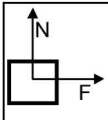
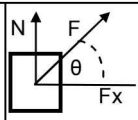
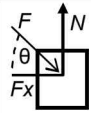
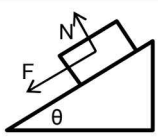
Gaya

A. Hukum Newton

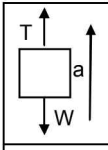
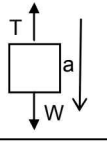
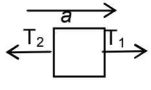
Hukum I Newton:	$\sum F = 0$ (benda diam atau GLB)
Hukum II Newton:	$\sum F = m.a$ (benda diam atau GLBB)
Hukum III Newton:	$F_{aksi} = -F_{reaksi}$
Dimana: F = Gaya: m = massa benda (kg); a = percepatan benda	

B. Gaya Normal dan Gaya Pendorong

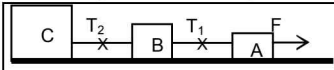
			
$N = W$ $F = F_x$	$N = W - F \sin \theta$ $F_x = F \cos \theta$	$N = W + F \sin \theta$ $F_x = F \cos \theta$	$N = W \cos\theta$ $F_x = F \sin\theta$
N = gaya normal (gaya yang diberikan bidang pada benda) tegak lurus dengan bidang. F_x = gaya menarik atau mendorong yang sejajar bidang yang menyebabkan pergeseran banda.			

C. Kasus-Kasus Hukum Newton

1. Kasus Tegangan Tali

		
$T - W = m.a$	$W - T = m.a$	$T_1 - T_2 = m.a$
Dimana: m = massa benda; W = berat benda (m.g); a = percepatan benda; T = tegangan tali; T_1 dan T_2 = tegangan tali 1 dan tali 2		

2. Kasus Gaya Menarik 3 Barang



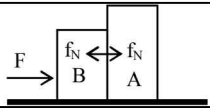
A = percepatan sistem massa (semua massa)
F = gaya yang bekerja pada sistem massa
m_A = massa A,
m_B = massa B,
m_C = massa C

$$a = \frac{F}{m_A + M_B + m_C} = \frac{F - T_1}{m_A} = \frac{T_1 - T_2}{m_B} = \frac{T_2}{m_C}$$

atau

$$\frac{F}{m_A + m_B + m_c} = \frac{T_1}{m_B + m_c} = \frac{T_1}{m_c}$$

3. Kasus Mendorong 2 Buah Barang

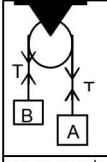


$$a = \frac{F}{m_A + m_B} = \frac{f_N}{m_B}$$

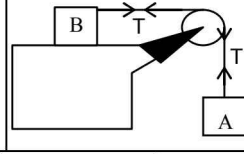
f_N = gaya kontak massa A dengan massa B
m_A = massa A m_B = massa B

4. Kasus Pada Sistem Katrol

(Massa A lebih berat dan pada bidang licin)



$$a = \frac{w_A - w_B}{m_A - m_B}$$



$$a = \frac{w_A}{m_A + m_B}$$

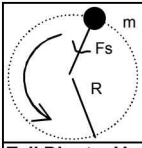
a = percepatan; T = tegangan tali; m_A = massa A
m_B = massa B N = gaya normal μ = koefisien gesekan

D. Gaya Gesek

Jika $F_x \leq \mu_s.N \rightarrow f_{gesek} = F_x \rightarrow$ **Benda Diam**
Jika $F_x > \mu_s.N \rightarrow f_{gesek} = \mu_k.N \rightarrow$ **Benda Bergerak**
F_x = gaya yang menyebabkan pergeseran f_{gesek} = gaya gesek
μ_s = koefisien gesek statis μ_k = koefisien gesek kinetis

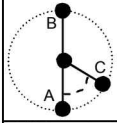
E. Gaya Gerak Melingkar

Gaya pada Gerak Melingkar	Gaya sentripetal:	Percepatan sentripetal:
	$a_s = \frac{v^2}{R} = \omega^2 R$	$F_2 = m\frac{v^2}{R} = m\omega^2 R$



Gaya sentripetal (F_s) = gaya tarik yang arahnya selalu ke pusat lingkaran

Tali Diputar Vertikal

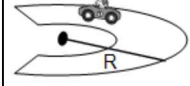


Di titik tertinggi (B) : $F_s = T + W$
Di titik terendah (A) : $F_s = T - W$
Di titik C : $F_s = T - W.\cos\theta$

Tali Berputar Horizontal

$F_s = T$ = tegangan tali

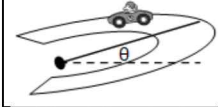
Kasus Tikungan Datar



Agar kendaraan membelok di suatu tikungan tidak selip maka berlaku rumus:

$$\frac{v^2}{R.g} = \mu_s$$

Kasus Tikungan Miring

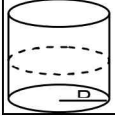


Agar kendaraan membelok di suatu tikungan tidak selip maka berlaku:

$$\frac{v^2}{R.g} = \frac{\mu_s + \tan\theta}{1 - \mu_s \tan\theta}$$

v = laju maksimum kendaraan
R = jari-jari putaran jalan
g = percepatan gravitasi
μ = koefisien gesekan statis antara roda dengan jalan
θ = sudut kemiringan jalan terhadap horinzontal

Sirkus Tong Setan



Motor sirkus harus berputar dengan kecepatan minimum pada dinding vertikal yang melingkar agar tidak jatuh, maka kecepatan minimum:

$$v_{min} = \sqrt{\frac{gR}{\mu_s}}$$

🕮 CONTOH SOAL DAN PEMBAHASAN

Soal 1

Dua balok masing-masing bermassa m dihubungkan dengan seutas tali dan ditempatkan pada bidang miring licin menggunakan sebuah katrol. Jika massa tali dan katrol diabaikan, dan sistem bergerak ke kiri maka besar tegangan tali adalah

A. ½ mg (sin θ_1 – sin θ_2)

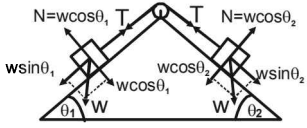
B. ½ mg (sin θ_1 + sin θ_2)

C. mg (sin θ_1 – sin θ_2)

D. mg (sin θ_1 + sin θ_2)

E. 2 mg (sin θ_1 - sin θ_2)

Jawab:



Benda bergerak kekiri maka :

$$\sum F = ma \rightarrow W\sin\theta_1 - W\sin\theta_2 = (m_1 + m_2)\,a \rightarrow a = \frac{w(\sin\theta_1 - \sin\theta_2)}{m_1 + m_2}$$

$$a = \frac{m.g}{2m}(\sin\theta_1 - \sin\theta_2)$$

Pada benda 1 $\sum F = m_1 . a \rightarrow mg\sin\theta_1 - T = m . \frac{g}{2}(\sin\theta_1 - \sin\theta_2)$

$$T = mg\sin\theta_1 - \frac{mg}{2}\sin\theta_1 + \frac{mg}{2}\sin\theta_2 \rightarrow T = \frac{mg}{2}(\sin\theta_1 - \sin\theta_2)$$

Jawaban: A