

Agenda:

- \* Did you fill out an Informed Consent Form? If not, see me.
- \* Return Exam 2 & Discuss
- \* Current grades are on D2L
- \* Linear Equations, cont.
- \* Algebra in Middle Grades

Oct 21-9:15 AM

Solving a Linear Equation in One Variable:

1. Clear Fractions
2. Simplify Each Side Separately
3. Isolate the Variable Terms on One Side
4. Transform so the Coefficient of the Variable is 1
5. Check

- Estimate first: Is x positive or negative?
- Flexibility: Can this be solved in more than one way?
- Reflect: Does the solution make sense?

Solve:  $2(k - 5) + 3k = k + 6$

$$2k - 10 + 3k = k + 6$$

$$5k - 10 = k + 6$$

$$4k = 16 \Rightarrow k = 4$$

Solve:  $\frac{4x+5}{5} - \frac{2x-3}{2} = 20$

$$\text{Step 1: } \frac{2(4x+5)}{5} - \frac{5(2x-3)}{2} = 20$$

$$2(4x+5) - 5(2x-3) = 20$$

$$\text{Step 2: } 8x + 10 - 10x + 15 = 20$$

$$(8-10)x + 25 = 20$$

$$-2x + 25 = 20$$

$$-2x = -5$$

$$\text{Step 3: } \frac{1}{-2}(-2x) = \frac{1}{-2}(-5)$$

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

- | Reason                    |
|---------------------------|
| - Multiplication Property |
| - Simplify                |
| - Distributive Property   |
| - Distributive Property   |
| - Subtraction Property    |
| - Mult. property          |

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Examples:

Solve:

$$100x(.02x - .12(x - 4)) = 200 \quad (\text{clear "fractions"})$$

$$2x - 12(x - 4) = 200$$

etc.

(HW)

Finish these 3, and justify steps using properties of equality.

Solve:

$$-6k + 2k - 11 = 4 - 2(2k - 3)$$

Solve:

$$4[6 - (1 + 2m)] + 10m = 2(10 - 3m) + 8m$$

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Types of Equations:



If an equation has...

... a finite number of solutions, we say it is a **conditional equation**.

... an infinite number of solutions, we say it is **an identity**.

... no solutions, we say it is a **contradiction**.



Examples: Classify these equations by their solution types.

Solve:  $\frac{4x+5}{5} - \frac{2x-3}{2} = 2$  conditional equation

Solution Set:  $\{5/2\}$

Solve:  $-6k + 2k - 11 = 4 - 2(2k - 3)$  contradiction

Solution Set:  $\{\}$ , or  $\emptyset$

Solve:  $4[6 - (1 + 2m)] + 10m = 2(10 - 3m) + 8m$

Solution Set:  $\{\text{All real numbers}\}$

identity

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Examples: Justify Each Step!

Reflexive Axiom ( $a = a$ )

Symmetric Axiom (If  $a = b$  then  $b = a$ )

Transitive Axiom (If  $a = b$  and  $b = c$ , then  $a = c$ )

Substitution Axiom (If  $a = b$ , then  $a$  may replace  $b$ )

Addition Property of Equality ( $a = b$  iff  $a + c = b + c$ )  
(Subtraction Property is similar)

Multiplication Property of Equality: If  $c$  is not 0, then...  
 $a = b$  iff  $ac = bc$

Distributive Property:  $a(b+c) = ab + ac$

Solve:

$$7x - 5x + 15 = x + 8$$

$$\begin{array}{r} (7-5)x + 15 = x + 8 \\ 2x + 15 = x + 8 \\ \underline{-x \quad -15} \quad \underline{-x \quad -15} \\ x = -7 \end{array}$$

*distributive property*  
*→ subtraction property of equality (twice)*

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Examples: Justify Each Step!

Reflexive Axiom ( $a = a$ )

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Transitive Axiom (If  $a = b$  and  $b = c$ , then  $a = c$ )

Substitution Axiom (If  $a = b$ , then  $a$  may replace  $b$ )

Addition Property of Equality ( $a = b$  iff  $a + c = b + c$ )  
(Subtraction Property is similar)

Multiplication Property of Equality: If  $c$  is not 0, then...  
 $a = b$  iff  $ac = bc$

Distributive Property:  $a(b+c) = ab + ac$

*HW*

Solve:

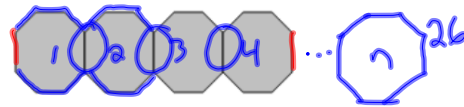
$$6x - 3(5x+2) = 4(1-x)$$

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What does algebra look like in the middle grades?

## Generalize

- Examine the four car octagonal train below. The length of each side is equal to one unit.



- Without counting, describe a strategy you could use to determine the perimeter of the four car train. Be sure to include drawings, words, and an arithmetic statement.

n	P
1	8
2	14
3	20
4	26

$$26 = 4(6) + 2 \rightsquigarrow n(6) + 2$$

$$26 = 2(7) + 2(6) \rightsquigarrow 2(7) + (n-2)6$$

$$26 = 4(8) - 6 \rightsquigarrow n(8) - (n-1)(2)$$

In words: Every time you add another train car, you add 6 to the perimeter.  
(recursive: current answer builds on previous answer)

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What does algebra look like in the middle grades?

- \* Identifying patterns
- \* Describing patterns in words *and* using symbols
  - Can be "recursive" or otherwise
- \* Using tables & graphs to record data and analyze patterns

See NCTM Activities:

- Houses
- Toothpicks

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