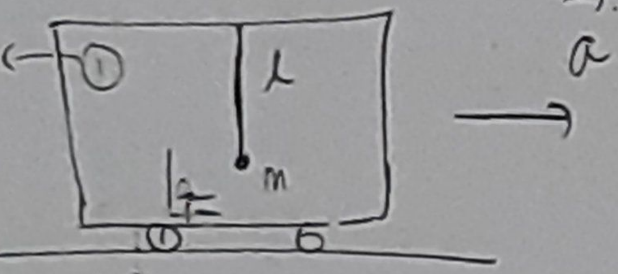
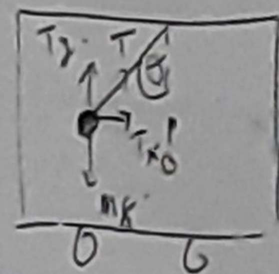
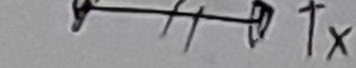
Dinamika Gaya fiktif → Pseudo force

K.A.N





K.A.I



②

→ Berlaku Hk. Newton

$$\sum \vec{F}_x = m \cdot \vec{a}_x \qquad \sum \vec{F}_y = 0$$

$$T_x = m \cdot \vec{a} \qquad T_y - mg = 0$$

$$\boxed{T \sin\theta = m \cdot \vec{a}} \qquad \boxed{T\cos\theta = mg}$$

Menurut K.A.2, massa m bisa bergerak karena ada komponen $\boxed{T_x}$

Kerangka Acuan → Inersial
→ Non-Inersial

K.A Inersial → H. Newton berlaku
$\Sigma F = m\vec{a}$

Konsep : - K.A → lokasi/Tempat Pengamat
- K.A yang diam relatif kejadian atau bergerak dengan kecepatan konstan.

$\underbrace{\text{bergerak dengan kecepatan konstan.}}$

K.A yg tidak dipercepat.

K. A. Non Inersial → K. A yg mengalami percepatan $\vec{a}$.

↳ Pengamat 1.

↳ Menurut pengamat 1, bandul m mengamati tidak ada komponen gaya yg mengakibatkan bandul m bergerak!

Gimana ??

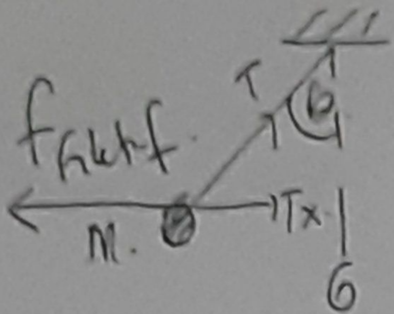
Supaya Hukum Newton bisa digunakan, diperkenalkan konsep gaya fiktif!

→ Menurut pengamat 2, bandul m mengalami gaya fiktif ke kiri yg besarnya adalah :

$$\boxed{f_{fiktif} = m_{objek} \, \vec{a}_{K.A.NI}}$$

I

① : f_{fnhf}.



$\longrightarrow \vec{a}_{K.A.}$

$$\boxed{f_{fnhf} = m \cdot a_{K.A.M}}$$

$\Sigma F_x = 0$

$T_x - f_{fnhf} = 0$

$T_x = f_{fnhf}$

$$\boxed{T \tan\theta = m \cdot a}$$ ✓

• K. A. Non Inersial → K. A yg mengalami percepatan $\vec{a}$.

↳ Pengamat ①.

↳ Menurut Pengamat ①, bandul m mengamati tidak ada komponen gaya yg mengakibatkan bandul m bergerak !

