No Minggu
Date 6-OKTOBER '24

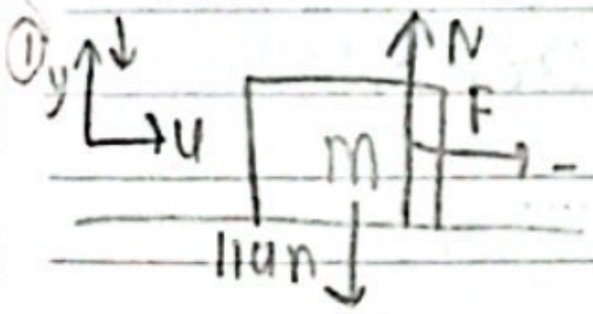
dinamika

* Dinamika → penyebab gerak → gaya / force [N] ($\vec{F}$)
<partikel>

Kinematika → gerak

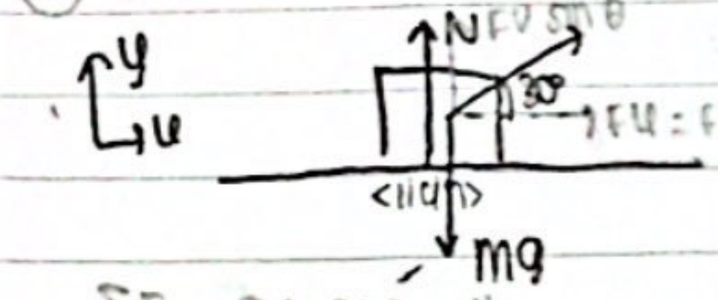
* Hukum newton :
  - ketika jumlah gaya yang bekerja pada suatu benda = 0, maka benda tsb diam / bergerak dengan kecepatan konstan.
    $\boxed{\Sigma F = 0}$ ①
  - ketika jumlah gaya yg bekerja pada suatu benda / partikel ≠ 0, maka benda tsb dipercepat
    $\boxed{\Sigma F = m.a}$ ② $\boxed{a \propto \Sigma F}$ $\boxed{m \propto \frac{1}{a}}$ $\boxed{a = \frac{\Sigma F}{m}}$
  - aksi - reaksi
    $\vec{F}_{12} = -\vec{F}_{21}$ ③ ← besarnya sama arah berlawanan

① $m = 2\ kg$, $F = 10\ N$



② gambar koordinat
① - Diagram bebas -
② Tuliskan persamaan Newton
u/ masing² koordinat
: $\Sigma F_y = 0$
$N - mg = 0$
$N = mg$
$= (2)(10) = 20\ N$
$\boxed{\Sigma F_x = m.a}$ → a → akut → percepatan arah horizontal
$F = m.a$
$10 = 2.a$
$\boxed{a = 5\ m/s^2}$

② Bergerak dan horizontal



$m = 2\ kg$
$g = 10\ m/s^2$

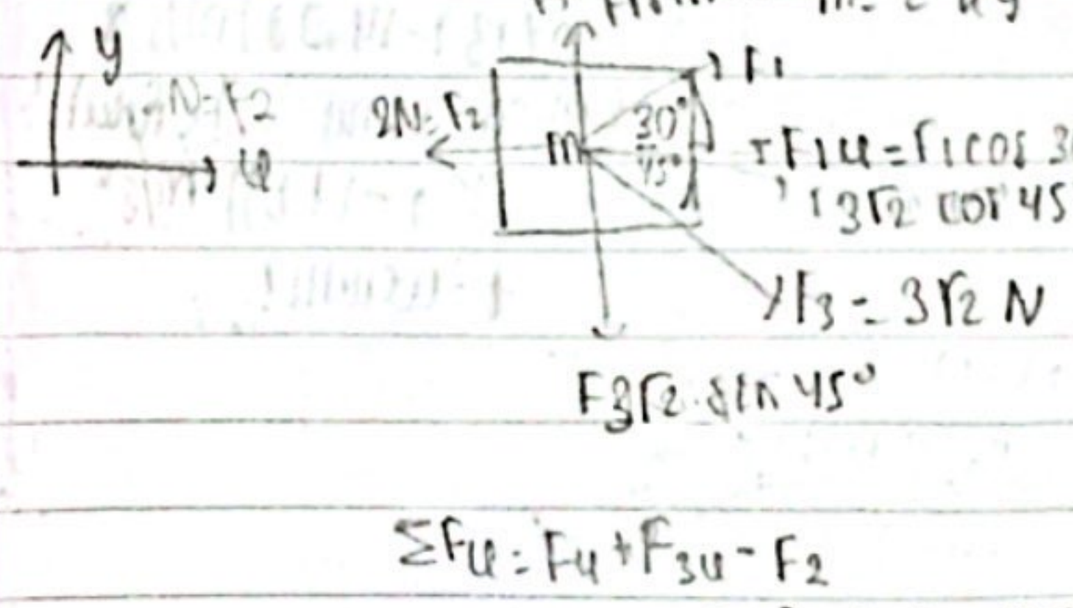
$\Sigma F_y = 0$ (horizontal)
$N + F_y - mg = 0$
$N + F \sin\theta - mg = 0$
$N = mg - F \sin\theta$
$= 20 - 6(\frac{1}{2})$
$= 17\ N$

