

## Topic 2-1: Understanding Equations

- equation: is true when both sides of the equation are equal.
- A solution to an equation is the value for the variable that makes the equation true.

\* Substitute each value of the variable to find the solution.

1.  $d + 9 = 35$       $d = 16, 22, 26, 36$

$$\begin{array}{l} 16 + 9 = 35 \\ \quad \checkmark \\ 25 \neq 35 \quad \underline{\text{NO}} \end{array}$$

$$d + 9 = 35$$

$$\begin{array}{l} 22 + 9 = 35 \\ \quad \checkmark \\ 31 \neq 35 \quad \underline{\text{NO}} \end{array}$$

$$d + 9 = 35$$

$$26 + 9 = 35$$

$$\begin{array}{l} \quad \checkmark \\ 35 = 35 \quad \underline{\text{YES!}} \end{array}$$

$$d + 9 = 35$$

$$36 + 9 = 35$$

$$\begin{array}{l} \quad \checkmark \\ 45 \neq 35 \quad \underline{\text{NO}} \end{array}$$

## Topic 2.2: Properties of Equality

- An equation is a sentence that uses an equal sign to show that two expressions have the same value.

$$5 + 3 = 8$$

- \* Think of an equation as a see-saw. To keep it balanced, you must do the same thing to both sides

$$\underline{5 + 3 = 8}$$

^

1. Addition Property of Equality (add) (+)

$$\underline{(5 + 3) + 2 = 8 + 2}$$

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2. Subtraction Property of Equality (subtract) (-)

$$\underline{(5 + 3) - 2 = 8 - 2}$$

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3. Multiplication Property of Equality (multiply) (x)

$$\underline{(5 + 3) \times 2 = 8 \times 2}$$

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4. Division Property of Equality (divide) ( $\div$ )

$$\underline{(5 + 3) \div 2 = 8 \div 2}$$

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## Topic 2-3: Solving Addition & Subtraction Equations

- How can you get the variable alone in an equation?
- Operations that "undo" each other have an inverse relationship. Subtracting 7 is the inverse of adding 7.

Ex:  $X + 7 = 25$  ▸ This is the equation

$X + \cancel{7} = 25 - 7$  ▸ This is the inverse operation

$X + \checkmark 0 = 18 \checkmark$  "7-7" cancels out, so all you're left with is "X!"

$$X = 18$$

To check, substitute 18 for X.

$$X + 7 = 25$$

$$18 + 7 = 25$$

$$\checkmark 25 = 25 \text{ YES! It checks } \checkmark$$

1.  $X - 19 = 34$

$$X - \cancel{19} + 19 = 34 + 19$$

$$X = 53$$

2.  $25 + m = 49$

$$\cancel{25} - 25 + m = 49 - 25$$

$$m = 24$$

## Topic 2-4 Problem Solving:

### Draw a Picture + Write an Equation

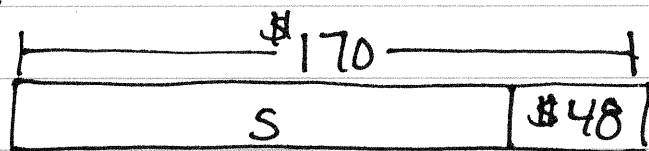
Jaron and Max sell pens and notebooks.

Total sales = \$170

They sold \$48 worth of pens.

How many dollars worth of notebooks did they sell?

Draw a picture:



Write an Equation:

$$\text{Solve } S + 48 = 170$$

$$S + \cancel{48 - 48} = 170 - 48$$

$$S = 122$$

★ They sold \$122 worth of notebooks.

## Topic 2-5 Solving Multiplication + Division Equations

- How can you get the variable alone in a multiplication problem?
- Use the inverse operation. Inverse means opposite!

Example:

$$3x = 45$$

$$\frac{3x}{3} = \frac{45}{3}$$

$$x = 15$$

Divide both sides by 3.

$3 \div 3 = 1$ , so that cancels out.

Substitute 15 for  $x$  to check.

$$3x = 45$$

$$3(15) = 45$$

$$45 = 45 \quad \text{YES! It checks!}$$

1.  $x \div 2 = 40$   
 $x \div 2 \times 2 = 40 \times 2$   
 $x = 80$

2.  $\frac{18x}{18} = \frac{36}{18}$   
 $x = 2$

## Topic 2-6: Solving Equations with Fractions

- How can you solve equations involving fractions and mixed numbers?
- Two fractions whose product is 1 are called reciprocals.

