

M1 JUNE 05

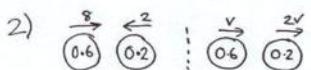
1)  $U = 2$   
 $t = 20$   
 $V = 74$

$$V = U + at \Rightarrow 74 = 2 + a \times 20$$

$$\Rightarrow 72 = 20a$$

$$\Rightarrow a = 3.6 \text{ ms}^{-2}$$

b)  $S = \frac{(U+V)t}{2} \Rightarrow S = \frac{(2+74) \times 20}{2} = 760 \text{ m}$   
 $\vec{BC} = 1200 - 760 = 440 \text{ m}$



Total before =  $0.6x8 + 0.2 \times -2 = 4.4 \text{ m/s}$   
Total after =  $0.6v + 0.2 \times 2v = v$   $v = 4.4 \text{ ms}^{-1}$

b) Momentum B before =  $0.2x-2 = -0.4 \text{ Ns}$   
Momentum B after =  $0.2 \times 8.8 = 1.76 \text{ Ns}$

Impulse =  $= 2.16 \text{ Ns}$

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

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

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

4)

$RF \uparrow = 0 \quad NR = 20 \cos 20 = 18.4 \text{ N}$   
 $RF \uparrow = ma \Rightarrow 18 - 20 \sin 20 - f_{\max} = 2a$   
 $f_{\max} = \mu NR = 11.05 \text{ N}$   
 $\Rightarrow 0.246 = 2a \Rightarrow a = 0.12 \text{ ms}^{-2}$

c)

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

$U = 6 \quad a = -\frac{1}{3} \quad V = 0$

$V^2 = U^2 + 2aS \Rightarrow 0 = 36 - \frac{2}{3}S \quad \frac{2}{3}S = 36 \quad S = 54 \text{ m}$

d) before

after

NR increases when towbar breaks.

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

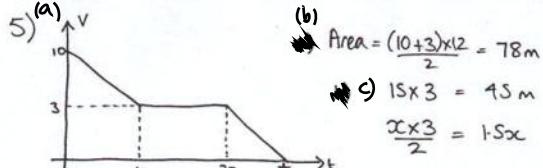
b) Position =  $(2i + j) + t(s_i + v_j) = (2 + 8t)i + (1 + 8t)j$

c) due North means i value is the same

$2 + 8t = 10 \Rightarrow 8t = 8 \Rightarrow t = 1.6 \text{ sec}$

d)  $B = (10i + 7j) + (0i + v_j)t = 10i + (7 + vt)$   
 $\Rightarrow t = 1.6 \Rightarrow 1 + 8t = 7 + vt$   
 $\Rightarrow 1 + 12.8 = 7 + 1.6v \Rightarrow 1.6v = 6.8$   
 $v = 4.2 \text{ ms}^{-1}$

e) friction of ball on the floor.



a) Area =  $\frac{(10+3) \times 12}{2} = 78 \text{ m}$

b)  $15 \times 3 = 45 \text{ m}$   
 $\frac{x \times 3}{2} = 1.5x$

$78 + 45 + 1.5x = 135 \Rightarrow 1.5x = 12 \Rightarrow x = 8 \text{ sec}$

Total = 35 sec

6)

$NR \times 2 = 12g \times 1.5$   
 $2NR = 18g$   
 $NR = 9g$

b)

$NR \times 2 = 12g \times 1.5 + 48g \times x$   
 $2NR = 18g + 48gx$   
 $60g = 18g + 48gx$   
 $x = \frac{42}{48} \Rightarrow x = 0.875$

7)

$NR \times 2 = 1500 - 900 = 2500$   
 $2NR = 2500$   
 $NR = 1250$

b)

$NR \times 2 = 1500 - 300 = 1200$   
 $2NR = 1200$   
 $NR = 600$

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

$\vec{RF} = ma \Rightarrow 1200 - 300 = 900a$   
 $900a = 900$   
 $a = 1 \text{ ms}^{-2}$

$\vec{RF} = ma \Rightarrow 1500 - 900 = 2500a$

$a = 0.24 \text{ ms}^{-2}$

$\vec{RF} = ma \Rightarrow 1200 - 300 = 900a$

$a = 1 \text{ ms}^{-2}$