gaya normal : besar kontak benda dan permukaan.

$\Sigma F_x = m.a$
$F_x = m.a$
$F \cos\theta = m.a$
$(6)(\frac{1}{2}\sqrt{3}) = 2.a$
$3\sqrt{3} = 2a$

$\boxed{a = \frac{3}{2}\sqrt{3}\ m/s^2}$

③ Tampak atas



$m = 2\ kg$

$\Sigma F_x = F_4 + F_{3x} - F_2$
$= F_1 \cos 30° + F_3 \cos 45° - F_2$
$= (2\sqrt{3})(\frac{1}{2}\sqrt{3}) + (3\sqrt{2})(\frac{1}{2}\sqrt{2}) - 2$
$= 3 + 3\frac{1}{2} - 2$
$= 6 - 2 = 4\ N = m.a$
$4 = 2a$
$\boxed{a = 2\ m/s^2}$

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$\Sigma F_y = F_{1y} - F_{3y}$

$= F_1 \sin 30° - F_3 \sin 45°$

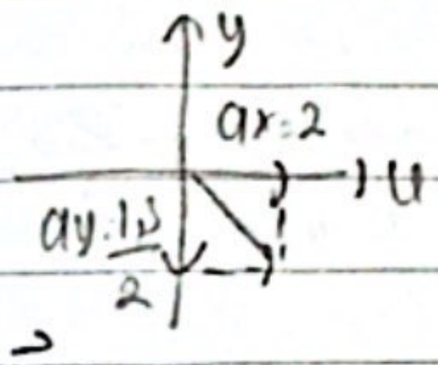
$= (2\sqrt{3})(\frac{1}{2}) - (3\sqrt{2})(\frac{1}{2}\sqrt{2})$

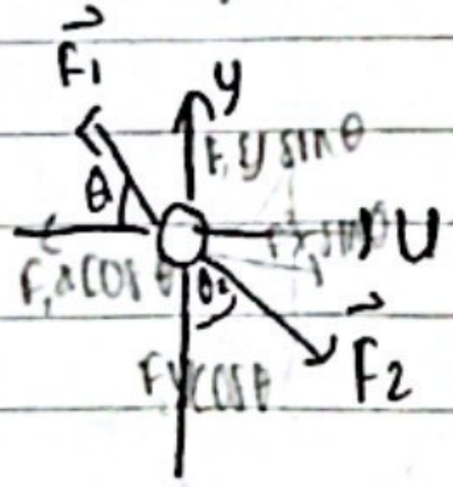
$= \sqrt{3} - 3 = -1,3 = ma_y$

$-1,3 = 2\,a_y$

$a_y = \frac{-1,3}{2}\ m/s^2$

a → percepatan (vektor)



④ 

$F_1 = 6\ N$

$\theta_1 = 30,0°$

$F_2 = 7\ N$

$\theta_2 = 30°$

Dalam notasi vektor satuan, berapakah gaya ke 3 jika 1/2 lemon:

(a) diam/setimbang

(b) memiliki v konstan: $(13\hat{i} - 14,0\hat{j})\ m/s$ &

(c) memiliki v berubah?: $(13\hat{i} - 14t\hat{j})\ m/s^2$

t = waktu?

