Foundations of Math
CHAPTER 1 - PART 1

NAME:

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Name: _____ Notes #1

Properties of Real Numbers

	Property	Example
1.	**Commutative Property of Addition**	
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3.	**Associative Property of Addition**	
4.	**Associative Property of Multiplication**	
5.	**Distributive Property**	
6.	**Additive Identity Property**	
7.	**Multiplicative Identity Property**	
8.	**Additive Inverse Property**	
9.	**Multiplicative Inverse Property**	
10.	**Zero Property**	
11.	**Closure Property**	

Name: _____ Notes #1

Identify the property used in the following examples:

1) $t + 0 = t$ _____

2) $1m = 1$ _____

3) $(-3 + 4) + 5 = -3 + (4 + 5)$ _____

4) $np = pn$ _____

5) $\frac{4}{3} * \frac{3}{4} = 1$ _____

6) $(3 * 8)4 = 3(8 * 4)$ _____

7) $p + q = q + p$ _____

8) $2 + 6 = 8$ _____

9) $a * 0 = 0$ _____

10) $7 + -7 = 0$ _____

11) $2(y - 7) = 2 * y - 2 * 7$ _____

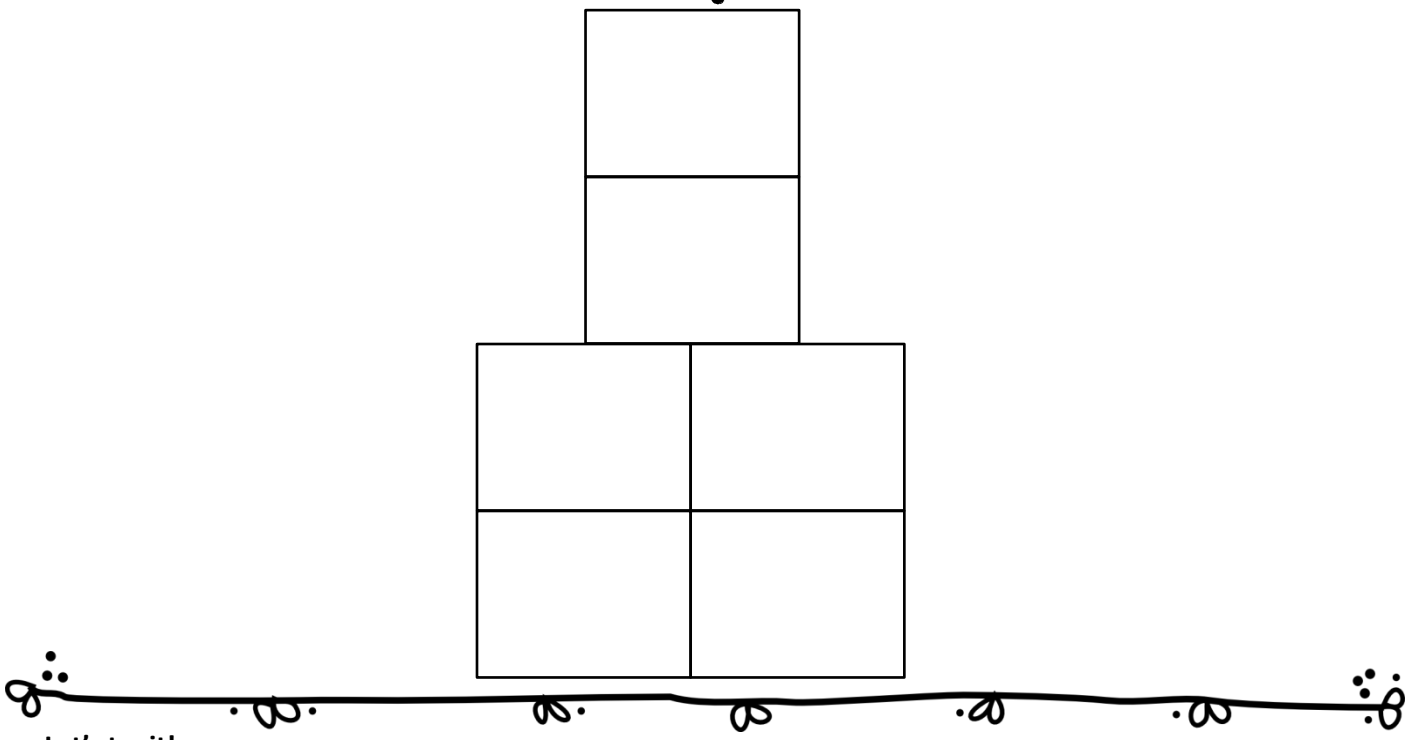
REMEMBER:

Commutative refers to _____

Associative refers to _____

Name: _____ Notes #2

Order of Operations



Let's try it!

