

Diagram showing a projectile launched horizontally from a height of 40m with an initial velocity $V_0 = 20 \frac{m}{s}$. The projectile follows a parabolic path and hits the ground. The horizontal axis is labeled x and the vertical axis is labeled y . Gravity g acts downwards. At the point of impact, the velocity components v_x (horizontal, red) and v_y (vertical, green) are shown, along with the resultant velocity vector v (blue).

a) TIME IN THE AIR
 b) RANGE? (Δx)
 c) V JUST BEFORE IT HITS THE GROUND? (MAG. & DIR.)

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(x)	(y)
$V_{0x} = 20 \frac{m}{s}$	$V_{0y} = 0$
$V_x = V_{0x} = 20 \frac{m}{s}$	$V_y = ?$
$a_x = 0$! ALWAYS!	$g = 9.8 \frac{m}{s^2}$
$\Delta x = ?$	$\Delta y = 40 m$
$t = ?$	$t = ?$

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a) y

$$\Delta y = V_{oy}t + \frac{1}{2}gt^2$$

$$40 = 0 + 4.9t^2$$

$$| t = 2.86 \text{ s} |$$

b) x

$$\Delta x = \frac{1}{2}(V_{ox} + V_x)t$$

$$\Delta x = \frac{1}{2}(70 + 70)(2.86)$$

$$| \Delta x = 57.2 \text{ m} |$$

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c) $\vec{V} = \vec{V}_x + \vec{V}_y$

x) $V_x = V_{ox} = 20 \frac{\text{m}}{\text{s}}$

y) $V_y = V_{oy} + gt$
 $V_y = 0 + 9.8(2.86)$
 $| V_y = 28.0 \frac{\text{m}}{\text{s}} |$

$$V = \sqrt{V_x^2 + V_y^2} \quad V = \sqrt{20^2 + 28^2}$$

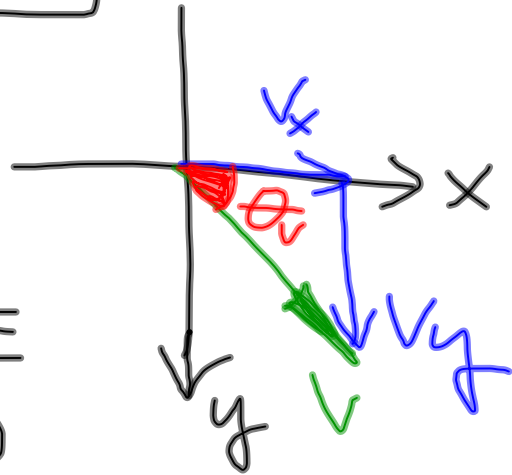
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$$V = 34.4 \frac{m}{s}$$

$$\theta_v = \tan^{-1} \left| \frac{V_y}{V_x} \right|$$

$$\theta_v = 54.5^\circ \text{ S of E}$$

(OR)

BELOW
HORIZONTAL

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