

1a)

$$s = 3$$

$$u = 0$$

$$v$$

$$a = ?$$

$$t = 2.5$$

$$s = ut + \frac{1}{2}at^2$$

$$3 = 0(2.5) + \frac{1}{2}(2.5)^2 a$$

$$3 = \frac{25}{8}a$$

$$24 = 25a$$

$$a = \frac{24}{25} = \underline{\underline{0.96 \text{ ms}^{-2}}}$$



b)

For A: $F = ma$

$$2g - T = 2(0.96)$$

$$T = \underline{\underline{2g - 1.92 \text{ N}}}$$

For B: $F = ma$

$$2g - 1.92 - mg = m(0.96)$$

$$2g - 1.92 = m(0.96) + mg$$

$$2g - 1.92 = m(0.96 + g)$$

$$m = \frac{2g - 1.92}{0.96 + g}$$

$$= \underline{\underline{1.64 \text{ kg}}} \text{ (3sf)}$$

c) The acceleration is the same for both particles.

2

A// $F = ma$

$T = 5a$

$\frac{T}{5} = a$

B// $F = ma$

$4g - T = 4a$

$\frac{4g - T}{4} = a$

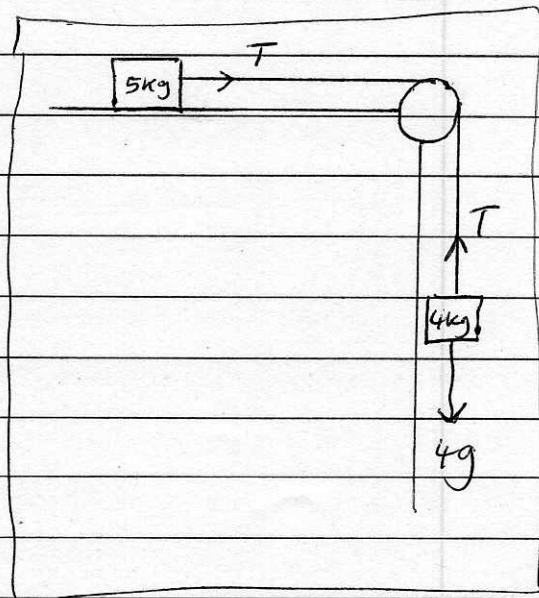
$\frac{T}{5} = \frac{4g - T}{4}$

$4T = 5(4g - T)$

$4T = 20g - 5T$

$9T = 20g$

$T = \frac{20g}{9} \text{ N}$



b/ $4g - \frac{20g}{9} = 4a$

$g - \frac{5g}{9} = a$

$\frac{4}{9}g = a$

$s = 1.4$

$u = 0$

✓

$a = \frac{4}{9}g$

$t = ?$

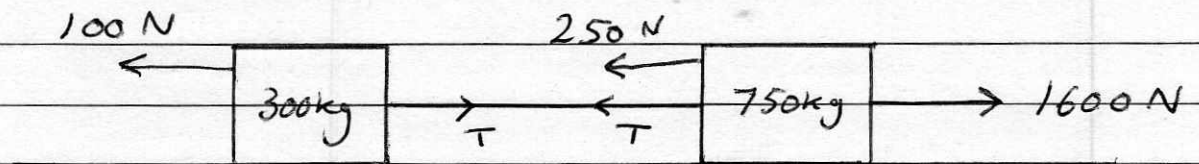
$s = ut + \frac{1}{2}at^2$

$1.4 = \frac{1}{2}\left(\frac{4}{9}g\right)t^2$

$1.4 = \frac{2}{9}gt^2$

$t = 0.80 \text{ s (2sf)}$

3



a) whole system:

