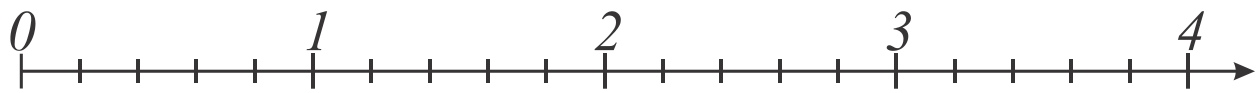
Math 4a. Classwork 8.

Algebra. Fractions.

Mark following fractions on the number line:

$\frac{1}{5}, \frac{3}{5}, \frac{3}{3}, \frac{7}{5}, \frac{10}{5}$

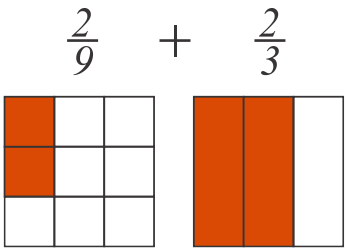


When we are talking about fraction we usually mean the part of a unit. Proper fractions are parts of a unit; improper fractions are sums of a natural number and a proper fraction. Sometimes we want to find a part of something which is not 1, but can be considered as a single object. For example, among 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 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: $\frac{2}{5} \times 30 = 30 \div 5 \times 2$

Addition and subtraction of fractions with unlike denominators.

Let's try to add $\frac{2}{9}$ and $\frac{2}{3}$. What should we do? Why do we need to bring both fractions to the same denominator? We can add together only similar objects: apples to apples and oranges to oranges. Are two fractions $\frac{2}{9}$ and $\frac{2}{3}$ similar objects?

$\frac{2}{3}=\frac{1}{3}+\frac{1}{3}$, $\frac{2}{9}=\frac{1}{9}+\frac{1}{9}$



How we can add together

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

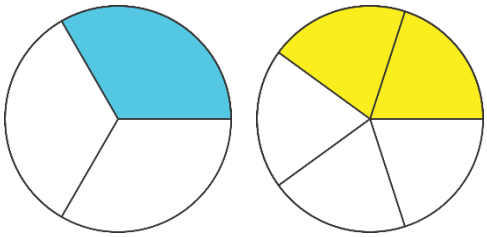
Which part of the unit the result should be?

To be able to add two fractions we have to be sure that they have the same denominator. Each $\frac{1}{3}$ is exactly the same as $\frac{3}{9}$ and $\frac{2}{3}=\frac{6}{9}$

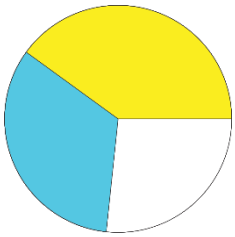
$$\frac{2}{3}\cdot 1=\frac{2}{3}\cdot\frac{3}{3}=\frac{2\cdot 3}{3\cdot 3}$$

If we multiply both, numerator and denominator by the same number the fraction will not change. To bring 2 fractions to the same denominators we have to multiply the numerators and the denominators of both fractions by two different numbers to get a common multiple as the denominator for both fractions. There are many common multiples of 2 numbers. Of course, one of them is their product, but is not always the simplest one. Usually, it is convenient to find LCM of these 2 (or, sometimes more than 2) numbers.

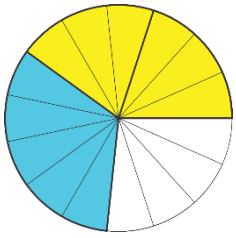
Another example, how add $\frac{2}{5}$ and $\frac{1}{3}$.



Which part of the whole circle will be the sum?



We need to divide the circle into so many part, the such part will fit in $\frac{2}{5}$ of the circle and $\frac{1}{3}$ of the circle whole number of time. The biggest such is $\frac{1}{15}$. $\frac{1}{30}$, $\frac{1}{45}$ and so on also will fit, but they are even smaller. 13, 30, 45 and so on, all these numbers are common multiples of 3 and 5, but the smallest one is 15.



