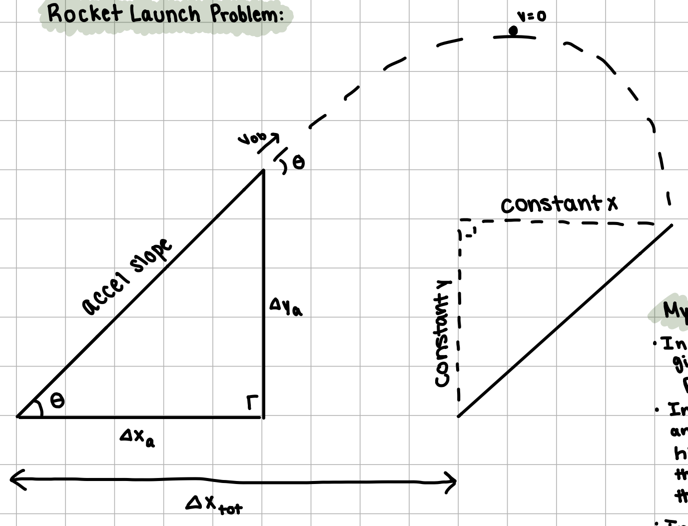
Rocket Launch Problem:



Given information

- Launch angle → 53°
- Engine burn time → 8.7sec
- Net a of rocket while engine burns → $4.2\,m/s^2$
- Vertical d rocket falls from max height before parachute opens → 76m
- Rocket w/ parachute constant vertical speed → 6.0 m/s
- Wind + rocket w/ parachute constant horizontal speed → 20 m/s

My strategy:

- In part A, I used the information given to find Δx and Δy for that part as well as the x and y velocities
- In part B, I solved for the max height and added it to my first Δy to find how high the max point was, then subtracted the vertical distance the rocket falls before the parachute opens
- In part C, I first solved for the time it would take to hit the ground and then used that to find that sections "Δx"
- To get my final answer, I added the Δx from part a and the Δx from part b and subtracted the Δx from part c to find the x displacement

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A)

$\theta = 53°$
$t = 8.7 sec$
$a = 4.2\,m/s^2$
$V_0 = 0$

$\Delta x = v_0 t + \frac{1}{2}at^2$
$\Delta x = 0 + \frac{1}{2}(4.2\cos 53)(8.7)^2$
$\Delta x = 95.6579\,m$

$\Delta y = v_{0y}t + \frac{1}{2}at^2$
$\Delta y = 0 + (4.2\sin 53)(8.7)^2$
$\Delta y = 126.942$

$V_y^2 = V_{0y}^2 + 2a\Delta y$
$V_y^2 = 0 + 2(4.2\sin 53)\cdot 126.942$
$V_y = 29.1821\,m/s$

$V_x^2 = V_{0x}^2 + 2a\Delta x$
$V_x^2 = 0 + 2(4.2\cos 53)\cdot 95.6579$
$V_x = 21.9903\,m/s$

B) Projectile Motion

$V_{oy} = 29.1821\,m/s$
$V_{ox} = 21.9903\,m/s$
$Y_0 = 126.942\,m$
$X_0 = 95.6579\,m$
$a = -9.8\,m/s^2$

$V_y^2 = V_{oy}^2 + 2a\Delta y$
$0 = 29.1821^2 + 2(-9.8)\Delta y$
$\Delta y = 43.4487\,m$

$126.942 + 43.4487 = 170.391 - 76 = 94.3907\,m$

x	y
$\Delta x = v_x t$	$y = y_0 + v_{oy}t - \frac{1}{2}at^2$
$\Delta x = 21.9903(6.91607)$	$94.3907 = 126.942 + 29.1821t - 4.9t^2$
$\Delta x = 152.086\,m$	$t = 6.91607 sec$

C) Last part

$Y_0 = 94.3907\,m$
$Y = 0\,m$
$V_x = 20\,m/s$
$V_y = 6\,m/s$

x	y
$\Delta x = v_x t$	$y = y_0 + v_{oy}t - \frac{1}{2}at^2$
$\Delta x = -20(15.7318)$	$0 = 94.3907 - 6t + 0$
$\Delta x = -314.636$	$t = 15.7318$

$152.086\,m + 95.6579 - 314.636$

$= -66.89\,m$ west

↳ Final answer