$a_x = 0 \quad a_y = 0$

(a) $\Sigma F = 0$

$\Sigma F_x = 0 \quad \Sigma F_y = 0$

$\Sigma F_y = 0$

$F_2 \sin\theta_2 - F_1 \cos\theta_1 + F_{3y} = 0$

$(7)(\sin 30°) - 6(\cos 30) + F_{3y} = 0$

$(7)\ 1/2 - 6\ 1/2\sqrt{3} + F_{3y} = 0$

$3,5 - 3\sqrt{3} + F_{3y} = 0$

$F_{3y} = 3\sqrt{3} - 3,5$

$\Sigma F_y = 0$

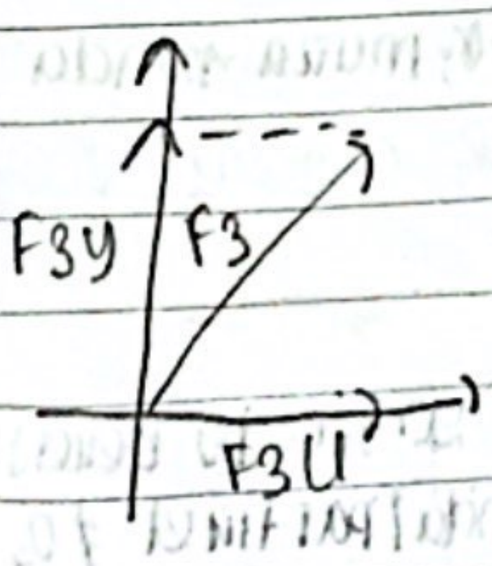
$F_1 \sin\theta_1 - F_2 \cos\theta_2 + F_{3y} = 0$

$6 \cdot \frac{1}{2} - 7 \cdot \frac{1}{2}\sqrt{3} + F_y = 0$

$3 - \frac{7}{2}\sqrt{3} + F_{3y} = 0$

$F_{3y} = -3 + \frac{7}{2}\sqrt{3}$

$= -3 + 3,5\sqrt{3} = 0,5\sqrt{3}$



$\vec{F}_3 = F_{3U}\hat{i} + F_{3y}\hat{j}$

b) Kecepatan konstan $= 0 \Rightarrow \Sigma F = 0$ ($\Sigma F_x = 0$, $\Sigma F_y = 0$)

c) percepatan!

$v = (13t\hat{i} - 14t\hat{j})\ m/s^2$

$\vec{a} = \frac{dv}{dt} = \frac{d}{dt}(13t\hat{i} - 14t\hat{j})$

$= 13\hat{i} - 14\hat{j}$

$= a_u\hat{i} + a_y\hat{j}$

$a_u = 13\ m/s^2 +$

$a_y = 14\ m/s^2\ (-)$

$\Sigma F_u = m.a_u$ karena ada @i

$F_2 \sin\theta_2 - F_1 \cos\theta_1 + F_{3U} = ma_u$

$(7)(\frac{1}{2}) - (6)(\frac{1}{2}\sqrt{3}) + F_{3U} = 1$

$F_{3U} = 3\sqrt{3} - 3,5$

$r_2 = \frac{1}{\sqrt{3}}$

HINDU
6 - OKTOBER - 2014

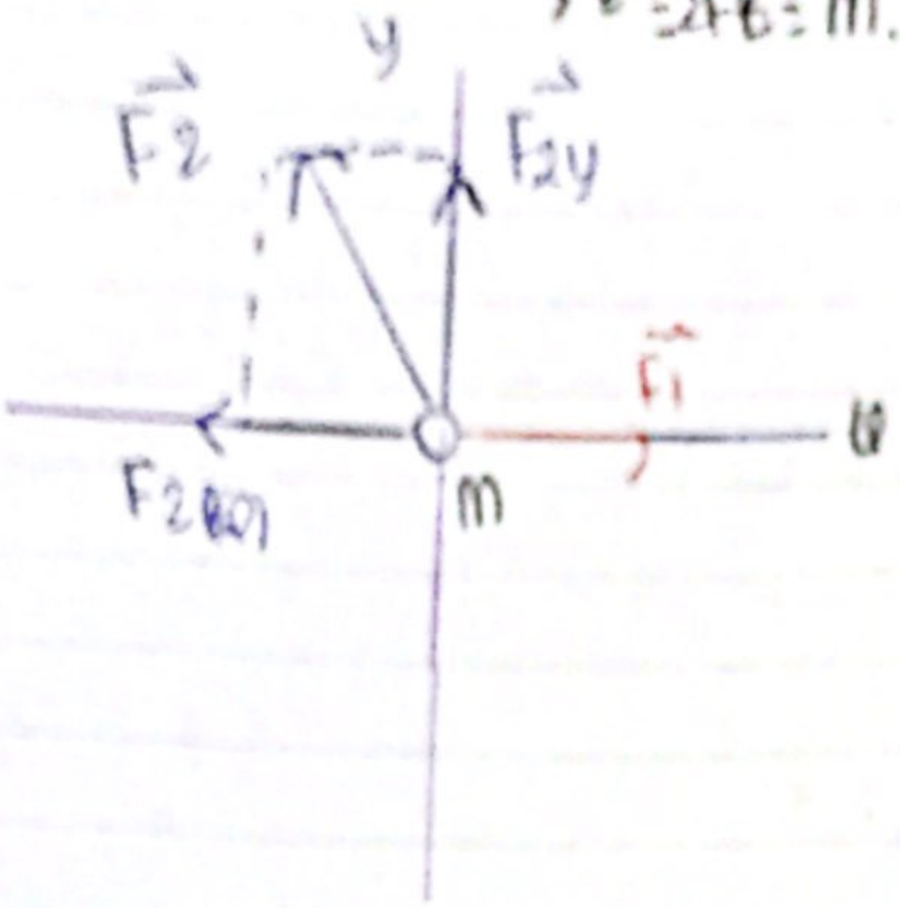
HUKUM 2 NEWTON :

