Math 5b. Classwork20.

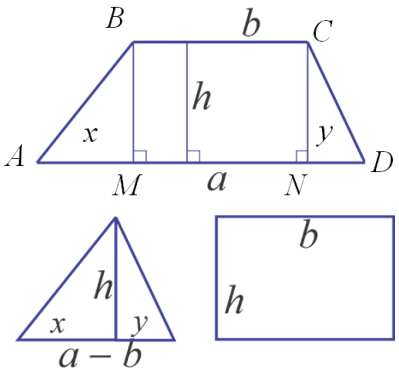
Find the sum of

$$\frac{1}{2\cdot 3}+\frac{1}{3\cdot 4}+\frac{1}{4\cdot 5}+\cdots+\frac{1}{2024\cdot 2025}$$

Quadrilaterals.

Polygons with four sides and four vertices are quadrilaterals. Quadrilaterals can have four non parallel sides, two parallel and two not parallel sides, and two pairs of parallel sides.

If the quadrilateral has only one pair of parallel sides and two other sides are not parallel are called trapezoids.



Trapezoid has two bases, a and b, they are parallel segments. h is an altitude (height), segment, perpendicular to bases. How to find area of the trapezoid?

MBCN is a rectangle, area of this rectangle is

$$S_{rectangle} = h \cdot |MN| = h \cdot b$$

Area of the trapezoid is

$$S = S_{rectangle} + S_{AMB} + S_{NCD}$$

$$S_{AMB} + S_{NCD} = \frac{1}{2}\cdot h \cdot (x+y) = \frac{1}{2}\cdot h \cdot (a-b)$$

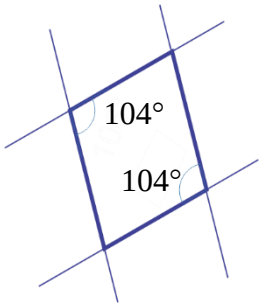
$$S = S_{rectangle} + S_{AMB} + S_{NCD}$$

$$= hb + \frac{1}{2}h(a-b) = hb + \frac{1}{2}ha - \frac{1}{2}hb = \frac{1}{2}hb + \frac{1}{2}ha = \frac{1}{2}h(a+b);$$

Area of a trapezoid is a half of the product of the altitude and the sum of the bases.

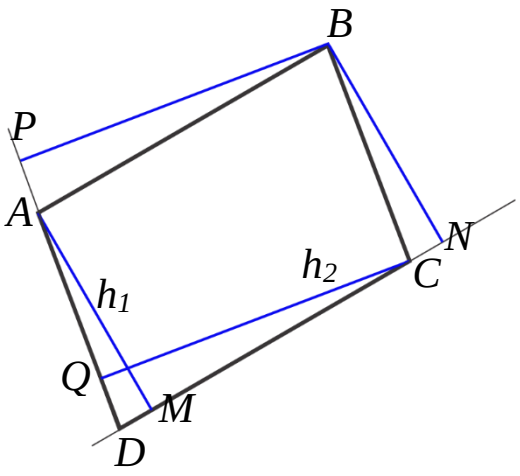
If a quadrilateral has two pairs of parallel lines it's called a parallelogramm. Parallelogramms havs e few properties:

- Their sides not only parallel, but also equal.



- Diagonal divides a parallelogram onto two equal (congruent) triangles.
- Diagonals intersect at the midpoint.
- Opposite angles are equal.

How do we call a parallelogram with all right angles? Parallelograms with equal sides are called rhombuses.



