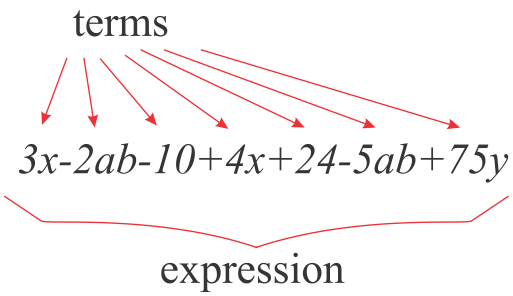
Math 4a. Class work 8.

Algebra.

1. Equalities: equations and identities.



Expressions.

Mathematical expressions are the mathematical phrases that contain numbers, symbols, letters. Terms can be numbers or numbers combined with letters. In the latter case letters are called “variables” and a number is called “coefficient”. If the term contains only the number than it’s called “constant”. In the term $2ab$ number 2 is a coefficient and $a,$ and b are variables. The "like terms" in the expression above are ones that have the same variable. All constants are like terms as well. To simplify the expression all like terms should be combined. In other words, all constant should be added together as well as all terms which contain the same variables. For the expression above

$$3x - 2ab - 10 + 4x + 24 - 5ab + 75y = 3x + 4x - 2ab - 5ab + 75y - 10 + 24 =$$
$$= 7x - 7ab + 75y + 14$$

Is there any difference between two following equalities:

$a(b + c) = ab + ac$
$a + 2 = 6$

Letters a, b, and c in both these expressions are called *variables*, we can put any number (whole or fraction) into it. In the first case the equality is still a true expression for any a, b, and c, this is a distributive property of addition.
The second expression is a true expression for only one value of $a = 4$ and we call this kind of expressions “an equation”. An equation is the problem of finding values of some variables, called *unknowns*, for which the specified equality is true. We have to solve the equation to find the value of an unknown variable.

2. How to solve an equation?

An equation is a statement that the values of two mathematical expressions are equal (indicated by the sign =). For example, in the equation

$$3x - 5 = 4x - 7$$

one expression $(3x - 5)$ equals to the expression $(4x - 7)$. Solving the equation, means to find such number x that will make the equality true.

In order to do it first we have to combine all like terms of the expressions. Because both side of the equation are equal than the equal terms can be added (or subtract) to (from) both sides and it will not change the equality rule:

$$3x - 5 = 4x - 7$$
$$3x - 3x - 5 = 4x - 3x - 7$$
$$-5 = x - 7$$
$$-5 + 7 = x - 7 + 7$$
$$2 = x$$

It is not really necessary to write all this sequential statements, we just need to rewrite the term on another side of the equation with the opposite sign (but you have to know why this is the right way to do). Both sides of the equation can be divided (or multiplied) by the same number (or term) and as the result we will get the equality again.

$$4 \cdot (x + 5) = 12$$

$$\frac{4 \cdot (x + 5)}{4} = \frac{12}{4}$$

$$x + 5 = 3$$

$$x + 5 - 5 = 3 - 5$$

$$x = -2$$

1. Simplify the following expressions:

   a. $2 + 3a + xy + 4 - a + xy - 6 =$
   b. $d - 4 + t + t + 32 + 3d =$
   c. $x + 5s - 3s + 2x =$

2. Solve the following equations:

$x \cdot \frac{3}{5} = \frac{2}{5}$

$3y + \frac{1}{2} = y + \frac{3}{2}$

$\frac{1}{2}z + \frac{3}{4} = \frac{3}{2}z - \frac{1}{4}$

$d \div \frac{2}{3} + \frac{1}{2} = \frac{7}{8}$

3. Compute:

$\left(\frac{1}{3}+\frac{2}{9}\right)\div\left(\frac{9}{10}-\frac{2}{5}\right)=$

$\left(4-\frac{2}{3}\right)\times\left(1\frac{1}{2}-\frac{3}{4}\right)=$

$\frac{7}{16}+\frac{9}{10}\times\frac{5}{14}\times\frac{7}{12}=$

$1-\frac{9}{16}\div\frac{9}{4}-\frac{1}{12}=$

Opposite number of any number (n) is a number which, if added to n, results in 0. The opposite number for n is written as −n. For example, −7 is opposite to 7, because $-7+7=0$.

number	Opposite number
5	
4	
-20	
-1000	
a	
-a	
-(-a)	
-(-(-a))	

Inverse or **reciprocal** for a number *x*, denoted by $\frac{1}{x}$, is a number which when multiplied by *x* yields 1.

Find the number inverse to 5, to $\frac{1}{5}$, to $\frac{3}{2}$, to 1000:

number	Inverse number
5	
$\frac{1}{5}$	
$\frac{3}{2}$	
1000	
a	
$\frac{1}{a}$	
$5x$	

3. Geometry.

A goat is tied to a stake (or 2 poles) with a rope of length (L). What shape it will graze?