CLASSWORK 3 AND REVIEW,
October 4, 2020

In mathematics and other sciences, we often use letters instead of numbers. Usually it is done to show that certain relationship will work for all numbers. Letters are also commonly used for unknown values. These letters are called **variables**.

Expressions involving both numbers and variables are called **algebraic expressions**.
Examples: 3a; 7b + 8; 357 + 10x; (65z − 459) ÷ 4

In algebraic expressions we omit the sign of multiplication between a number and a variable. Instead of 7×b we write 7b, instead of 10×z we write 10z. In products, a number goes first, and then goes a variable. We do not write k × 10, we write 10k.

Using variables, we can write the basic rules for **addition** and **multiplication** as follows:

a + b = b + a **commutative law for addition**
ab = ba **commutative law for multiplication**

a + (b + c) = (a + b) + c **associative law for addition**
a(bc) = (ab)c **associative law for multiplication**

a(b + c) = ab + ac **distributive law**

These laws can be used for simplifying calculations and rewriting expressions in a simpler form.
Some more rules for simplification:

a(b − c) = ab − ac **distributive law**
a − (b + c) = a − b − c **distributive law**
a − (b − c) = a − b + c **distributive law**

Fraction multiplication: $\frac{3}{4} \cdot \frac{2}{3} =.$

1. Multiply enumerators and denominators:

$$\frac{3}{4} \cdot \frac{2}{3} = \frac{3 \cdot 2}{4 \cdot 3}$$

2. Simplify by using number prime factorization:

$$\frac{3}{4} \cdot \frac{2}{3} = \frac{3 \cdot 2}{4 \cdot 3} = \frac{3 \cdot 2}{2 \cdot 2 \cdot 3} = \frac{1}{2}$$

Fraction division: $\frac{1}{2} \div \frac{2}{3} =$

1. Find a reciprocal (invers element) of the divisor. Reciprocal of $\frac{2}{3}$ is $\frac{3}{2}$.
2. Turn division into multiplication and simplify by using prime factorization:

$$\frac{1}{2} \div \frac{2}{3} = \frac{1}{2} \cdot \frac{3}{2} = \frac{1 \cdot 3}{2 \cdot 2} = \frac{3}{4}$$

3. **Does it make sense?**

Lets look into the example: $\frac{1}{2} \div \frac{1}{6} =.$

It is asking How many times $\frac{1}{6}$ is in $\frac{1}{2}$?

$\frac{1}{2} \div \frac{1}{6} = \frac{1}{2} \cdot \frac{6}{1} = \frac{1 \cdot 6}{2 \cdot 1} = 3$ times!

Another example: $\frac{1}{4} \div \frac{1}{2} =$

It is asking How many times $\frac{1}{2}$ is in $\frac{1}{4}$

$\frac{1}{4} \div \frac{1}{2} = \frac{1}{4} \cdot \frac{2}{1} = \frac{1 \cdot 2}{4 \cdot 1} = \frac{1}{2}$ times!

If you still have questions, visit this website http://www.mathsisfun.com/fractions_division.html

HOMEWORK 3,
October 4, 2020

1. Compute:
   (a) $-4-(-9)=$ (b) $-(-8+(-4))=$ (c) $-3-(9+(-6)=$
   (d) $-3-(-7)+(-5)=$ (e) $-2\cdot(-5)\cdot(-2)=$ (f) $-\frac{3}{5}-(-1\frac{1}{5})=$

2. Find the values of these algebraic expressions:

   (a) 78 + 3x for x = 8; and $\frac{2}{3}$;
   (b) 54 ÷ (x − 7) for x = 9; and 10;

3. Solve equations: *(First - open parenthesis, second - collect all Xs at the left, and numbers at the right, find X)*

   (a) $3(3x-1)=2(2x+11)$

   (b) $5(x-2)=3x+20$

   (c) $2(x-7)=x+11$

4. Calculate, simplify! Use prime factorization, if needed.

   (a) $1\frac{3}{4}\cdot\frac{2}{7}=$ (b) $\frac{5}{9}\cdot\frac{3}{15}=$ (c) $\frac{9}{20}\cdot\frac{10}{27}=$

   (d) $\frac{9}{2}\div\frac{21}{2}=$ (e) $6\frac{2}{3}\div\frac{2}{5}=$ (f) $7\div\frac{14}{3}=$

5. *Below are some examples from a multiplication table in an unknown language. All of the products are numbers less or equal than 20.
   pe × nei = nei la nei
   nei × hato = liomu la pe
   hato × hato = nei la tano
   pe × pe = nei
   pe × tano = liomu
   hato × * = liomu la tano

What number should be there in place of *?