Area of a parallelogram. On the picture below. ABCD is a parallelogram. Segments [AM] and [BN] are equal and perpendicular to lines (DC) and (AB). Triangles DAM and CBN are equal. You can see it by superimposing them (and it can be proved based on the theorems of triangle equalities). So the area of parallelogram is equal to the area of a rectangle

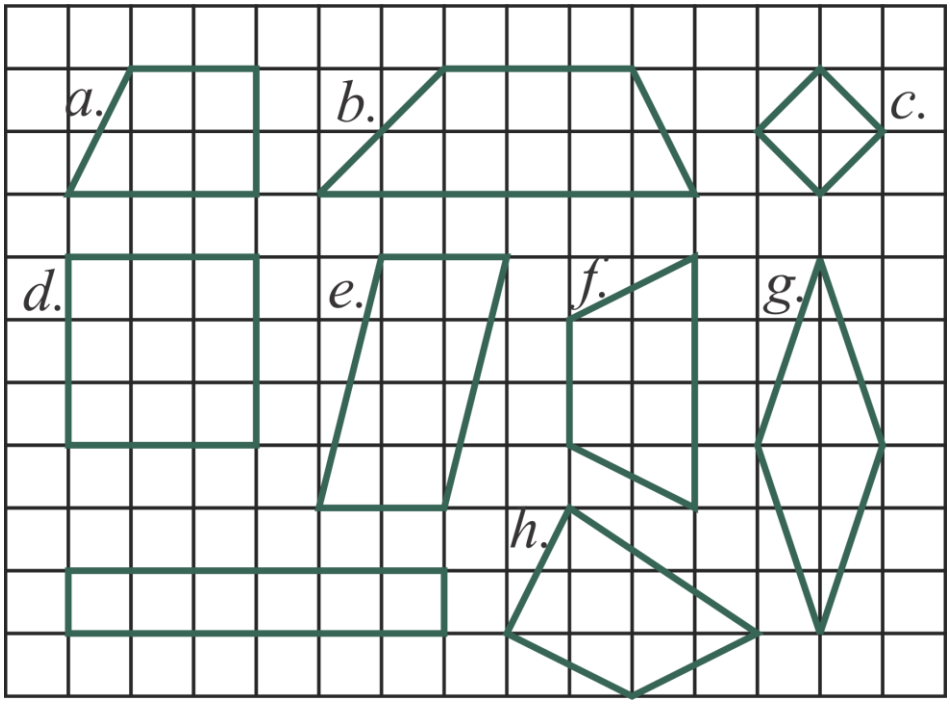
$$S_{ABNM} = |MN| \cdot h_1 = |DC| \cdot h_1$$

(h_1 is an altitude, distance between a pair of parallel lines. Of course, it's also equal to

$$S_{ABNM} = |AD| \cdot h_2$$

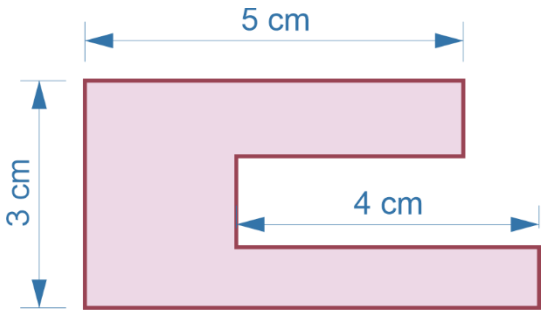
Exercises:

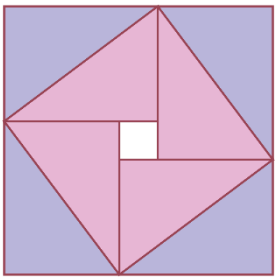
1. Find area of the quadrilaterals:



2. On a graph paper draw a square with the area equal to 2 cells, 4 cells, 5 cells, 8, 10.

3. Peter's garden has the shape shown. All the sides are either parallel or perpendicular to each other. Some of the dimensions are shown in the diagram.
What is the perimeter of Peter's garden?





4. A large square consists of four identical rectangles and a small square. The area of the large square is 49 cm² and the length of the diagonal AB of one of the rectangles is 5 cm. What is the area of the small square?

5. Two squares lie inside a large square, as shown in the figure. The side of square A is $\frac{1}{2}$ of the side of the large square. The side of square B is $\frac{1}{3}$ of the diagonal of the large square. What is the area of the square A if the area of the square B is 16?