

Operations with decimals.

Today we are going to do some arithmetic operations with decimals.

Addition and subtraction.

To perform addition or subtraction with decimals using column method, both numbers should be written one under another in a way that decimal points are aligned, as shown on the pictures below.

$$\begin{array}{r}
 \overset{1}{} \quad \overset{1}{} \\
 12.47 \\
 +13.68 \\
 \hline
 26.15
 \end{array}
 \qquad
 \begin{array}{r}
 \overset{1}{} \quad \overset{1}{} \quad \overset{1}{} \\
 23.21 \\
 -15.78 \\
 \hline
 07.43
 \end{array}$$

Multiplication by 10:

Let's multiply the decimal by 10 (or 100):

$$\begin{aligned}
 25.3 \cdot 10 &= (20 + 5 + 0.3) \cdot 10 = 10 \cdot 20 + 10 \cdot 5 + 10 \cdot 0.3 = 20 + 5 + 3 \\
 &= 253
 \end{aligned}$$

Using the distributive property, we showed 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), It's equivalent to increasing all place values 10 times.

Division by 10:

Let's divide a number by 10:

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

When we divide a number by 10, the result will be the number with the decimal point moved one step to the left.

Multiplication of decimal numbers:

$$\begin{array}{r} 43 \\ 64 \\ 64 \\ 38.6 \\ 5.78 \\ \hline 3088 \\ + 2702 \\ \hline 1930 \\ \hline 223108 \end{array}$$

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*.

Why is it?

When we did the multiplication, and 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 $10 \cdot 100 = 1000$ (in our example) time than the one we are looking for:

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

Homework

1. Evaluate:

$a. 12.53 \cdot 10;$ $b. 4.7 \cdot 100;$ $c. 34.18 : 10;$ $d. 0.26 : 100;$
 $e. 0.0384 \cdot 100;$ $f. 0.0025 \cdot 1000;$ $g. 0.05 : 10;$ $h. 21.19 : 1000;$

2. How far the cyclist will travel at the speed of 12 km/h in 0,4 hours? In 0.25 hours? In 1 hour and 15 minutes?



3. Compare *without* doing calculations:

$a. 2.76 \cdot 3.1 \dots 2,76$ $b. 5 \cdot 0.3 \dots 0.3$ $c. 0.4 \cdot 0.37 \dots 0.4$
 $d. 41.2 \cdot 0.2 \dots 41.2$ $e. 0.75 \cdot 1 \dots 0.75$ $c. 0.2 \cdot 0.58 \dots 0.58$

4. Write five numbers, the first of which is 1.44 and each next is 1.5 times greater. Can we continue this sequence indefinitely?

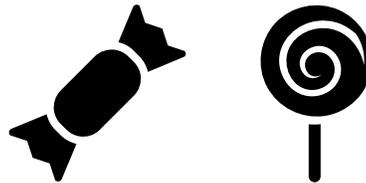
5. Write five numbers, the first of which is 2.25 and each next is 0.8 of the previous. Can we continue this sequence indefinitely?

6. Evaluate by the most convenient way:

$a. 0.2 \cdot 7.8 \cdot 5;$ $b. 0.5 \cdot 3.9 \cdot 20;$ $c. 2.5 \cdot 125 \cdot 8 \cdot 4;$ $d. 14 \cdot 8 \cdot 0.125 \cdot 0.2$

7. 1 kilogram of candies costs 16 dollars. How much

- a. 0.5 kg will cost?
- b. 1.2 kg will cost?
- c. 0.75 kg will cost?
- d. 0.4 kg will cost?



8. If Mark the gnome buys 15 books, he will have 7 gold coins left. If he buys 20 such books, he will need 8 more gold coins.

- A) How much does a book cost?
- B) How much money does Mark have?

