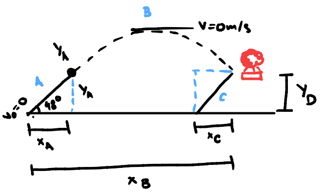
Rocket Problem



$V = at$

$V = (v_0 \sin\theta)t\,[\Delta Y]$ $\quad V = (v_0 \cos\theta)t\,[\Delta x]$

$V_x = (6.1\cos\theta)(7.5) = 30.613\,m/s$

$V_y = (6.1 \cos\theta)(7.5) = 33.999\,m/s$

Part A

A: $t = 7.5$ sec, $\theta = 48°$, $a = 6.1\,m/s^2$

$\Delta x = \cancel{v_0 t} + \frac{1}{2}at^2 \rightarrow a = a\cos\theta\,[\Delta x]$ or $a\sin\theta\,[\Delta Y]$

$\hookrightarrow v_0 = 0$

$\Delta x_A = \frac{1}{2}(6.1 \cos 48°)(7.5)^2 = 114.79772\,m$

$\Delta Y_A = \frac{1}{2}(6.1 \sin 48°)(7.5)^2 = 127.49578\,m$

Part B

B: Drop from max = 70m, $a_g = 9.8\,m/s$

Time	Max Height
$v = at$ $\quad \frac{v}{a} = t$	$V^2 = \boxed{v_0^2} + 2a_g\,\Delta Y$ [Vertical] $\quad$ $\star V_y$
$t_{up} = \frac{33.999\,[V_y]}{9.8\,[a_g]}$	$0 = (33.999)^2 + 19.6\,\Delta Y$
$t_{up} = 3.47$ sec	$\Delta Y = 58.976m \leftarrow \Delta Y$ Max
	$+\ 127.49578m$ (initial height for Part B → Y_A)
$\Delta Y = \cancel{v_0 t} + \frac{a}{2}t^2$	$186.4719025m$ (Max height)
$t = \sqrt{\frac{2}{a_g}\Delta Y}$	$-\ 70m$ (Drop)
$t_{down} = \sqrt{\frac{2}{9.8} \cdot 70} = 3.78$ sec	$116.472\,m$ (when parachute opens → Y_D)

Horizontal Distance:

$\Delta x = vt$

$\Delta x_B = (30.613\,m/s)(3.78 + 3.47) = 221.94425m$ (V_x; total time)

Part C

– constant horizontal + vertical speeds

C: $V_{cy} = 9\,m/s$, $V_{cx} = 15\,m/s$

Horizontal	Vertical
$\Delta x = -V_{cx}t$	$\frac{\Delta Y_D}{V_{cy}} = t$
$\Delta x_c = -15\,(12.9413)$	$\frac{116.472m}{9} = 12.9413$ sec
$\Delta x_c = -194.1195m$	
↳ negative because going West	

Final Answer

$\Delta x_A + \Delta x_B - \Delta x_c = \Delta X$

$114.79772m + 221.94425m + (-194.1195m)$

$\boxed{= 142.6225\ m\ \text{East}}$