07 May 2011
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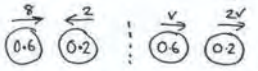
• M1 JUNE 05

1) $u=2$, $t=20$, $v=74$ $\quad v=u+at \Rightarrow 74=2+a\times20 \Rightarrow 72=20a \Rightarrow a=3.6\,ms^{-2}$

b) $S=\frac{(u+v)t}{2} \Rightarrow S=\frac{(2+74)\times20}{2}=760m$ A to B

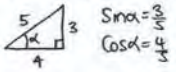
$\vec{BC}=1200-760=440m$

2) 

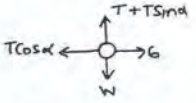
Total before $=0.6\times8+0.2\times-2=4.4$ Ns
Total after $=0.6v+0.2\times2v=v$ $\quad v=4.4\,ms^{-1}$

b) Mom B before $=0.2\times-2=-0.4$ Ns
Mom B after $=0.2\times8.8=1.76$ Ns
Impulse $=2.16$ Ns

3) $\tan\alpha=\frac{3}{4}$



$\sin\alpha=\frac{3}{5}$ $\quad \cos\alpha=\frac{4}{5}$



$\vec{RF}=0 \quad \frac{4}{5}T=6 \Rightarrow T=7.5N$

$Rf\uparrow=0 \quad 7.5+7.5\times\frac{3}{5}=W \Rightarrow W=12N$

4)

$\mu=0.6$

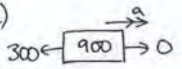
$Rf\uparrow=0 \quad NR=2g\cos20=18.4N$

$Rf\rightarrow=ma \Rightarrow 18-2g\sin20-f_{max}=2a$

$f_{max}=\mu NR=11.05N$

$\Rightarrow 0.246=2a \Rightarrow a=0.12\,ms^{-2}$

c)

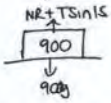


$\vec{RF}=ma \Rightarrow -300=900a \Rightarrow a=-\frac{1}{3}\,ms^{-2}$

$u=6 \quad a=-\frac{1}{3} \quad v=0$

$v^2=u^2+2as \Rightarrow 0=36-\frac{2}{3}s \quad \frac{2}{3}s=36 \quad s=54m$

d) before



$NR=900g-T\sin15$

after

$NR=900g$

NR increases when tow bar breaks.

8) Speed $=\sqrt{5^2+8^2}=9.43\,ms^{-1}$

b) Position $=(2i+j)+t(5i+8j)=(2+5t)i+(1+8t)j$

c) due North means i value is the same

$2+5t=10 \Rightarrow 5t=8 \Rightarrow t=1.6$ sec

d) $B=(10i+7j)+(0i+vj)t=10i+(7+vt)j$

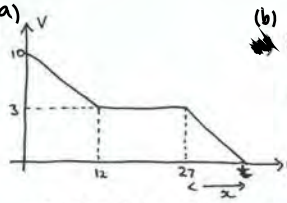
$\Rightarrow t=1.6 \Rightarrow 1+8t=7+vt$

$\Rightarrow 1+12.8=7+1.6v \Rightarrow 1.6v=6.8$

$v=4.25\,ms^{-1}$

e) friction of ball on the floor.

5) (a)



(b) Area $=\frac{(10+3)\times12}{2}=78m$

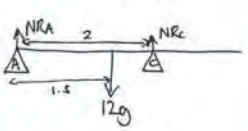
c) $15\times3=45m$

$\frac{x\times3}{2}=1.5x$

$78+45+1.5x=135 \Rightarrow 1.5x=12 \quad x=8$ sec

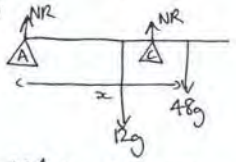
Total $=35$ sec

6)



A2 $NRc\times2=12g\times1.5$
$2NRc=18g$
$NRc=9g\,N$

b)



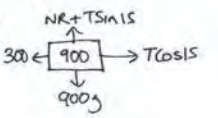
A2 $NRx2=12g\times1.5+48g\times x$
$2NR=18g+48gx$
$60g=18g+48gx$
$x=\frac{42g}{48g} \quad x=0.875$

$Rf\uparrow=0 \quad 2NR=60g$
$NR=30g$

7)

$\vec{RF}=ma \Rightarrow 1500-900=2500a$
$a=0.24\,ms^{-2}$

b)



$\vec{RF}=ma \Rightarrow Tcos15-300=900\times0$
$Tcos15=516$
$T=534.2N$