Classwork 23. Algebra.

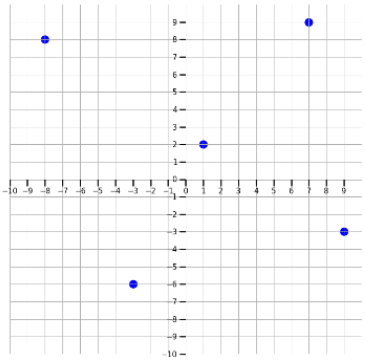
Algebra.

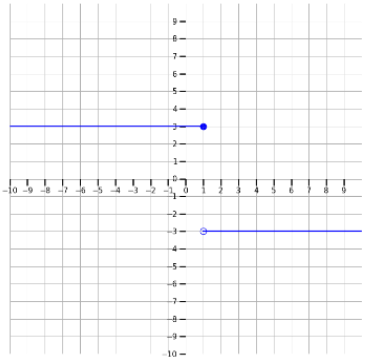
More about functions.

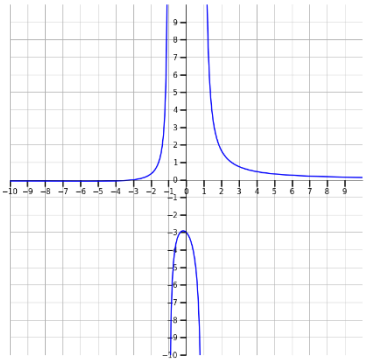
Function is a set of rules, defining the relationship between the elements of two sets, so that each element of the first set connects with only one element of the second set.

If such relationship established between two number sets, we can plot these pairs of numbers on the coordinate plane. A function can be defined directly, for example as a table of values for its independent and dependent variables.

x	1	-3	-8	7	9
f(x)	2	-6	8	9	-3







The domain of this function is the set of numbers {1, -3, -8, 7, 9} and the range of this function is another set {2, -6, 8, 9, -3)

Function can be defined by description:

$$f(x) = \begin{cases} 3 \; for \; x \leq 1 \\ -3 \; for \; x > 1 \end{cases}$$

Domaine of this function is the set of real numbers, from $-\infty$ to $+\infty$. Na the range is only two numbers, 3 and -3.

Also, a function can be defined by formula:

$$f(x) = \frac{x+3}{x^2-1}$$

Try to plot function of absolute value of a number.

Solve the following system analytically, then express y as a function of x, plot the lines on a graph paper, check your solutions

$a.$ $\begin{cases} 2x - y + 1 = 0 \\ -x - y - 2 = 0 \end{cases}$

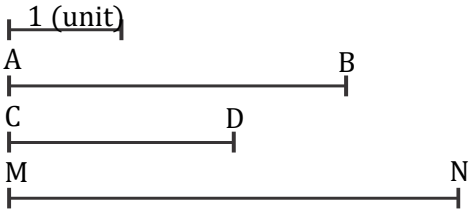
$b.$ $\begin{cases} 2x - y - 4 = 0 \\ \frac{1}{2}x - y + \frac{1}{2} = 0 \end{cases}$

Geometry.

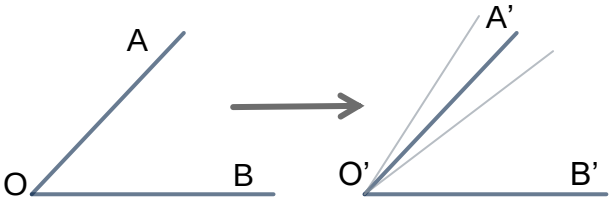
Congruent and non-congruent segments. Two segments are congruent if they can be laid on onto the other so that their endpoints coincide. Suppose that we put the segment [AB] onto the segment [CD] (pict. below) by placing the point A at the point C and aligning the ray [AB) with the ray [CD). If, as the result of this, the points B and D merge, then the segments [AB} and [CD] congruent, or equal. Otherwise, they are not congruent, and the one which makes a part of the other is considered smaller.

We can introduce the concept of sum of several segments, we can subtract one segment from another.

On the picture below, each segment contains several unit segments. Using compass find the length of each segment (in the unit segments).

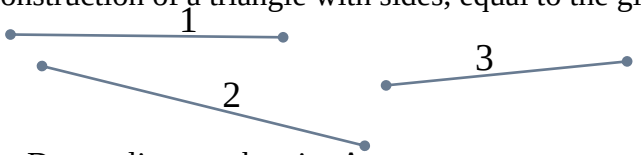


How to construct the segment equal to another segment?

