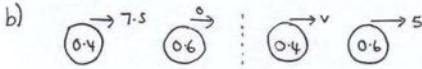


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1) momentum before = 0 ⇒ impulse = 3Ns!
momentum after = 3Ns

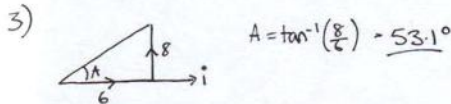
$$0.4v = 3 \Rightarrow v = \frac{3}{0.4} = 7.5 \text{ ms}^{-1}$$



Total momentum before = 3Ns
Total momentum after = 0.4v + 0.6 × 5 ⇒ 3 = 3 + 0.4v
0.4v = 0 ⇒ v = 0

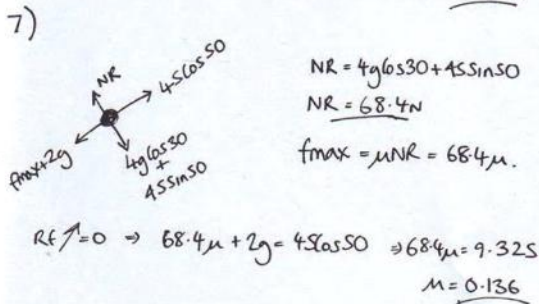
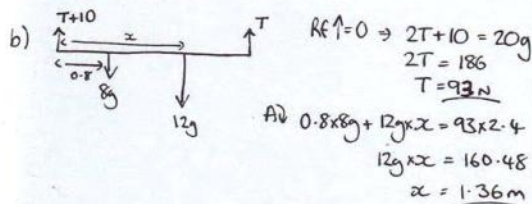
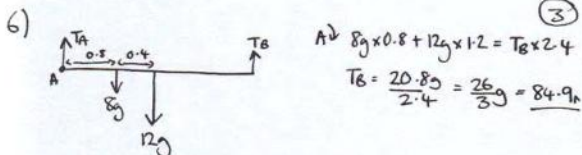
2) $u \uparrow = u$ $v^2 = u^2 + 2as$
 $v \uparrow = -17.5$ $(-17.5)^2 = u^2 - 19.6 \times 10$
 $s = -10$ $u^2 = 110.25 \Rightarrow u = 10.5 \text{ ms}^{-1} \uparrow$
 $a \uparrow = -9.8$ $u^2 = 110.25 \Rightarrow u = 10.5 \text{ ms}^{-1} \uparrow$
 $v \downarrow = 17.5$

b) $v = u + at$ $-17.5 = 10.5 - 9.8t \Rightarrow t = \frac{-28}{-9.8} = 2.86 \text{ s}$

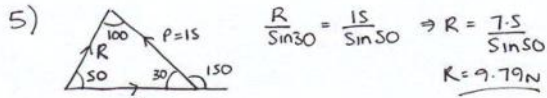
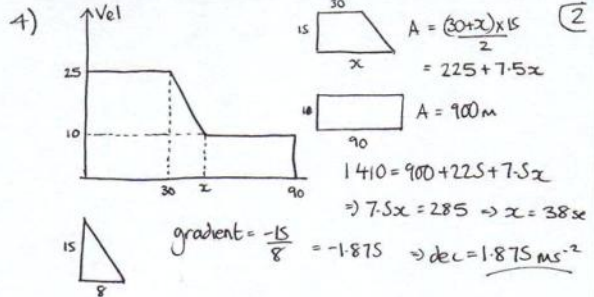


b) $Rf = ma \Rightarrow F = 0.4(6i + 8j) = 2.4i + 3.2j$
 $|F| = \sqrt{2.4^2 + 3.2^2} = 4 \text{ N}$

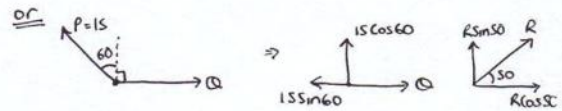
c) $v = \text{original vel} + t(\text{acc})$
 $v = (9i - 10j) + 5(6i + 8j) = (39i + 30j) \text{ ms}^{-1}$



①

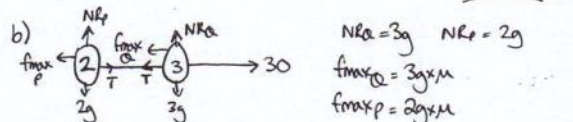


b) $\frac{Q}{\sin 100} = \frac{15}{\sin 50} \Rightarrow Q = 19.3 \text{ N}$

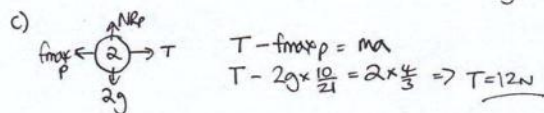


$R \sin 50 = 15 \cos 60 \Rightarrow R = 9.79 \text{ N}$
 $R \cos 50 = Q - 15 \sin 60 \Rightarrow Q = 19.3 \text{ N}$

8) $u = 0$ $t = 3$ $s = 6$
 $s = ut + \frac{1}{2}at^2 \Rightarrow 6 = 0 + \frac{1}{2}(a)3^2 \Rightarrow a = \frac{4}{3} \text{ ms}^{-2}$



whole system $Rf = ma$
 $30 - f_{\text{max}q} - f_{\text{max}p} = (3+2) \times \frac{4}{3}$ (T cancels in the system)
 $30 - 5g \mu = \frac{20}{3} \Rightarrow 5g \mu = \frac{20}{3} \Rightarrow \mu = \frac{70}{15g} = \frac{10}{21} = 0.476$



d) inextensible ⇒ same acceleration for P and Q
e) $u = 0$ $t = 3$ $s = 6$ $a = \frac{4}{3}$ $v = u + at \Rightarrow v = \frac{4}{3} \times 3 = 4 \text{ ms}^{-1}$

