Math 4a. Class work 11.

# Algebra.

1. A swimming pool can be filed with one pipe in 10 hours. Full pool can be drain out with another pipe in 20 hours. How long it will take to fill up the pool with opened drain pipe?

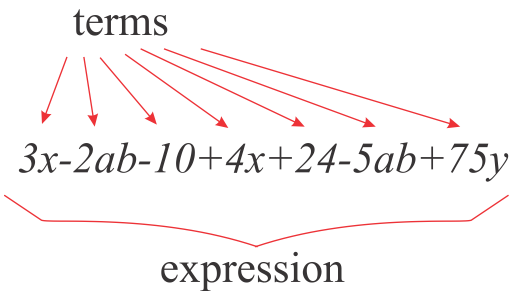
2. Jane and Mary are planting flowers. Jane can plant all flowers in 2 hours, Mary can do it in 3 hours. How many hours they need to plant all flowers together?

3. Jane and Mary are doing fall clean up in a backyard. Mary can do the job in 6 hours; together they can do it in 4 hours. How many hours does Jane need to clean up the backyard?

4. 5 hamsters will eat 5 bags of hamster food in 5 days. How many days 10 hamsters need to eat 10 bags of food?

5. **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 $a,\ \text{and}\ b$ 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.

## 6. 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:

| | |
|---|---|
| $x \cdot \frac{3}{5} = \frac{2}{5}$ | $3y + \frac{1}{2} = y + \frac{3}{2}$ |
| $\frac{1}{2}z + \frac{3}{4} = \frac{3}{2}z - \frac{1}{4}$ | $d \div \frac{2}{3} + \frac{1}{2} = \frac{7}{8}$ |

**Geometry.**

Measuring angles with protractor.

Supplementary angles. Draw the 2 supplementary angles to each angle on the picture below. Can you tell without measuring, the measure of this supplementary angles? Measure them.