Math 4b. Classwork. **Fractions addition, subtraction.**

Addition of fractions with the same denominator.

Let's have a look at the example:

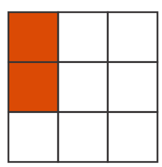
$$\frac{2}{7}+\frac{3}{7}=\frac{5}{7}$$

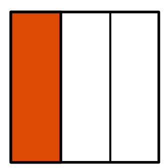
We divided a whole into 7 small equal parts, took 2 of small parts and then took 3. The result is 5 of $\frac{1}{7}$ parts of a whole.

Addition and subtraction of fractions with unlike denominators.

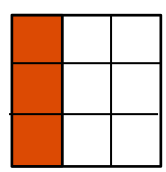
Let's try to add $\frac{2}{9}$ and $\frac{2}{3}$. What should we do? What part of the whole the result is?

$$\frac{2}{9} \quad + \quad \frac{1}{3}$$





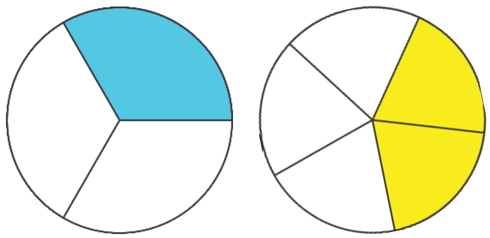
We divided a whole into 9 small equal parts, took 2 of them. We also divided a whole into 3 bigger parts and took 1 of them. How can we add 2 smaller parts and 1 bigger part? To be able to add parts we need them to be of the same size. We can split each big part into 3 smaller parts.



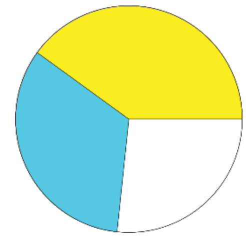
Now we can add 2 parts and 3 parts of the same size.

$$\frac{2}{9}+\frac{1}{3}=\frac{2}{9}+\frac{1\cdot 3}{3\cdot 3}=\frac{2}{9}+\frac{3}{9}=\frac{5}{9}$$

Another example, how to add $\frac{2}{5}$ and $\frac{1}{3}$.

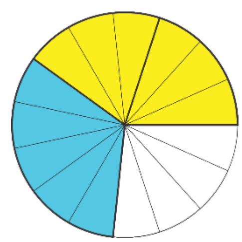


Which part of the whole circle will be the sum?



We need to divide each circle into parts, such that each part will fit into $\frac{2}{5}$ of the circle and $\frac{1}{3}$ of the circle whole number of times. We can divide the circle into 15 parts, 30 parts, 45 parts, etc. All these are common multiples of both denominators 5 and 3. There are many common multiples of 2 numbers, however the most convenient multiple is the Least Common multiple (LCM). LCM (5, 3) = 15. If we split the circle into 15 parts, each such part will fit 6 times into $\frac{2}{5}$ part of the circle, and 5 times into $\frac{1}{3}$ part of the circle.

$$\frac{2}{5} + \frac{1}{3} = \frac{2 \cdot 3}{5 \cdot 3} + \frac{1 \cdot 5}{3 \cdot 5} = \frac{6}{15} + \frac{5}{15} = \frac{11}{15}$$

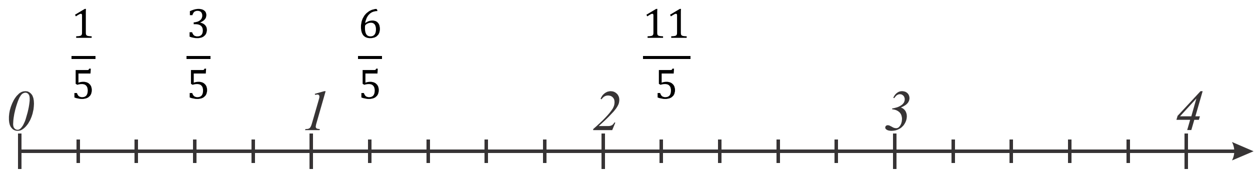


One more example:

$$\frac{1}{6} + \frac{4}{9} =$$

The most convenient common denominator is 18, LCM of 6 and 9.

$$\frac{1}{6} + \frac{4}{9} = \frac{1 \cdot 3}{6 \cdot 3} + \frac{4 \cdot 2}{9 \cdot 2} = \frac{3}{18} + \frac{8}{18} = \frac{11}{18}$$



When we are talking about fraction, we usually mean the part of a unit as shown in a number line above. **Proper** fractions are parts of a unit; **improper fractions** are the sums of a natural number and a proper fraction.

Sometimes we want to find a part of something which is not 1, but can be considered as a single object. For example, among my 30 pencils $\frac{2}{5}$ are yellow. How many yellow pencils do I have? What does it mean to find $\frac{2}{5}$ out of 30? The whole pile of all of all these pencils is a single object and we want to calculate how many pencils does a little pile of $\frac{2}{5}$ of 30 contain? $\frac{2}{5}$ is 2 times $\frac{1}{5}$, and $\frac{1}{5}$ of 30 is $30 \div 5$. So $\frac{2}{5}$ of 30 pencils will be twice more: $\frac{2}{5} \times 30 = 30 \div 5 \times 2$

Homework.

1. Bring the following fractions to denominator 36, if possible:

$$\frac{7}{12}; \quad \frac{7}{11}; \quad \frac{7}{10}; \quad \frac{7}{9}; \quad \frac{7}{8}; \quad \frac{7}{7};$$

2. Calculate:

$$\frac{1}{5}+\frac{1}{5}+\frac{1}{5}= \qquad \frac{2}{7}+\frac{1}{7}= \qquad \frac{7}{9}-\frac{3}{9}=$$

$$\frac{1}{8}+\frac{1}{4}= \qquad \frac{3}{5}+\frac{2}{6}=$$

3. Simplify the following fractions:

Examples:

$$\frac{3\cdot5\cdot7}{5\cdot7\cdot11}=\frac{3}{11}; \qquad \frac{56}{64}=\frac{7\cdot8}{8\cdot8}=\frac{7}{8}$$

$$\frac{2\cdot3}{7\cdot2}; \quad \frac{5\cdot4}{4\cdot9}; \quad \frac{7\cdot5}{2\cdot7}; \quad \frac{2\cdot3}{4\cdot5}$$

$$\frac{22}{66}; \quad \frac{125}{75}; \quad \frac{24}{360}; \quad \frac{100}{250};$$

4. Evaluate:

Example:

$$\frac{1}{2}-\frac{1}{3}+\frac{1}{4}=\frac{6}{12}-\frac{4}{12}+\frac{3}{12}=\frac{6-4+3}{12}=\frac{5}{12}$$

$$\frac{1}{2}-\frac{1}{4}+\frac{3}{5}=$$

$$\frac{3}{4}-\frac{1}{2}+\frac{7}{8}=$$

$$\frac{5}{6}-\frac{2}{3}+\frac{1}{4}=$$

5. Math class lasts for $\frac{3}{4}$ of an hour. How many minutes does the class last?

6. Julia's father's step is 70 cm long, Julia's step is 20 cm smaller. They start walking making their first step simultaneously. How far they should go to have next simultaneous step?

7. Peter spent 2 hours doing his homework. $\frac{1}{3}$ of this time, he spent doing his math homework and $\frac{1}{4}$ of the remaining time he spent on the history assignment. How many minutes did Peter spent on his history assignment and how many minutes did he spent doing his math homework?

8. Copy the figure: