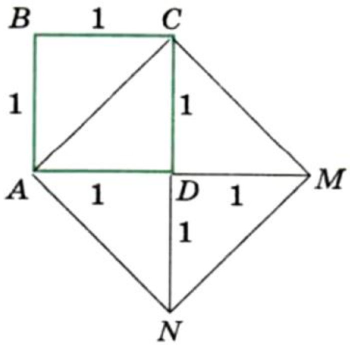
Classwork 17.

Irrational numbers.



The length of the segment [AC] is $\sqrt{2}$ (from Pythagorean theorem). The area of the square ACMN is twice the area of the square ABCD. Let assume that the $\sqrt{2}$ is a rational number, so it can be represented as a ratio $\frac{p}{q}$, where $\frac{p}{q}$ is nonreducible fraction.

$$\left(\frac{p}{q}\right)^2 = 2 = \frac{p^2}{q^2}$$

Or $p^2 = 2q^2$, therefore p^2 is an even number, and p itself is an even number, and can be represented as

$$p = 2p_1$$

Consequently

$$p^2 = (2p_1)^2 = 4{p_1}^2 = 2q^2$$

$$2{p_1}^2 = q^2$$

q also is an even number and can be written as $q = 2q_1$.

$$\frac{p}{q} = \frac{2p_1}{2q_1}$$

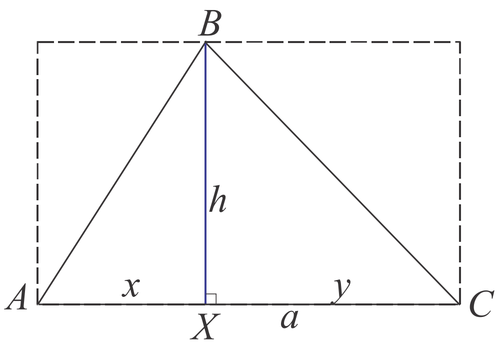
therefore fraction $\frac{p}{q}$ can be reduced, which is contradict the assumption. We proved that the $\sqrt{2}$ isn't a rational number by contradiction.

Prove that the value of the following expressions is a rational number.

1. $(\sqrt{2}-1)(\sqrt{2}+1)$
2. $(\sqrt{5}-\sqrt{3})(\sqrt{5}+\sqrt{3})$
3. $(\sqrt{2}+1)^2+(\sqrt{2}-1)^2$
4. $(\sqrt{7}-1)^2+(\sqrt{7}+1)^2$
5. $(\sqrt{7}-2)^2+4\sqrt{7}$

Last week we did a litle review of a geomery conveptes as point, ray, straight line, angle, straght angle and right angle.
Area of a triangle :

$$S = \frac{1}{2}ah.$$



Area of the triangle.

$$S_{\Delta} = \frac{1}{2} h \times a$$

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

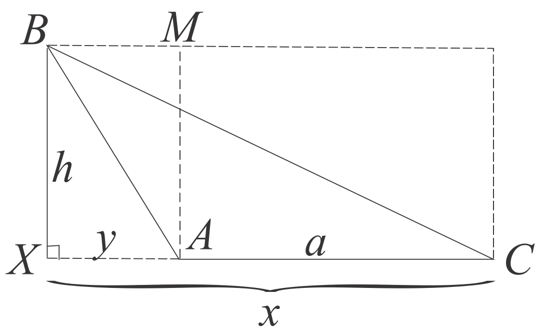
For the acute triangle it is easy to see.

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

$$S_{\Delta ABX} = \frac{1}{2} h \times x,$$

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

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



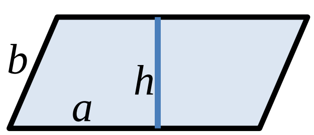
For an obtuse triangle, for one out of the three heights, it is not so obvious.

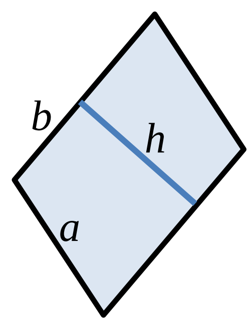
$$S_{\Delta XBC} = \frac{1}{2} h \times x, \qquad S_{\Delta XBA} = \frac{1}{2} h \times y$$

$$S_{\Delta ABC} = S_{\Delta XBC} - S_{\Delta XBA} = \frac{1}{2} h \times x - \frac{1}{2} h \times y$$

$$= \frac{1}{2} h \times (x - y) = \frac{1}{2} h \times a$$

Parallelogramm is a shape which has two pairs of parallele lines:

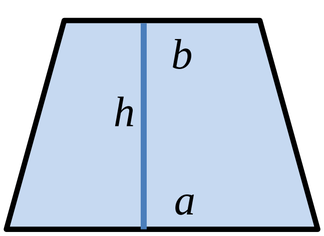




a and b are sides of the trapezoid, h is a distance between two parallel sides (any pair of parallel sides).

Can you find the area of a parallelogramm?

Trapezoid is a shape quadrilateral with a pair of a parallel side.



Can you find the area of a trapezoid?