Math 5. Homework.

Rational numbers. Algebraic expression.

Expressions where variables, and/or numbers are added, subtracted, multiplied, and divided.

For example:

$$2a; \quad 3b+2; \quad 3c^2-4xy^2$$

We can do a lot with algebraic expressions, even so we don't know exact values of variables. First, we always can combine like terms:

$$2x+2y-5+2x+5y+6=2x+2x+5y+2y+6-5=4x+7y+1$$

We can multiply an algebraic expression by a number or a variable:

$$3\cdot(1+3y)=3\cdot 1+3\cdot 3y=3+9y$$

In this example the distributive property was used. Using the definition of multiplication we can write:

$$3\cdot(1+3y)=(1+3y)+(1+3y)+(1+3y)=3+3\cdot y=3+9y$$

Another example:

$$5a(5-5x)=\underbrace{(5-5x)+(5-5x)+\dots+(5-5x)}_{5a\ times}=\underbrace{5+5+\dots+5}_{5a\ times}-\underbrace{5x-5x-\dots-5x}_{5a\ times}$$

$$=\underbrace{5+5+\dots+5}_{5a\ times}-\underbrace{5x-5x-\dots-5x}_{5a\ times}=5a\cdot 5-5a\cdot 5x=25a-25ax$$

If we need to multiply two expressions

$$(a+2)\cdot(a+3)$$

We can use a substitution technic, we will substitute one of the expressions with a variable, for example, instead of $(a+2)$ we can use u.

$$(a+2)=u$$

And then we will multiply

$$u\cdot(a+3)=u\cdot a+3u$$

We know, that actually u should not be there, $(a+2)$ should.

$$u\cdot(a+3)=(a+2)\ \cdot a+3(a+2)$$

We know how to multiply an expression by a variable (or number):

$$(a+2)\cdot a+3(a+2)=a\cdot a+2a+3a+3\cdot 2=a^2+5a+6$$

$$(a+2)\cdot(a+3)=a\cdot a+3a+2a+3\cdot 2=a^2+5a+6$$

$$(a+2)\cdot(a+3)=a^2+5a+6$$

Exercises.

1. Multiply.

   $a.\quad (a+2)(a+2);$ $\qquad b.\quad (3+y)(y+4);$

   $c.\quad (3+x)(3-x);$ $\qquad d.\quad (y-2)(3-y);$

   $e.\quad (2a+c)(a+ac);$ $\qquad f.\quad (2d+3l)(2d+3l)$

2. Represent as fractions;
   $1.23\overline{56},$ $\qquad 5.4\overline{345}$

3. Represent as decimal:
   $\frac{2}{5};\quad \frac{2}{9};\quad \frac{2}{8};\quad \frac{2}{15};\quad \frac{3}{16};$

4. Evaluate (use the properties of exponents):

   $$\frac{3^{10}\cdot(3^2)^4}{(3^5)^3\cdot 3}$$

5. Write the number 100 in binary and ternary (base of 3) systems.