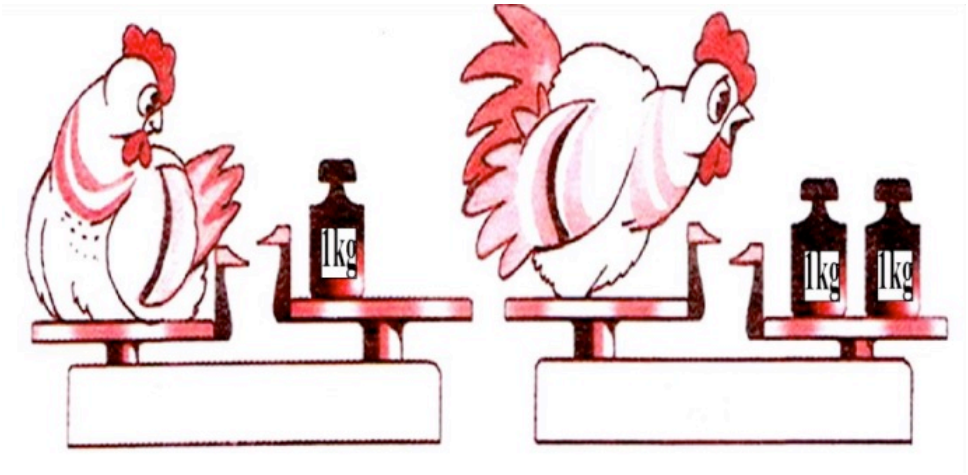
Math 4b. Classwork 14.

## Decimals

In a process of measurement, we compare a standard unit, such as 1m for length, 1kg for mass, 1degree Celsius for temperature, and so on (we can use another standard units, for example 1 foot, 1 degree Fahrenheit) with the quantity we are measuring. It is very likely that our measurement will not be exact and whole number of standard units will be either smaller, or greater than the measured quantity.




In order to carry out more accurate measurement we have to break our standard unit into smaller equal parts.

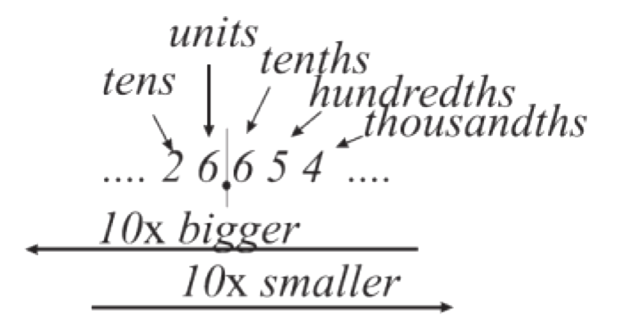
It turns out that perhaps the most convenient way is to divide a unit into 10 equal parts. Then each of one tenth into another 10 even smaller equal parts and so on. In this way we will get a series of fractions with denominators 10, 100, 1000 and so on:


$$\frac{1}{10}, \frac{1}{100}, \frac{1}{1000} \ldots$$

The result of our measurement can be written in a 10 based place value system.

$$26.654 = 10 \cdot 2 + 1 \cdot 6 + \frac{1}{10} \cdot 6 + \frac{1}{100} \cdot 5 + \frac{1}{1000} \cdot 4$$
$$= 10 \cdot 2 + 1 \cdot 6 + \frac{6}{10} \cdot + \frac{5}{100} + \frac{4}{1000}$$
$$= 10 \cdot 2 + 1 \cdot 6 + \frac{600}{1000} + \frac{50}{1000} + \frac{4}{1000}$$

Of course all such numbers can be expressed in the fractional notation as fractions with denominators 10, 100, 1000 …, but in decimal notation all arithmetic operations are much easier to perform.