1) $(4^2 - 2 + 2) - 8 - 6$

2) $(1 - 6) + 2$

3) $(5 + 7 + 2)$

4) $(2 + 8) * 7$

5) $(2 \div 1^2 + 2) + 1$

6) $5^2 * (8 - 8) - 6$

7) $(7 * 2) - 6$

8) $9 * (9 \div 3^2) + 9 + 4$

Name: _____ Notes #2.5

BASIC SUBSTITUTION

What does substitution mean?

What are some examples of "substitution" in the real world?

In math, we substitute by replacing _____ with _____.

Let's try it!

Evaluate each using the values given.

1) $y \div 2 + x;\ for\ x = 1\ and\ y = 2$

2) $p^2 + m;\ for\ m = 1\ and\ p = 5$

3) $a - 5 - b;\ for\ a = 10\ and\ b = 4$

4) $m + p \div 5; for\ m = 1\ and\ p = 15$

5) $(6 + h^2 - j) \div 2; for\ h = 6\ and\ j = 4$

6) $z(x + y); for\ x = 6, y = 8, and\ z = 6$

7) $p^2 m \div 4; for\ m = 4\ and\ p = 7$

8) $y - (z + z\text{^}2);\ for\ y = 10\ and\ z = 2$

Name: _____ Notes #3

Rational or Irrational?

Rational numbers- _____

_____

ex)

Irrational numbers- _____

_____

ex)

Rational Numbers can be divided into different categories:

Natural Numbers=

Whole Numbers=

Integers=

Name the set(s) of numbers to which each number belongs:

2.8	38	$\frac{-17}{31}$	0	$\sqrt{10}$	-46	$\frac{2}{3}$	$3.\overline{3}$	-0.002	$12\frac{1}{2}$	7.26841973 …

Natural:

Whole:

Integers:

Rational:

Irrational:

Which of the following is irrational? $\frac{6}{11}, \frac{2}{5}, \sqrt{10}$

What is a counterexample?

Is each statement true or false? If the statement is false, give a counterexample.

1) Every whole number is an integer.

2) Every integer is a whole number.

3) Every whole number is a natural number.

4) Every natural number is a rational number.

5) The product of two rational numbers is rational.

6) The sum of two irrationals is rational.

Name: _____ Notes #4

SOLVING ONE STEP EQUATIONS

What is so special about an equation?

Something without an equal sign is called an _____.

An equation must always remain _____.

What you do to one side of the equation, _____.

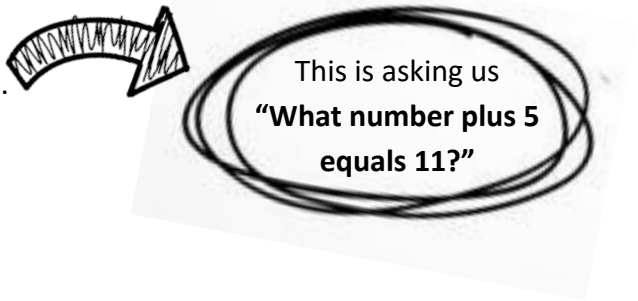
If you subtract the same number from each side of the equation, the two sides remain EQUAL!
If you add the same number from each side of the equation, the two sides remain EQUAL!

How do you undo addition? (In other words, what is the opposite of addition) _____

How do you undo subtraction? (In other words, what is the opposite of subtraction) _____

EXAMPLE 1

Solve: $x + 5 = 11$. Solve & identify the property used.



EXAMPLE 2

Solve $b - 28 = 22$. Solve & identify the property used.

