Math 4. Class work 15.

Algebra.

How do we perform the multiplication.

If we need to multiply the natural number by 10 (or 100, or 10000):

$$245 \cdot 10 = (100 \cdot 2 + 10 \cdot 4 + 5) \cdot 10 = 100 \cdot 10 \cdot 2 + 10 \cdot 10 \cdot 4 + 10 \cdot 5$$
$$= 1000 \cdot 2 + 100 \cdot 4 + 10 \cdot 5 + 1 \cdot 0 = 2450$$

$$245 \cdot 100 = (100 \cdot 2 + 10 \cdot 4 + 5) \cdot 100 = 100 \cdot 100 \cdot 2 + 10 \cdot 100 \cdot 4 + 100 \cdot 5$$
$$= 10000 \cdot 2 + 1000 \cdot 4 + 100 \cdot 5 + 10 \cdot 0 + 1 \cdot 0 = 24500$$

Using the distributive property, we have just shown that when we need to multiply any natural number by 10 we just need to write 0 at the end of a number, increasing all place values by 10 times.

If we need to multiply the decimal by 10 (or 100)

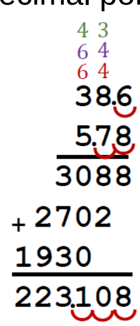
$$245.23 \cdot 10 = (100 \cdot 2 + 10 \cdot 4 + 5 + 0.1 \cdot 2 + 0.01 \cdot 3) \cdot 10$$
$$= 100 \cdot 10 \cdot 2 + 10 \cdot 10 \cdot 4 + 10 \cdot 5 + 0.1 \cdot 10 \cdot 2 + 0.01 \cdot 10 \cdot 3 =$$
$$= 1000 \cdot 2 + 100 \cdot 4 + 10 \cdot 5 + 1 \cdot 2 + 0.1 \cdot 3 = 2452.3$$

Using the distributive property, we proved that the result will be the number with decimal point moved one step to the right. (2 steps for multiplication by 100, and so on).

$$230: 10 = 230 \cdot \frac{1}{10} = (200 + 30 + 0) \cdot \frac{1}{10} = \frac{200}{10} + \frac{30}{10} + \frac{0}{10} = 20 + 3 = 23$$

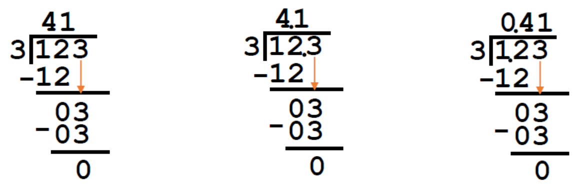
$$235: 10 = 235 \cdot \frac{1}{10} = (200 + 30 + 5) \cdot \frac{1}{10} = \frac{200}{10} + \frac{30}{10} + \frac{0}{10} = 20 + 3 + \frac{5}{10} = 23.5$$

To perform the long multiplication of the decimals, we do the multiplication procedure as we would do with natural numbers, regardless the position of decimal points, then the decimal point should be placed on the resulting line as many steps from the right side



as the sum of decimal digits of both numbers. When we did the multiplication, we didn't take into the consideration the fact, that we are working with decimals, it is equivalent to the multiplication of each number by 10 or 100 or 1000 … (depends of how many decimal digits it has). So, the result we got is greater by $10 \cdot 100 = 1000$ time then the one we are looking for.

$$38.6 \cdot 5.78 = 38.6 \cdot 10 \cdot 5.78 \cdot 100: (10 \cdot 100) = 386 \cdot 578: 1000$$



$0.7 \cdot 10$ $: 2$ $- 0.3$ $: 0.4$ _____	$5 : 10$ $\cdot\ 0.2$ $+2$ $: 0.7$ _____	$4 - 0.8$ $: 0.8$ $: 10$ $\cdot\ 0.5$ _____	$0.9 + 0.06$ $: 0.3$ $- 0.2$ $\cdot\ 0.1$ _______	$1 - 0.7$ $\cdot\ 5$ $: 15$ $\cdot\ 100$ ______
$1 - 0.25$ $\cdot\ 2$ $: 0.3$ $- 0.05$ ______	$0.9 - 0.09$ $: 9$ $+ 0.6$ $\cdot\ 10$ ______	$23.9 - 3.9$ $\cdot\ 0.15$ $- 0.8$ $: 0.1$ _______	$12 + 0.6$ $: 3$ $- 0.2$ $\cdot\ 2.5$ _____	$1 - 0.4$ $\cdot\ 5$ $- 0.5$ $: 5$ _____

1. Evaluate the following using decimals:

$0.36 + \frac{1}{2};$ $\quad 5.8 - \frac{3}{4};$ $\quad \frac{2}{5} : 0.001;$ $\quad 7.2 \cdot \frac{1}{1000}$

2. Evaluate the following using fractions:

$\frac{2}{3} + 0.6;$ $\quad 1\frac{1}{6} - 0.5;$ $\quad 0.3 \cdot \frac{5}{9};$ $\quad \frac{8}{11} : 0.4;$

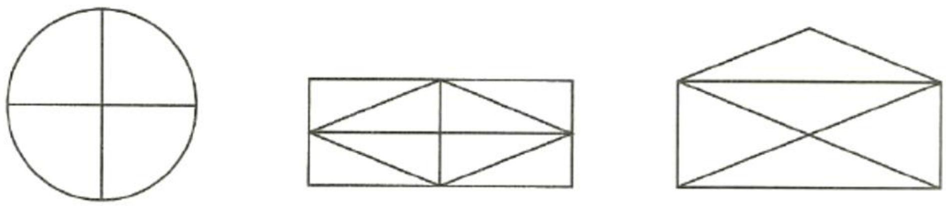
3. Evaluate as more convenient:

$3\frac{4}{5} - 1.8;$ $\quad 2.2 : \frac{11}{15};$ $\quad 4.2 : 3\frac{1}{2};$ $\quad 5.384 - 4\frac{3}{20};$

$0.84 \cdot \frac{3}{4};$ $\quad 3\frac{9}{10} + 1.68;$ $\quad \frac{1}{5} \cdot 20.08;$ $\quad 1\frac{2}{3} + 2.5;$

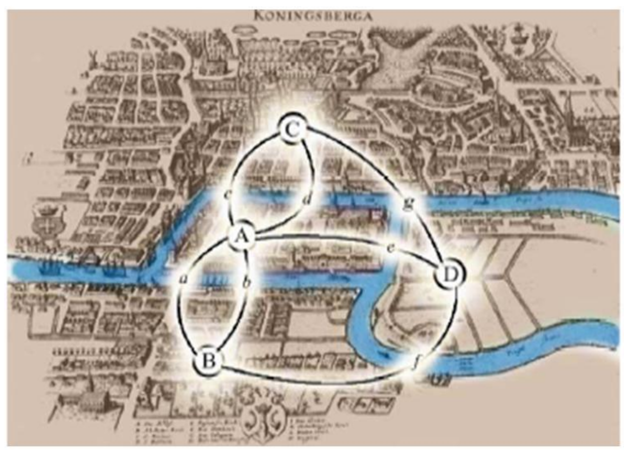
Geometry.

We did many problems about how to draw a picture without tracing twice any segment in a figure. Can you tell right away which figure can be traced this way and which cannot?



The old town of Königsberg has seven bridges:

Can you take a walk through the town, visiting each part of the town and crossing each bridge only once?



- A point is called a **vertex** (plural vertices)
- A line is called an **edge**
- The whole diagram is called a **graph**.