3x - 3] = 8 - 3x$

$5x - 2(7x - 3) = 8 - 3x$

$5x - 14x + 6 = 8 - 3x$

$-9x + 6 = 8 - 3x$

$+3x \quad +3x$

$-6x + 6 = 8$

$-6 \quad -6$

$\frac{-6x}{-6} = \frac{+2}{-6}$ $x = \frac{-2}{6} = -\frac{1}{3}$

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Example 3 – Solving Linear Equations Involving Fractions 1

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a. $\frac{3x}{2} - \frac{1}{3} = 2$

$6\left(\frac{3x}{2} - \frac{1}{3} = 2\right)$

$\frac{6}{1} \cdot \frac{3}{2} = \frac{18}{2} = 9$

$\frac{6}{1} \cdot \frac{-1}{3} = \frac{-6}{3} = -2$

$6 \times 2 = 12$

Original Equation

$9x + 2 = 12$

$-2 \quad -2$

$\frac{9x}{9} = \frac{14}{9}$

$x = 1.5\overline{5}$

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Example 3 – Solving Linear Equations Involving Fractions 2

b. $\frac{1x}{5} + \frac{3x}{4} = 19$

$20\left(\frac{1x}{5} + \frac{3x}{4} = 19\right)$

$\frac{20}{1} \cdot \frac{1}{5} = \frac{20}{5} = 4$

$\frac{20}{1} \cdot \frac{3}{4} = \frac{60}{4} = 15$

Original Equation

$4x + 15x = 380$

$\frac{19x}{19} = \frac{380}{19}$

$x = 20$

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Example 3 – Solving Linear Equations Involving Fractions 3

c. $\frac{2}{3}\left(x+\frac{1}{4}\right)=\frac{1}{2}$

Original equation $8x+2=6$

$-2 \quad -2$

$\frac{8x}{8}=\frac{4}{8}$

$x=\frac{1}{2}=0.5$

12

$\frac{2}{3}x+\frac{2}{12}=\frac{1}{2}$

$\frac{12}{1}\cdot\frac{2}{3}=\frac{24}{3}=8$

$\frac{12}{1}\frac{2}{12}=\frac{24}{12}=2$

$\frac{12}{1}\cdot\frac{1}{2}=\frac{12}{2}=6$

Example 4 – Finding a Test Score

(x)

To get an A in a course, you must have an average of at least 90 points for 4 tests of 100 points each. For the first 3 tests, your scores were 87, 92, and 84. What must you score on the fourth test to earn a 90% average for the course?

Solution: $87+92+84+x$

Verbal Model: $\frac{\text{Sum of 4 tests}}{4} = 90$

$4\left(\frac{263+x}{4}\geq 90\right)4$

$263+x\geq 360$

$-263 \quad -263$

$x\geq 97$

Example 5 – Solving a Linear Equation Involving Decimals

Solve $0.3x + 0.2(10 - x) = 0.15(30)$.

$0.3x + 2 - 0.2x = 4.5$

$0.1x + 2 = 4.5$

$-2 \quad -2$

$0.1x = 2.5$

$\frac{0.1x}{0.1} = \frac{2.5}{0.1}$

$x = 25$

Example 6 – Data Analysis: U.S. Population

The bar graph shows the U.S. population P (in millions) from 2000 through 2017. A model for the U.S. population is $P = 2.56t + 282.8$, where t represents the year, with $t = 0$ corresponding to 2000. Use the model to predict the year in which the U.S. population will be 398 million. (*Source:* U.S. Census Bureau)

398

2000

$398 = 2.56t + 282.8$

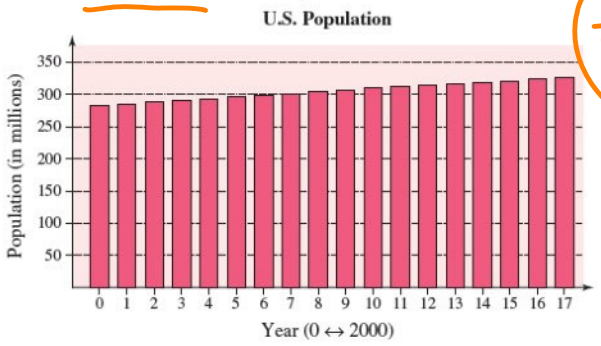
$-282.8 \quad -282.8$

$115.2 = 2.56t$

$\frac{115.2}{2.56} = \frac{2.56t}{2.56}$

$t = 45$

2045



Year ($0 \leftrightarrow 2000$)