

PROJECTIVE PROBLEM SET 3

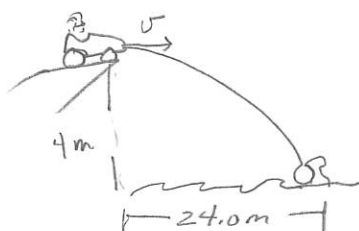
①



$U_0 = 45 \text{ m/s}$ A) $a_x = 0$
 $\theta = 45^\circ$ $U_x = \cos 45 (45) = 31.82 \text{ m/s}$ $a_y = -9.80 \text{ m/s}^2$
 $d_x = U_x t$ $U_y = \sin 45 (45) = 31.82 \text{ m/s}$
 $(31.82 \text{ m/s})(6.494)$ $d_y = 0$
 $d_x = 206.6$ $U_{y2} = -31.82 \text{ m/s}$
 $\boxed{\text{RANGE} = 207 \text{ m}}$ $t = \frac{U_{y2} - U_{y1}}{g} = \frac{-31.82 - 31.82}{-9.8}$
 $t = 6.494 \text{ s}$

B) $U_{y1} = 31.82$ $U_{y2} = 0$
 $d_y = \frac{U_{y2}^2 - U_{y1}^2}{2g} = \frac{0 - (31.82)^2}{2(-9.8)} = d_{y \text{ max}} = 51.659$
 $\boxed{\text{MAX HEIGHT} = 51.7 \text{ m}}$

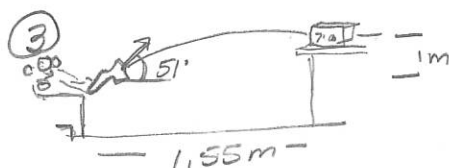
②



$a_x = 0$ $a_y = -9.8 \text{ m/s}^2$
 $d_x = 24.0 \text{ m/s}$ $d_y = -4.00 \text{ m}$
 $U_{y1} = 0$
 $t = \sqrt{\frac{2d_y}{g}} = \sqrt{\frac{2(-4.00)}{-9.80}} = .9035 \text{ sec}$
 $U_x = \frac{d_x}{t} = \frac{24.0 \text{ m}}{0.9035} = 26.56 \text{ m/s}$

SHE WAS SPEEDING
26.6 m/s

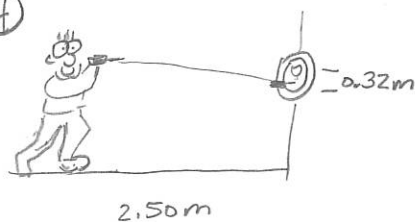
③



$a_x = 0$ $a_y = -9.80 \text{ m/s}^2$
 $d_x = 1.55 \text{ m}$ $d_y = 1.00 \text{ m}$
 $U_x = \cos 51^\circ U_0$ $U_y = \sin 51^\circ (U_0)$
 $\theta = 51^\circ$
 $d_x = U_x t = \cos \theta U_0 t$ $t = \frac{d_x}{\cos \theta U_0}$
 $d_y = U_{y1} t + \frac{1}{2} g t^2 = \frac{\sin \theta U_0 d_x}{\cos \theta U_0} + \frac{1}{2} g \left(\frac{d_x}{\cos \theta U_0} \right)^2$
 $1 \text{ m} = \tan 51 (1.55 \text{ m}) + \frac{1}{2} (-9.8) \frac{1.55^2}{(\cos 51)^2 U_0}$

$\boxed{U_0 = 5.70 \text{ m/s}}$

④



$a_x = 0$ $a_y = -9.80 \text{ m/s}^2$
 $d_x = 2.50 \text{ m}$ $d_y = -0.320 \text{ m}$
 $U_{y1} = 0$
 $t = \sqrt{\frac{2d_y}{g}} = \sqrt{\frac{2(-0.32 \text{ m})}{-9.8}} = 0.2556 \text{ sec}$
 $U_x = \frac{d_x}{t}$

$U_x = \frac{2.50 \text{ m}}{0.2556 \text{ s}} = 9.783$

$\boxed{U_0 = 9.78 \text{ m/s @ } 90^\circ}$