EXAMPLE 3

Solve $8.6 = n + 7.1$. Solve & identify the property.

EXAMPLE 4

Solve $15 = -12 + t$. Solve & identify the property.

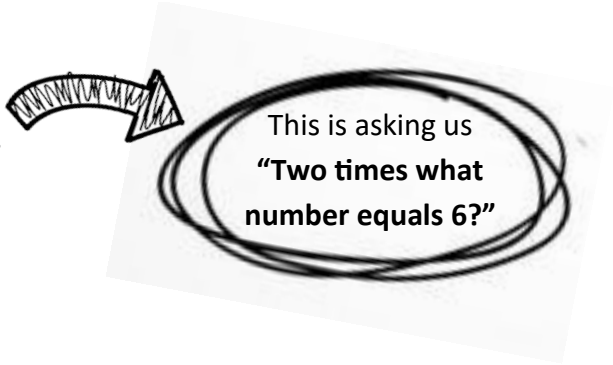
WHEN WE SOLVE, WE ARE ISOLATING THE VARIABLE
(IN OTHER WORDS, WE ARE TRYING TO GET THE LETTER BY ITSELF)

How do you undo multiplication? (In other words, what is the opposite of multiplication) _____

How do you undo division? (In other words, what is the opposite of division) _____

EXAMPLE 5

Solve: $2w = 6$. Solve & identify the property used.



EXAMPLE 6

Solve $\frac{x}{2} = 14$. Solve & identify the property used.

EXAMPLE 7

Solve $-4y = 60$. Solve & identify the property.

EXAMPLE 8

Solve $f \div 3 = 4$. Solve & identify the property.

You try it! Solve and identify the property used.

3) $x - 8 = -3$

1) $-\frac{1}{4}x = 5$

4) $3y = 15$

2) $6 + x = 5$

Name: _____ Notes #5

SOLVING TWO STEP EQUATIONS

Review: Solve, check and identify the property.

1. $-3 + x = -18$

2. $\frac{p}{3} = 8$

Two-step equations- equations that require you to perform two operations in order to

_____.

STEPS TO SOLVE TWO STEP EQUATIONS:

1) Draw a line down from _____
2) Circle the _____.
3) Move the term that is _____ from the circled variable.
   To do this, **undo** it by performing the _____.
4) Move (**undo)** the term that is _____ the variable by
   performing the _____.

ALMOST ALWAYS YOU WILL HAVE TO: 1ST UNDO ADDITION/SUBTRACTION AND 2ND UNDO MULTIPLICATION/DIVISION.

Examples: Solve & identify each property that you use.

1) $5x + 14 = 74$

3) $-9 - 4x = 21$

2) $-3 + \frac{p}{4} = 19$

4) $\frac{k}{5} - 6 = 3$

REMEMBER: UNDO ADDITION/SUBTRACTION FIRST, AND MULTIPLICATION/DIVISION LAST.

5) $\frac{s}{6} - 5 = -8$

7) $9 + \frac{k}{5} = 6$

6) $5y + 16 = 51$

8) $-12 + 5x = 28$

REMEMBER: UNDO ADDITION/SUBTRACTION FIRST, AND MULTIPLICATION/DIVISION LAST.

Name:_____ Notes #6

Combining Like Terms

term: _____

_____

coefficient: _____

Important: Whenever a variable does not have a _____ it is always an imaginary _____!

examples of terms:

like terms:

- terms with the same _____ raised to the same _____
- _____ do not have to be the same

like terms	$3x$ and $2x$	w and $\frac{w}{7}$	5 and 1.4
unlike terms	$3x^2$ and $2x$	r and $\frac{w}{7}$	3.2 and x

combining like terms: all you have to do is _____ the _____!

NOTHING happens to the _____. It always STAYS THE _____.

non-algebra example: What is 2  + 3  ? Answer:_____

algebra example: What is $2x + 3x$? Answer: _____

try it!

1) $14b - 8b$	**2)** $2x^3 + 9x^3$	**3)** $20x - 2x + 4x$

Name:_____ Notes #6.5

Distributing

Recall: The distributive property is all about _____.

You **distribute** when a term is directly **in front of** or **behind** a set of _____.