$\Sigma F = m.a$

x : $\Sigma F_x = m.a_x$

y : $\Sigma F_y = m.a_y$

z : $\Sigma F_z = m.a_z$



$\Sigma F_x : a\ m_x$

$F_1 - F_{2x} = m.a_x$

$F_1 - F_2 \cos\theta = m.a_x$

$\Sigma F_y : a\ m_y$

$F_{2y} = m a_y$

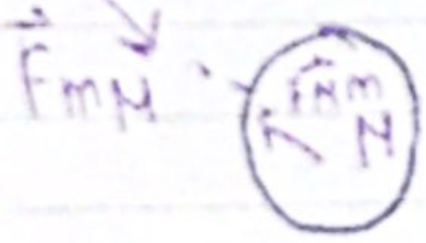
$F_2 \sin\theta = m a_y$

$\vec{a} = a_x \hat{i} + a_y \hat{j}$

$a = \sqrt{a_x^2 + a_y^2}$

Gaya :

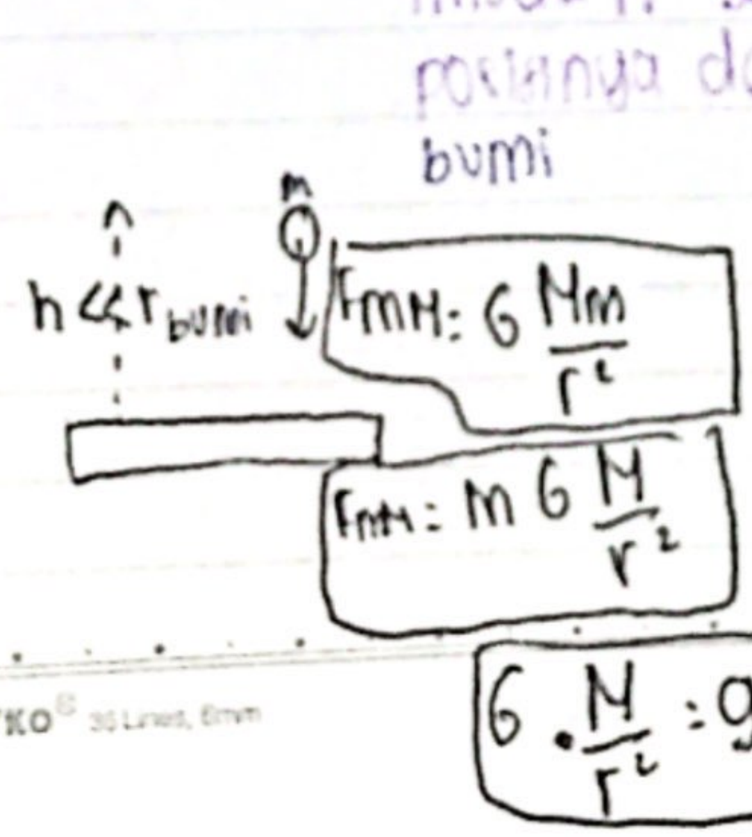
gravitasi



$F_{mH} = F_{Hm}$

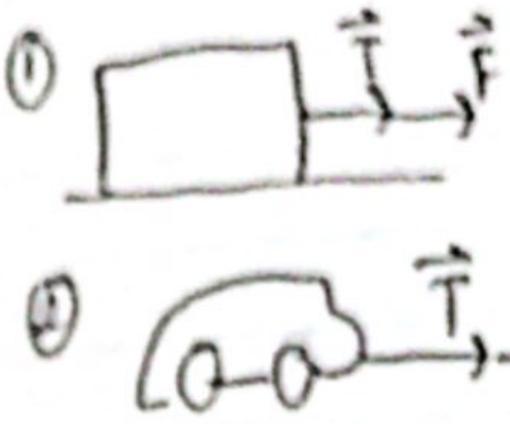
$= G \frac{Mm}{r^2}$

tinjau N yang posisinya dekat bumi

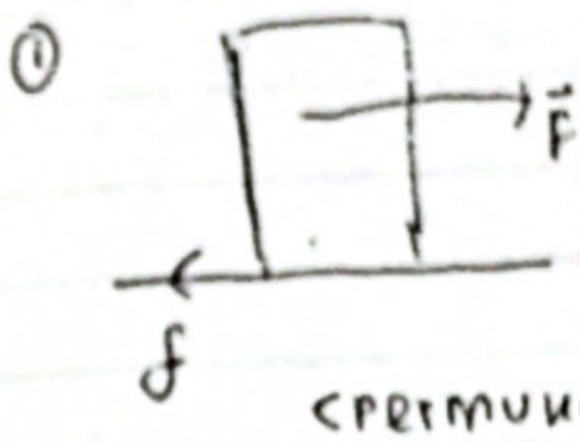


$F_{mN} = F_g = m.g$

Tegangan tali :



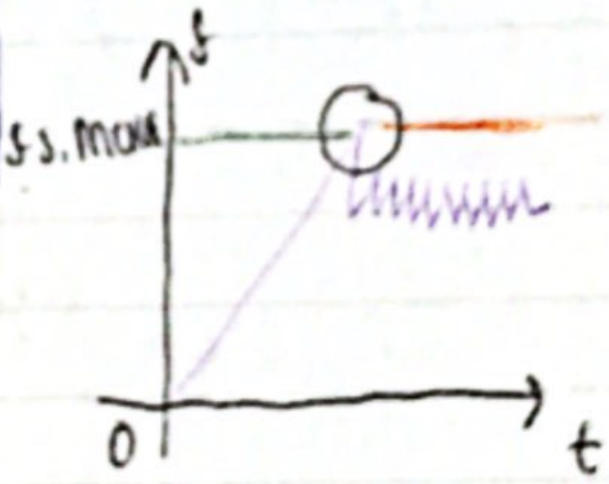
gaya gesek :



(permukaan berganti)

$\Sigma F_y : 0 \leftrightarrow F - f = 0 \longleftarrow f_s = F$

