UNIFORM MOTION SOLUTIONS

1. GIVEN:
   $v = 2.5 \frac{m}{s}$
   $t = 5.0\ s$
   $d = ?$

   $v = \frac{d}{t}$
   $d = vt$
   $= (2.5)(5.0)$
   $= 12.5\ m \rightarrow 13\ m$

2. given:
   $v = 8.10 \frac{m}{s}$
   $d = 100.\ m$
   $t = ?$

   $v = \frac{d}{t}$
   $t = \frac{d}{v}$
   $= \frac{100.}{8.10}$
   $= 12.3\ s$

3. a) 1500m ⟵ / ⟶ 450m

   $d = 1500 + 450$
   $= 1950\ m$

   GIVEN:
   $d = 1950\ m$
   $t = 1200\ s$
   $v = ?$

   $v = \frac{d}{t}$
   $= \frac{1950}{1200}$
   $= 1.63 \frac{m}{s}$

   b) 1500m ⟵ / ⟶ 450m

   $\vec{d} = 1500 - 450$
   $= 1050\ m$ WEST

   GIVEN:
   $\vec{d} = 1050\ m$ EAST
   $t = 1200$
   $\vec{v} = ?$

   $\vec{v} = \frac{\vec{d}}{t}$
   $= \frac{1050}{1200}$
   $= 0.88 \frac{m}{s}$ WEST

4. a) GIVEN:

$v_1 = 8.0 \frac{m}{s}$

$t_1 = 30.0 \text{ min} = 1.80 \times 10^3 \text{ s}$ ($30.0 \text{ min} \times \frac{60 \text{ s}}{\text{min}}$)

$d_1 = ?$

$v_1 = \frac{d_1}{t_1}$

$d_1 = v_1 t_1$

$= (8.0)(1.80 \times 10^3)$

$= 14400 \text{ m}$

GIVEN:

$v_2 = 10.0 \frac{m}{s}$

$t_2 = 20.0 \text{ min} = 1.20 \times 10^3 \text{ s}$ ($20.0 \text{ min} \times \frac{60 \text{ s}}{\text{min}}$)

$d_2 = ?$

$v_2 = \frac{d_2}{t_2}$

$d_2 = v_2 t_2$

$= (10.0)(1.20 \times 10^3)$

$= 12000 \text{ m}$

$d_T = d_1 + d_2$

$= 14400 + 12000$

$= 26400 \text{ m} \longrightarrow 26000 \text{ m}$

b) $\vec{d}_1 = 14400 \text{ m}$ WEST

$\vec{d}_2 = 12000 \text{ m}$ EAST

$d_T = d_1 - d_2$

$= 14400 - 12000$

$= 2400 \text{ m}$ WEST

5. GIVEN:

$d = 42.0 \text{ km} = 4.20 \times 10^4 \text{ m}$

$t = 2 \text{ h } 57 \text{ min} = 177 \text{ min} = 10620 \text{ s}$ ($177 \text{ min} \times \frac{60 \text{ s}}{\text{min}}$)

$v = ?$

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

$= \frac{4.20 \times 10^4}{10620}$

$= 3.95 \frac{m}{s}$

6. a) GIVEN: $40.0 \frac{km}{h} \times \frac{1000\ m}{km} \times \frac{h}{60\ min} \times \frac{min}{60\ s}$

*SHORTCUT: $\frac{km}{h} \xrightarrow{\div 3.6} \frac{m}{s}$ $\xleftarrow{\times 3.6}$

$V_1 = 40.0 \frac{km}{h} = 11.\overline{11} \frac{m}{s}$

$t_1 = 30.\ min = 1800\ s$

$d_1 = ?$

$V_1 = \frac{d_1}{t_1}$

$d_1 = v_1 t_1$

$= (11.\overline{11})(1800)$

$= 20000\ m$

GIVEN: $60.0 \frac{km}{h} \times \frac{1000\ m}{km} \times \frac{h}{60\ min} \times \frac{min}{60\ s}$

$V_2 = 60.0 \frac{km}{h} = 16.\overline{66} \frac{m}{s}$

$t_2 = 15\ min = 9.0 \times 10^2\ s$

$d_2 = ?$

$V_2 = \frac{d_2}{t_2}$

$d_2 = V_2 t_2$

$= (16.\overline{66})(9.0 \times 10^2)$

$= 15000\ m$

$d_T = d_1 + d_2$

$= 20000 + 15000$

$= 35\,000\ m$ or $35\ km$

7. a) GIVEN:

$d = 10 \times 8.0\ km = 80.\ km = 8.0 \times 10^4\ m$

$t = 20.0\ min = 1.20 \times 10^3\ s$

$V = ?$

$V = \frac{d}{t}$

$= \frac{8.0 \times 10^4}{1.20 \times 10^3}$

$= 67 \frac{m}{s}$

b) GIVEN:

$\vec{d} = 0$ STARTS AND FINISHS AT THE SAME POSITION

$t = 20.0 \text{ min} = 1.20 \times 10^3 \text{ s}$

$\vec{V} = ?$

$\vec{V} = \frac{\vec{d}}{t}$

$= 0$

8. a) given:

$t_1 = 3.0\text{h} = 180 \text{ min} = 10800\text{s}$

$V_1 = 80.0 \frac{\text{km}}{\text{h}} \xrightarrow{\div 3.6} 22.\overline{22} \frac{\text{m}}{\text{s}}$

$d_1 = ?$

$V_1 = \frac{d_1}{t_1}$

$d_1 = V_1 t_1$

$= (22.\overline{22})(10800)$

$= 240000\text{m}$

GIVEN:

$t_2 = 2.0\text{h} = 120 \text{ min} = 7200\text{s}$

$V_2 = 100.0 \frac{\text{km}}{\text{h}} \xrightarrow{\div 3.6} 27.\overline{77} \frac{\text{m}}{\text{s}}$

$d_2 = ?$

$V_2 = \frac{d_2}{t_2}$

$d_2 = V_2 t_2$

$= (27.\overline{77})(7200)$

$= 200\,000 \text{ m}$

$d_T = d_1 + d_2$

$= 240000 + 200\,000$

$= 440\,000 \text{ m}$ OR 440 km

b) given:

$d_T = 440000\text{m}$

$t_T = 10800\text{ s} + 7200\text{s} = 18000\text{s}$

$V_T = ?$

$V_T = \frac{d_T}{t_T}$

$= \frac{440000}{18\,000}$

$= 24 \frac{\text{m}}{\text{s}}$

- OR -

given:

$d_T = 440\ km$

$t_T = 3.0\ h + 2.0\ h = 5.0\ h$

$V_T = ?$

$$V_T = \frac{d_T}{t_T} = \frac{440}{5.0} = 88\ \frac{km}{h}$$

THIS WHOLE QUESTION COULD HAVE BEEN DONE IN USING km FOR DISTANCE, h FOR TIME AND $\frac{km}{h}$ FOR SPEED.

9. GIVEN:

$d_1 = 8.0\ km = 8.0 \times 10^3\ m$

$V_1 = 10.0\ \frac{m}{s}$

$t_1 = ?$

$$V_1 = \frac{d_1}{t_1}$$

$$t_1 = \frac{d_1}{V_1} = \frac{8.0 \times 10^3}{10.0} = 8.0 \times 10^2\ s$$

GIVEN:

$d_2 = 40.0\ km = 4.00 \times 10^4\ m$

$V_2 = 25\ \frac{m}{s}$

$t_2 = ?$

$$V_2 = \frac{d_2}{t_2}$$

$$t_2 = \frac{d_2}{V_2} = \frac{4.00 \times 10^4}{25} = 1600\ s$$

GIVEN:

$d_T = 8.0 \times 10^3\ m + 4.00 \times 10^4\ m = 4.80 \times 10^4\ m$

$t_T = 8.0 \times 10^2\ s + 1600\ s = 2400\ s$

$V_T = ?$

$$V_T = \frac{d_T}{t_T} = \frac{4.80 \times 10^4}{2400} = 20.\ \frac{m}{s}$$

10. CALCULATE THE SPEED OF THE JOKER RUNNER

GIVEN:

$d = 100.\ m$

$t = 10.1\ s$

$v = ?$

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

$= \frac{100.}{10.1}$

$= 9.\overline{90}\ \frac{m}{s}$

IT TAKES THE GRIFFIN RUNNER 9.8 s TO RUN 100. m. CALCULATE HOW FAR THE JOKER RUNNER CAN RUN IN THIS AMOUNT OF TIME

GIVEN:

$v = 9.\overline{90}\ \frac{m}{s}$

$t = 9.8\ s$

$d = ?$

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

$d = vt$

$= (9.\overline{90})(9.8)$

$= 97.03\ m$

THE JOKER RUNNER MUST HAVE A LEAD EQUAL TO

$100.\ m - 97.03\ m = 2.97\ m$

$\longrightarrow$ 3 m