2.1 Properties and 2.2 The Distributive Property:

Review:

**COMMUTATIVE PROPERTIES** (change position)

For any real numbers and :

Addition:

Multiplication: (also written )

**ASSOCIATIVE PROPERTIES** (change grouping)

For any real numbers , and .

Addition:

Multiplication:

We use these properties to simplify expressions, both variable and numeric:

🡪 Rearrange: = \_\_\_\_\_\_\_\_\_\_\_

How does this make the problem easier?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

🡪 Add the numbers together: x + (7 + 4) =\_\_\_\_\_\_\_\_\_

🡪 Multiply the numbers together

**Identity Properties**: (New)

( did not change: it kept its identity 🡪 0 is the additive identity)

(still did not change: it kept its identity 🡪 1 is the multiplicative identity)

**Zero Property of Multiplication**: (New- Be careful. This can easily be confused with the multiplicative identity property.)

When you multiply any number by zero, the product is zero.

**The Distributive Property:**

**2(35) =**

The two is distributed to both the 30 and the 5.

Simplify = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* Multiply the number outside the parentheses by everything inside the parentheses.
* Do not add . Since we don’t know the value of *x*, we must stop here. Order of operations states that we can’t add until we multiply first.

Practice:

1. = \_\_\_\_\_\_\_\_\_\_\_\_\_\_ 2. = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. = \_\_\_\_\_\_\_\_\_\_\_\_\_\_ 4. = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Note that the number can on the other side of the parentheses:

= \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

NOTE: When writing each term, the number ALWAYS goes in front of the variable.

The number in front of the variable is called the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

I WILL MARK IT PARTIALLY WRONG IF YOU PUT THE VARIABLE FIRST!!!!

The number in a variable expression WITHOUT a variable is called a \_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Use the Distributive Property to write an equivalent expression.

5. = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 6. = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

7. = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 8. = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

The distributive property can help you multiply:

I bought 4 items that were each 99 cents. What was the before tax total?

=

Remember your area formulas:

Area of a rectangle: Area of a triangle:

The length of a rectangle is ; the width is more than twice a number. What is the area?

* Write an expression for the width using a variable to represent the unknown number
* Then substitute into the formula.

9. The base of a triangle is 5 less than *m* meters. The height is 6 meters. Find the area.

Practice: Find the product by using the Distributive Property.

3. 3(96) 4. 6(103)

Complete # 11 in book, page 75.

HW: 2.1 (page 66) #24-31 all

AND

2.2 (page 76) #20 – 26 even, 28-35, 38-40 all

2.3 Simplifying Variable Expressions

The \_\_\_\_\_\_\_\_\_\_\_\_\_ are the parts of an expression that are added (or subtracted). The sign in front of the term stays with the term.

The expression has 2 terms.

Terms: \_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_ Coefficient: \_\_\_\_\_\_\_\_\_\_ Constant: \_\_\_\_\_\_\_\_

The expression has 3 terms.

Terms: \_\_\_\_\_ \_\_\_\_\_\_\_ \_\_\_\_\_\_\_ Coefficients: \_\_\_\_ \_\_\_\_ Constant: \_\_\_\_\_\_\_\_

Like terms are ones where the variables are IDENTICAL.

and are like terms.

and are not like terms.

and are not like terms. (Notice the exponents are different.)

Are the following sets of terms like terms?

and \_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_

Only like terms can be added or subtracted. Unlike terms cannot be simplified.

Remember: there is an invisible 1 in front of the .

Check: Substitute

🡪 Cannot be simplified.

Check: Substitute

Practice:

= \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

= \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

= \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

= \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **Step 1**: Clear parentheses by using the Distributive Property.

**Step 2:** Combine Like Terms.

Simplify the following expressions:

1. 2.

3. 4.

5. 6.

How do you know when to put a “+” sign and when to put a “-“ sign between your terms?

If the sum of your like terms is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, put a \_\_\_\_\_\_\_\_\_\_\_\_\_\_ sign.

If the sum of your like terms is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, put a \_\_\_\_\_\_\_\_\_\_\_\_\_\_ sign.

HW: 2.3 (page 81) # 10 – 30 even, 33 – 36

2.4 Variables and Equations

We did translations earlier of words into expressions, now we will translate words into equations. What is the difference between an expression and an equation?

Expression: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Equation: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

The key word in a phrase that tells you if it is an expression or an equation is the word IS. (Sometimes the word WAS could be used instead.)

Examples:

1. The sum of twice a number and 8 is 20 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. Four less than a number is 15 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. 7 is the quotient of a number and 3 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

4. The product of 5 and a number is -30 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* Sometimes we want to know if an answer is a solution to a problem. Substitute the answer in for the variable and simplify. If the two sides are equal, then the given answer is a solution. If the two sides are not equal, the given answer is not a solution.

Is a solution to the equation?

Substitute:

Simplify:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_ a solution to the equation.

Is a solution to the equation?

Substitute:

Simplify:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ a solution to the equation.

Is a solution to the equation?

