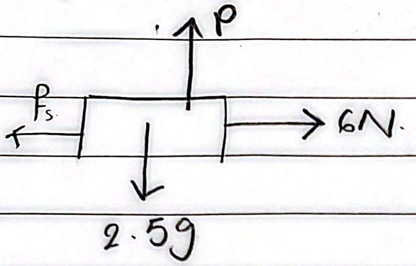
5, ~~7, 9, 10~~, 23, 27,
42, 43, 49, 57, 59, ~~66~~ 69,
79, 88 Date / /

Chapter 6

5.



a) When $P = 8N$

$R + P = 2.5 \times 9.8$

$R = 24.5 - 8 = 16.5 N$

$F_s = \mu R = 0.4 \times 16.5 = 6.6 N$ (UF...

~~$F_k = \mu R = 0.25 \times 16.5 = 4.125$~~

$\therefore$ Block does not move.

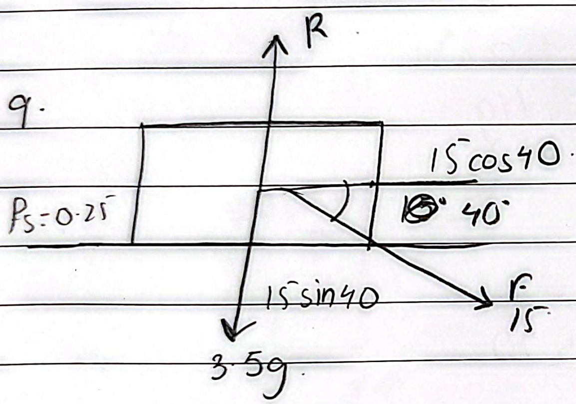
b) When $P = 10N$,

$F_N = 2.5 \times 9.8 - 10 = 14.5 N$

$F_s = 0.4 \times 14.5 = 5.8 N$

$F_k = 0.25 \times 14.5 = 3.625 N$ (An

9.



$R = 15 \sin 40 + 3.5 \times 9.8 = 43.94$

$F = 11.49$

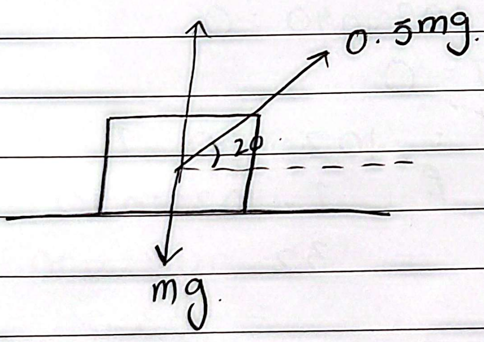
$F = 0.25 \times 43.94 = 10.98$

$11.49 > \cancel{10}$ a) $F = 10.98 N$

b) $11.49 - 10.98 = 3.5a$

$a = 0.14 ms^{-2}$

10).



$F = 0.5mg \cos 20 = 0.47mg$

$R + 0.5mg \sin 20 - mg = 0$

$R = 0.5mg \sin 20 + mg$

$0.171mg + mg$

$R = 1.171mg$

$F_s = 0.6 \times 1.171mg = 0.7026mg$

$\therefore$ object was at rest.

$F = ma \quad a = 0$

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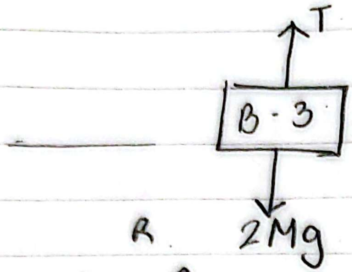
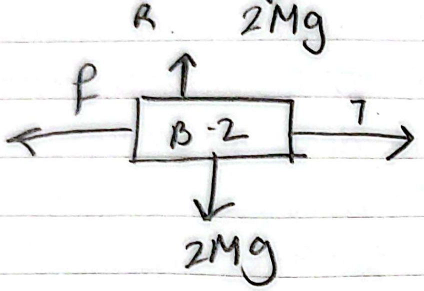
*23. $a = 0.5$



