Question#19157

a certain athlete consistently throws a javelin at a speed 25m/s.what is her best distance?on one occasion the athlete released the javelin poorly,and achieved only one half of his distance.at what elevation angle did she release the javelin

Solution:

The best distance is if elevation angle equal to 45^0

The distance is:

$S = v_x t$ were t – time of flight of a javelin, v_x- the horizontal component of velocity.

$v_x = vcos\alpha,\ were\ \alpha - the\ elevatin\ angle$

Such as the javelin move with by gravity force:

$v_y = gt,\ \ t = \frac{v_y}{g}\ were\ v_y -\ vertical\ component\ of\ velocity, g$ –the gravity acceleration.

$v_y = vsin\alpha$

$t = 2\frac{vsin\alpha}{g}$

$$\boldsymbol{S = 2\frac{v^2 sin\alpha cos\alpha}{g} = \frac{v^2 sin2\alpha}{g}}$$

$$\boldsymbol{S = \frac{25^2 sin(2*45^\circ)}{9.8} = 63.78\ m}$$

If the distance is a half of S,

such as $\sin(2*45^0)=\sin 90^0=1$, the angle will be:

$$\boldsymbol{sin\alpha = 0,5}$$

$$\boldsymbol{\alpha = arcsin0.5 = 30^\circ}$$

Answer: distance is: 63.78 m, angle is: 30^0