

1. A particle of mass m is projected from the origin O of a Cartesian coordinate system with an initial velocity \vec{v} making an angle θ with the positive x -axis. The particle moves in a parabolic path under the influence of gravity g . The horizontal distance R and the maximum height H reached by the particle are given by the following expressions:

$$R = \frac{v^2 \sin 2\theta}{g}$$
$$H = \frac{v^2 \sin^2 \theta}{2g}$$

Calculate the value of θ for which the horizontal distance R is maximum.

2. A particle of mass m is projected from the origin O of a Cartesian coordinate system with an initial velocity \vec{v} making an angle θ with the positive x -axis. The particle moves in a parabolic path under the influence of gravity g . The horizontal distance R and the maximum height H reached by the particle are given by the following expressions:

$$R = \frac{v^2 \sin 2\theta}{g}$$
$$H = \frac{v^2 \sin^2 \theta}{2g}$$