gaya gesek statik



Benda diam
- fs bergerak pada benda
- $f_s = F$

Benda bergerak
- fk bergerak pd benda
- $f_k = \mu_k . N$

$f_{s\,maks}$: Benda tepat bergerak
- gaya gesek statik maximum bekerja pada benda
- $f_{s,maks} = \mu_s N$

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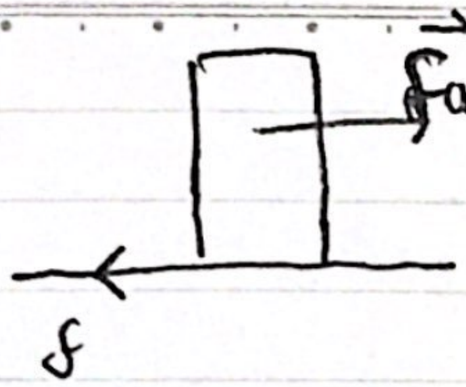
② 

* Benda masih diam:
→ gaya gesek statik

$f_s = F_{app}$

* Bergerak:

$f_\delta = \mu_\delta . N$

* telah bergerak:

$f_k = \mu_k . N$

Dinamika 1

No 7-Agustus 2024
Date

- Kinematika → gerak
- Dinamika → penyebab gerak → gaya/force [N] (F)
- t, r, Δx, kec, perc.
  $\vec{r}(t), \vec{v}(t), \vec{a}(t)$

1) Gerak dengan percepatan konstan [GLBB]
$\vec{a}$ = konstan

(1) $\vec{a} = \frac{d\vec{v}}{dt}$ → definisi percepatan.