Example:  $\frac{1}{5}$  and  $\frac{5}{1}$  are reciprocals

$$\frac{1}{5} \times \frac{5}{1} = \frac{5}{5} = \boxed{1}$$

1.  $3\frac{3}{4} + x = 6$

~~$3\frac{3}{4} + x = 6$~~   $3\frac{3}{4} + x = 6 - 3\frac{3}{4} \rightarrow$  (inverse operation)

$x = 5\frac{4}{4} - 3\frac{3}{4} \rightarrow 5\frac{4}{4} = 6$  \*you need a common denominator

$x = 2\frac{1}{4}$

2.  $\frac{3}{8}n = 15$

$\frac{8}{3}(\frac{3}{8})n = 15(\frac{8}{3}) \rightarrow$  multiply by the reciprocal

$n = \frac{5}{1} \times \frac{8}{1} \rightarrow$  3 goes into 3 1 time

3 goes into 15 5 times

$n = \frac{5}{1} \times \frac{8}{1}$  simplify the fractions when possible

$n = \frac{40}{1}$  or  $\boxed{40}$

## Topic 2-7: Writing Inequalities

- An inequality is a mathematical sentence that contains  $<$  (less than),  $>$  (greater than),  $\leq$  (less than or equal to) or  $\geq$  (greater than or equal to.)
- $\neq$  this symbol means "not equal to"

Examples:

1. The piece of wire ( $w$ ) is longer than 20 ft.

$$w > 20$$

2. The pizza ( $p$ ) will cost at least \$8.

$$p \geq 8$$

3. Henry's height ( $h$ ) is less than 60 inches.

$$h < 60$$

4. The classroom holds at most 30 students ( $s$ )

$$s \leq 30$$

5. Zoe ( $z$ ) is not 11 years old.

$$z \neq 11$$

6. A number ( $n$ ) is greater than 22

$$n > 22$$

7. The distance ( $d$ ) is at least 110 miles

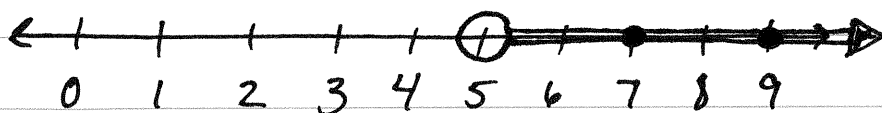
$$d \geq 110$$

## Topic 2-8: Solving Inequalities

- An inequality uses  $>$ ,  $<$ ,  $\geq$ , or  $\leq$  to compare 2 expressions.
- Inequalities have an infinite number of solutions.

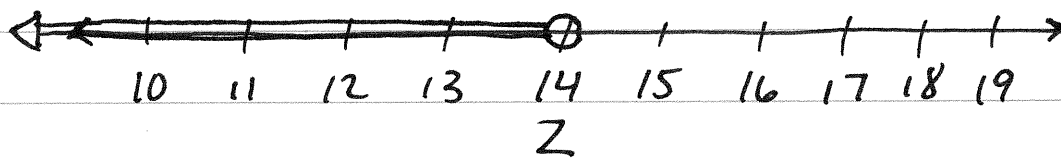
Example:

- $x > 5$
- $x$  could equal 7 because 7 is greater than 5.
  - Graph all solutions



- an open circle shows 5 is not a solution
- Solutions are represented by a dot on the number line like 7 and 9.
- Draw an arrow to show that the solutions go on forever.

- What inequality does this graph represent?



$$z < 14$$



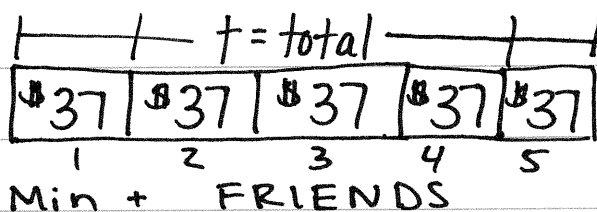
Topic 2-9: Problem Solving -

Draw a Picture and Write  
an Equation

Min and her 4 friends had a garage sale  
They divided the earnings so that each  
person had \$37

How much was their total earnings.

Draw a picture:



Write an equation:

$$t \div 5 = 37$$

$$t \div \cancel{5} = 37 \times 5 \quad (\text{inverse operation})$$

$$t = 185$$

They raised \$185.