$2Mg - T = 0.5a$

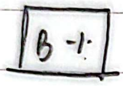


$T - f = 0.5a$

$T = 0.5a + f_k$

$f_k = \mu R = 2\mu Mg$

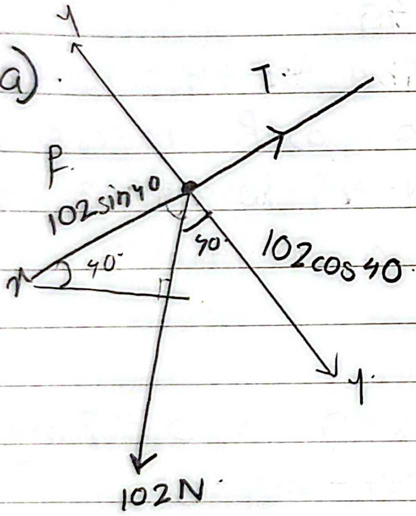
$T = 0.5a + 2\mu Mg$



$T - Mg = 0.5a$

$T = 0.5a + Mg$

27. a)



$R = 102\cos 40$

$T - f - 102\sin 40 = 0$

$32 - T = 0$

$-f = 102\sin 40 - T$

$f = T - 102\sin 40$

$32 - 102\sin 40$

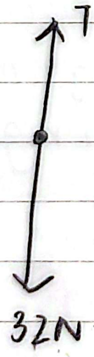
$= -33.56$

$f_{smax} = \mu R$

$= 0.56 \times 102\cos 40$

$= 43.76$

$a = 0$



$f_{smax} > f \therefore a = 0$

$v = u + at$ $\quad v^2 = u^2 + 2as.$
$s =$

Date / /

42. $f_s = \mu_s N = \mu_s mg$

$f_c = \frac{mv^2}{r}$

$\mu_s mg = \frac{mv^2}{r} \qquad \mu_s g = \frac{v^2}{r}$

$v = \sqrt{\mu_s g r}$

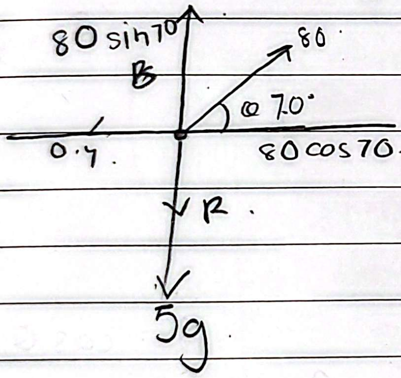
43. $F = \mu R$

$= 0.32mg$

$f = \frac{mv^2}{r}$

$0.32\cancel{m}g = \cancel{m} \times \frac{\left(\frac{29 \times 1000}{60 \times 60}\right)^{}}{r}$

69.



$F = \mu R$

~~$80\sin70 + R = 5 \times 9.8$~~

~~$R =$~~

$R + 5 \times 9.8 = 80\sin70$

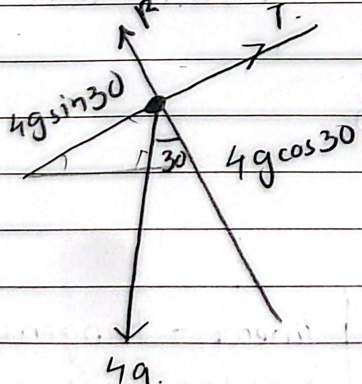
$R = 26.175$

$f = 0.4 \times 26.175 \quad 10.47$

$27.36 - 10.47 = 5a$

$a = 3.38$

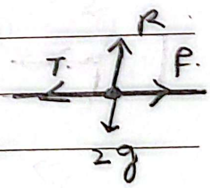
79.



