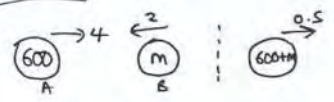


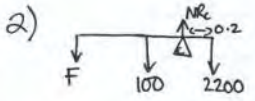
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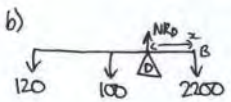


Total mom before =  $600 \times 4 + -2 \times m = 2400 - 2m$   
 Total mom after =  $(600+m) \times 0.5 = 300 + \frac{1}{2}m$   
 $\Rightarrow 2400 - 2m = 300 + \frac{1}{2}m \Rightarrow 2\frac{1}{2}m = 2100$   
 $\Rightarrow m = 840 \text{ kg}$

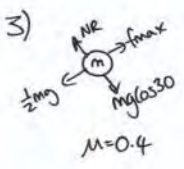
b) Mom A before =  $2400 \text{ N s}$   
 Mom A after =  $600 \times 0.5 = 300 \text{ N s} \Rightarrow \text{Impulse} = 2100 \text{ N s}$



$\circlearrowleft 2200 \times 0.2 = 100 \times 0.8 + F \times 1.8$   
 $440 = 80 + 1.8F$   
 $1.8F = 360$   
 $F = 200 \text{ N}$



$NR_0 = 120 + 100 + 2200 = 2420 \text{ N}$   
 $\circlearrowleft 2420 \times x = 100 \times 1 + 120 \times 2$   
 $2420x = 340$   
 $x = 0.14 \text{ m}$

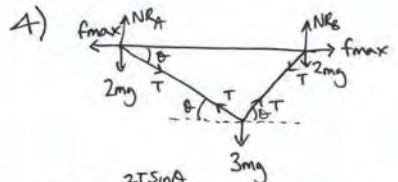


$NR = 0.866mg$   $f_{max} = \mu NR = 0.34g$   
 $RF = ma \Rightarrow \frac{1}{2}mg - 0.346mg = ma$   
 $0.154g = a$   $a = 1.5 \text{ ms}^{-2}$

1

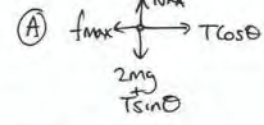
b)  $s=3$   $u=0$   $a=1.5$   
 $v^2 = u^2 + 2as \Rightarrow v^2 = 9 \Rightarrow v = 3 \text{ ms}^{-1}$   
 c)  $1.5 \text{ ms}^{-2}$

2

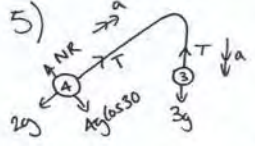


$\tan \theta = \frac{3}{4}$   
 $\cos \theta = \frac{4}{5}$   
 $\sin \theta = \frac{3}{5}$

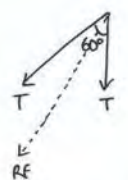
$\circlearrowleft T \cos \theta = 2T \sin \theta$   $\Rightarrow 2T \times \frac{3}{5} = 3mg$   
 $T = \frac{5}{2}mg \text{ N}$



$NR_A = 2mg + \frac{5}{2}mg \times \frac{3}{5}$   
 $NR_A = 3.5mg \text{ N}$   
 $f_{max} = \mu \times NR = \mu \times 3.5mg$   
 $RF = 0 \Rightarrow T \cos \theta = f_{max} \Rightarrow \frac{4}{5} \times \frac{5}{2}mg = \mu \times 3.5mg$   
 $2 = \mu \times 3.5$   $\mu = \frac{4}{7}$



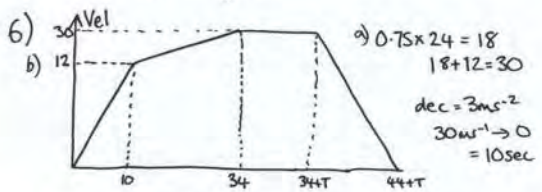
$3g - T = 3a$   
 $T - 2g = 4a$   
 $g = 7a \Rightarrow a = \frac{1}{7}g \text{ ms}^{-2}$   
 $T = 4a + 2g \Rightarrow T = \frac{18}{7}g \text{ N}$



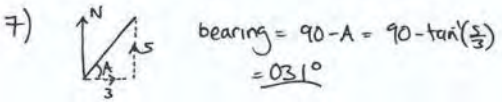
Isosceles  
 $RF^2 = T^2 + T^2 - 2T^2 \cos 120$   
 $RF^2 = 3T^2$   
 $RF^2 = 1905.12$   
 $RF = 43.6 \text{ N}$

3

c) 'light' - same tension in string at A and B. no weight.



b)  $0.75 \times 24 = 18$   
 $18 + 12 = 30$   
 $dec = 3 \text{ ms}^{-2}$   
 $30 \text{ ms}^{-1} \rightarrow 0 = 10 \text{ sec}$   
 c)  $A = \frac{10 \times 12}{2} + \frac{(12+36) \times 24}{2} = 60 + 504 = 564 \text{ m}$   
 d)  $564 + T \times 30 + \frac{30 \times 10}{2} = 3000$   
 $\Rightarrow 30T = 2286 \Rightarrow T = 76.2 \text{ sec}$



bearing =  $90 - A = 90 - \tan^{-1}(\frac{5}{3})$   
 $= 031^\circ$   
 a)  $A = 0i + 0j + t(0i + 9j) = 9tj$   
 $B = -10i + 0j + t(3i + 5j) = (-10 + 3t)i + 5tj$

c) B is due south of A when values of i are equal  
 $\Rightarrow -10 + 3t = 0 \Rightarrow 3t = 10 \Rightarrow t = 3\frac{1}{3} = 3 \text{ hrs } 20 \text{ min}$   
 $1520$

d)  $dist = (0 - (-10 + 3t))i + (9t - (5t))j$   
 $= (10 - 3t)i + 4tj$   
 $d^2 = (10 - 3t)^2 + (4t)^2 = 100 - 60t + 9t^2 + 16t^2$   
 $d^2 = 25t^2 - 60t + 100$

e)  $d=10 \Rightarrow d^2=100 \Rightarrow 25t^2 - 60t + 100 = 100$   
 $25t^2 - 60t = 0$   
 $25t(5t - 12) = 0$   
 $t=0$   $t = \frac{12}{5} = 2.4 = 2 \text{ hr } 24 \text{ min}$   
 $1424$