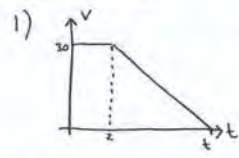
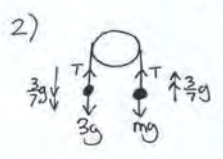


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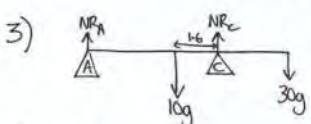
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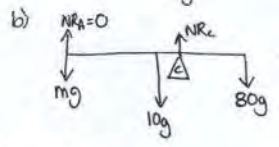
Area = $\frac{(2+t) \times 30}{2} = 300$
 $2+t = 20 \Rightarrow t = 18 \text{ sec}$



a) $3g - T = 3 \times \frac{3}{7}g \Rightarrow T = 3g - \frac{9}{7}g = \frac{12}{7}g$
 b) $T - mg = m \times \frac{3}{7}g$
 $\frac{12}{7}g = \frac{3}{7}mg + mg \Rightarrow \frac{12}{7}g = \frac{10}{7}mg$
 $m = 1.2 \text{ kg}$



$\sum \tau = 0$
 $30g \times 0.4 + NR_C \times 3.6 = 10g \times 16$
 $12g + 3.6NR_C = 16g$
 $3.6NR_C = 4g$
 $NR_C = 10.89 \text{ N}$



$\sum \tau = 0$
 $80g \times 0.4 = 10g \times 1.6 + mg \times 3.6$
 $32g = 16g + 3.6mg$
 $16g = 3.6mg \Rightarrow m = \frac{16}{3.6} = 4.4$

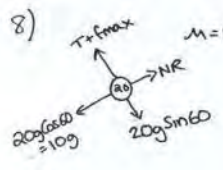
- 4) $\textcircled{30g} \downarrow 16$
- $\textcircled{10g} \downarrow 0$
-
- $\textcircled{80g} \downarrow$

total momentum before = 48Ns
 total momentum after = 3.2v Ns
 $48 = 3.2v \Rightarrow v = 15 \text{ ms}^{-1}$
 Mom before = 48Ns Mom after = 0Ns Impulse = 48
 Impulse = $f \times t \Rightarrow 48 = f \times 0.05 \Rightarrow f = 960 \text{ N}$

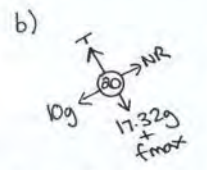


$NR = 30g \Rightarrow f_{max} = \mu NR$
 $f_{max} = 0.2 \times 30g$
 $f_{max} = 6g$
 $R_F = ma \Rightarrow -6g = 30a \Rightarrow a = -1.96$

$U = 12 \quad a = -1.96 \quad v = 0$
 $v^2 = U^2 + 2as \Rightarrow 0 = 144 - 3.92s \Rightarrow s = \frac{144}{3.92} = 36.7 \text{ m}$



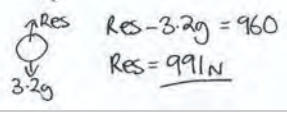
$m = 0.4 \quad R_F = 0 \Rightarrow NR = 10g \text{ N}$
 $f_{max} = \mu NR = 0.4 \times 10g = 4g \text{ N}$
 $R_F = 0 \quad T + 4g = 17.32g$
 $T = 13.32g = 130.5 \text{ N}$



$NR = 10g \Rightarrow f_{max} = 4g \text{ N}$
 $R_F = 0$ (no acceleration)
 $T = 21.32g = 208.9 \text{ N}$

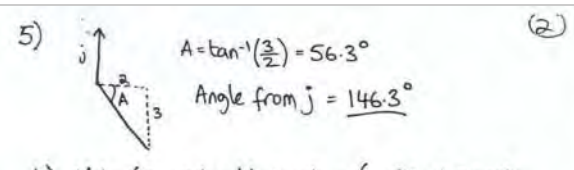
- c) i) f_{max} acts down the slope when the package moves up the slope
- ii) Constant speed \Rightarrow no acceleration $\rightarrow R_F = 0$

4b) $R_F = 960$



$Res - 3.2g = 960$
 $Res = 991 \text{ N}$

(1)

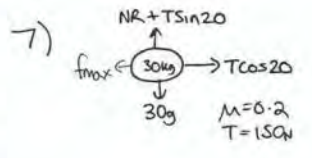


- b) $Vel = (2i - 3j) + t(-i + 2j) = (2-t)i + (-3+2t)j$
- c) $t = 3 \Rightarrow Vel = -i + 3j \text{ ms}^{-1}$ Speed = $\sqrt{1^2 + 3^2} = 3.16 \text{ m/s}$
- d) parallel to i when j value is zero
 $(-3+2t) = 0 \Rightarrow 2t = 3 \Rightarrow t = 1.5 \text{ sec}$

6) $U = 20 \quad a = 4 \quad S = 78$
 $v^2 = U^2 + 2as \Rightarrow v^2 = 400 + 624 \Rightarrow v = 32 \text{ ms}^{-1}$

b) $v = u + at \Rightarrow 32 = 20 + 4t \Rightarrow 4t = 12 \Rightarrow t = 3 \text{ sec}$
 In 3 sec A travels 90m

c) $S = ut + \frac{1}{2}at^2 \quad S = 20t + 2t^2 \quad S = 30t$
 Overtakes when $S_B = S_A$
 $\Rightarrow 20t + 2t^2 = 30t \Rightarrow 2t^2 - 10t = 0$
 $\Rightarrow 2t(t-5) = 0$
 $t = 0 \quad t = 5$



$NR + 150 \sin 20 = 30g$
 $NR = 24.2 \text{ N}$
 $R_F = ma$
 $150 \cos 20 - f_{max} = 30a$
 $92.4 = 30a \quad a = 3$