The parentheses will have terms inside that are being _____ or _____.

examples: $6(x+2)$ and $(k-3)7$

non-examples: $6+(x+2)$ and $(k-3)-7$

The term on the _____ of the parentheses needs to be _____to every term on the inside.

steps to distribute:

1) draw a "_____" from the term on the outside of the ( ) to the first term inside.

2) Multiply the two terms that you just connected and write down your answer.

3) Draw a "_____" from the term on the outside of the ( ) to the next term inside.

4) Multiple the two terms that you just connected and write down your answer.

5) Repeat until the term on the outside has been multiplied to each term on the inside.

6) Combine like terms if necessary.

7) Circle your answer.

Example: **1)** $-8(x+3)-15$ **2)** $-2(x-3)+7x-9$

try it!

1) $5(9+w)$	**2)** $9(7+p)$	**3)** $4(5j-3)$
4) $5(6k+10)-15k$	**5)** $2(3b+2)-2b$	**6)** $3(4c+2)-6-11c$

Name: _____ Notes #7

Solving Multi-Step Equations

Review:

1) $4y + 5 = -31$

2) $-36 + 9n = -27$

A **multi-step** equation is an equation that requires _____ _____ in order to solve. Typically you will have to **undo** more than just _____ and _____. You may encounter problems where you have to _____ like _____ or _____.

STEPS FOR SOLVING MULTI-STEP EQUATIONS:

Note: these steps can be followed for solving one and two step equations also

Step 1: Draw a _____ down from the _____ _____.

Step 2: _____ if needed.

Step 3: Combine _____ _____ .

Step 4: _____ the variable.

Step 5: Undo any _____ or _____.

Step 6: Undo any _____ or _____.

Step 7: _____ each step (which means _____ the property that you used).

Let's try it!

1) $2n + 3n + 7 = -41$	**2)** $3h - 5h + 11 = 17$
3) $2(m + 1) - 4 = 16$	**4)** $3(t - 12) = 27$

5) $8 + 2k - k = -3$	**6)** $6a - 2a = -36$
7) $3c - 8c + 7 = -18$	**8)** $-14 - 7g + 5g = 8$
9) $5(3x + 12) = -15$	**10)** $\frac{1}{2}(12g - 8) = 26$
11) $2d - 6 + 3d = 14$	**12)** $5(b + 4) - 6b = -24$

Name: _____ Notes #8

Equations with Variables on Both Sides

Review:

1) $2(3y + 4) = 20$

2) $-12 + 6b - 2b = -8$

Sometimes we will encounter problems that have a _____ on both sides of the equation.

Steps for Variables on Both Sides:

Step 1: Draw a _____ down from the equal sign to separate the two sides.

Step 2: _____ if needed.

Step 3: Combine _____ _____ on each side **separately** if needed.

Step 4: _____ the terms with the variable.

Step 5: Move the _____ variable to the other side by doing the _____.

Step 5: Undo any _____ or _____.

Step 6: Undo any _____ or _____.

Step 7: _____ each step.

Let's try it!

1) Solve $6y + 21 = 9y$

3) Solve $2(c - 6) = 9c + 2$

2) Solve $4x + 2x - 24 = 8x$

4) $5a - 12 = 3a + 8$

6) $4b - 13 = 7b - 28$

5) $9x + 4 = 12x - 6x - 11$

7) $2(k + 1) = 3k + 5$

Name:_____ Notes #9

Equations with decimals & fractions

Review: Solve the following equations and check:

1) $2w - 6 = 4w + 8$

2) $r + 3 = 5r + 19$

When an equation has _____ and _____, not much changes!

USE YOUR CALCULATOR!!! IT IS YOUR FRIEND!

Convert all fractions to decimals first **if you can.**

If a fraction is attached to your variable (and it **can't** be converted to a decimal), _____

both sides of the equation by the _____ to get rid of it. (_____!)

Let's try it!

1) $0.02\text{x} + 0.7 = 0.8$

3) $\frac{2}{3}x + \frac{1}{2} = \frac{5}{6}$

2) $0.06y + 200 = 0.03y + 350$

4) $\frac{1}{4}n + 5 = 5\frac{1}{2}$

Your turn!