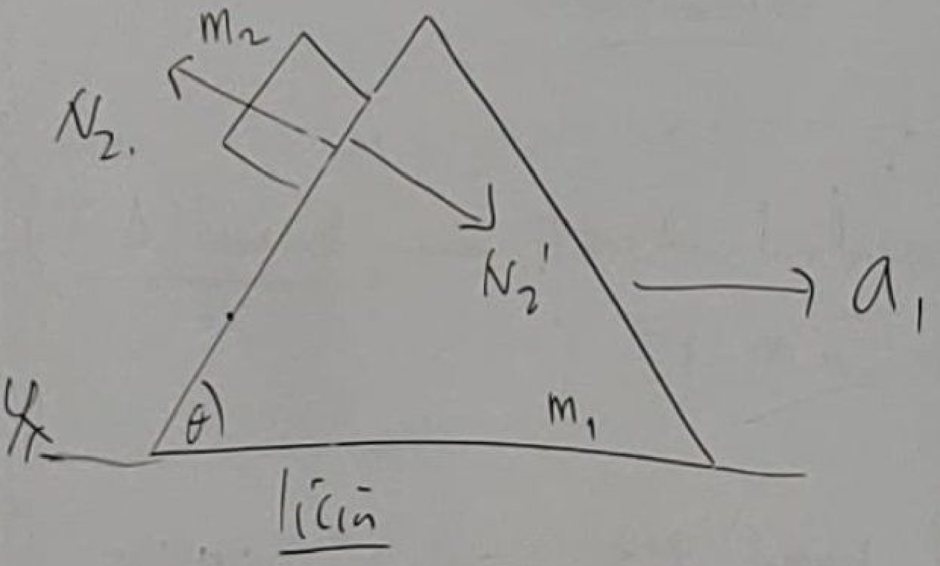
Gimana ??

Supaya Hukum Newton bisa digunakan, diperkenalkan konsep gaya fiktif !.

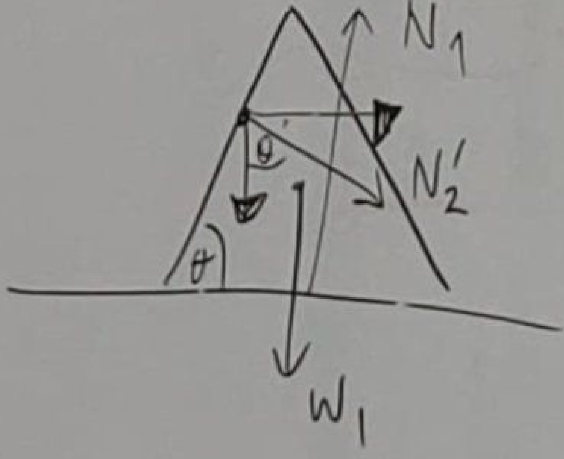
↳ Menurut Pengamat ②, bandul m mengalami gaya fiktif ke kiri yg besarnya adalah :

$$\boxed{f_{fiktif} = m_{objek}\,\vec{a}_{K.A.NI}}$$

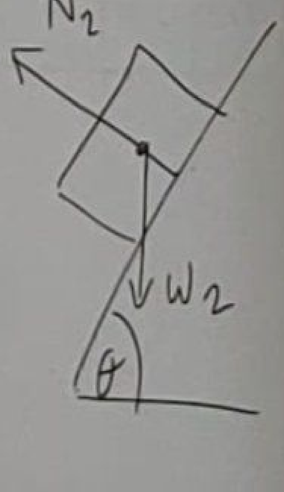
Cth :