$R = 4g\cos30$

$4g\sin30 - T = 4a$

$19.6 - 4a = T$



$T = 13\text{ N}$

$T - f = 2a$

$T - 0.5 \times 2 \times 9.8 = 2a$

$T = 2a + 9.8$

$2a + 9.8 = 19.6 - 4a$

$6a = 9.8$

$a = 1.63\,ms^{-2}$

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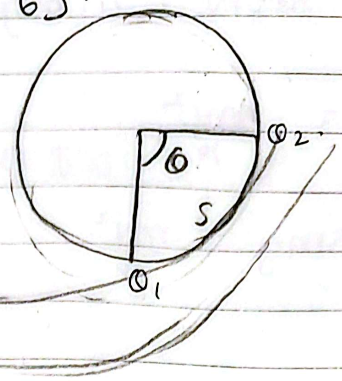
~~88~~ Uniform Circular motion (Chapter 6).



$\theta \rightarrow$ angular position.

$\Delta\theta \rightarrow$ angular displacement

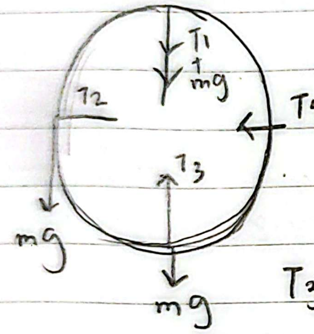
$\omega \rightarrow$ angular velocity.

$$\omega = \frac{\Delta\theta}{\Delta t} = \frac{d\theta}{dt}.$$

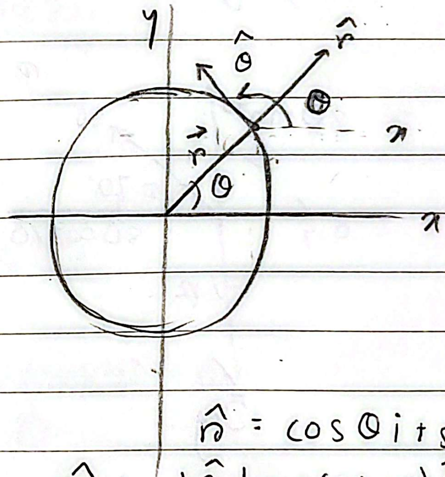
$\alpha \rightarrow$ angular acceleration.

$$\alpha = \frac{\Delta\omega}{\Delta t} = \frac{d\omega}{dt} = \frac{d^2\theta}{dt^2}.$$

$$\boxed{\begin{aligned} v &= \omega r. \\ a_c &= \omega^2 r = \frac{v^2}{r}. \\ F_c &= m a_c. \end{aligned}}$$



$T_3 - mg$



$$\hat{r} = \cos\theta\, \hat{i} + \sin\theta\, \hat{j}$$

$$\hat{\theta} = |\hat{\theta}| \cos(90+\theta)\hat{i} + |\hat{\theta}| \sin(90+\theta)\hat{j}$$

$$\Rightarrow \hat{\theta} = -\sin\theta\, i + \cos\theta\, j$$

$$\vec{r} = r\cos\theta\, i + r\sin\theta\, \hat{j}$$

$$\vec{v} = \frac{d\vec{r}}{dt} = r\left\{-\sin\theta \frac{d\theta}{dt} i + \cos\theta \frac{d\theta}{dt} \hat{j}\right\}$$

$$\vec{v} = r\frac{d\theta}{dt}(-\sin\theta\, i + \cos\theta\, j).$$

$$\vec{v} = r\omega\hat{\theta} \rightarrow v = \omega r.$$

$$\vec{a} = \frac{d\vec{v}}{dt}\left\{r\frac{d\theta}{dt}(-\sin\theta\, i + \cos\theta\, j)\right\}$$

$$\boxed{\begin{aligned} &\text{linear} - \text{tangent} \\ &\text{angular} - \text{outward/inward.} \end{aligned}}$$

$$u = \frac{d\theta}{dt} \qquad v = -\sin\theta\, i + \cos\theta\, j$$

$$\frac{dv}{d\theta} = \cancel{r\cos\theta}$$

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$$= r \left\{ -\left(\frac{d\theta}{dt}\right)^2 (\cos\theta\,\hat{i} + \sin\theta\,\hat{j}) + \hat{\theta}\frac{d^2\theta}{dt^2}\right.$$