5) $0.35x + 0.6 = 0.1x + 1$

6) $2(x - 3) = 1.2 - x$

7) $\frac{1}{16}x + \frac{1}{4} = \frac{1}{2}$

8) $3.3 - x = 3(x - 1.7)$

Name: _____ Notes #10

solving one-step inequalities

(SHOULD BE) REVIEW

>	<	≤	≥

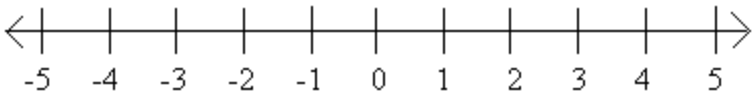
When graphing, if ____ or _____, the circle will be _____ on the value.

When graphing, if ____ or _____, the circle will be _____ on the value.

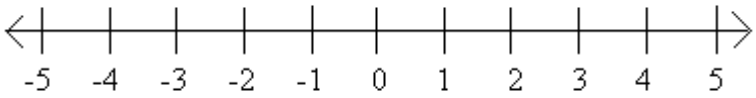
Depending on the inequality sign: _____ in the direction of the values that satisfy the inequality.

Examples:

1) a < 2



2) 3 ≥ d



Just like with equations, our goal is to _____ the variable.

Examples:

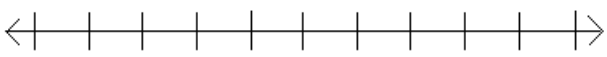
Let's solve, number line and explain each of the following inequalities.

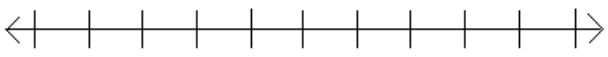
1) $x + 3 > 10$

2) $-12 \geq 7 + x$

3) $6 < 2k$

4) $\frac{x}{2} \geq 4$





Solve each inequality and graph it on a number line. Explain the solution.

1) $b + 7 \leq -4$

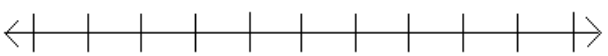
2) $-5 < n - 3$

3) $3x > -18$

4) $-2 \leq \frac{x}{4}$

5) $-12 + c < 14$

6) $\frac{x}{3} \geq 5$



Name: _____ Notes #11

Solving Two-Step Inequalities

Consider the inequality 4 > 1.

1. Complete each statement on the right by choosing < or >.
2. What happens to the inequality symbol when you multiply each side by a positive number?

3. What happens to the inequality sign when you multiply each side by a negative number?

4 · 3 ____ 1· 3
4 · 2 ____ 1· 2
4 · 1 ____ 1· 1
4 · –1 ____ 1· –1
4 · –2 ____ 1· –2
4 · –3 ____ 1· –3

Solve and Compare:

1.) $3x > 9$

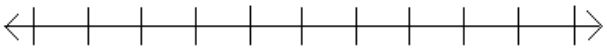
2.) $-3x > 9$

If you multiply or divide each side of an inequality by a _____ number, the inequality stays in the same direction.

If you multiply or divide each side of an inequality by a _____ number, the inequality **flips directions**.

Solve, graph, and explain the solution

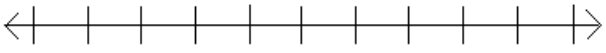
1) $2k + 4 < 6$



2) $-3m - 6 < 9$

3) $4 \leq \frac{x}{2} - 3$

4) $-\frac{x}{3} + 2 \geq 1$

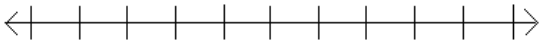


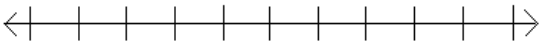
Name: _____ **Homework #11**

EXAMPLES: Solve and graph and explain the solution.

1) $3g + 9 < 18$

2) $\frac{k}{-2} + 5 \leq -4$





What numbers are a part of the solution set? Circle all that apply. (there can be more than one)

3.) $-5c + 9 < -11$

a) 6 b) -3 c) -4 d) 4

4.) $\frac{x}{3} - 1 \leq 2$

a) 3 b) 9 c) 4 d) 10

Name:_____ Homework #10

Solve the following inequalities. **Graph and explain the solution.**

1.) $n - 7 > 2$

2.) $x + 1 < -3$

3.) $60 < 12b$

4.) $-5 \geq \frac{t}{3}$

5.) $6 < y - 3$

6.) $16d > -64$

7.) $\frac{w}{7} > 0$

Name_____ Homework #9

Solve each problem and JUSTIFY each step.

