If the body is thrown at an angle to the horizontal, gravity and the force of air resistance act on it. If the power of resistance is to be neglected, there remains the only force - the force of gravity. Therefore, because of the Newton's 2nd law body moves with an acceleration equal to the acceleration due to gravity $\vec{a} = \vec{g}$; projections on the axes of acceleration equal ax = 0, ay = -g.

Any complex motion of a particle can be represented as a superposition of independent movements along the coordinate axes, and in the direction of different axes of movement type may vary. In our case, the motion of a flying body can be represented as a superposition of two independent motions: uniform motion along the horizontal axis (X-axis) and the uniformly accelerated motion along the vertical axis (the axis Y)

Projection of the velocity of the body, therefore, vary with time as follows:

$$v_x = v_{x0} = v_0 \cos\alpha,$$
$$v_y = v_{y0} - gt = v_0 \sin\alpha - gt,$$

where v_0 – initial velocity, α - angle of throwing.
Coordinates of the body, therefore, vary as follows:

$$x = x_0 + v_0 t \cos\alpha,$$
$$y = y_0 + v_0 t \sin\alpha - \frac{1}{2} g t^2.$$

With our choice of the initial coordinates of the origin $x_0 = y_0 = 0$ then

$$x = v_0 t \cos\alpha,$$
$$y = v_0 t \sin\alpha - \frac{1}{2} g t^2. \quad (1)$$

Let us analyze the formula (1). We define the movement of the body cast. For this we set the y-coordinate equal to zero, because at the time of landing height of the body is zero. Hence we obtain the time of flight:

$$t_0 = \frac{2 v_0 \sin\alpha}{g}. \quad (2)$$

The second time value, in which the height is zero, zero, which corresponds to the cast, ie This value also has a physical meaning.

Flight distance is obtained from the first formula (1). Range - the value of the coordinate x at the end of the flight, ie at time equal to t0. Substituting the value of (2) in the first formula (1), we obtain:

$$l = \frac{v_0^2 \sin 2\alpha}{g}. \quad (3)$$

This formula shows that the maximum range is reached at the corner cast of 45 degrees.

Maximum height of lift cast body can be obtained from the second formula (1). To do this, we substitute in this formula, the value of time equal to half the time of flight (2), because it is in the middle of the trajectory altitude maximum. Carrying out the transformations, we obtain

$$h = \frac{v_0^2 \sin^2 \alpha}{2g} \tag{4}$$

From equations (1) can be obtained equation of the path of the body, ie equation relating x and y coordinates of the body during movement. To do this, from the first equation (1) to express the time:

$$t = \frac{x}{v_0 \cos \alpha}$$

and substitute it into the second equation. Then we obtain:

$$y = x tg\alpha - \frac{g}{2v_0^2 \cos^2 \alpha} x^2.$$

This equation is an equation of motion paths. We see that this equation is a parabola, located down the branches, indicated "-" sign in front of the quadratic term. It should be borne in mind that the angle α and throwing its function - it is simply a constant, i.e. constants.