$$F = ma$$

$$1600 - 250 - 100 = 1050 a$$

$$1250 = 1050 a$$

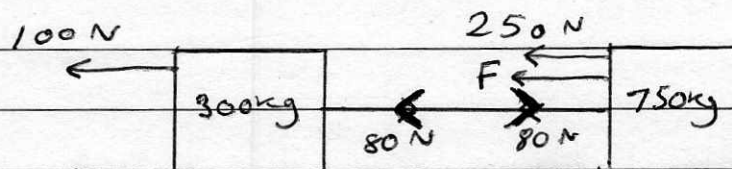
$$a = \frac{25}{21} \text{ ms}^{-2}$$

b) Trailer: $F = ma$

$$T - 100 = 300 \left(\frac{25}{21} \right)$$

$$T = \frac{3200}{7} \text{ N}$$

c/

Trailer Only $F = ma$

$$-100 - 80 = 300 a$$

$$-180 = 300 a$$

$$a = -0.6 \text{ ms}^{-2}$$

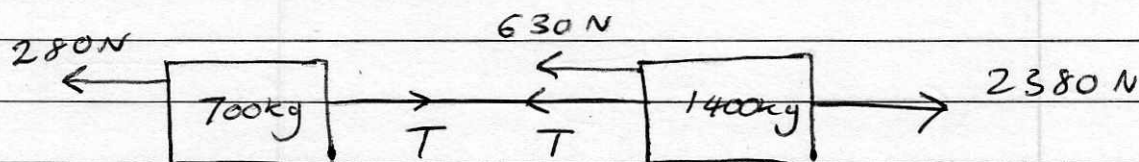
Car Only: $F = ma$

$$80 - 250 - F = 750 (-0.6)$$

$$-170 - F = -450$$

$$\underline{\underline{280 \text{ N} = F}}$$

4

a) whole system: $F = ma$

$$2380 - 630 - 280 = 2100 a$$

$$1470 = 2100 a$$

$$a = \underline{\underline{0.7 \text{ ms}^{-2}}}$$

b) Trailer Only: $F = ma$

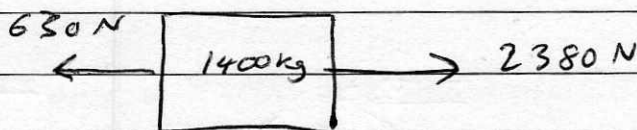
$$T - 280 = 700(0.7)$$

$$T - 280 = 490$$

$$T = \underline{\underline{770 \text{ N}}}$$

c) The masses are concentrated at one point.

d)



$$F = ma$$

$$2380 - 630 = 1400 a$$

$$1750 = 1400 a$$

$$a = \underline{\underline{1.25 \text{ ms}^{-2}}}$$

$$s = ?$$

$$u = 12$$

$$v$$

$$a = 1.25$$

$$t = 4$$

$$\begin{aligned} s &= ut + \frac{1}{2} a t^2 \\ &= 12(4) + \frac{1}{2}(1.25)(4)^2 \\ &= \underline{\underline{58 \text{ m}}} \end{aligned}$$

5a/ whole system: $F = ma$

$$30 - 4 - 2 = 10a$$

$$24 = 10a$$

$$a = \underline{\underline{2.4 \text{ ms}^{-2}}}$$

b/ S

$$u = 0$$

v

$$a = 2.4$$

$$t = 5$$

$$v = u + at$$

$$= 0 + 2.4(5)$$

$$= \underline{\underline{12 \text{ ms}^{-1}}}$$

c/

P only: $F = ma$

$$T - 2 = 4(2.4)$$

$$T = \underline{\underline{11.6 \text{ N}}}$$

d/

whole system: $F = ma$

$$-4 - 2 = 10a$$

$$-6 = 10a$$

$$a = \underline{\underline{-0.6 \text{ ms}^{-2}}}$$

$$s = ?$$

$$u = 12$$

$$v = 0$$

$$a = -0.6$$

t

$$v^2 = u^2 + 2as$$

$$0 = (12)^2 + 2(-0.6)s$$

$$0 = 144 - 1.2s$$

$$-144 = -1.2s$$

$$s = \underline{\underline{120 \text{ m}}}$$

e/

P only: $F = ma$

$$-2 - T = 4(-0.6)$$

$$-2 - T = -2.2$$

$$T = \underline{\underline{0.2 \text{ N}}}$$