$$\int_{t_1}^{t_2} a\,dt = \int_{t_2}^{t_F} d\vec{v}$$

$$\vec{a}(t_F - t_1) = \vec{v}(t_1) - \vec{v}(t_1)$$

$$\vec{a}\Delta t = \vec{v}_F - \vec{v}_1$$

$$\boxed{v_F = v_1 + a\Delta t}$$

$t_1 = 0$
$t_F = t$
$\vec{v}_F = \vec{v}_0 + \vec{a}t$

F: Final
I: Inisial

2) Kecepatan

$\vec{v} = \frac{d\vec{r}}{dt}$ definisi kecepatan

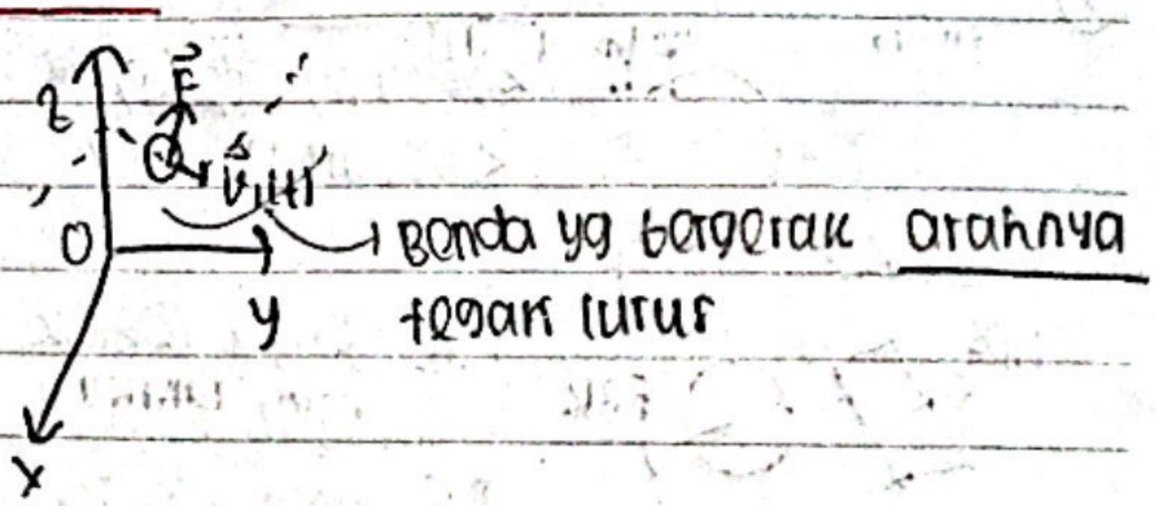
$$\int_0^t \vec{v}\,dt = \int_i^f d\vec{r}$$

$$\int_0^t (\vec{v}_0 + \vec{a}t)\,dt = \vec{r}_f - \vec{r}_i$$

$$\vec{v}_0 t + \frac{1}{2}\vec{a}t^2 = \vec{r}_f - \vec{r}_i$$

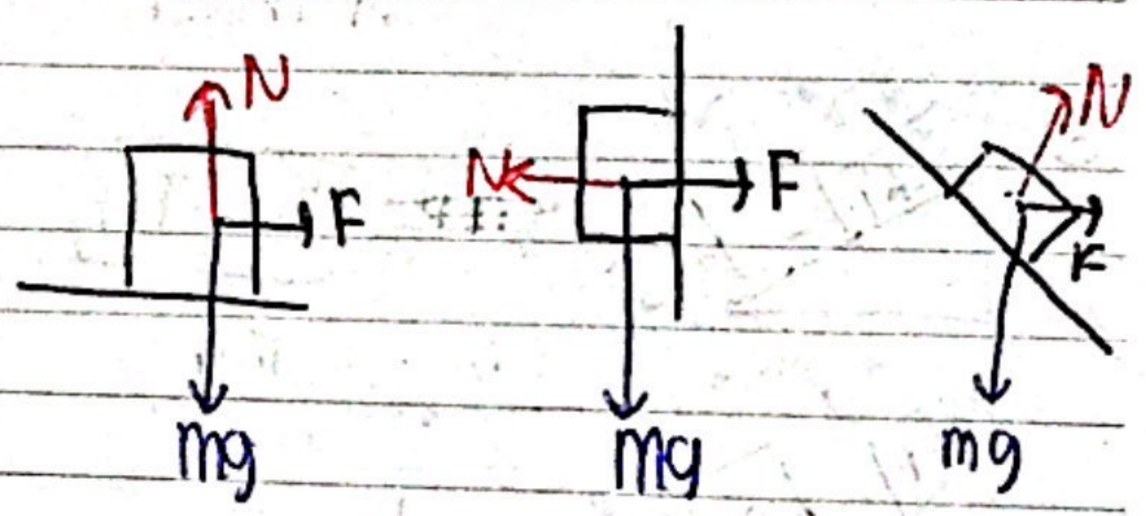
$$\vec{r}_f = \vec{r}_i + \vec{v}_0 t + \frac{1}{2}\vec{a}t^2 \;//$$

