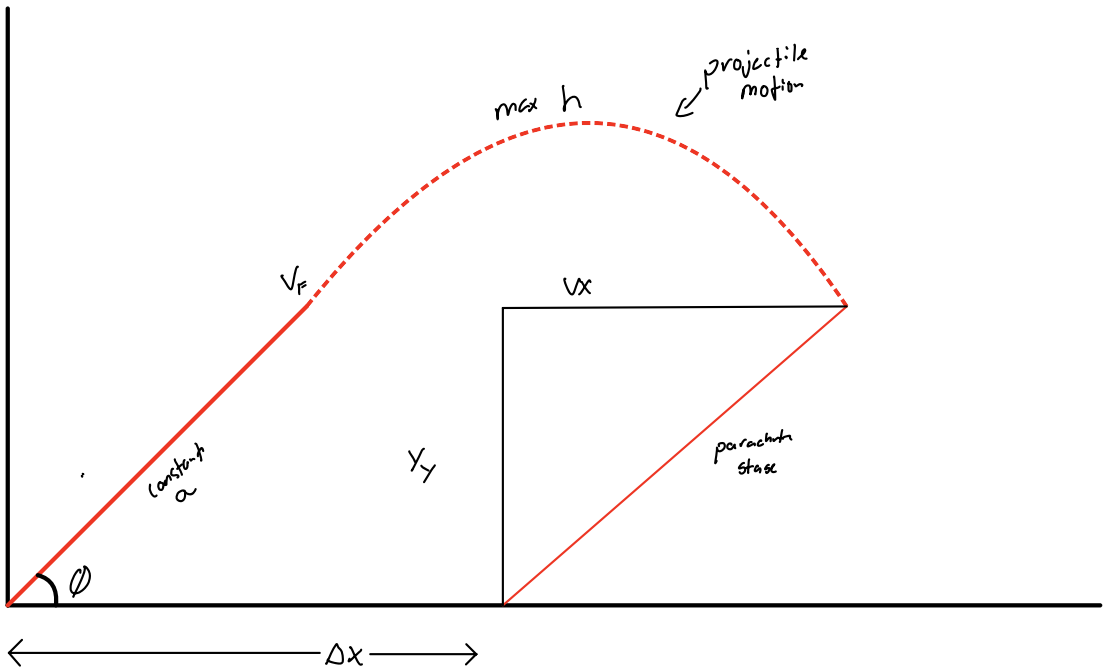

given

launch angle 49°

engine burn time 8.2 seconds

net acceleration of rocket while engine burns 6.5 m/s²

vertical distance rocket falls from max height before parachute opens 75 m

Rocket with parachute constant vertical speed 9 m/s

wind and rocket with parachute constant horizontal speed 15 m/s

Step 1

find rockets final velocity during engine burn cycle

$V_F = V_i + at$ — given

$V_F = 0 + 6.5(8.2)$ — no V_i initial

$V_F = 53.3 \text{ m/s}^2$

Step 2

find how far rocket travels in first stage

$\Delta x = \left(\frac{V_i + V_F}{2}\right) t$

$\Delta x = \left(\frac{0+53}{2}\right) 8.2$ — no V_i; V_F found in Step 1; given

$\Delta x = 218.53 \text{m}$

Step 3

Find x and y components from Δx

y component $= \sin(49) = \frac{Y}{218.53}$ ← Step 2

$x = 164.9267$

x component $= a^2 + b^2 = c^2$

$164.9267^2 + b^2 = 218.53^2$ ← Step 2

$b = 143.3283$ $x = 143.3283 \text{m}$

Step 4

Find max height reached when in projectile stat

$V_y^2 = V_{oy}^2 - 2gh$

$0 = 53.3(\sin 49)^2 + 2(-9.8)\,\Delta y$

$\Delta y = 82.557$

max height

$\Delta y_{projectile} + \Delta y_{rocket} = \text{max height}$ (step 4, step 3)

max height $= 82.557 + 164.9267$

max height $= 247.4837\text{m}$

Step 5

Find height parachute opens

max height -75

$247.4837 - 75$ ← given

172.4837m (step 4)

Step 6

Find projectile x value.

H	V
$\Delta x = Vxt$	$y = Y_0 + V_{oy}t - \frac{1}{2}gt^2$ (step 5, step 3)
$\Delta x = 53.3(\cos 49)t$	$172.4837 = 164.9267t + 53(\sin 49)t - 4.9t^2$
$\Delta x = 53.3(\cos 49)8.017$	$0 = -4.9t^2 + 53(\sin 49) - 7.557$
$\Delta x = 280.3380\text{m}$	$t = 8.017$

Step 7

Find x component of parachute

H	V
$\Delta x = Vxt$ (given)	$y = Y_0 + V_{oy}t + \frac{1}{2}gt$
$\Delta x = 15(19.1649)$	$y = Y_0 + V_yt$
$\Delta x = 287.4735\text{m}$	$y = Y_0 + gt$ (step 5)
	$0 = 172.4837 - 9t$ (given)
	$t = 19.1649$

note will be − because it going west

Find Step

add the x components

$143.3283 + 280.3380 - 287.4735$

Step 3 Step 6 Step 7

$\Delta x = 136.228\text{m}$