$$\vec{a} = -r\omega^2\hat{r} + r\alpha\hat{\theta}$$

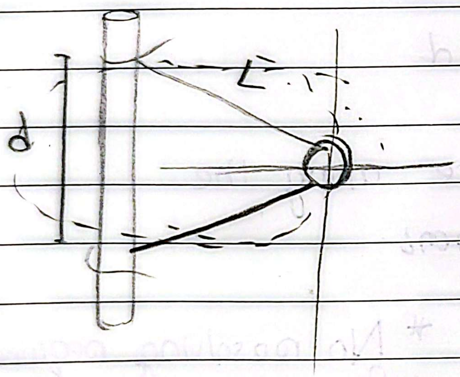
$$\therefore \vec{a} = \vec{a_c} + \vec{a_T}$$

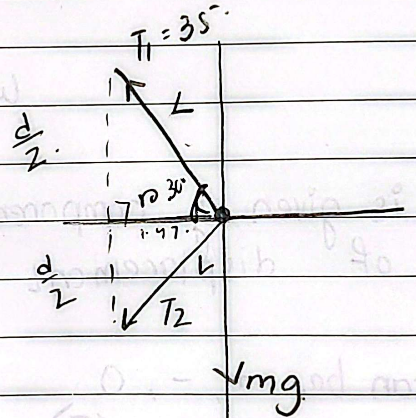
$a_c = \omega^2 r$

$a_T = r\alpha$

For uniform circular motion, ω (angular velocity) is constant. $\therefore$ α is zero. Hence there is no tangential acceleration. Net force along tangent = 0.

Ch(6; sum-59)





Vertical

$T_1 \sin 30 - T_2 \sin 30 - m \times g = 0$

$35 \times 0.5 - T_2 \times 0.5 - 1.34 \times 9.8 = 0$

$T_2 = 8.736\ N$

$F_c \Rightarrow T_1 \cos 30 + T_2 \cos 30 = ma_c$

$\frac{35\cos 30 + 8.736 \cos 30}{1.34} = a_c$

$\therefore a_c = 28.26\ ms^{-2}$

$a_c = \frac{v^2}{r} \Rightarrow v = \sqrt{a_c r}$

$= \sqrt{28.26 \times 1.47}$

$= 6.44\ ms^{-1}$

$r = \sqrt{(L)^2 - (\frac{d}{2})^2}$

$r = 1.47$

$\sin\theta = \frac{d/2}{L} = \frac{1}{2}$

$\theta = 30°$

$T_1 \begin{cases} x \rightarrow T_1 \cos 30 \\ y \rightarrow T_1 \sin 30 \end{cases}$

T_2. [$x \rightarrow T_2 \cos 30$ $y \rightarrow T_1 \sin 30$

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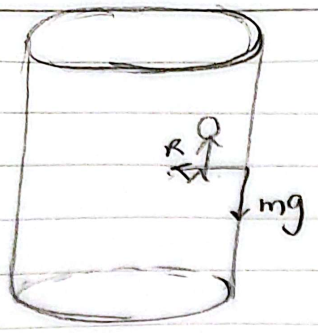


$f_s = \mu_s R$

Reaction force = centripetal force

$v \uparrow \; R \uparrow \; CF \uparrow$

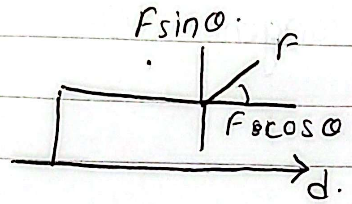
$R = f_c = \frac{mv^2}{r}$

Chaptero - 7.

Work - Kinetic Enerogy.

$W = F \times D$.

~~For f =~~



$W = F\cos\theta \times d$

∴ Work done is given by component of force along the direction of displacement × displacement.

Work done can be +, −, 0.
It is a scalaro quantit. (J)

* No resolving required
* Foro reaction Forsce WD is always 0

$W_{net} = W_1 + W_2 + W_3 + \dots$

$W_{net} = F_{net\ \text{along direction}} \times d$.