gaya



Benda yg bergerak arahnya searah lurus

Diagram benda bebas

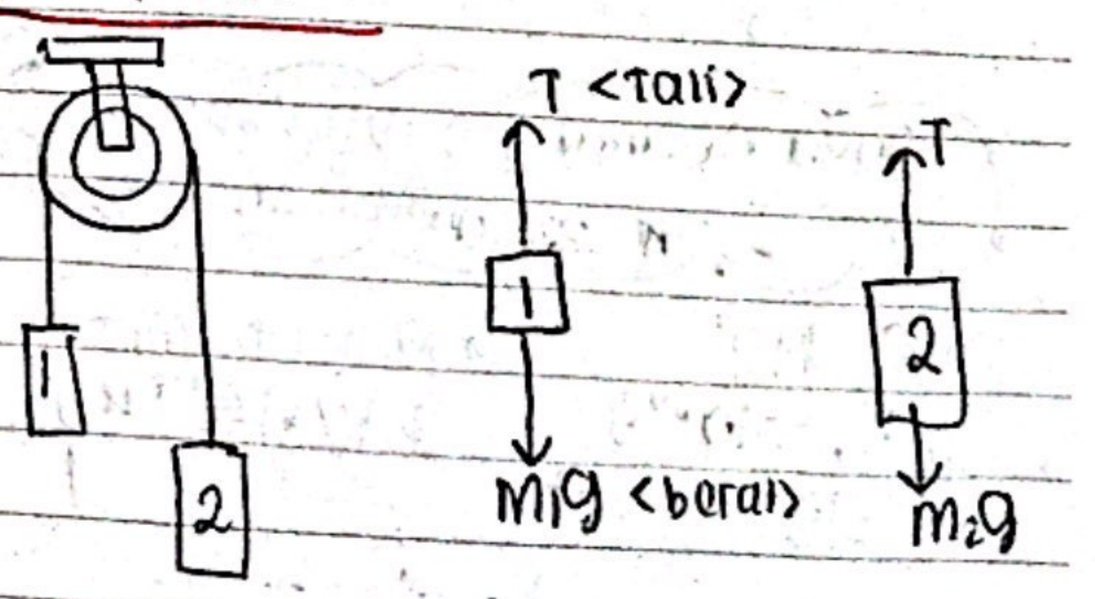


<arah & panah>

Resultan gaya

$\Sigma\vec{F} = \vec{N} + \vec{F}$

Tali & katrol



→ licin sempurna
→ tdk elastik & ringan

Hukum Newton

→ Huk. 1 <gaya ada perubahan>
→ Huk. 2 <F = m.a>
→ Huk. 3 <aksi-reaksi> <$F_{12} = -F_{21}$>

CO: gravitasi

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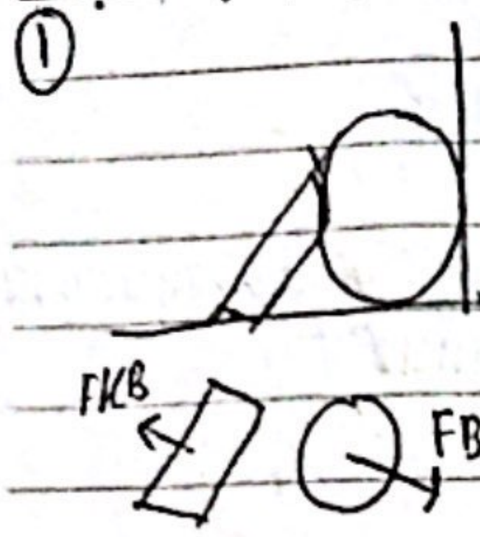
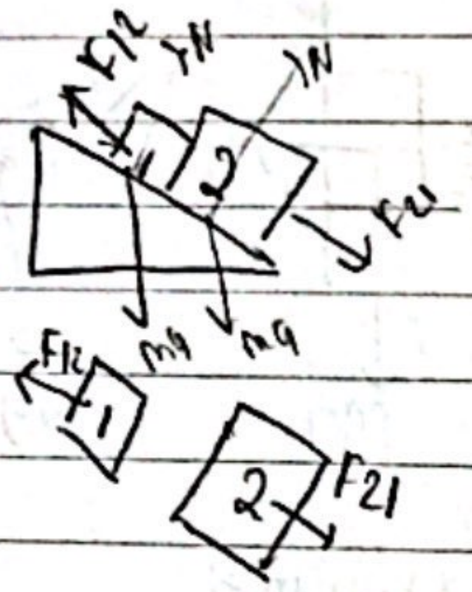
hukum III

