(a) $s = 3$

$u = 0$

v

$a = ?$

$t = 2.5$

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

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

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

$24 = 25a$

$a = \frac{24}{25} = 0.96 \text{ ms}^{-2}$
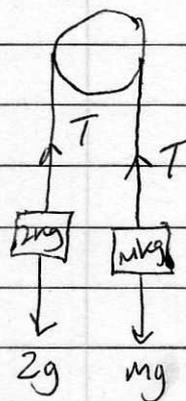
b) For A: $\quad F = ma$

$2g - T = 2(0.96)$

$T = 2g - 1.92 \quad N$

For B: $\quad F = ma$

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

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

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

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

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

c) The acceleration is the same for both particles.

2   A// $F = ma$ B// $F = ma$

$T = 5a$ $4g - T = 4a$

$\dfrac{T}{5} = a$ $\dfrac{4g - T}{4} = a$

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

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

$4T = 20g - 5T$

$9T = 20g$

$T = \dfrac{20g}{9}$ N
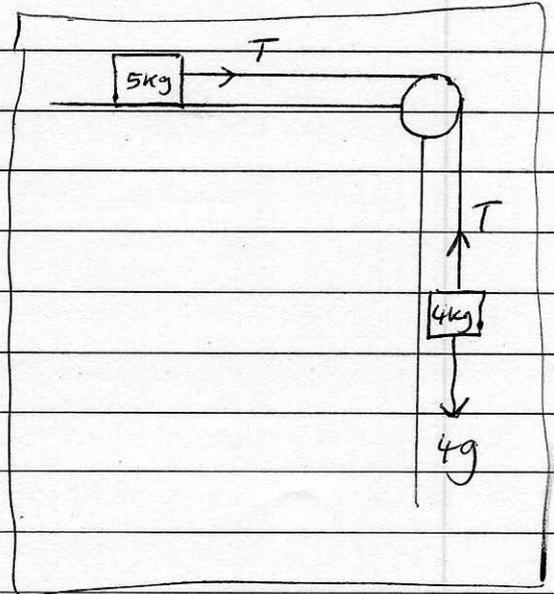
b/ $4g - \dfrac{20g}{9} = 4a$

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

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

$s = 1.4$ $s = ut + \dfrac{1}{2}at^2$

$u = 0$ $1.4 = \dfrac{1}{2}\left(\dfrac{4}{9}g\right)t^2$

$v \cdot$

$a = \dfrac{4}{9}g$ $1.4 = \dfrac{2}{9}gt^2$

$t = ?$

$t = 0.80$ s $(2sf)$

3

100 N ← □ 300kg | → T ← T □ 750kg → 1600 N   250 N ←
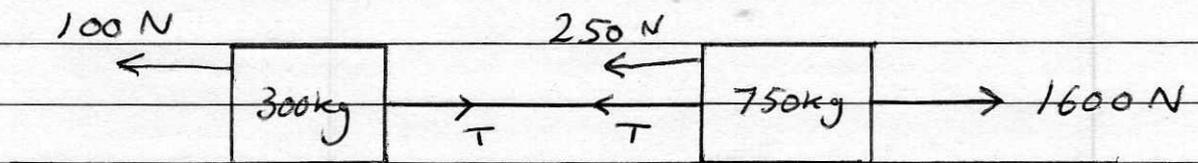
a) whole system:

$$F = ma$$

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

$$1250 = 1050a$$

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

b) Trailer: $F = ma$

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

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

c) 100 N ← □ 300kg ←80 N F← →80 N □ 750kg   250 N ←
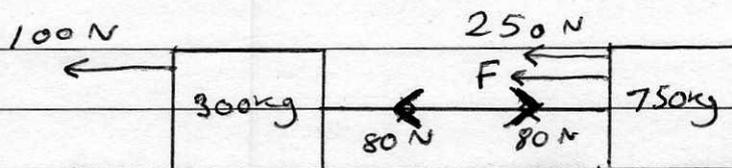
Trailer Only $F = ma$

$$-100 - 80 = 300a$$

$$-180 = 300a$$

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

Car Only: $F = ma$

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

$$-170 - F = -450$$

$$280 N = F$$

4

280N ← [700kg] → T T ← [1400kg] → 2380 N   with 630 N ← above
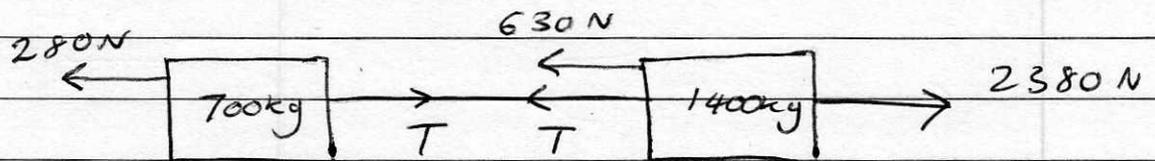
a/ whole system: $F = ma$

$$2380 - 630 - 280 = 2100\,a$$
$$1470 = 2100\,a$$
$$a = 0.7 \ ms^{-2}$$

b/ Trailer only: $F = ma$

$$T - 280 = 700(0.7)$$
$$T - 280 = 490$$
$$T = 770 \ N$$

c/ The masses are concentrated at one point.

d/

630 N ← [1400kg] → 2380 N
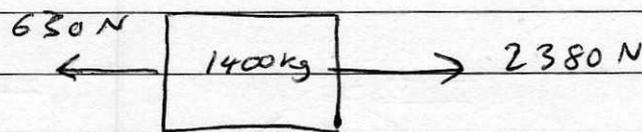
$$F = ma$$
$$2380 - 630 = 1400\,a$$
$$1750 = 1400\,a$$
$$a = 1.25 \ ms^{-2}$$

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

$u = 12$ \qquad $= 12(4) + \frac{1}{2}(1.25)(4)^2$

v \qquad\qquad $= 58 \ m$

$a = 1.25$

$t = 4$

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: $F = ma$

$$-2 - T = 4(-0.6)$$
$$-2 - T = -2.4$$
$$T = \underline{\underline{0.4 \text{ N}}}$$