November 1-st   Math 5b: Homework 6

Equalities: equations and identities.

terms

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".

$3x\text{-}2ab\text{-}10\text{+}4x\text{+}24\text{-}5ab\text{+}75y$

expression

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

$$3x - 2ab - 10 + 4x + 24 - 5ab + 75y = 3x + 4x - 2ab - 5ab + 75y - 10 + 24 =$$
$$= 7x - 7ab + 75y + 14$$
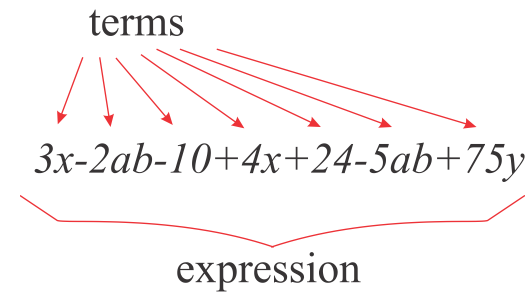
Is there any difference between two following equalities?

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

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.

1. (a) Convert the following fractions to decimal:

$$\frac{3}{10} \qquad \frac{5}{100} \qquad \frac{45}{100}$$

   (b) Find the sum of the decimals in (a)

2. Find the reciprocal (inverse) element for the following numbers. Remember that $r(a)$ is defined such that: $a \cdot r(a) = 1$, for example $r\left(\frac{2}{9}\right) = \frac{9}{2}$.

   (a) $r\left(\frac{13}{7}\right)$ (b) $r\left(\frac{1}{7}\right)$ (c) $r(3)$ (d) $r\left(1\frac{6}{7}\right)$

   (e) $r\left(3\frac{1}{5}\right)$ (f) $r(0.1)$ (g) $r(1.1)$ (g) $r\left(\frac{a}{b}\right)$

3. Solve the equations (Hint: multiply each side by the same fraction)

   (a) $\frac{3}{5}x = \frac{11}{55}$ (b) $\frac{2}{11}x = \frac{11}{2}$ (c) $\frac{2}{11}x = 5\frac{1}{2}$

   (d) $\frac{3}{4}(x + 8) = 10$ (e) $\frac{1}{2}(x + 1) = x - 3$ (f) $\frac{1}{2}x + \frac{1}{3}x = x - \frac{1}{12}$

4. Using the distributive property, to open brackets, and the commutative law for multiplication ($ab = ba$), to recognize similar terms, simplify:

   (a) $3a(b + ac) - c(3a^2 - 2) + 2ab =$
   (b) $2a(2a + 3) + 3(2a + 3) =$

5. Open the brackets of:

   (a) $(a + 1)^2 = (a + 1)(a + 1) =$
   (b) $(a - 5)^2 =$
   (c) $(2a + 2b)^2 =$

6. Use the formula $(a + b)^2 = a^2 + 2ab + b^2$ to solve:

   (a) $(x + 1)^2 - 2x =$
   (b) $(3x - 5)^2 - 25 =$

7. Captain John, a pirate, can drink a barrel of rum in 14 days. If he drinks the barrel together with pirate Bill, they will finish the barrel in 10 days. How long would it take Bill to drink the barrel of rum alone?

8. A truck can cover the distance between two cities in 10 hours. A fast car, which goes 10 miles per hour faster than the truck, can cover the same distance in 8 hours. What is the

distance between the two cities? *[Hint: if the speed of the truck is x mph, then the distance is equal to 10x miles. On the other hand, ...]*

9. A florist has 36 roses, 90 lilies, and 60 daisies. What is largest amount of bouquets he can create from these flowers evenly dividing each kind of flowers between them?

10. Using the distributive property, to open brackets, and the commutative law for multiplication ($ab = ba$), to recognize similar terms, simplify:

$\quad$ (c) $4a(ba + ac) - b(2a^2 - 2a) + 7ab - 11c^2a - 19aca + 15\ cac$
$\quad$ (d) $-8d(2bc + 9cbc) + 3(2bdc^2 + 7) - 3b(2c^2 + 4cd) + 3(-17 + 2d^2 + 13bcc) =$

11. Solve the equations (only if you did not do problem 0 in homework 5)

$\quad$ (a) $|\,x - 7 + 6x| = 14$ $\qquad$ (c) $4 + |\,2x - 8| = 20$ $\qquad$ e) $3 * |\,y - 12\,| = 18$

$\quad$ (b) $6 * |\,3x + 3|\,-15 = 39$ $\qquad$ (d) $6 - |z - 5| = -15$ $\qquad$ f) $|2y - 17y + 30| = 90$

Classwork 6 Notes

Expression – contains numbers, symbols, letters

Examples: A, B (letters) – variables ; 2,3 (numbers) – coefficients

"Like-terms" – expressions that have the same variable

Example: are the following 'like-terms':

3 & 5 – YES, constants are always like-terms

3a & 5 – NO

6a & 5b – YES (Michael, Brian) – NO, different variables
NO (Tanvi, Avya, Ben, Mridula)

4ab & 7b – NO because 4 & 7 are not the same term – wrong explanation
NO because 'ab' and 'b' are not the same variable

$5*x^3$ and $5*x^2$ - YES (Mridula, Brian Avya , Kelly, Tanvi, Ben, Manha, Michael, Lena)

$5 * x * x * x$
$5 * x * x$

$5*x^3 + 5*x^2 =$

$3 + 5 = 8$
$3a + 6a = 9a$
$b - 4b = -3b$

$3a + 8ab = 11ab$ (Mridula, Manha,)
Cannot add – Kelly, Michael, Avya, Ben, Tanvi, Ben

$X^2 + X^2 = 2 X^2$
$X^3 + X^2$ – CANNOT ADD, NOT LIKE-TERMS

$3a^2b + 3ab$ CANNOT ADD
$3a*a*b + 3 a*b$