(a) Diagram gaya Prisma relatif Lantai

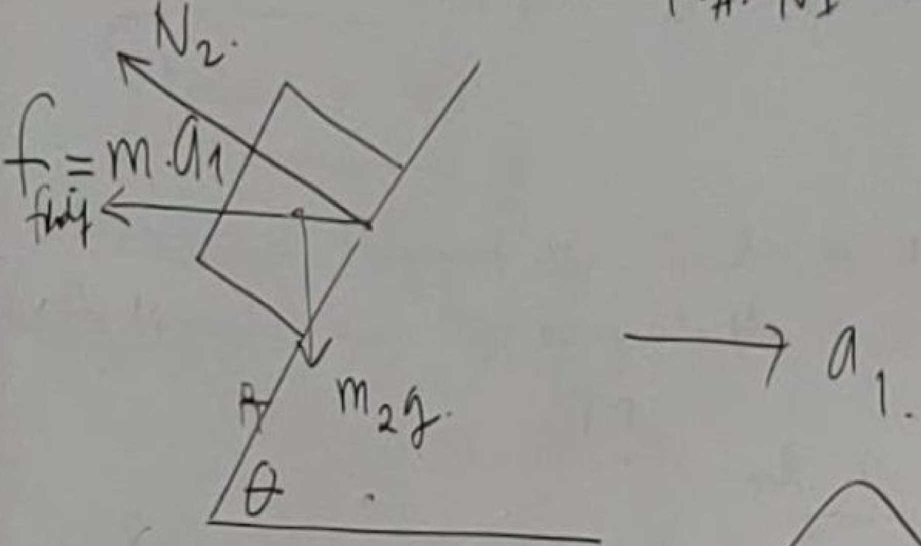


(b) → kotak relatif la



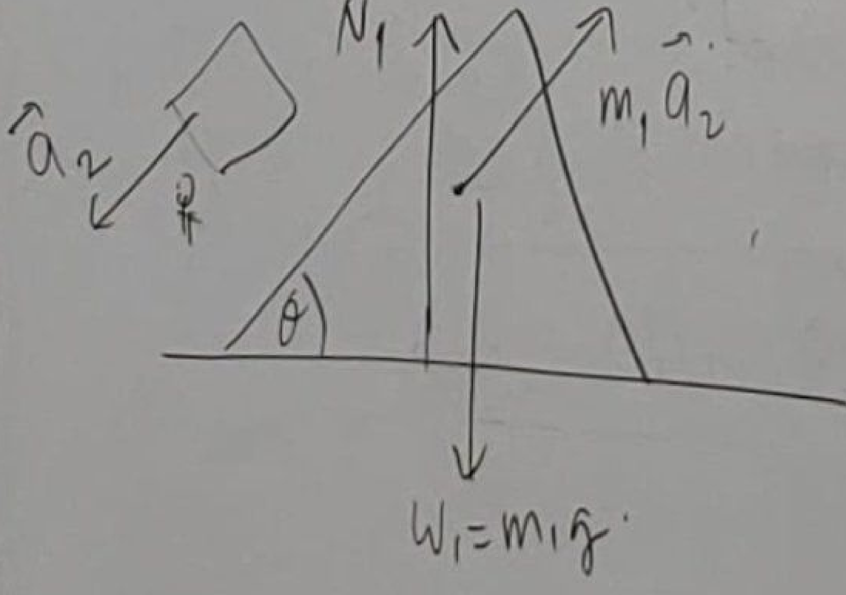
c) Diagram gaya pd kotak relatif prisma. $\vec{a}_1 \longrightarrow$ kanan.

K.A. NI.



K-A- NI.

d) Diagram gaya pada prisma relatif kotak, jika kotak mengalami percepatan a_2 sepanjang bidang miring.

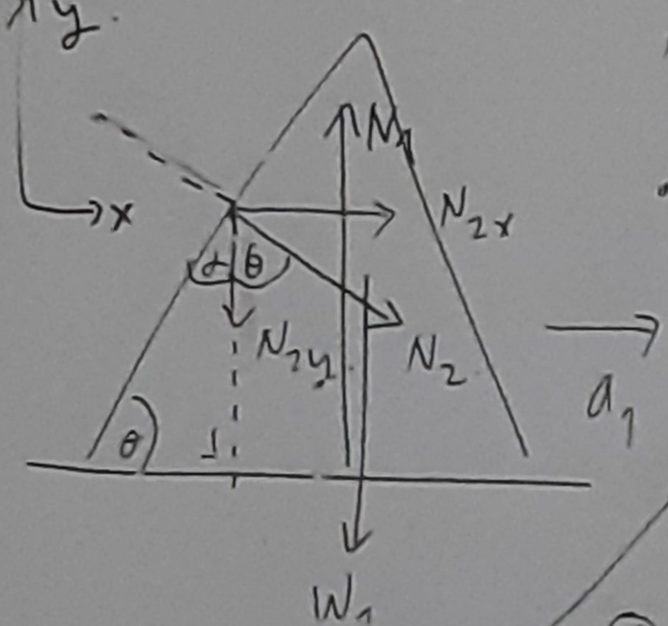


I

e) Persamaan gaya pada prisma Relatif lantai.

sb x.

