Rocket problem Luke Lee

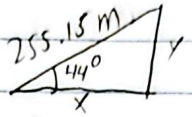
Engine Burn

$\theta = 44^\circ$
$t = 9s$
$a = 6.3 m/s^2$
Find x & y

$V_{xy} = V_0 + at$
$V_{xy} = 0 + 6.3 \cdot 9$
$V_{xy} = 56.7 m/s$

$\Delta y_x = \left(\frac{V_0 + V}{2}\right) t$

$\Delta y_x = \left(\frac{0 + 56.7}{2}\right) 9 = 255.15 m$



$\frac{x}{255.15} = \cos(44)$ $\frac{y}{255.15} = \sin(44)$

$x = 183.53955 m$ $y = 177.242 m$

Free fall up

$\theta = 44^\circ$
$V_0 = 56.7 m/s$
$y_0 = 177.242 m$
$a = -9.8 m/s^2$
$V_y = 0$
$x_0 = 183.53955$
Find: x & y

X

$\Delta x = V_x t$
$\Delta x = 56.7 \cos 44 \, t$
$\Delta x = 56.7 \cos(44) 4.019135$
$\Delta x = 163.9265137 m$
total $x = x + x_0 =$
$347.4660637 m$

Y

$V_y^2 = V_{oy}^2 + 2a\Delta y$
$0 = (56.7 \sin 44)^2 + 2(-9.8)\Delta y$
$19.6 \Delta y = 1551.245979$
$y = 79.150305 m$
$\Delta y = y + y_0 =$ $256.392405 m$
$y = y_0 + V_{oy} t - \frac{1}{2} g t^2$ Assume at $y_0 = 0$
$79.150305 = 0 + (56.7 \sin 44) t - 4.9 t^2$
$0 = -4.9 t^2 + 39.387296 t - 79.150305$
$t = 4.019135$

Free fall down

$\theta = 0^\circ$
$V_0 = 56.7 m/s$
$y_0 = 256.392405 m$
$a = -9.8 m/s^2$
$V_{x0} = 0$
$x_0 = 347.4660637 m$
$y = 256.392405 - 80$
Find X

X

$\Delta x = V_x t$
$\Delta x = 56.7(\cos(44)) t$
$\Delta x = 40.8 \cdot 4.040610178$
$\Delta x = 164.8076165 m$

Y

$y = y_0 + V_{oy} t - \frac{1}{2} g t^2$
$176.392405 = 256.392405 + 0 - 4.9 t^2$
$-80 = -4.9 t^2$
$t = 4.040610178 s$

Parachute

	X	Y
$V_y = -6 m/s$	$\Delta x = V_x t$	$y = y_0 + v_{0y} t - \frac{1}{2} g t^2$
$V_x = -15 m/s$	$\Delta x = -15t$	$0 = 176.392405 - 6t$ — (-0)
$y_0 = 176.392405$	$\Delta x = (-15)(29.39873417)$	$6t = 176.392405$
Find X	$\Delta x = -440.9810125 m$	$t = 29.39873417 s$

Putting it all together

Engine burn varables: $X_1 = 183.5395 m$, $Y_1 = 177.242 m$, $a_1 = 53 m/s^2$
$V_{x_1} = 40.787 m/s$ $V_{y_1} = 39.387 m/s$ $V_{xy} = 56.7 m/s$ $t_1 = 9 s$ $\theta = 44°$

Free fall up: $X_2 = 163.9265137 m$ $Y_2 = 79.150305 m$
$a_2 = -9.8 m/s^2$ $t_2 = 4.01913 s$

Free fall down: X_3 $164.8026165 m$ $Y_3 = -80 m$ $t_3 = 4.040610173 s$

parachute: $X_4 = -440.9810125 m$ $Y_4 = -176.392405$ $t_4 = 29.39873417 s$
$V_{y_2} = -6 m/s$ $V_{x_2} = -15 m/s$

Total X: $X_1 + X_2 + X_3 + X_4 \approx$
Total X $= 183.5395 + 163.9265 + 164.8026 - 440.9810 =$ 71.2877 m East