<u>First practical work</u>
Topic: Direct geodetic problem (task)

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Purpose of the work:

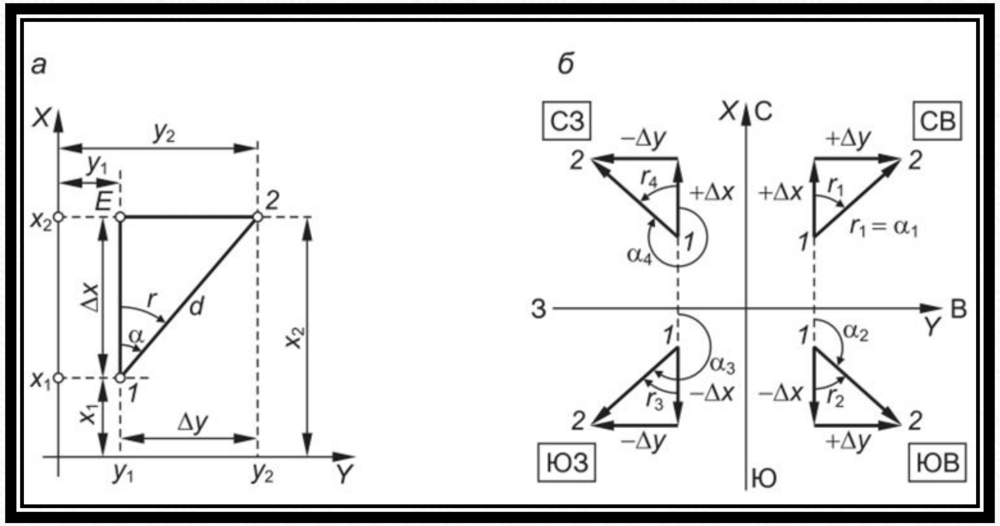
Based on the known coordinates, it is necessary to determine the coordinates of the second point according to the known horizontal distance (line) and the known directional angle.

Introduction

Computational processing of the results of measurements on the ground, carried out in the preparation of plans, the solution of a number of land management problems, the preparation of data for the removal of projects in nature are directly related to direct geodetic problems on coordinates.

Direct geodetic problem.

The essence of this problem (pic. 1): according to the known coordinates of point 1 (X_1, Y_2) of line 1-2, the directional angle of this line α_{1-2} and its horizontal distance D_{1-2} d1-2, it is required to determine the coordinates of point 2.



Pic. 1. Direct geodetic problem

Drawing through points 1 and 2 lines parallel to the coordinate axes, we get a right triangle 1-2'-2, in which the hypotenuse D_{1-2} and the acute angle r = α_{1-2} are known.

The legs of this triangle are the increment of the Δx and Δy coordinates, which can be obtained by the formulas:

$\Delta x = D_{1-2} \cos \alpha_{1-2}$; $\Delta y = D_{1-2} \sin \alpha_{1-2}$.

Examination:

$D = \sqrt{\Delta X^2 + \Delta Y^2}$

- It should be remembered that in the general case, the signs of the increments of coordinates depend on the quarter determined by the directional angle of the given direction (tabl. 1)

Quarter and their name	The value of directional angles	Connection of rumbs (table corners) with directional angle	Coordinate increment signs	
			ΔX	ΔУ
1 quarter – NE,	0° — 90°		+	+
2 quarter – SE	90° — 180°		-	+
3 quarter – SW,	180° — 270°		-	-
4 quarter – NW	270° — 360°		+	-

- Then the coordinates of the desired point 2 are determined by the formulas:

$$X_2 = X_1 + \Delta X; \qquad Y_2 = Y_1 + \Delta Y;$$

or

$$X_2 = X_1 + D_{1-2} \cos \alpha_{1-2}; \qquad Y_2 = Y_1 + D_{1-2} \sin \alpha_{1-2};$$

The increment of coordinates and the coordinates of the required point are calculated with an accuracy corresponding to the accuracy of measuring the horizontal length of the line.