#1) $2(x+2) = \frac{9}{2}$

#2) $0.3n + 4.1 = -0.6n - 1.2$

#3) $\frac{1}{3}\left(\frac{3}{5}w + \frac{12}{10}\right) = \frac{4}{5}w + \frac{1}{10}$

#4) $0.4(m+0.7) = 1.5$

Name: _____ Homework #8

Solve the equation and justify each step.

1. $5 + 4x = x + 8$

2. $3z + 7 = 2(z + 5)$

3. $-2(6 - 2m) = 3m - 8 + 5m$

4. $3(x - 2) - 2x = 4x + 9$

Name: _____ Homework #7

Solve the following equations and identify the properties used.

1) $3(d + 2) = 6$

2) $26 = 2(m + 10)$

3.) $18 = 2m + 6 - 5m$

4.) $2(b - 3) - 4b = 4$

Homework #6

Use the Distributive Property
& Combine Like Terms

Name:_____

1.) $3 - 3(x - 2)$

2.) $-(1 - 5n) - 7n$

3.) $8 + 7(7n - 4)$

4.) $4x + 5(3x - 3)$

5.) $5 - 2(8x + 4)$

6.) $1 - 8x - 5x$

7.) $7 + 6x + 9x + 9$

8.) $-3 + 8x + 2$

9.) $5 - 8n - 4n$

10.) $9 + 3x + 1 - 2x$

Name:_____ Homework #5

Solve the following 2 step equations and CHECK! Then identify the properties used.

1.) $2c + 5 = 35$

2.) $\frac{p}{4} + 3 = 15$

3.) $34 = 14n - 8$

4.) $5y + 16 = 51$

4.) $-\frac{m}{9} + 7 = 3$

6.) $\frac{n}{4} - 3 = 6$

7.) $-3 = -3k + 6$

8.) $-9 = -\frac{s}{12} + 5$

Name:_____ Homework #4

Solving one-step equations

You must **show your work** to get credit. Identify the property you used.

1) $y + 9 = 23$

2) $\frac{x}{4} = 16$

3) $-78 + z = 100$

4) $-8c = 96$

5) $3n = 39$

6) $10 = a - 15$

7.) $48 + b = 56$

8.) $\frac{1}{5}x = 4$

Name:_____ Homework #3

1.) Determine the set or sets the following numbers belong to:

-3.2 -35 7 0 $\sqrt{8}$ $\frac{3}{5}$ .23974...

Natural:

Whole:

Integer:

Rational:

Irrational:

2.) Which statement is *not* always true?

(1) The product of two irrational numbers is irrational.
(2) The product of two rational numbers is rational.
(3) The sum of two rational numbers is rational.
(4) The sum of a rational number and an irrational number is irrational.

3.) Given: $L = \sqrt{2}$
$M = 3\sqrt{3}$
$N = \sqrt{16}$
$P = \sqrt{9}$

Which expression results in a rational number?

(1) $L + M$
(2) $M + N$
(3) $N + P$
(4) $P + L$

Name:_____ Homework #2

Identify the property that each example illustrates.

1 Which property is illustrated by the equation $ax + ay = a(x + y)$?

2 Which property of real numbers is illustrated by the equation $-\sqrt{3} + \sqrt{3} = 0$?

3 Which property of real numbers is illustrated by the equation $52 + (27 + 36) = (52 + 27) + 36$?

4 If *M* and *A* represent integers, $M + A = A + M$ is an example of which property?

5 Which property is illustrated by the equation $\frac{3}{2}x + 0 = \frac{3}{2}x$?

6 Which property is illustrated by the equation $6 + (4 + x) = 6 + (x + 4)$?

7 What is the multiplicative inverse of $\frac{3}{4}$?

8. Under which operation is the set of odd integers closed?
   1) addition
   2) subtraction
   3) multiplication
   4) division