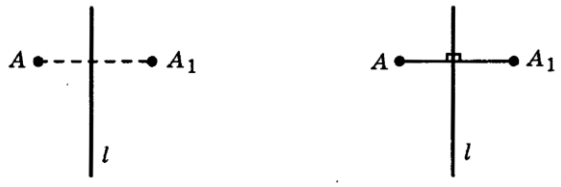
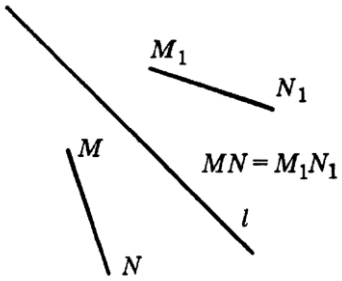
Math 4 d. Class work 26.

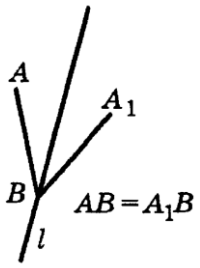
For any point in the plane, you can construct a point symmetrical to it with respect to given line.

- The segment, connecting symmetrical points is a perpendicular to the line of symmetry.



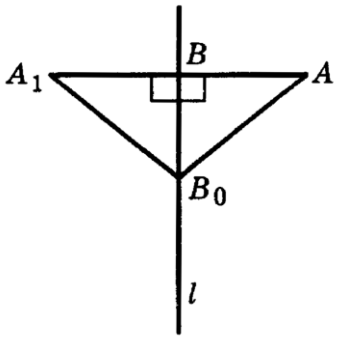
- If the segment MN is symmetrical to the segment M_1N_1 relative to the straight line l, then their lengths are equal





- If point A_1 is symmetrical to point A with respect to straight line l, then for any point B on this line segments A_1B and AB are equal

An important property of the plane follows from the properties of symmetry.



If A is a point on the plane and B is point on the line l, then the length of the segment AB will be smallest if segment AB is perpendicular to line l.

Let's prove it. Point B is taken so that segment AB is perpendicular to line l. Let B_0 be any other point on the line l. We need to prove that AB is less than AB_0. Let's construct point A_1 symmetrical to point A with respect to l. Then point B will lie on segment AA_1 (property 2), AB =

BA_1 and $AB_0 = B_0A_1$ (property 4). Segment AA_1 is shorter than AB_0A_1. Therefore, AB is also less than AB_0, as required.

If we now draw a circle centered at the point A passing through the point B (i.e. AB - radius), then this circle will have with the line l the only one common point B. In this case, we say that the circle touches the line l or that the line l is tangent to the circles.

In fact, we have proved one very important property of circle and tangent to it:

Straight lone perpendicular to the radius of the circle and passing through the end of this radius, is a tangent line (has only one common point with this circle).

Exercises:

1. Given a straight line l and two points A and B on one side of it. Find a point M on the line such that the path from A to B through M is the shortest.

2. There is a circle and a point A, outside of the circle. Two tangent lines are drawn from A to the circle. One line touches the circle at the point B and another line touches at the point C. AC=AB. Why it is true?

3. Caterpillar wants to go from a point G to point A on a cube. What would be the shortest way to go?