$\Sigma F_x = m_1 a_1 \leftrightarrow N_{2x} = m_1 a_1$



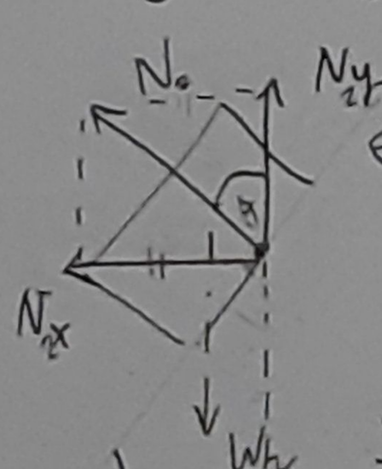
$N_2 \sin\theta = m_1 a_1$ . . . (1)

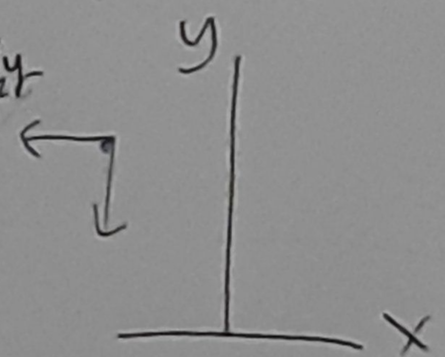
sb y. $\Sigma F_y = 0$

$N_1 - N_{2y} - W_1 = 0$

$N_1 - N_2 \cos\theta - m_1 g = 0$. (2)

