$\frac{343\text{ m}}{1\text{ s}} = \frac{x\text{ m}}{9.5\text{ s}}$

$x = 3258.5\text{ m}$

$\frac{3.0\times10^8\text{ m}}{1\text{ s}} = \frac{3258.5\text{ m}}{x}$

$\frac{3258.5}{3.0\times10^8} = \frac{(3.0\times10^8)x}{3.0\times10^8}$

$1.086\times10^{-5} = x$

$D_{Total} = D_{bicycle} + D_{run} = 17.5 + 6.5 = 24$

$S_{avg} = \frac{\text{Total distance}}{\text{Total time}}$

$T_{total} = \frac{24}{12.6\text{ mph}} = \text{total time} = 1.9\text{ h}$

$T_{bicycle} = \frac{17.5}{19.9} = 0.87\text{ h}$

$T_{run} = T_{total} - T_{bicycle} = 1.03\text{ h}$

$S_{run} = \frac{D_{run}}{T_{run}} = 6.31\text{ mph}$

$\frac{D_1}{T_1} = V_1$ $\quad V_{avg} = \frac{D_1 + D_2}{T_1 + T_2}$

$\frac{D_2}{T_2} = V_2$ $\quad V_{avg} = \frac{457+721}{8.9+106.5} = 10.20$

$x(t) = At + Bt^2$

$x'(t) = A + 2Bt$

$0 = -4.6 + 2(6.6)t$

$+4.6$

$4.6 = 2(6.6)t$

$\frac{4.6}{13.2} = \frac{13.2t}{13.2}$

$t = 0.348$

$x(t) = At + B\cos(t)$

$A - B\sin(t)$

$v(t) = 3.20\text{ m/s}(t)$

$\int 3.2t\ dt$

$3.2t$

$3.2\int t\ dt$

$\frac{1}{2}t^2$

$x(t) = \frac{3.2}{2}t^2$

$\frac{3.2}{2}(3.83)^2$

14.66

$\frac{46.94}{2} = 23.47\text{ m}$

$v(t) = 16 - 1.5t - 7.5$

$v(t) = -1.5t + 8.5$

$16 - (1.5(t-5))$

$16 - (1.5t - 7.5)$

$16 - 1.5t + 7.5$

$-1.5t(t)\ 7.5 + 16$

$\int -1.5t + 8.5\ dt$

$-1.5\int t - 5.667$

$\int -1.5t(t)\ 23.5$

$\frac{-1.5}{2}t^2(t)\ 23.5t$

$x(t) = \frac{-1.5}{2}t^2 + 8.5t$

$-43.54 + 64.77$

$x(7.62) = 21.221$

$\frac{-1.5}{2}(58.064)(t)\ 179.07$

$-93.548(t)\ 179.07$

135.52 m

$\frac{3.2}{2}t^2\Big]_0^5 = \left(\frac{3.2}{2}(5)^2 - \frac{3.2}{2}(0)^2\right)$

$\frac{25(3.2)}{2}$

$x(t) = At + (t)Bt^2$

$x'(t) = v(t) = A(t)\ 2Bt$

$v(3) = A + 2B(3)$

$-2.5 + 2(3.9)(3)$

$-2.5 + 2(11.7)$

$-2.5 + 23.4$

$v(3) = 20.9$ ✓

$0 = A + 2Bt$

$2.5 = 2(3.9)t$

$\frac{2.5}{7.8} = \frac{7.8t}{7.8}$

$t_0 = 0.32$

$0 = -2.5t\ (t)\ 3.9t^2$

0.641

$+(-2.5 + 3.9t)$

$0 = -2.5 + 2(3.9)t$

$-2.5 + 7.8t$

$+2.5$

$\frac{2.5}{7.8} = \frac{7.8t}{7.8}$

$0.32 = t$

$-2.5 + 7.8(0.641)$

2.49

$\frac{-1.5}{2}(2.62)^2 + 23.5(2.62)$

$\frac{-1.5}{2}(6.864)$

$-5.1483 + 61.57 = 56.42$

$\frac{-1.5}{2}t^2 + 23.5t\Big]_5^{7.62}$

$\left(\frac{-1.5}{2}(7.62)^2 + 23.5(7.62)\right) - \left(\frac{-1.5}{2}(5)^2 + 23.5(5)\right)$

$-43.548 + 179.07$ $\quad -98.75$

$135.52 - 98.75$

306.5

$\frac{-1.5}{2}(11)^2 + 23.5(11)$

$-90.75 + 258.5$

$167.75 +$

266.5

$40 + 69 + 19.32$

$\frac{-1.5}{2}(13.76)^2 + 23.5(13.76)$

$-142 + 323.36$

$181.35 - 266.5$

$V(11) = 16 - 1.5t + 7.5$

$V(11) = 7$

$7t\Big]_{11}^{13.76}$

$96.32 - 77$

19.32

$-90.75 + 258.5$

$(167.75) - 98.75$

69

$(v)_f^2 = (v)_i^2 + 2a\Delta x$

d (displacement)

$(361)^2 = 0 + 2a(1090)$

1.09km → m

$\frac{130321}{2180} = \frac{2180a}{2180}$

$59.78 = a$

After engine shut off until it reaches the ground; the rocket's acceleration is $g = -9.8\text{ m/s}^2$.