Substitute:

Simplify:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ a solution to the equation.

Sometimes we can solve the equations using mental math. If you can, try them. If not, we will learn the algebraic way in the next few days.

When solving word problems, read through the problem. When finished, decide what the variable should represent. WRITE DOWN what it should represent. This is called defining the variable.

= number of cars, = rate in miles per hour, = time in hours

Write an equation using that variable. Then solve the equation.

Example: I averaged 60 miles per hour on a trip that was 240 miles long. How many hours did I travel?

What don’t we know? That should be our variable🡪 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Hopefully you know that (distance = rate time)

Write your equation and solve mentally.

I traveled for \_\_\_\_\_\_\_\_\_\_ hours.

HW: 2.4 (page 87) #8 – 19 all, 20 – 34 even, 35, 36, 37

2.5/2.6: Solving One-Step Equations

Solving Equations Using Addition or Subtraction

An algebraic equation has a variable, numbers, and mathematical symbols and an equal sign.

What is it called if there is not equal sign?

We learned earlier it is called an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

* Algebraic expressions can be simplified and/or evaluated. You cannot solve them.
* Algebraic equations can be SOLVED.

The trick to algebra is to know how to UNDO what was done to *x* so that you can get it ALL BY ITSELF. Then you will know what *x* equals.

Read it out loud: x plus 5 equals 9. What did I do to the *x*? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What is the opposite of adding 5? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

I can subtract 5 as long as I do it to both sides of the equation. Think about a balance. If the two sides are balanced, then it will stay balanced as long as I do the same thing to both sides.

Adding (or subtracting) the same number from both sides of the equations is called:

the \_\_\_\_\_\_\_\_\_\_\_\_\_\_ (or subtraction) property of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

🡪 I used the subtraction property of equality.

This can also be solved down the page. You do it either way.

***To check***, put the 4 back in the original equation and make sure that it is true.

This is true, so is the real solution.

Sometimes instead of subtracting we need to add to get *x* all by itself.

Here, we are subtracting 10 from *x*. To undo it, I need to \_\_\_\_\_\_\_\_\_\_.

(Remember: do the opposite!)

***Check***: 🡪

Try these AND check them:

ONE STEP EQUATIONS REQUIRE SHOWING ONE STEP OF WORK!!

1. 2. 3.

Check: Check: Check:

4. 5. 6.

Check: Check: Check:

Adding (or subtracting) the same thing to both sides of an equation is a new property:

Addition Property of Equality: If , then

You used this property every time you solved one of the equations above.

Solving Equations using Multiplication or Division

Some algebraic equations require multiplying or dividing instead of adding and subtracting.

🡪 Remember that means 2 TIMES *x*.

How do we UNDO Multiplication? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

🡪 Remember:

Whatever you do to the left side you must ALSO do to the right side. The equation must stay the same.

Check:

Sometimes the equation has division:



How do we undo division? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ REMEMBER BOTH SIDES!



Check:

The -3 in the top and bottom cancel, leaving us with *x* = \_\_\_\_\_\_\_\_\_\_.

YOU MUST SHOW A STEP OF WORK!!!!!!

**Inverse Operations:**

Remember to un-do multiplication, you divide.

When you see division, you can un-do it by using multiplication. DO THE OPPOSITE!

Try these:

1. 2. 3.



4. 5. 6.



7. 8. 9.

Sometimes you should simplify the equation before beginning:

Simplify the denominator.

HW:

2.5 (page 93) #11–25 odd (only show check for #11 -15), 26, 32-40 even

2.6 (page 99) #8 – 24 Even (only check 8 and 12), 28-34 even

2.7 Decimal Operations and Equations with Decimals

Not all equations have nice integers. Sometimes we must also use decimals. Let’s review the rules for decimal operations.

When adding or subtracting decimals, LINE THE DECIMAL POINT in each number. If some numbers have more decimals than others, add zeroes to make them all even.

Notice the decimal points are neatly lined up.

Zeroes were added so that they all go to the thousandths place.

Multiplying is different. You do NOT line up the decimals.

🡪Now count the TOTAL number of decimals places in both numbers. In this case there are 3 decimal places. So, the final answer must have 3 decimals places.

For dividing--Divide as usual. Count how many places you need to move the decimal point on the outside number to make it a whole number. Move the decimal point on the inside that many points. Place the decimal point for the final answer above that decimal point.

1.23 🡪 Move decimal 2 places and it becomes 123, a whole number. Move the decimal in 5.535 2 places and place the decimal point there.

When dealing with negatives, remember, the rules did not change.

Practice:

Solve.

1. 2.

3. 4.

5. 6.

7. 8. = -6.8

Remember, in algebra we are UNDOING what was done to the variable. Make sure you do the opposite.

Do NOT use a calculator to complete this lesson. You will not use a calculator on the test. If you need to show arithmetic on the side, that is fine. I would expect you to need to do some work. You MUST still show ONE step of work because these are one-step equations.

HW: 2.7 (page 105) # 12 – 34 even, 38-44