$\frac{1}{5}=\frac{3}{15}$; $\frac{2}{5}=\frac{6}{15}$, $\frac{1}{3}=\frac{5}{15}$

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

Exercises.

1. Rewrite these expression of division as fractions:
   Example: $3 \div 5 = \frac{3}{5}$

   $9 \div 5 =$ $5 \div 11 =$ $2 \div 6 =$

2. Compare:

   $\frac{3}{5}$ $\frac{2}{5}$ $\frac{3}{5}$ $\frac{3}{8}$ $\frac{3}{6}$ $\frac{1}{2}$

   $\frac{1}{5}$ $\frac{5}{1}$ $\frac{4}{12}$ $\frac{3}{4}$ $\frac{2}{11}$ $\frac{1}{12}$

3. Calculate:

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

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

4.

a. What is bigger, the number c or $\frac{2}{3}$ of the number c? Why?

b. What is bigger, the number b or $\frac{3}{2}$ of the number b? Why?

c. What is bigger, $\frac{2}{3}$ of a number m or $\frac{3}{2}$ of a number m? Why?

5. a. $\frac{1}{7}$ of all students in the class is 4. How many students are there in the class?

   b. $\frac{2}{5}$ of all students in a class is 10. How many students are there in a class?

6. In the school cafeteria there are 12 tables. There are 10 seats at each table. At the lunch time $\frac{4}{5}$ of all sits were occupied by students. How many students were in the cafeteria?

7. An apple worm was eating an apple. On the first day it ate half of the apple, on the second day it ate half of the rest, and on the third day it ate half of the rest again. On the fours day it ate all the leftovers. What part of the apple did it eat on the fourth day?

8. 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?

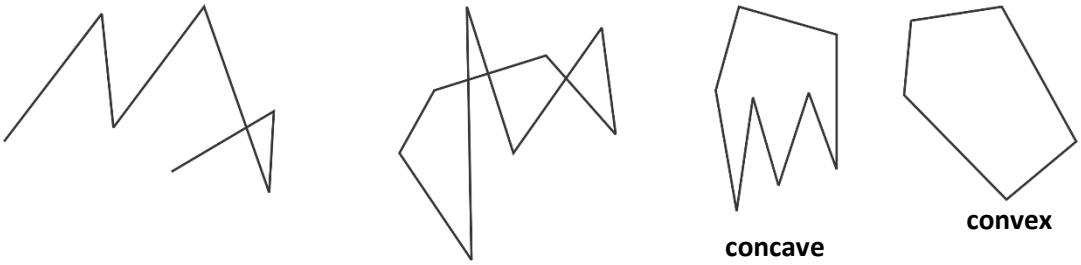
9. Write the expression for the following problems:
   a. 3 packages of cookies cost a dollars. How many dollars do 5 of the same packages cost?
   b. 5 bottles of juice cost b dollars. How many bottles can one buy with c dollars?

Geometry.

Polygons.

Draw a chain of segments, so that the last point of one segment is a first point of the next, and two consecutive points don't lie on the same line.

Draw such chain so that the last point of the last segment is the first point of the first one. We got a closed broken line. Is this a sufficient condition to get a polygon?



In geometry, a **polygon** is a plane figure that is bounded by a finite chain of straight line segments closing in a loop to form a closed chain. These segments are called its *edges* or *sides*, and the points where two edges meet are the polygon's *vertices* (singular: vertex) or *corners*. The interior of the polygon is sometimes called its *body*. An ***n*-gon** is a polygon with *n* sides; for example, a triangle is a 3-gon.

- *What is the difference between convex and concave polygons?*

  The simplest polygon is a triangle.

  Draw a triangle. Measure its angles. Add them. How much did you get?

1. Draw a triangle with sides 3 cm, 5 cm and the angle between them 50°.

2. Draw a triangle with angles 30° and 50° and the side between them 7 cm. Do we need another information to construct a triangle?

Circle is the set of all points in a plane that are at a given distance from a given point, the center.