The maximum height

$(v)_f^2 = (v)_i^2 + 2ad$

$0 = (361)^2 + 2(-9.8)d$

$(361)^2 - 19.6d$

$\frac{-130321}{-19.6} = \frac{-19.6d}{-19.6}$

Total distance = 7739.03

from launch

$6649.03 = d$ (after shut off)

1090

$3.9t = 2.5$

$\frac{3.9t}{3.9} = \frac{2.5}{3.9}$

$t = 0.641$

Derivation or something similar

$x(t) = h$

$h = v_0t + \frac{1}{2}at^2 - h$

$-h$

$0 = (v_0 + (t)\frac{1}{2}at^2 - h)2$

$= 2v_0t + at^2 - 2h$

b a c

$t = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$t = \frac{-2v_0 \pm \sqrt{4v_0^2 + 8ah}}{2a} = \frac{-2v_0 \pm 2\sqrt{v_0^2 + 2ah}}{2a}$

$t = \frac{-v_0 \pm \sqrt{v_0^2 + 2ah}}{2}$

$-18.75 + 117.5$

Tower $= 324\text{ m}$

$V_0 = 5\text{ m/s}$

$\frac{-5 \pm \sqrt{(5)^2 + 2(9.8)(324)}}{-9.8} = \frac{-5 + \sqrt{6375.9}}{9.8} = \frac{79.84 - 5}{9.8} = 7.637$

Speed of penny hits ground

$v_f^2 = v_i^2 + 2a\Delta x$

$(5)^2 + 2(9.8)(324)$

$v_f = 79.89$

$v_f^2 = v_i^2 + 2a\Delta x$

$\frac{2v_f}{2} = \frac{2v_i}{2} + a\Delta x$

$v_f = v_i + a\Delta x$

Magnitude of acceleration

$|a| = \sqrt{9.8^2}$

$|a| = 9.8$

$v_f = \sqrt{v_i^2 + 2a\Delta x}$

Magnitude of v_f

$v_0t + \frac{1}{2}a(t)^2$

$\frac{1}{2}\frac{(9.8)(2.14)^2}{2} = 22.44$

$a = x$

$v = \int a$

9.8

$C = 2\pi r;\ s = \frac{d}{t}(t)$

$\frac{ts}{s} = \frac{d}{s}$

$t = \frac{d}{s} = \frac{C}{v}$

km → m

$2\pi(6370)$

40003.6

$\frac{40023.89}{209} = 191.5$

$= 2\pi r = C$

$v_f^2 = v_i^2 + 2a\Delta x$

$0 = (209)^2 + 2(18)\Delta x$

$0 = 43681 + -36\Delta x$

-43681

$\frac{-43681}{-36} = \frac{-36\Delta x}{-36}$

$1213.36 = \Delta x$

$0 = v_0^2 + 2a\Delta x$

$\frac{-v_0^2}{2a} = \frac{2a\Delta x}{2a}$

$\sqrt{v_f^2} = \sqrt{v_0^2 + 2a\Delta x}$

$v_i + at$ react $\quad v_f = \sqrt{v_0^2 + 2a\Delta x}$

$\sqrt{v_0^2 + 2a(x_f - v_0 t_{react})}$

$(34.7)^2 + 2(6.48)(82.9 - (34.7)(0.75))$

$82.9 - 26.025$

$-2(6.48)\ (56.875)$

$1204.09 - 737.1$

$466.99 \rightarrow \sqrt{466.99} = 21.609$

$\sqrt{(34.7)^2 - 2(6.48)(82.9 - (34.7)(1))}$

$2(6.48)(48.2)$

$1204.09 - 624.672$

$579.418 \rightarrow \sqrt{579.418} = 24.071\text{ m/s}$

$C = 2\pi r = \frac{40023890.41}{209}$

$v_f^2 = v_i^2 + 2ad$

$x(t) = x_0 + v_0t$

$x_f = v_0t$

209

$\frac{1\text{ km}}{1000\text{ m}} = \frac{6370}{1000\text{ m}}$

6370000 m

$\frac{v_f^2 - v_i^2}{2a} = d$

$\frac{0 - (209)^2}{2(18)}$

-1213.36

$0 = 4 + 0 + \frac{1}{2}at^2$

$4 + \frac{at^2}{2}(2)$

-4

$(2) - 4 =$

$\frac{-8}{a} = \frac{at^2}{a}$

$\sqrt{\frac{-8}{9.8}} = t$

$v_f = v_0 + at$

$5.0 = 0 + 2.9t$

$\frac{5.0}{2.9} = \frac{2.9t}{2.9}$

$t = 1.72\text{ s}$

$v_f^2 = v_0^2 + 2ad$

$(5)^2 = v^2 + 2(2.9)(4)$

$25 = v_0^2 + 23.2$

$-23.2 \quad -23.2$

$\sqrt{1.8} = \sqrt{v_0^2}$

$1.341 = v_0$

v

$v_0t + \frac{2.9t^2}{2} = 4.0(2)$

$\frac{2.9t^2}{2.9} = \frac{8}{2.9}$

$t = \sqrt{\frac{8}{2.9}} =$

$x^2 - 3x + 2$

$1 \quad -3 \quad 2$

$\frac{2x}{(x-1)(x-2)} = \frac{A}{(x-1)}\frac{(x-2)}{(x-2)} + \frac{B}{(x-2)}\frac{(x-1)}{(x-1)}$

$\frac{-2}{x-1} + \frac{4}{x-2}$

$2x = A(x-2) + B(x-1)$

$2x = Ax - 2A + Bx - B$

$Ax + Bx - 2A - B$

$2x + c = 2x - 2x$

$-2x$

$c = 0$

$2x = (A+B)x$

$2 = A + B$

$0 = -2A - B$

$2 = A + B$

$B = -2A$

$2 = A(-2A)$

$2 = A - 2A$

$2 = -A$

$-2 = A$

$B = 4$