## Lesson 4-4A Solving Equations and Equations by Multiplying or Dividing

**Vocabulary and Key Concepts**

1. Inverse Operations are operations that undo each other.
2. Goal is to isolate the variable.
3. The variable tells you what value makes the equation true.
4. You can check your solution by substituting the value into the ORIGIONAL equation or inequality

| Multiplication Words | Division Words |
|---|---|
| product | Quotient |
| per | divided |
| of | |
| each (day, hour etc) | each (you have a total) |
| | |
| | |

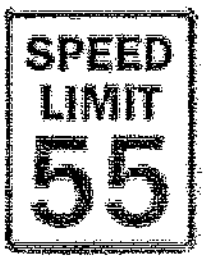
**Inequalities Review:**

**Match the symbol with the words.**

1. D $>$ a) less than or equal to
2. B $<$ b) less than
3. A $\leq$ c) greater than or equal to
4. C $\geq$ d) greater than

**Define a variable, write an inequality and state the meaning of the inequality.**

a)




Variable: $s$ = Speed limit

Inequality: $s \leq 55$

Meaning: can't go faster than 55 mph

## Solving Multiplication Equations

**Inverse Operation of Multiplication =** Division (3x means 3 times x)

| Words | Algebra |
|---|---|
| $3x = 15$<br>See: M Do: D<br>Step 1: divide 3 both sides<br>Solution: x has a value of 5. | $3x = 15$<br>$\frac{3}{3} \quad \frac{3}{3}$<br>$x = 5$ |

| Check | |
|---|---|
| | Substitute 5 for x and simplify to see if the left and right sides are equal. |

| Check | 3-Step Check | 2-Step Check |
|---|---|---|
| | $3x = 15$<br>$3 \cdot 5 = \downarrow$<br>$15 = 15$ | $3 \cdot 5 = 15$<br>$15 = 15$ |

| Words | Algebra |
|---|---|
| $150 = -5x$<br>See: M Do: D<br>Step 1: Divide -5 both sides<br>Solution: x has a value of -30. | $150 = -5x$<br>$-5 \quad -5$<br>$-30 = x$ |

| Check | |
|---|---|
| | Substitute -30 for x and simplify to see if the left and right sides are equal. |

| Check | 3-Step Check | 2-Step Check |
|---|---|---|
| | $150 = -5x$<br>$\downarrow = -5 \cdot -30$<br>$150 = 150$ | $150 = -5 \cdot -30$<br>$150 = 150$ |

**Example 3: Solve for x. Show work.**

$\frac{2}{5}x = 50$

$\frac{2}{5} \quad \frac{2}{5}$

$x = 125$

| Check | 3-Step Check | 2-Step Check |
|---|---|---|
| | $\frac{2}{5}x = 50$<br>$\frac{2}{5} \cdot 125 = \downarrow$<br>$50 = 50$ | $\frac{2}{5} \cdot 125 = 50$<br>$50 = 50$ |

**Example 4: Solve for x. Show work.**

$-2.8x = 28$

$-2.8 \quad -2.8$

$x = -10$

| Check | 3-Step Check | 2-Step Check |
|---|---|---|
| | $-2.8x = 28$<br>$-2.8 \cdot -10 = \downarrow$<br>$28 = 28$ | $-2.8 \cdot -10 = 28$<br>$28 = 28$ |

## Solving Division Equations

Inverse Operation of Division = Multiplication ($\frac{x}{3}$ means x divided by 3)

| Words | Algebra |
|---|---|
| $\frac{x}{5} = 4$<br>See: D Do: M<br>Step 1: Mult both sides by 5<br>Solution: x has a value of 20. | $5 \cdot \frac{x}{5} = 4 \cdot 5$<br>$x = 20$ |

| Check | |
|---|---|
| | Substitute 20 for x and simplify to see if the left and right sides are equal. |

| Check | 3-Step Check | 2-Step Check |
|---|---|---|
| | $\frac{x}{5} = 4$<br>$\frac{20}{5} = \downarrow$<br>$4 = 4$ | $\frac{20}{5} = 4$<br>$4 = 4$ |

| Words | Algebra |
|---|---|
| $\frac{x}{7} = 5.5$<br>See: D Do: M<br>Step 1: Mult both sides by 7<br>Solution: x has a value of 38.5 | $7 \cdot \frac{x}{7} = 5.5 \cdot 7$<br>$x = 38.5$ |

| Check | |
|---|---|
| | Substitute 38.5 for x and simplify to see if the left and right sides are equal. |

| Check | 3-Step Check | 2-Step Check |
|---|---|---|
| | $\frac{x}{7} = 5.5$<br>$\frac{38.5}{7} = \downarrow$<br>$5.5 = 5.5$ | $\frac{38.5}{7} = 5.5$<br>$5.5 = 5.5$ |

**Example 3: Solve for x. Show work.**

$-7 \cdot \frac{x}{-7} = -5 \cdot -7$

$x = 35$

| Check | 3-Step Check | 2-Step Check |
|---|---|---|
| | $\frac{x}{-7} = -5$<br>$\frac{35}{-7} = \downarrow$<br>$-5 = -5$ | $\frac{35}{-7} = -5$<br>$-5 = -5$ |

**Example 4: Solve for x. Show work.**

$-8 \cdot \frac{x}{-8} = 15 \cdot -8$

$x = -120$

| Check | 3-Step Check | 2-Step Check |
|---|---|---|
| | $\frac{x}{-8} = 15$<br>$\frac{-120}{-8} = \downarrow$<br>$15 = 15$ | $\frac{-120}{-8} = 15$<br>$15 = 15$ |

**Word Problems:**

1. A total of 288 pens are boxed by the dozen. How many boxes are needed?

Let x = # of boxes

**Words** number of pens | is | 12 | times | number of boxes

**Equation** $\frac{288}{12} = \frac{12x}{12}$

$24 = x$

Explain Solution: 24 boxes are needed.

2. At a restaurant, Mike and his three friends decided to divide the bill evenly. If the bill came to $52, how much did each person pay?

Let x = cost per person

**Words** 4 friends times cost = 52

**Equation** $\frac{4x}{4} = \frac{52}{4}$

**Explain Solution:** Each person paid $13.

3. How many video games can you buy with $125 if one video game costs $5?

Let x = # of games

**Words** $5 per video game = 125

**Equation** $\frac{5x}{5} = \frac{125}{5}$

$x = 25$

**Explain Solution:** 25 video games

4. Amanda and her best friend found $186 buried in a field. They split the money evenly.
How much money did each girl get?

Let x = $ each girl gets

**Words** 2 friends · $ equals $186

**Equation** $\frac{2x}{2} = \frac{186}{2}$

$x = 93$

**Explain Solution:** Each girl gets $93.