

Projectiles

Physics

Separating horizontal and vertical motion, and why it works.

The standard method, ignoring air resistance.

1

Resolve the initial velocity

$u \cos \theta$ horizontally, $u \sin \theta$ vertically.

2

Horizontal: constant velocity

No horizontal force, so $a = 0$. $s = u \cos \theta \times t$.

3

Vertical: constant acceleration

$a = -g$. Use SUVAT.

4

Time links them

Solve the vertical for t , then substitute into the horizontal.

USEFUL RESULTS

Maximum range at 45° on level ground

Time to peak = $u \sin \theta \div g$

At the peak the vertical velocity is zero, not the total

At the highest point the vertical component is zero and the horizontal component is unchanged. The projectile is still moving.