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Integrated Algebra A
Notes/HW Packet 2

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Translating Words into Algebraic Expressions

We don't only use the terms, add/subtract/multiply/divide when talking about operations. Fill in the chart with other terms that can be used for these operations.

+	-	x	÷
Ways to write the operation			
+	-	x	÷

Emphasis on "less than"

Example: If I were to say, "How much is three less than five?" you are doing the math in your head. What you are doing in your head, even though it is an easy question, is "5 - 3."

So when you see the words "less than" or a version of it, you must _____ the terms and put a _____ sign in between them. (This also applies to terms with the word 'from.'

Examples:

1) Five less than x. _____

2) Eight subtracted from g. _____

3) y less than fifteen. _____

Parentheses: Some phrases are worded in a way that you need parentheses to make the problem make sense. Commas are sometimes used to specify parentheses, and phrases such as "4 times the sum of…"

Examples:

1) The product of x and y, decreased by 2 _____

2) The sum of 10 and a number, divided by 3 _____

3) Nine times the sum of x and 6 _____

4) 11 times the difference of 3 and y _____

Practice

Use mathematical symbols to translate the following verbal phrases into algebraic language:

1) w more than 3 _____

2) r decreased by 2 _____

3) The product of 5r and s _____

4) The sum of t and u, divided by 6 _____

5) Twice the sum of x and y _____

6) Five times the sum of a number and 8 _____

Using the letter ***n*** to represent "a number", write each verbal phrase as an algebraic expression:

1) A number increased by 12 _____

2) 7 less than a number _____

3) 4 added to twice a number _____

4) The sum of a number and 5, decreased by 7 _____

5) 4 more than two thirds of a number _____

Word Problems:

Ex. 1: Represent the following by an algebraic expression:
"a distance that is 20 meters shorter than **x** meters" _____

Translating Words into Algebraic Equations

Expressions cannot be solved because they do not have an equal sign. **Equations** on the other hand have an equal sign! Yesterday, we learned how to translate words into algebraic expressions and today we are going to take that one step further!

Words that indicate when to put an " = " sign:

- is
- the result is
- equals
- exceeds by

Translate the following sentences into equations.

1. Four times a number is 20. _____
   *Can you figure out what "the number" is? ____

2. A number decreased by 6 equals 8. _____
   *Can you figure out what "the number" is? ____

3. A number divided by 2 is 4. _____
   *Can you figure out what "the number" is? ____

4. 5 times a number, decreased by 7 is 13. _____

5. When a number is subtracted from 8, the result is 10. _____

6. 9 less than twice a number is 10. _____

7. The sum of 50 and a number is equal to 6 times that number. _____

8. 4 times a number increase by 5 exceeds the number by 10. _____

Classwork:

A. Translate these *expressions*.

1. Twice a number, increased by 8 _____

2. 4 times the sum of a number and 7 _____

3. 3 less than 6 times a number _____

4. The sum of a number and 5, divided by 3 _____

B. Translate these *equations*.

1. If two-thirds of a number is diminished by 8, the result is 32. _____

2. 10 times a number increased by 6 is 112. _____

3. When a number is doubled, the result is 24. _____

4. The product of a number and 11 is 99. _____

5. 7 times the sum of a number and 4 exceeds 3 times that number by 17. _____

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HW #2

Match the following words to the correct expressions:

1. 3 less than twice a number ____	A. n - 6
2. 8 more than 4 times a number ____	B. $\frac{x}{3}$
3. 6 less than a number ____	C. 3(y - 2)
4. 3 times the difference of a number and 2 ____	D. 2d – 3
5. a number decreased by 3 ____	E. k – 3
6. 8 multiplied by the sum of a number and 4 ____	F. 8 + 4x
7. a number diminished by 6 ____	G. h – 6
8. one-third of a number ____	H. 8(f + 4)

Translate the following words into algebraic equations.

1. A number increased by 3 is 14. _____
2. 4 times a number decreased by 6 is equal to 6 times that number. _____
3. The sum of 50 and a twice a number equals 30 minus that number. _____
4. A number plus 15 exceeds twice that number by 3. _____
5. Three-fourths of a number less than 6 is 10. _____
6. Three times a number decreased by 8 is equal to 4 times that number increased by 12. _____

Review:

Which transformations preserve congruence (keeps the figures the same shape and same size)? _____

Variables and Like Terms

Vocabulary

1) Variable - _____

2) Coefficient - _____

3) Term - _____

4) Like terms - _____

5) Simplify - _____

Number of terms: We count how many terms a polynomial has **after** combining all like terms.