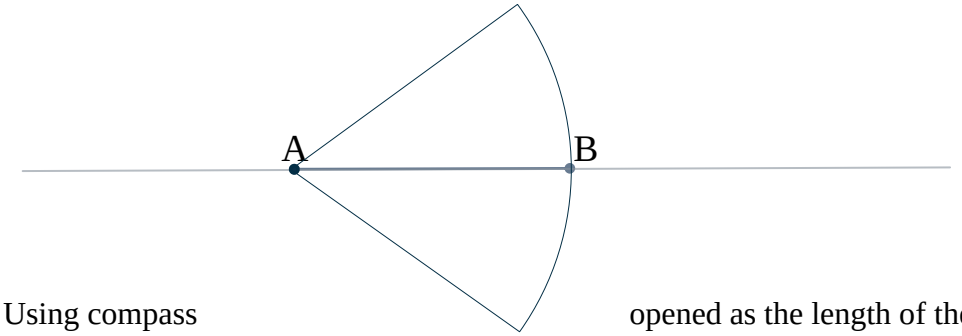


In the very similar way we can define when two angles are congruent. Two angles are congruent if by moving one of them it is possible to combine it with the other. The point O should be superimposed with point O', ray OB is combined with ray O'B'. If the ray OA will superimpose with ray O'A' then 2 angles are congruent.

Construction of a triangle with sides, equal to the given segments.

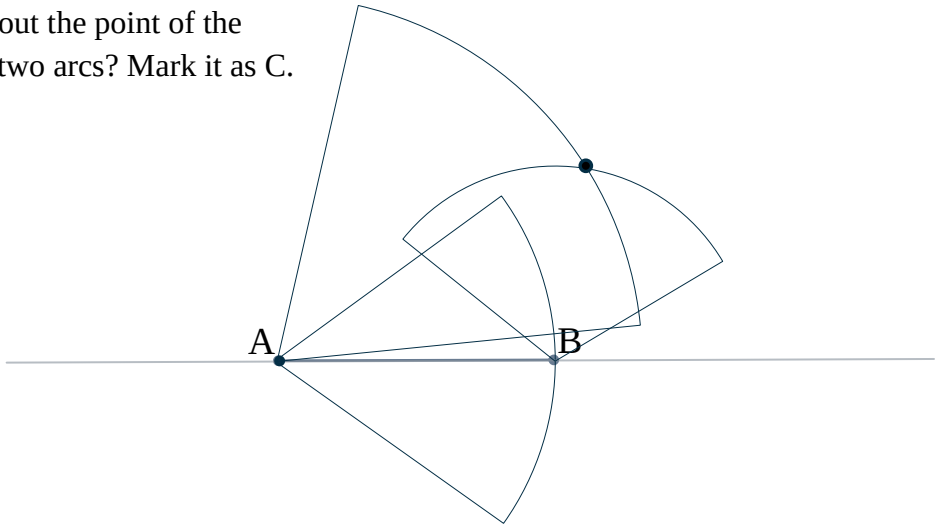


1. Draw a line, mark point A.

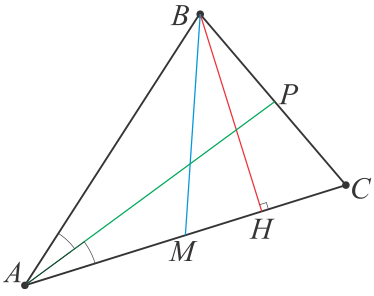


2. Using compass opened as the length of the segment 1 Mark the point B.

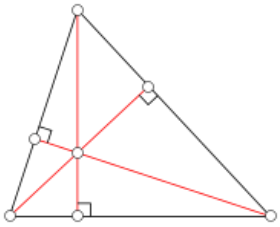
3. With the point A as a center draw an arc with radius equal to the length of the segment 2, and with point B as a center and with radius equal to the length of the segment 3 draw a second arc. What you can say about the point of the intersection of these two arcs? Mark it as C.



Special segments of a triangle.



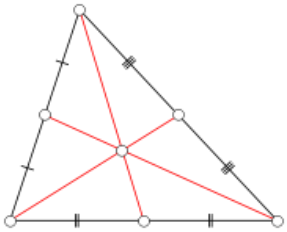
From each vertices of a tringle to the opposite side 3 special segment can be constructed.

