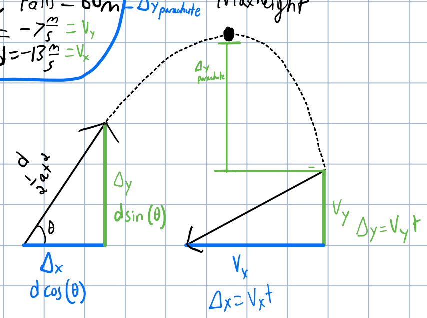
Steps:

1. Find position when acceleration stops
2. Use sin and cos to find Δx and Δy in first stage
3. Find velocity, V_x, and V_y when acceleration stops
4. Find max height and how long it takes to get there
5. Use time to max height and v_x to find Δx between end of acceleration and max height
6. Find time for y to decrease by 60m from max height
7. Use time from 6 to find Δx using V_x from max height to parachute
8. Find time using v_y to hit the ground
9. Use time and v_x given to calculate Δx in final stage
10. Add the 4 Δx values calculated to get the final position

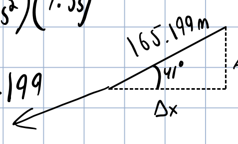
Launch Angle = 41°
Engine burn time = 7.3s = t
Acceleration while rocket burns = $6.2 \frac{m}{s^2}$ = a
Vertical fall before parachute falls = 60m = $\Delta y_{parachute}$
Parachute constant vertical speed = $-7 \frac{m}{s}$ = V_y
Parachute constant horizontal speed = $-13 \frac{m}{s}$ = V_x



Stage 1

Given:
$t = 7.3s$
$a = 6.2 \frac{m}{s^2}$

$$d = \frac{1}{2}at^2$$
$$d = \frac{1}{2}\left(6.2\frac{m}{s^2}\right)(7.3s)^2$$
$$d = 165.199$$

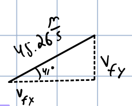


$\Delta x = 165.199\cos(41) = 124.68$
$\Delta y = 165.199\sin(41) = 108.38m$

finding Δx and Δy

$$V_f^2 = v_i^2 + 2ad$$
$$V_f^2 = 2ad$$
$$V_f^2 = 2(6.2)(165.199)$$

$V_f = 45.26 \frac{m}{s}$



$V_{fx} = 45.26\cos(41) = 34.16 \frac{m}{s}$
$V_{fy} = 45.26\sin(41) = 29.69 \frac{m}{s}$

finding final velocities Stage 1

Stage 2

Given:
$V_{0x} = 34.16 \frac{m}{s}$
$V_{0y} = 29.69 \frac{m}{s}$

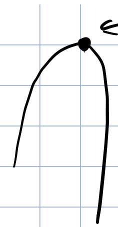
$$V_f^2 = v_i^2 + 2a\Delta y$$
$$-v_i^2 = 2a\Delta y$$
$$\frac{-(v_i)^2}{2a} = \Delta y$$
$$\frac{-\left(29.69\frac{m}{s}\right)^2}{-19.6\frac{m}{s^2}} = \Delta y$$

$\Delta y = 44.97m$

$$\Delta y_{stage 2} + \Delta y_{stage 1} = Y_{max}$$

$124.68m + 44.97m = 153.35 = Y_{max}$

Finding Max Height



$V_y = V_{0y} + at$

$\frac{-V_{0y}}{a} = \frac{at}{a}$ $\frac{-V_{0y}}{a} = t$

$\frac{-29.69\frac{m}{s}}{-9.8} = t = 3.030s$

Time to get to max height

$V_x = 34.16\frac{m}{s}$

$\Delta x_1 = 34.16\frac{m}{s}(3.030s)$

$\Delta x_1 = 103.5m$

Δx from end of stage 1 to max height

$\Delta x = v_{0y}t + \frac{1}{2}at^2$ $\Delta y = -60m$

$\Delta y = \frac{1}{2}at^2$

$\frac{2\Delta y}{a} = t^2$ $t = \sqrt{\frac{2\Delta y}{a}}$ $t = \sqrt{\frac{2(-60)}{-9.8}}$

$t = 3.497s$

$\Delta x_2 = V_x t$ $\Delta x_2 = 34.16\frac{m}{s}(3.497s) = 119.4m$

Δx from max height to end stage 2

$\Delta x_1 + \Delta x_2 = 222.9m$ in stage 2

$103.5m + 119.4m = 222.9m$

Stage 2 Δx

Stage 3

$V_y = 7\frac{m}{s}$

$V_x = 13\frac{m}{s}$

$\Delta y = V_y t$ $\Delta y = y_{max} - 60$

$t = \frac{\Delta y}{V_y}$ $\Delta y = 93.35m$

$t = \frac{93.35m}{7\frac{m}{s}} = 13.34s$

Solving for time on stage 3

$\Delta x = v_x t$

$\Delta x = 13(13.34_s)$ backwards

$\Delta x = -173.42m$

] Δx Stage 3

$\Delta x_{stage 1} + \Delta x_{stage 2} + \Delta x_{stage 3}$

$108.38 + 222.9 - 173.42$

$x_{Final} = 174.2m$ E

] Δx altogether