One term	Two terms	Three terms	Four terms
Ex:	Ex:	Ex:	Ex:

We cannot count the number of terms unless all of the like terms have been put together so we must combine the like terms. When combining like terms you have to pay attention to the _____ attached and the _____ in front of the coefficient.

Combining Like Terms

Steps:

- Identify like terms.
- Combine the coefficients of the like terms and keep the common variable attached.
- Repeat this process for all sets of like terms.
- Separate all of your answers with addition/subtraction signs.

Examples:

1) $5x + 3x$ _____

2) $5m^2 - 1m^2 + 8m - 3m^2 + 6m$ _____

3) $1xy + 3n - 2n + 4xy - 5$ _____

4) $4a - 12b + 16$ _____

5) $10x^2 + x - 7x^2 - x$ _____

Practice

1. $5x + 7x$

2. $-3x^2 + 10x^2$

3. $13c – 12c$

4. $19y + y$

5. $3yz – 5yz$

6. $–e + 8e$

7. $4a + 9 + a$

8. $7s + 5x – 8s$

9. $4.7x – 5.9x$

10. $5x – 6y – 8y + 7x$

11. $23x + 8 + 6x + 3y$

12. $4a^2 – 3 – 2a^2$

13. $10b^2 – 9b – 4b^2 + 6b$

14. $5y^2 + y – 7y^2 - y$

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HW #3

Practice

1. $20n + 30n$

2. $15x^2 + (-3x^2)$

3. $6x - 11x$

4. $m + m + 4m$

5. $2abc - 6abc$

6. $-f - 10f$

7. $5z + 3 - z$

8. $9p + 15r + 8p$

9. $-9k + 14k$

10. $7s + 6u - 5s - 10u$

11. $8h - 4g - 8h + 4g$

12. $-9x^2 + 1 - 3x^2$

13. $40y^2 + 16y - 15y - 13y^2$

14. $8u^3 + 5u - u^2 + 6u - 3u^3 + u^2$

Solving One-Step Equations (+/-)

Now that we know how to set up **equations**, we are going to **solve** them using **addition** and/or **subtraction**!

Example 1: $x + 4 = 7$

_____ [***Subtract 4 from each side*** to undo the addition]

← [Here is your answer!]

Example 2: $y - 3 = 12$

_____ [***Add 3 to each side*** to undo the subtraction]

← [Here is your answer!]

<u>Our Goal</u>:
To **isolate** the variable (get the variable **by itself** on one side).

Solve the equation [Show <u>ALL</u> Work!]:

1) $x = 4 - 7$

2) $x + 5 = 10$

3) $t - 2 = 6$

4) $11 = r - 4$

5) $-9 = 2 + y$

6) $n - 5 = -9$

7) $-3 + x = 7$

8) $\frac{2}{5} = a - \frac{1}{5}$

9) $r - (-7) = 16$

One-Step Equations (×/÷)

Today we are going to solve equations dealing with multiplications and division.

Example 1: $6x = 18$

[***Divide each side by 6*** to undo the multiplication]

← [Here is your answer!]

Example 2: $\frac{y}{-3} = 9$

[***Multiply both sides by -3*** to undo the division]

← [Here is your answer!]

Example 3: $\frac{2}{5}x = 4$

[***Multiply both sides by the reciprocal*** to get rid of the fraction]

← [Here is your answer!]

Solve the equation [Show <u>ALL</u> Work!]:

1) $7x = 14$

2) $-6x = 24$

3) $\frac{y}{8} = -4$

4) $\frac{1}{4}y = 10$

5) $-81 = -9n$

6) $\frac{x}{-3} = -1$

7) $12x = -48$

8) $\frac{-3}{4}n = 12$

9) $-20x = -20$

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HW #4

SHOW ALL WORK on here or another sheet of paper!

"How did the Vikings send secret messages?"

Solve for x. The answer to each problem will match a letter that will allow you to figure out the joke.