f) Pers gaya pd balok Relatif lantai





sb y

$\Sigma F_y = m_2 \vec{a}_{2y}$

$W_2 - N_{2y} = m_2 a_{2y}$

$\boxed{W_2 - N_2 \cos\theta = m_2 a_{2y}}$

sb x

$\Sigma F_x = m_2 \vec{a}_{2x}$

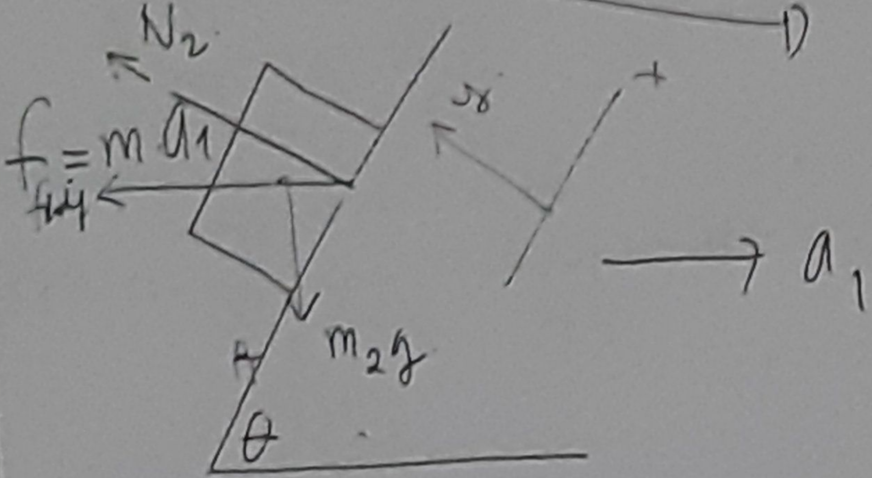
$N_{2x} = m_2 a_{2x}$

$N_2 \sin\theta = m_2 \vec{a}_{2x}$

rakyatIndonesia

c) Diagram gaya pd kotak relatif prisma. $\vec{a}_1 \to$ kanan

K.A.NI



$\vec{v}_{A,B} = \vec{v}_{A,T} - \vec{v}_{B,T}$

$= 180 - 80$

$\vec{v}_{A,B} = 0$ km

g) Pers gerak kotak relatif prisma $\parallel, \perp$

$\sum \vec{F}_x = m_2 \vec{a}_{2,1}$

$\vec{v}_{12} = \vec{v}_{1,T} + \vec{v}_{T,2}$

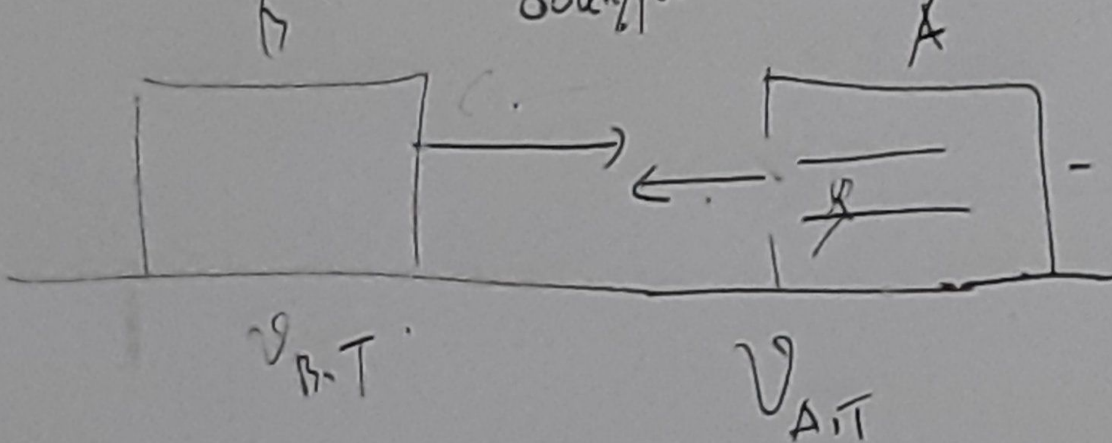
$$\boxed{\vec{v}_{1,2} = \vec{v}_{1,T} - \vec{v}_{2,T}}$$

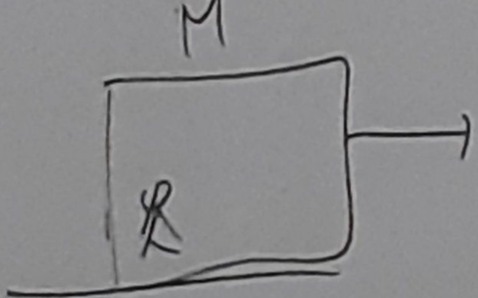
$$\vec{v}_{A,B} = \vec{v}_{A,T} - \vec{v}_{B,T}$$
$$= -80 - 80$$
$$\boxed{v_{A,B} = -160 \text{ km/jr}}$$

gerak relatif

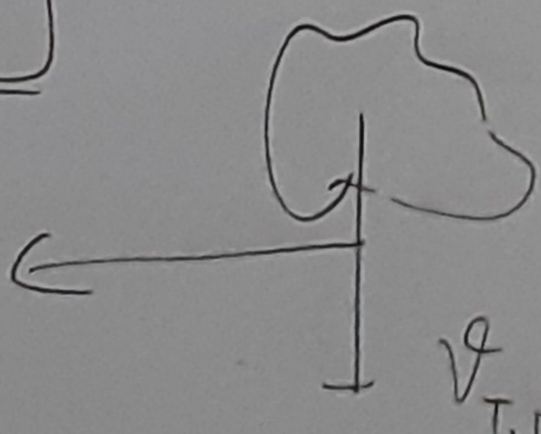
→ Bus → $\vec{v}$ = 80 km/jam

80km/jam





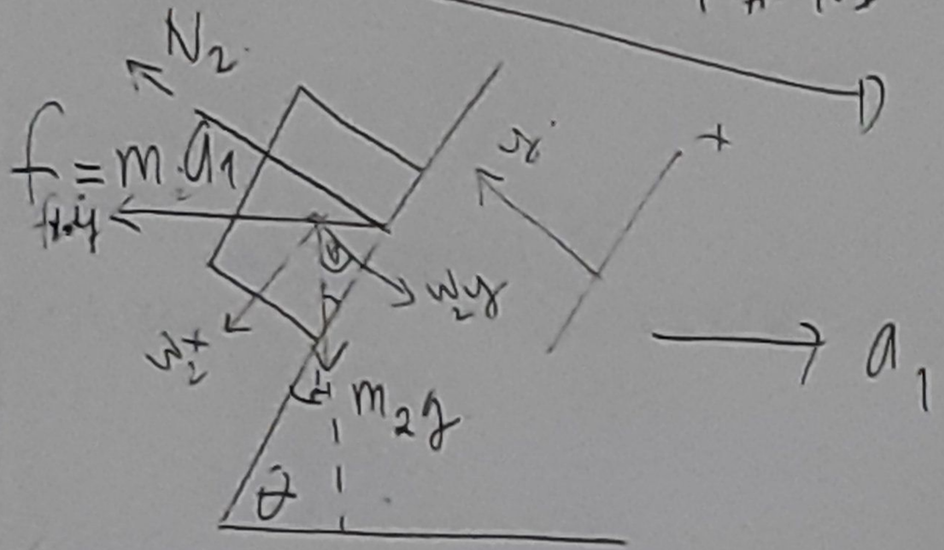
$\vec{v}_{M,T} = +80$ km/jam



$v_{T,M} = -80$ km/jam //

(c) Diagram gaya pd katrol relatif prisma. $\vec{a}_1 \rightarrow$ kanan.