<ereunya beda>
<berarnya sama>

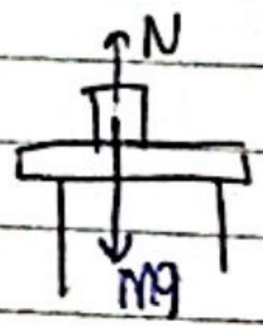
① 

FKB: gaya kontak oleh bola
FBK: gaya bola oleh kotak

② 

$F_{12} = -F_{21}$

Question

① 

apakah kedua gaya merupakan aksi - reaksi
⇒ tidak

gaya normal + gaya kontak/ sentuhan

$mg = Mg'$
$10^2 \cdot 10 = 10^{24} g$
$g' = 10^{-21} m/s^2$

* Masa bumi = $5{,}97 \times 10^{24}$ kg

latihan <Modul

⑯ 

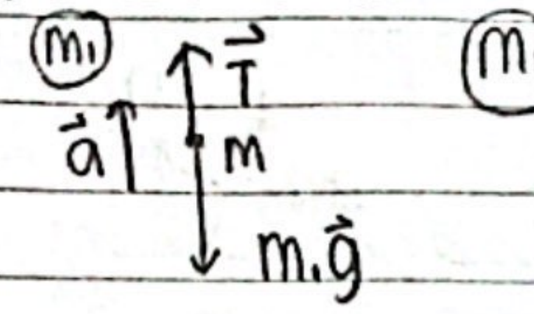
t = 0
$m_1 = 1{,}30$ kg
$m_2 = 2{,}8$ kg
Percepatan = 0,200 kg/s

(a) t = 0 s

(b) t = 3,00 s

Kecepatan percepatan mencapai nilai maks!

⇒ Diagram benda



⊙ karena ga punya dimensi

$\Sigma F = m \cdot a$ $\quad \Sigma F = m \cdot a$

$T - mg = ma_1$, $\quad -T + m_2 g = m_2 a_2$

$a_1 = a_2 = a_3$

per F, T & a:

$T_1 - mg = ma_1$

$T_2 - mg = m_2 a_2$ +

$(m_2 - m_1) g = a$
$m_1 + m_2$

$\frac{2{,}8 - 1{,}3}{2{,}8 + 1{,}3} 10 = a$

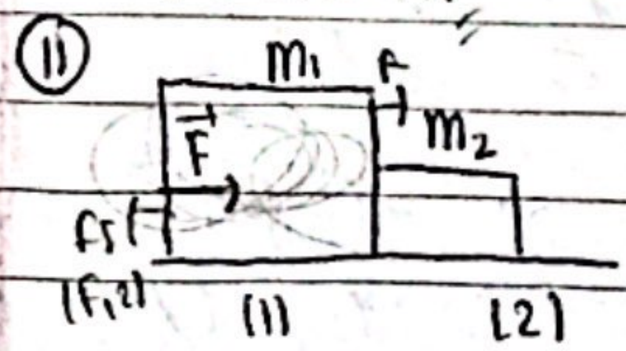
$T - mg + ma = 0$

$T - m_1 g = m_1 \cdot a$

$T = m_1 \cdot a + m_1 \cdot g$

$= 3{,}26 + 9{,}8$

$T =$

⑪ 

$m_1 = 2{,}3$ kg $\quad m_2 = 1{,}2$ kg

F = 32 N

(a) Besar gaya kontak yang bekerja diantara kedua balok!

Konsep aksi reaksi → saling kontak <bersentuhan> 2 benda
→ gaya bekerja pada 2 benda berbeda