1. $x + 6 = 23$
2. $x - 11 = 37$
3. $18 + x = 42$
4. $-4 + x = 16$
5. $x + 21 = 50$
6. $35 = 16 + x$
7. $x - 23 = 34$
8. $-1 + x = 29$
9. $63 = x - 2$
10. $13 + x = 40$
11. $-15 + x = 10$

C. 25
E. 20
N. 27
M. 21
Y. 48
O. 19
S. 17
T. 8
B. 30
L. 14
D. 29
O. 24
E. 65
I. 0
R. 57
A. 51

8	2	10	3	7	1	4	11	6	5	9

"What do you get if you cross a chicken with a cement mixer?"

Solve for x. The answer to each problem will match a letter that will allow you to figure out the joke.

1. $3x = 63$
2. $-5x = 150$
3. $\frac{x}{2} = 12$
4. $-240 = 12x$
5. $\frac{x}{-6} = -5$
6. $244 = 4x$
7. $16 = \frac{x}{-3}$
8. $13x = 169$
9. $-7x = 91$
10. $-19 = -19x$

K. -20

T. 41

A. 13

N. -18

C. -48

O. 15

R. 61

I. -30

B. -13

U. -25

L. 24

E. 21

S. 22

M. 0

Y. 1

R. 30

8	9	5	2	7	4	3	8	10	1	6

Solving 2-Step Equations

☻ Solving equations is just a matter of undoing the operations that are being done to the variable. We already did 1-step equations…

Example 1:

$x - 3 = -9$

Operation Now:

Opposite Operation:

Answer

Example 2:

$-5x = 30$

Operation Now:

Opposite Operation:

Answer

☻ In an equation which has more than one operation, we have to undo the operations in the correct order. First, undo addition or subtraction, then undo multiplication or division.

Example 1: $5x - 2 = 13$ Let's check our answer!

Example 2: $\frac{1}{2}x + 6 = 2$ Check

Example 3: $7 - x = -15$ Check

Classwork: Show all steps and check the odd problems!

1. $6x - 2 = 22$ Check

2. $2x + 8 = 6$

3. $\frac{1}{3}m - 7 = -10$ Check

4. $16 - 8r = 40$

5. $6 - \frac{3}{4}x = -12$ Check

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HW #5

"What do you call a crate of mallard ducks?"

Solve for x. The answer to each problem will match a letter that will allow you to figure out the joke.

1) $3x + 2 = 26$

2) $4x - 5 = 35$

3) $2x + 3 = 13$

4) $-7x - 7 = 49$

5) $10 - 6x = 46$

6) $9 = 6 - x$

7) $2x - 1 = -9$

8) $-7 - 9x = -61$

9) $-23 = 7 - 15x$

10) $14x + 6 = 6$

11) $-1 - 8x = 7$

12) $16 = -3x + 1$

I. 1

A. 0

B. 5

K. 6

N. 7

E. -6

O. -4

Q. -5

Z. 18

X. 2

L. -9

S. 8

R. -1

F. -8

M. 11

D. 9

C. 10

D. 9

C. 10

W. 14

U. -3

____	____	____	____	____	____	____	____	____	____	____	____	____	____
10	3	7	9	7	4	12	6	10	2	8	5	11	1

Solving Multi-Step Equations with Distribution

Do you remember how to use the **Distributive** Property? Let's see:

1) $5(x + 2)$ 2) $-2(6 - x)$

Do you remember how to solve 2-step equations? I hope so! Let's try:

1) $5x - 2 = 18$ 2) $7 - x = -10$

IMPORTANT: Leave *the term with the variable* **ALONE** until the **last** step!

Now, let's put these two together and solve multi-step equations using the distributive property!

Example 1: $5(x - 7) = 90$

Steps:
Distribute the 5.

Add 35 to both sides.

Divide by 5 on both sides.

Check:

Example 2: $3(x - 2) = 18$

Check:

Example 3: $\frac{1}{2}(x + 6) = 12$

Check:

Example 4: $4x - 3(x - 2) = 21$

Steps:
Distribute the –3 first!!!
(Bring down the 4x)
Combine like terms.

Subtract 6.

Check:

Example 5: $-2(4 - x) - 5 = 11$

Practice:

1) $3(y - 9) = 30$

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

3) $5x + 3(x + 4) = 28$

4) $9t - (2t - 4) = 25$

5) $-8(2 - x) - 4(x - 2) = 8$

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HW #6

"Who wrote the book 'Grocery Packing at the Supermarket'?"

