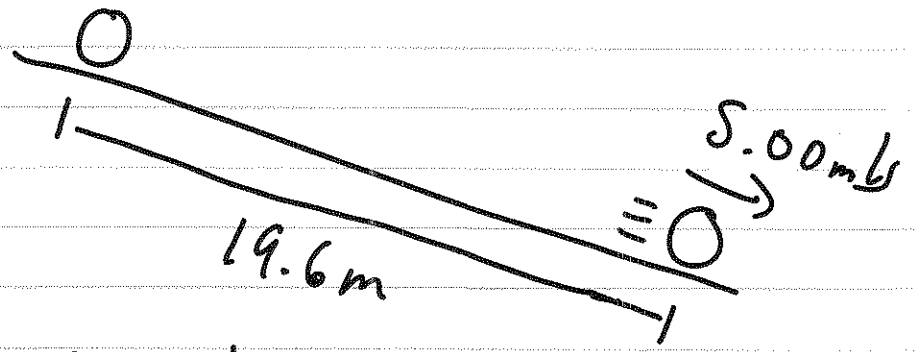
Kinematics wksht 5.3

Note Title 15/10/2009

1)



$V = 5.00\ m/s$

$V_0 = 0$

$a = ?$

$d = 19.6\ m$

$t =$

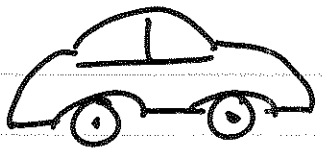
$V^2 = V_0^2 + 2ad$

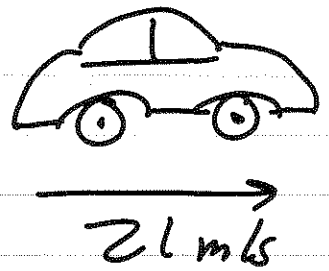
$V^2 - V_0^2 = 2ad$

$a = \dfrac{V^2 - V_0^2}{2d} = \dfrac{(5.00)^2}{2(19.6)}$

$= \boxed{0.638\ m/s^2}$

2) $t = 7.0\,s$





$v = 21\,m/s$

$v_0 = 0\,m/s$

$a = ?$

$d =$

$t = 7.0\,s$

$v = v_0 + at$ ($v_0 = 0$)

$v = at$

$a = \frac{v}{t} = \frac{21\,m/s}{7.0\,s}$

$= 3.0\,m/s^2$

$v = ?$

$v_0 = 0$

$a = 3.0\,m/s$

$d =$

$t = 2.0\,s$

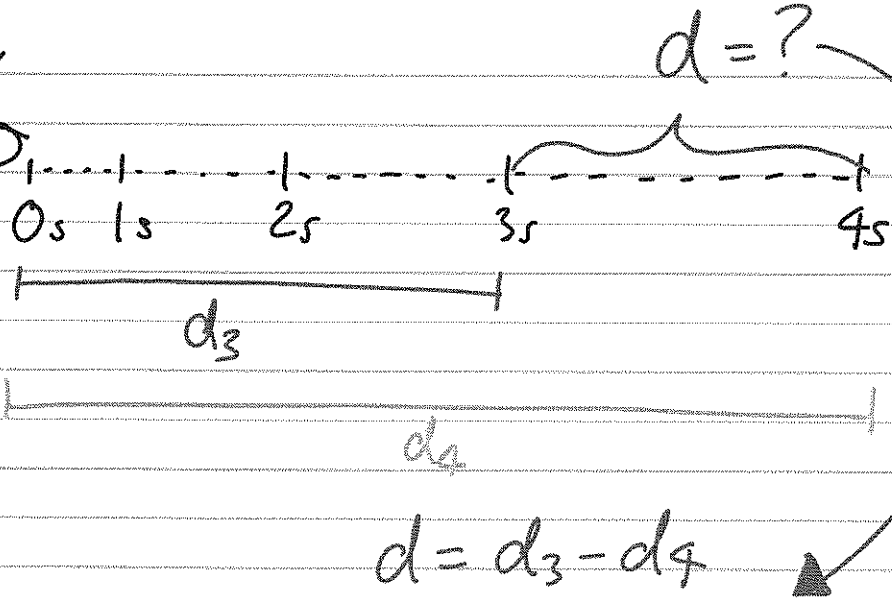
$v = v_0 + at$ ($v_0 = 0$)

$v = at$

$= (3.0)(2.0)$

$= 6.0\,m/s$

3)



