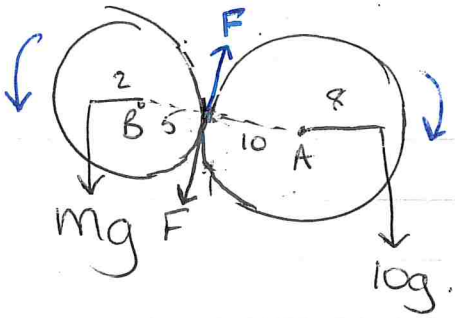
Mechanics J - Answers.

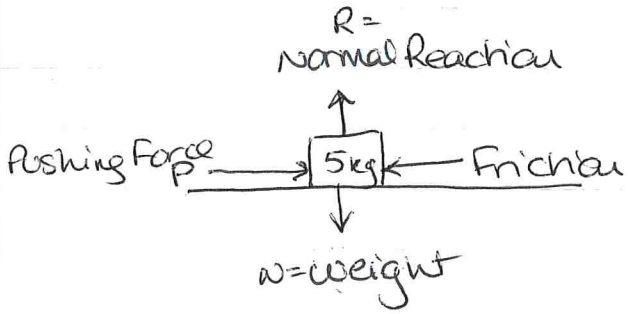


4.4). A) $8 \times 10g = 10 \times \text{Force} \Rightarrow \text{Force} = 8g$ on large.

B) $5 \times \text{Force} = 2 \times Mg. \Rightarrow 40g = 2 \times Mg.$

$M = 20kg.$

5.1)



($F_{max} = 0.3 \times 5g = 14.7$)

a) $w = 5g.$

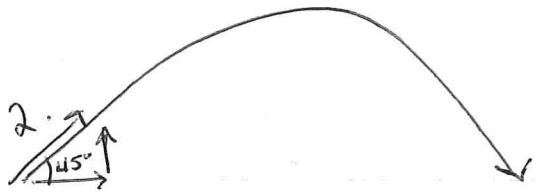
$R = 5g.$

$P = 6N$

Friction $= 6N$ (not $0.3 \times 5g$ since $14.7 > 6$).

b). $0.3 \times 5g = 14.7N.$

6.2.



(↑)

$s = ?$

$u = 2\sin 45$

$v = 0$

$a = -10$

$t = ?$

(→)

$s = ?$

$u = 2\cos 45$

$t = ?$

(↑) $v^2 = u^2 + 2as.$

$0 = (2\sin 45)^2 + 2 \times -10 \times s.$

$-2 = -20 \times s$

$s = 0.1m.$

(↑)

$v = u + at$

$0 = 2\sin 45 - 10t.$

$t = \sqrt{2}/10$

(→)

$s = 2\cos 45 \times \sqrt{2}/10$

$= 0.2m$

$(0.2, 0.1).$

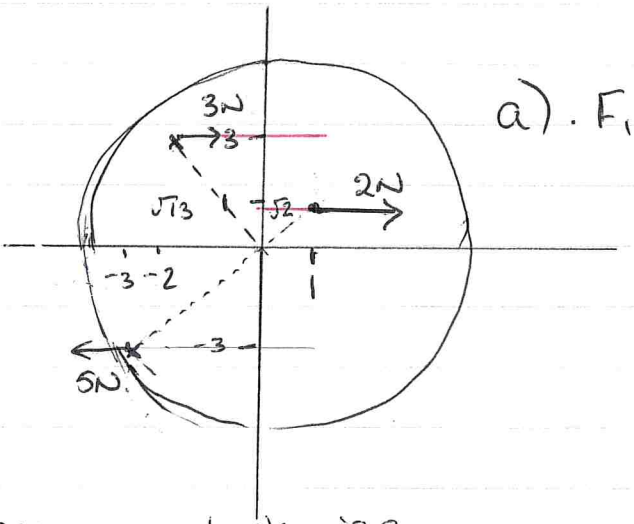
b) (↑)
$s = ?$
$u = 2\sin 45$.
$v = ?$
$a = -10$
$t = ?\ \sqrt{2}/20$.

(→)
$s = 0.1$
$u = 2\cos 45$
$t = ?$
$0.1 = (2\cos 45)t$
$t = \sqrt{2}/20$.

$s = ut + \frac{1}{2}at^2$
$= (2\sin 45)\frac{\sqrt{2}}{20} + \frac{1}{2}(-10)\left(\frac{\sqrt{2}}{20}\right)^2 = \frac{3}{40} = 0.075\text{m}$.

c) Assumed no air resistance.

7.2.



a). $F_1 + F_2 + F_3 = 0$

$\begin{pmatrix}2\\0\end{pmatrix} + \begin{pmatrix}3\\0\end{pmatrix} + \begin{pmatrix}p\\0\end{pmatrix} = \begin{pmatrix}0\\0\end{pmatrix}$

$\Rightarrow p = -5$.

b) All go clockwise.
$1 \times 2 + 3 \times 3 + (-3) \times (-5) = 26\text{Ncm}$
$= 0.26\text{Nm}$.

s↑ s.
v↓ d/dt
a

8.1 a) $r = \int ti + 3t^2 j\ dt$
$= \frac{t^2}{2}i + t^3 j + ci + dj$.

$i = 0 + 0 + c \Rightarrow c = i \quad d = 0$.
$r = \frac{1}{2}t^2 i + t^3 j + i = \left(\frac{1}{2}t^2 + 1\right)i + t^3 j$

b) $a = \frac{dv}{dt} = i + 6tj = i + 24j$

c). j component of $r = 1 \Rightarrow t^3 = 1 \Rightarrow t = 1 \Rightarrow$ i-comp $= 1.5$.
$r = 1.5i + j$