Solve for x. The answer to each problem will match a letter that will allow you to figure out the joke.

1. $3(x + 2) = 21$

2. $5(2x – 1) = -25$

3. $–4(3x – 5) = -16$

4. $–2(4 – x) – 5 = 11$

5. $3(-6x + 7) + 4x = -7$

6. $2(3x – 4) + 5(2x + 3) = -9$

7. $5(x + 9) = 65$

8. $\frac{1}{2}(x – 3) = -4$

9. $5x + 2(x – 6) + 7 = 2$

10. $9(x + 3) - 14x – 15 = 52$

M. 7

R. 1

S. 3

Z. 9

E. -5

A. -2

U. 4

W. -11

C. -18

B. -1

T. No Solution

D. -8

F. 25

G. 12

L. 5

O. 6

S. 2

9	7	5	3	8	1	10	6	2	4

Solving Equations with Variable on Both Sides

Suppose there are variables on both sides of the equation. The trick now, is to get the variables on the **same** side by adding or subtracting them.

Example 1:

$4x + 5 = x - 4$

We need to get the x over with the 4x so we will subtract it from both sides.

Now we are at a 2-step equation! Let's subtract 5 from both sides.

Divide by 3!

Check:

Example 2:

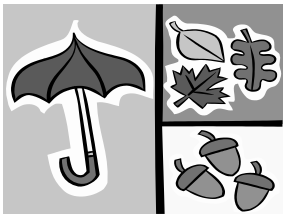
$3x - 5 = 5x + 7$

Check:

Example 3:

$7y + 5 - 3y + 1 = 2y + 2$

Check:



Example 4:

$4x - 7 = 6x + 5 - 2x$

Something *weird* is going to happen here!

Practice:

1. $12x - 9 = 4x + 15$

Check:

2. $5 + 3x = 28 + 7x - 7$

Check:

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HW #7

"Who wrote the book 'Terrible Weather'?"

Solve for x. The answer to each problem will match a letter that will allow you to figure out the joke.

1. $5x - 7 = 4x + 3$

2. $6 + 2x = 7x - 9$

3. $8x + 1 = -8 - x$

4. $-5 + 12x = 18x + 7$

5. $-4x + 3 = 5x - 13 - x$

6. $-10 - 11x + 24 = 3x$

7. $8 + 3x = x + 11 + 2x$

8. $5 + 17x + 9 = 23x + 14$

9. $-7x + 18 = -7 - 2x$

10. $-12 - x = 2x + 6 + 3x$

B. 4

Y. No Solution

N. 10

I. -11

S. -2

P. -3

V. -7

E. 1

W. 5

F. -6

O. 3

A. -1

R. 2

W. 8

Y. -13

D. 0

____	____	____	____	____	____	____	____	____	____
9	3	7	1	6	8	5	2	10	4

Solving Equations w/Variable on Both Sides *and* Distribution

Distribute the following:

1) $-8(x - 2)$

2) $7(4 - x)$

Combine like terms:

3) $-5x + 2 + 7x - 14$

4) $-14 + 5 - x - 3 + 4x$

Solve equations with Variables on BOTH sides (Combine Like Terms First for #6):

5) $3x + 5 = 4x + 2.5$

6) $2x + 4 - 3x = -9 + x + 5$

Now, let's put these **three** concepts together:

Example 1: $2(4x + 15) = 7x + 3$

Steps:
1) Distribute the 2.

2) Subtract 7x from each side.

3) Subtract 30 from each side.

Check:

Example 2: $4(x - 5) + 2 = x + 3$

Steps:
1) Distribute the 4.
2) Combine Like Terms.
3) Subtract x from each side.
4) Add 18 to each side.
5) Divide both sides by 3.

Check:

Practice:

1) $15x = 29 + 2(3x - 1)$

2) $22x = 16 + 3(5x + 4)$

3) $100(x - 3) = 50(9 - x)$

4) $9x - (2x - 4) = 16 + x$

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HW #8

Solve:

1) $4(2 - x) = 24$

2) $6x + 2(4x - 1) = 26$

3) $-3x + 14 = -5x$

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

5) $-5(2x - 7) - x = 2(x + 2) - 8$

6) $5x - (6 - x) = 2(x - 7)$