$d = d_3 - d_4$

at t = 3.0s

$v =$
$v_0 = 0$
$a = 2.0\ m/s^2$
$d =$
$t = 3.0\ s$

$d_3 = v_0 t + \frac{1}{2} a t^2$ ($v_0 = 0$)

$d_3 = \frac{1}{2} a t^2$

$= \frac{1}{2}(2.0)(3.0)^2$

$= 9.0\ m$

at t = 4.0s

$v =$
$v_0 = 0$
$a = 2.0\ m/s^2$
$d =$
$t = 4.0\ s$

$d_4 = v_0 t + \frac{1}{2} a t^2$ ($v_0 = 0$)

$d_4 = \frac{1}{2} a t^2$

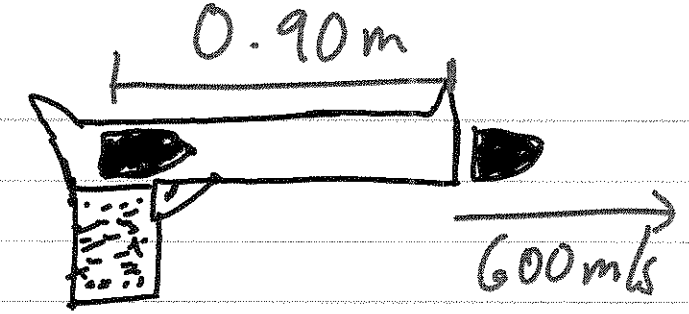
$= \frac{1}{2}(2.0)(4.0)^2$

$= 16\ m$

$d = d_4 - d_3 = 16 - 9.0$

$= \boxed{7\ m}$

4)



$V = 600\ m/s$

$V_0 = 0\ m/s$

$a =$

$d = 0.90\ m$

$t =$

$V^2 = V_0^2 + 2ad$

$V^2 = 2ad$

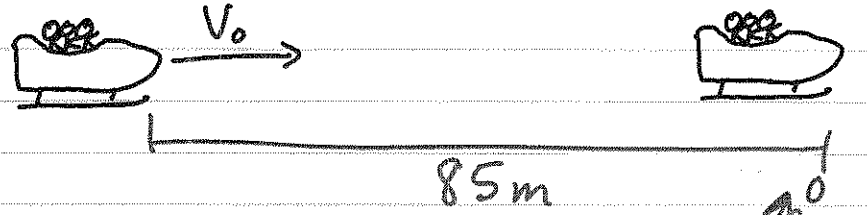
$a = \frac{V^2}{2d} = \frac{(600\ m/s)^2}{2(0.90\ m)}$

$= \boxed{2.0 \times 10^5\ m/s^2}$

has to be negative!

$a = -0.43\ m/s^2$

5]



$V = 0$

$V_o = ?$

$a = -0.43\ m/s^2$

$d = 85\ m$

$t = ?$ ← can't find this right away so... look for V_o first

$V^2 = V_o^2 + 2ad$

$-V_o^2 = 2ad$

$V_o^2 = -2ad$

$V_o = \sqrt{-2ad}$

$= \sqrt{-2(-0.43\ m/s^2)(85)}$

$= 8.550\ m/s$

$V = V_o + at$

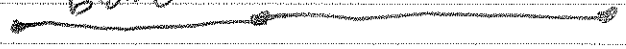
$t = \frac{V - V_o}{a} = \frac{-(8.550\ m/s)}{(-0.43\ m/s^2)} = 20.\ s$

$= \boxed{2.0 \times 10^1\ s}$

Bonus

d traveled before brake

d traveled after brakes



$t = 0.75s$

$V_0 = 90 km/h$ at $25 m/s$

$d_x = 40.0 m$

$25 \cdot 0.75 = 18.75 m$

$a_x = 10.0 m/s^2$

$t = ?$

$\frac{90 km}{hr} \left| \frac{1 hr}{3600 s} \right| \frac{1000 m}{km} = 25 m/s$

$t = ?$

$V_0 = 25 m/s$

$a = 10.0 m/s^2$

$d = ?$

$V = 0$

$0 = 25 m/s + 10 m/s \cdot t$

$2.5 s = t$

$d = 25 \cdot 2.5 + \frac{1}{2} \cdot 10 \cdot 2.5^2$

$d = 31.25$

$d_{tot} = 50 m$

Hit the wall V_0

b) distance for second portion would be $d = 21.25 m$

$V_0 = ?$ $d = 21.25 m$ $t = 2.5 s$ $a = -10.0 m/s^2$

$21.25 m = V_0 \cdot 2.5 + \frac{1}{2} \cdot 10 \cdot 2.5^2$

$V_0 = 21 m/s$ max