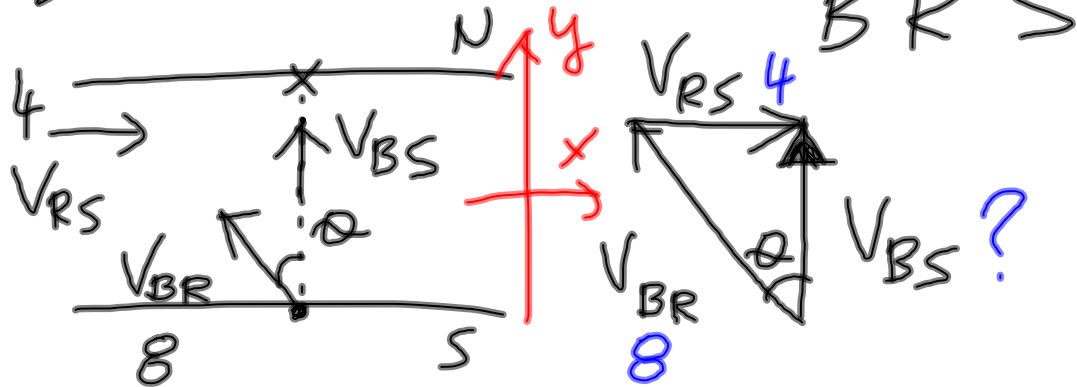


BOATS CROSSING RIVERS.



$$V_{BR}^2 = V_{RS}^2 + V_{BS}^2$$

$$V_{BS} = \sqrt{V_{BR}^2 - V_{RS}^2}$$

Nov 3-7:52 AM

$$\sin \theta = \frac{V_{RS}}{V_{BR}}$$

$$\theta = \sin^{-1}\left(\frac{4}{8}\right)$$

IF Δy IS KNOWN, CALC. t TO CROSS?

$$\Delta y = V_{BS} \cdot t$$

$$t = \frac{\Delta y}{V_{BS}}$$

Nov 3-8:02 AM

#38

Diagram showing a projectile launched from a height of 1.06 m at an angle of 50°. The initial velocity is V_0 . The vertical displacement is 6.74 m. The horizontal displacement is 1.06 m. The velocity components V_{0x} and V_{0y} are shown. A coordinate system with y up and x right is indicated.

Equations:

$$V_{0x} = V_0 \cos 50^\circ$$

$$V_{0y} = V_0 \sin 50^\circ$$

(y) $\Delta y = \frac{V_y^2 - V_{0y}^2}{2 \cdot g}$

$V_{0y} = \sqrt{\Delta y \cdot 2g}$

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$V_{0y} = V_0 \sin 50^\circ$

$\sqrt{2g \Delta y} = V_0 \sin 50^\circ$

$V_0 = \frac{\sqrt{2g \Delta y}}{\sin 50^\circ}$

Nov 3-8:13 AM

b) Get total time from given Δx .

$V_{0x} = \text{known}$.

$$\Delta x = V_{0x} \cdot t$$

$$t = \frac{\Delta x}{V_{0x}}$$

$$\Delta y = V_{0y}t + \frac{1}{2}gt^2$$

Nov 3-8:15 AM

#63

Diagram showing a projectile launched from a height of 15m. The horizontal distance is 40m. The initial velocity v_0 is at an angle of 53° . The horizontal component of velocity is v_{0x} and the vertical component is v_{0y} .

Equations for the components of the initial velocity:

$$V_{0x} = v_0 \cos 53^\circ$$

$$V_{0y} = v_0 \sin 53^\circ$$

Nov 3-8:16 AM

An engineer calculated the theoretical maximum height of a ball shot straight up into the air. The initial velocity was known (v_0). An experiment was set up and the measured max. height was lower than the theoretical. List possible causes of the discrepancy with detailed explanation (derivations). There is no air resistance!

① $V_{0E} < V_{0T}$

$$\Delta y = \frac{V_{fy}^2 - V_{0y}^2}{2 \cdot g}$$

②

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$$\Delta y = \frac{-V_{0y}^2}{2g}$$

$V_{0E} < V_{0T}$, so

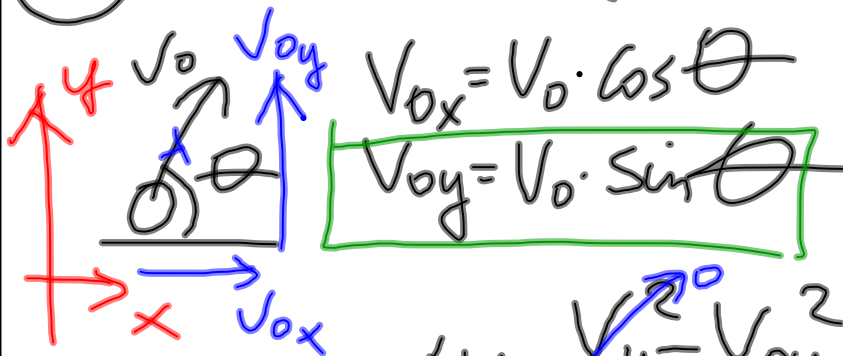
THE NUMERATOR IS SMALLER, SO Δy IS LESS.

$V_{0y} = V_0$

SHOT AT $\theta = 90^\circ$

Nov 3-9:03 AM

(2) $\theta \neq 90^\circ$ (SAY: $\theta < 90^\circ$)



$$\Delta y = \frac{V_y^2 - V_{0y}^2}{2 \cdot g}$$

$$\Delta y = \frac{(V_0 \sin \theta)^2}{2 \cdot g}$$

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IF $\theta = 90^\circ$, $\sin 90^\circ = 1$, so $\Delta y = \text{MAX}$.
 IF $\theta < 90^\circ$, $\sin(\theta) < 1$, so Δy IS LESS.



Nov 3-9:09 AM