**Homework**

1. Write in decimal notation the following fractions:

$2\frac{4}{10} =$ $1\frac{1}{10} =$

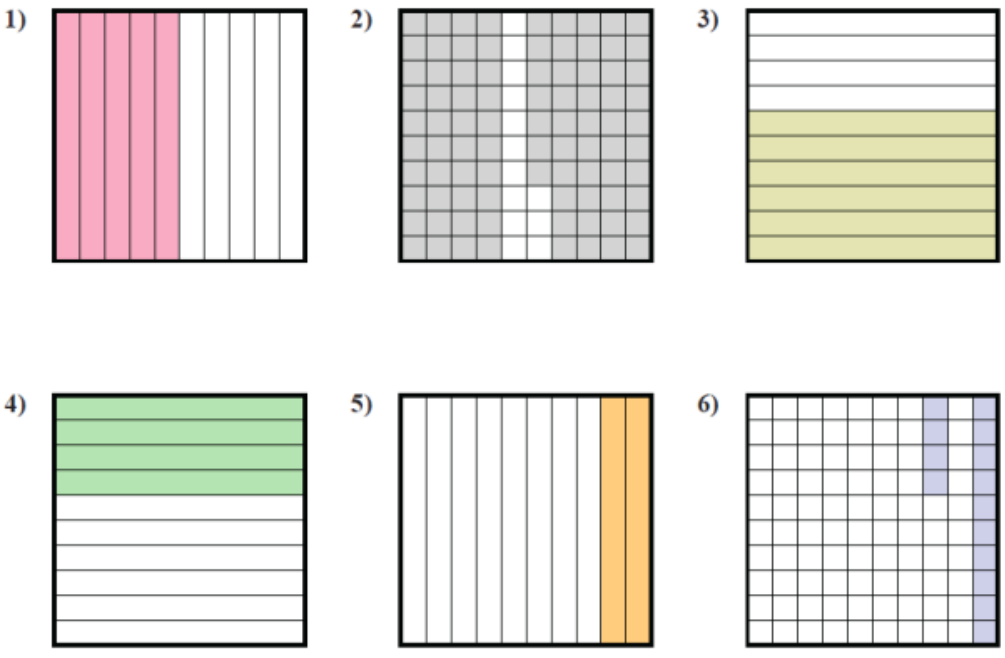
$4\frac{9}{10} =$ $4\frac{333}{1000} =$

$24\frac{25}{100} =$ $8\frac{45}{1000} =$

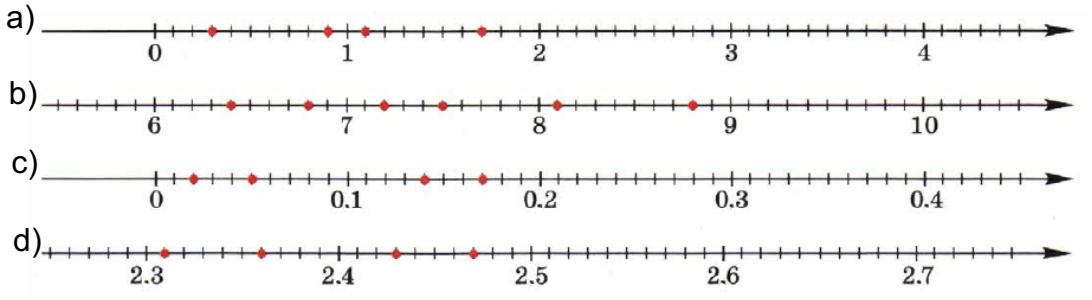
$98\frac{3}{100} =$ $75\frac{8}{10000} =$

$1\frac{1}{100} =$ $9\frac{565}{10000} =$

2. Which part of the squares are shaded? Write your answer in decimals and as a reduced (if possible) fraction



3. Which numbers are marked on the number lines below:




4. Draw a number line in your notebook, use 10 squares as a unit. Mark points with coordinates 0.1, 0.5, 0.7, 1.2, 1.3, 1.9.
5. There are 100 cm in 1 meter, 1000 meters in 1 kilometer, 10 millimeters (mm) in 1 centimeter, 1000 grams in 1 kilogram.
   **Example:** Which part of 1 m is 1 cm? **Answer:** $1\ cm = 0.01\ m$

   Which part of 1 km is 1 m?
   Which part of 1 cm is 1 mm?
   Which part of 1 kg is 1 g?
6. Write decimals as fractions and evaluate the following expressions:

$$a)\ \frac{2}{3} + 0.5; \qquad b)\ \frac{1}{3} \cdot 0.9; \qquad c)\ \frac{3}{16} \cdot 0.16$$

$$d)\ 0.6 - \frac{2}{5}; \qquad e)\ 0.4 : \frac{2}{7}; \qquad f)\ \frac{9}{20} : 0.03$$

7. On the picture below, every arm of the balance is in equilibrium. (The horizontal bars are suspended at their midpoints.) Identical shapes have identical masses. The mass of the square is 1 kg. What are the masses of the other shapes?