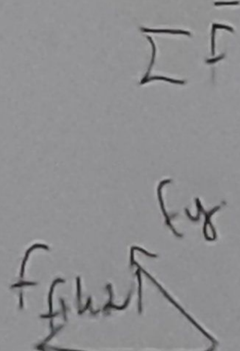
K.A. NI



(g) Pers gerak katrol relatif prisma

• Sejajar bidang Miring

$$\sum \vec{F}_x = m_2 \vec{a}_{2,1}$$



$$W_{2x} + f_{fikt,x} = m_2 \vec{a}_{2,1}$$

$$m_2 g \sin\theta + (m_2 a_1) \cdot \cos\theta = m_2 \vec{a}_{2,1}$$

Prisma bergerak ke kanan
kotak ke kiri

- Tegak lurus bidang miring

$$\Sigma F_y = 0$$

$$N_2 + f_{2,1,y} - W_{2y} = 0$$

$$N_2 + m_2 a_1 \sin\theta - m_2 g \cos\theta = 0 \; ...$$

(4) Percepatan kotak relatif lantai → $\vec{a}_{2,L}$

Percepatan prisma relatif lantai → $\vec{a}_{1,L}$

Percepatan kotak relatif prisma → $\vec{a}_{2,1}$
2 1

- Komponen percepatan sb x

$$\vec{a}_{21} = \vec{a}_{2,L} + \vec{a}_{L,1} = \vec{a}_{2,L} - \vec{a}_{1,L}$$

ke kanan → positif
ke kiri → Negatif

$$\boxed{-\vec{a}_{2,1x} = -\vec{a}_{2,x} - a_1}$$

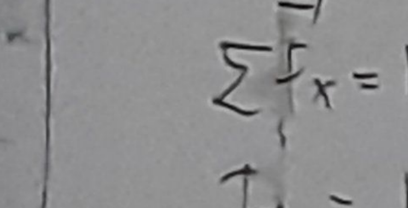
[redacted]

by.

$$\vec{a}_{2,1,y} = \vec{a}_{2y} - 0$$

$$\boxed{\vec{a}_{21,y} = \vec{a}_{2,y}}$$

K.A.1

② 

$$\sum \vec{F}_x = m \cdot \vec{a}_x \qquad \sum \vec{F}_y = 0$$

$$T_x = m \cdot \vec{a} \qquad T_y - mg = 0$$

$$\boxed{T \sin\theta = m \cdot \vec{a}} \qquad \boxed{T \cos\theta = mg}$$

Menurut K.A.2, massa m bisa bergerak karena ada komponen $\boxed{T_x}$.

$\hat{i}$: $N_2 \sin\theta = m_1 a_1$ --- ①

- $N_2 \sin\theta = m_2 a_{2x}$ --- ②
- $m_2 g - N_2 \cos\theta = m_2 a_{2y}$ --- ③
- $\vec{a}_{2y} = \vec{a}_{21,y}$ --- ④

- $\vec{a}_{2x} = \vec{a}_{21,x} - \vec{a}_1$ --- ⑤

- $\tan\theta = \dfrac{\vec{a}_{21,y}}{\vec{a}_{21,x}}$ --- ⑥

Dari pers ④ dan ⑥

$$\vec{a}_{2y} = \vec{a}_{21,x} \tan\theta \quad \text{--- ⑦}$$

Dari pers ⑤ dan ⑦

$$\vec{a}_{21,x} = \vec{a}_{2x} + \vec{a}_1$$

$$\vec{a}_{2y} = (\vec{a}_{2,x} + \vec{a}_1)\tan\theta \quad \text{... (8)}$$

Subs ⑧ ke ③

$$m_2 g - N_2\cos\theta = m_2(\vec{a}_{2,x} + a_1)\tan\theta \quad \text{... (9)}$$

