

Warm-up: Solve each equation.

$$1. \quad \frac{1}{3}x - 7 = 11$$

$$\frac{1}{3}x - 7 + 7 = 11 + 7$$

$$\frac{1}{3}x = 18$$

$$\frac{1}{3}x \cdot 3 = 18 \cdot 3$$

$$x = 54$$

$$2. \quad \frac{x}{4} + 3 = 9$$

$$\frac{x}{4} + 3 - 3 = 9 - 3$$

$$\frac{x}{4} = 6$$

$$\frac{x}{4} \cdot 4 = 6 \cdot 4$$

$$x = 24$$

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### Rules for solving multi-step equations

1. You want to isolate the variable  
(meaning get the variable by itself)
2. Get rid of parenthesis first.  
(meaning use the distributive property)
3. Combine like terms
4. Then you need to **UNDUE** the operations being done to the variable **AND** order matters!
  - a. First, undue addition or subtraction
  - b. Second, undue multiplication or division
5. Don't forget, whatever you do to one side of the equation has to be done to the other side

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**Example 1:** Solve each equation.

$$a. \quad 3t + 5t - 5 = 11$$

$$8t - 5 = 11$$

$$8t - 5 + 5 = 11 + 5$$

$$8t = 16$$

$$\frac{8t}{8} = \frac{16}{8}$$

$$t = 2$$

$$b. \quad 10 + 7x - 3 + 5x = 151$$

$$12x + 7 = 151$$

$$12x + 7 - 7 = 151 - 7$$

$$12x = 144$$

$$\frac{12x}{12} = \frac{144}{12}$$

$$x = 12$$

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**Example 2:** Solve each equation.

$$a. \quad 5a + 3(a + 2) = 22$$

$$5a + 3a + 6 = 22$$

$$8a + 6 = 22$$

$$8a + 6 - 6 = 22 - 6$$

$$8a = 16$$

$$\frac{8a}{8} = \frac{16}{8}$$

$$a = 2$$

$$b. \quad 7(d - 5) + 12 = 5$$

$$7d - 35 + 12 = 5$$

$$7d - 23 = 5$$

$$7d - 23 + 23 = 5 + 23$$

$$7d = 28$$

$$\frac{7d}{7} = \frac{28}{7}$$

$$d = 4$$

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**Checkpoint:** Solve the equation. Check your solution.

$$1. \quad 9d - 4d - 2 = 18$$

$$5d - 2 = 18$$

$$5d - 2 + 2 = 18 + 2$$

$$5d = 20$$

$$\frac{5d}{5} = \frac{20}{5}$$

$$d = 4$$

$$2. \quad 2x + 7(x - 3) = 6$$

$$2x + 7x - 21 = 6$$

$$9x - 21 = 6$$

$$9x - 21 + 21 = 6 + 21$$

$$9x = 27$$

$$\frac{9x}{9} = \frac{27}{9}$$

$$x = 3$$

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3.  $3w + 4 + w = 36$

$$\begin{array}{r} 3w + 4 + w = 36 \\ 4w + 4 = 36 \\ -4 \quad -4 \\ \hline 4w = 32 \\ \frac{4w}{4} = \frac{32}{4} \\ w = 8 \end{array}$$

4.  $40 = 2(10 + 4k) + 2k$

$$\begin{array}{r} 40 = 2(10 + 4k) + 2k \\ 40 = 20 + 8k + 2k \\ 40 = 20 + 10k \\ -20 \quad -20 \\ \hline 20 = 10k \\ \frac{20}{10} = \frac{10k}{10} \\ 2 = k \end{array}$$

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**Example 3:** Solve each equation.

$\frac{4}{3}(a-5) = \frac{9}{1} \cdot \frac{4}{3} \cdot \frac{36}{3}$

$$\begin{array}{r} \frac{4}{3}(a-5) = 12 \\ +5 \quad +5 \\ \hline a = 17 \end{array}$$

$\frac{4}{3}(n+3) = \frac{9}{1} \cdot \frac{4}{3} \cdot \frac{36}{3}$

$$\begin{array}{r} \frac{4}{3}(n+3) = 12 \\ -3 \quad -3 \\ \hline n = 9 \end{array}$$

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**Partner Check** Solve the equation. Check your solution.

$\frac{1}{2}(4x - 2) = 7$

$$\begin{array}{r} \frac{1}{2}(4x - 2) = 7 \\ \hline x = 4 \end{array}$$

$\frac{5}{6}(2x + 4) = 10$

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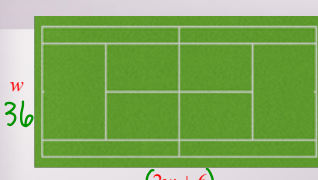
**Example 4:** An online ticket agency charges the amounts shown for basketball tickets. The total cost for an order is \$220.70. How many tickets are purchased?

Charge	Amount
Ticket Price	\$32.50 per ticket
Convenience Charge	\$3.30 per ticket
Processing Charge	\$5.90 per order

$$\begin{array}{r} 32.50x + 3.30x + 5.90 = 220.70 \\ 35.80x + 5.90 = 220.70 \\ -5.90 \quad -5.90 \\ \hline 35.80x = 214.80 \\ \frac{35.80x}{35.80} = \frac{214.80}{35.80} \\ x = 6 \end{array}$$

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**Example 5:** The perimeter of the tennis court is 228 feet. What are the dimensions of the court? (Hint:  $P = 2l + 2w$ )



$$\begin{array}{r} P = 2l + 2w \\ 228 = 2(2w + 6) + 2w \\ 228 = 4w + 12 + 2w \\ 228 = 6w + 12 \\ -12 \quad -12 \\ \hline 216 = 6w \\ \frac{216}{6} = \frac{6w}{6} \\ 36 = w \end{array}$$

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