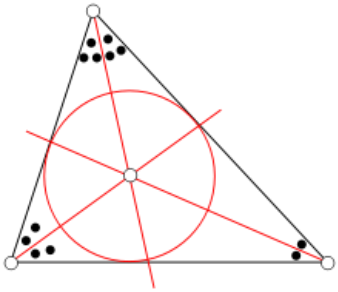


An **altitude** of a triangle is a straight line through a vertex and perpendicular to (i.e. forming a right angle with) the opposite side. This opposite side is called the *base* of the altitude, and the point where the altitude intersects the base (or its extension) is called the *foot* of the altitude.

An **angle bisector** of a triangle is a straight line through a vertex which cuts the corresponding angle in half.

A **median** of a triangle is a straight line through a vertex and the midpoint of the opposite side, and divides the triangle into two equal areas.





Area.

Area of a shape is a measure of surface of a plane, covered with a shape.

1. Can we measure the area in a triangles with side equal to 1 unit? How many such triangles in an equilateral triangle with side 7 units?

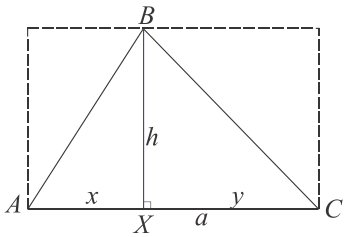
2. How the area of a square will change if we increase the length of the side 2 times? 3 times? $2\frac{1}{2}$ times? How will change the area of a triangle if each of its side will be increase 2 times? 3 times?

Area of a rectangle

$$S = a \cdot b$$

Area of a triangle.

The area of a triangle is equal to half of the product of its altitude and the base, corresponding to this altitude.

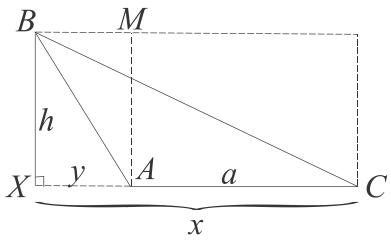


For the acute triangle it is easy to see.

$$S_{rec} = h \times a = x \times h + y \times h$$

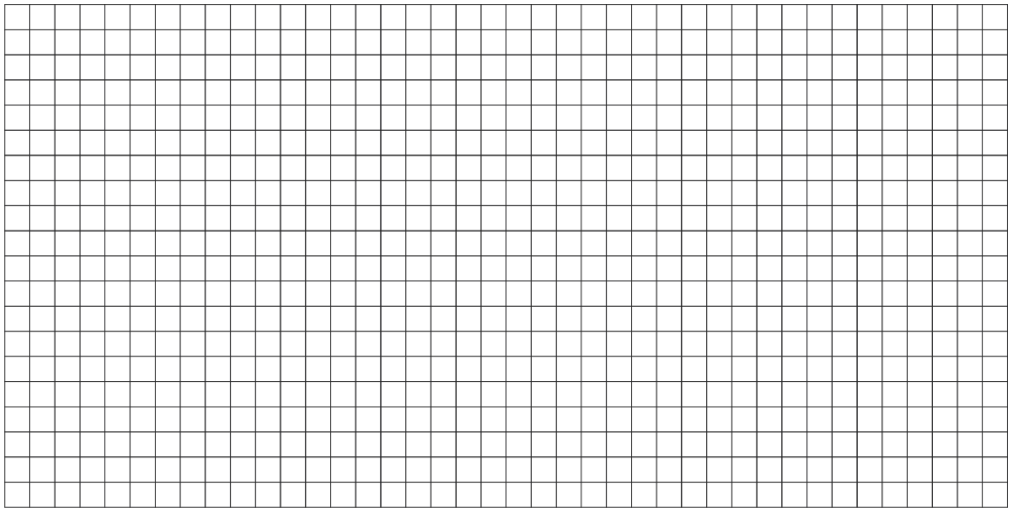
$$S_{\Delta ABX} = \frac{1}{2}h \times x, \qquad S_{\Delta XBC} = \frac{1}{2}h \times y, \qquad S_{\Delta ABC} = S_{\Delta ABX} + S_{\Delta XBC}$$

$$S_{\Delta ABC} = \frac{1}{2}h \times x + \frac{1}{2}h \times y = \frac{1}{2}h(x+y) = \frac{1}{2}h \times a$$



For an obtuse triangle it is not so obvious for the altitude drawn from the acute angle vertex.

1. On a graph paper draw a square with the area equal to 2 cells, 4 cells, 5, 8, 9, 10, 16, 20, 35 cells.



Trapezoid and the are of trapezoid.