Sub ② ke ⑨

$$m_2 g - N_2\cos\theta = m_2\left(\frac{N_2\sin\theta}{m_2} + \vec{a}_1\right)\tan\theta \quad \text{... (10)}$$

Subs ① ke ⑩

$$m_2 g - \frac{m_1 a_1}{\sin\theta}\cdot\cos\theta = m_2\left(\frac{\frac{m_1 a_1}{\cancel{\sin\theta}}\cdot\cancel{\sin\theta}}{m_2} + a_1\right)\tan\theta$$

$$m_2 g - \frac{m_1 a_1}{\sin\theta}\cdot\cos\theta = m_2\left(\left(\frac{m_1 a_1}{m_2}\right) + a_1\right)\tan$$

$$m_2 g - \frac{m_1 a_1}{\sin\theta}\cos\theta = \cancel{m_2}\left(\left(\frac{m_1 a_1}{\cancel{m_2}}\right) + a_1\right)\tan\theta$$

$$m_2 g - \frac{m_1 a_1 \cos\theta}{\sin\theta} = (m_1 a_1)\tan\theta + m_2$$

$\tan\theta$

$$m_2 g - \frac{m_1 a_1 \cos\theta}{\sin\theta} = m_1 a_1 \tan\theta + m_2 a_1 \tan\theta$$

$$m_2 g = \left(\frac{m_1 \cos\theta}{\sin\theta} + m_1 \tan\theta + m_2 \tan\theta\right) a_1$$

$$a_1 = \frac{m_2 g}{\frac{m_1\cos\theta}{\sin\theta} + m_1\tan\theta + m_2\tan\theta}.$$

$$= \frac{m_2 g}{m_1 \frac{1}{\tan\theta} + m_1\tan\theta + m_2\tan\theta}$$

$=$

(1) $a_1 = \dfrac{m_2 g \cos\theta \sin\theta}{m_1 + m_2 \sin^2\theta}$ ✓

$m_2 g - \dfrac{m_1 a_1}{\sin\theta} \cdot \cos\theta = \cancel{m_2}\left(\left(\dfrac{m_1 a_1}{\cancel{m_2}}\right) + a_1\right)\tan\theta$

(8) $= m_2 g - \dfrac{m_1 a_1 \cdot \cos\theta}{\sin\theta} = (m_1 a_1)\tan\theta + m_2$

$\tan\theta$

$m_2 g - \dfrac{m_1 a_1 \cos\theta}{\sin\theta} = m_1 a_1 \tan\theta + m_2 a_1 \tan\theta$

θ --(9)

$m_2 g = \left(\dfrac{m_1 \cos\theta}{\sin\theta} + m_1 \tan\theta + m_2 \tan\theta\right) a_1$

--(10)

$+ a_1 \Big) \dfrac{1}{\tan\theta}$

$a_1 = \dfrac{m_2 g}{\dfrac{m_1 \cos\theta}{\sin\theta} + m_1 \tan\theta + m_2 \tan\theta}.$

$= \dfrac{m_2 g}{m_1 \dfrac{1}{\tan\theta} + m_1 \tan\theta + m_2 \tan\theta}$ ✓

$=$

$(\times 2)$

$a_1 = $ //

$\rightarrow$ $N_2 \sin\theta = m_1 a_1$ . . . . (1)

$N_2 + m_2 a_1 \sin\theta - m_2 g \cos\theta = 0$. (2)

$N_2 = m_2 g \cos\theta - m_2 a_1 \sin\theta$ . . subs ke (1)

$(m_2 g \cos\theta - m_2 a_1 \sin\theta) \sin\theta = m_1 a_1$

$m_2 g \sin\theta \cos\theta - m_2 a_1 \sin^2\theta = m_1 a_1$

$m_1 a_1 + m_2 a_1 \sin^2\theta = m_2 g \sin\theta \cos\theta$

$$a_1 = \frac{m_2 g \sin\theta \cos\theta}{m_1 + m_2 \sin^2\theta}$$

$\sin 2\theta = 2\sin\theta\cos\theta$

$$\boxed{a_1 = \frac{m_2 g \sin 2\theta}{2m_1 + 2m_2 \sin^2\theta}}$$