Dynamics:

Newton's Law of Motion:

First Law: (Inertial Law)

Inertia, " an object resistance to acceleration " is directly related to its mass.

No unbalanced $\vec{F}_{net}$, no $\vec{a}$ 1) if $\vec{v}_i = 0$, then $\vec{v}_f = 0$

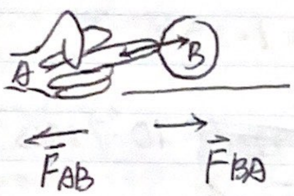
2) if $\vec{v}_i \neq 0$, then $\vec{v}_f \neq 0$ or $\vec{v}_f = \vec{v}_i$

Third Law (Action & Reaction Laws)

To each action, there's an equal but opposite reaction.

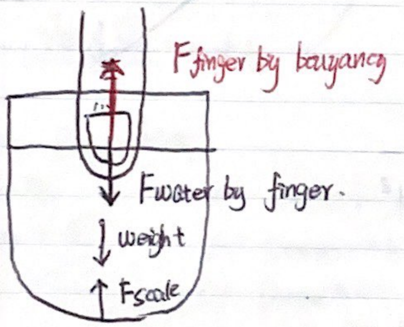
$$\vec{F}_{AB} = -\vec{F}_{BA}$$

on By



$\vec{F}_{AB} + \vec{F}_{BA} = 0$

ex 2.



Second Law:

- Relates: $\vec{F}$, m, $\vec{a}$ relatively.

Two experiments

1) Holding __m__ constant, determine how __$\vec{a}$__ varies with __$\vec{F}$__.
2) Holding __$\vec{F}$__ constant, determine how __$\vec{a}$__ varies with __m__.

from experiment 1) $\vec{a} \propto \vec{F}$
from experiment 2) $\vec{a} \propto \frac{1}{m}$ $\quad \Big\} \quad \vec{a} \propto \frac{\vec{F}}{m}$

$\vec{a} = \frac{\vec{F}}{m}$ $\quad (F = N) \quad N = kgm/s^2$

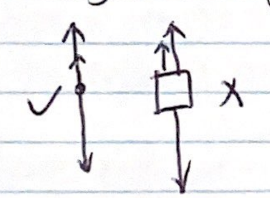
$\vec{F}_{net} = m\vec{a}$
$\hookrightarrow \Sigma \vec{F} = m\vec{a}$

Forces:

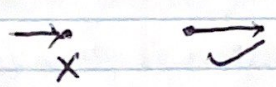
① Strong Nuclear Force. (Force between protons etc)
② Electromagnetic Force
③ Weak Nuclear Force: (binds neutrons, beta decay,
④ Gravitational Force (weakest force, force of attraction between all objects with mass)

Free Body Diagram [FBD]

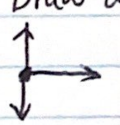
Drawing Free Body Diagram: ① Use dots to represent the object.



② Always use the tail to connect the dot



③ Draw arrows if the object is accelerating.



→ Contact forces:
- Applied force - F_a or F_A
  - A push on an object

- Tension , F_T
  - A pull on an object through a rope or cable

- Normal force , F_N
  - prependicular to two surface in contact
  - a reaction force
  - ' How hard two surfaces are squeezing together.

- Friction , F_f
  - parallel to two surfaces in contact.
  - Opposes relative motion between two surfaces.

- Spring force
  - Return force opposite to the direction you pull a spring

- Action at-a-Distance Forces :
  - Weight or Gravitational Force, W $\cancel{F}$ or F_g
  - Electrostatic or Electric or Coulomb Force F_E
  - Magnetic Force F

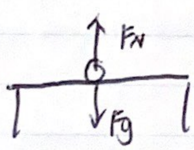
- Whatever Force F + subscript.

① Weight. $W = mg$ $(g = 9.8 m/s^2)$

• Drop an apple, apple also pulls the earth, yet acceleration is much less.

• Force and acceleration are in same direction.

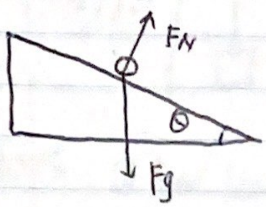
② Normal Force :



In particular situation $F_N = F_g$.

$F_N = mg$

2. Incline dynamics.



$F_N \neq F_g$

Friction: between the contact between two surfaces.
parallel to the surfaces.

- Friction is due to electrostatic attraction between the atoms of objects in contact
- It can speed up, slow down, or turn.

Two kinds of friction: static friction ÷ kinetic friction
- Static friction: there is a range (max) / stops an object from moving.
- kinetic friction: weaker than static friction / can't stop an object.

Friction strength is dependent on how hard the two surfaces are pressed together
the coefficent is μ

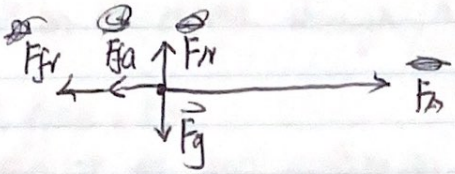
Static coefficient --- μ_s ~ kinetic coefficient --- ~~Tttg~~ μ_K

Static friction formula: $F_N = \mu_s F_N$

kinetic friction: $F_{fK} = \mu_K F_N$ / There is no "maximum F_{fK}".

FBD then second-law

6.



$\sum \vec{F} = m\vec{a}$

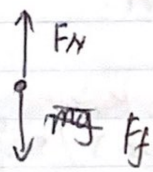
$\vec{F_A} - \vec{F_{fr}} - \vec{F_{fa}} = m\vec{a}$

$\vec{a} = \dfrac{\vec{F_A} - \vec{F_{fr}} - \vec{F_{fa}}}{m} \Rightarrow \vec{a} = \dfrac{(10700 - 2500 - 7.0\times10^3)N}{2500\,kg} = 0.48 m/s^2$

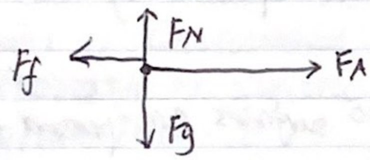
7) $F_f = \mu F_N \quad m = 1500\,kg$

$F_f = \mu W = \mu mg$

~~FA~~ $\mu = \dfrac{F_f}{W}$



9).



$\sum \vec{F} = m\vec{a}$

$\vec{F_A} - \vec{F_f} = m\vec{a}$

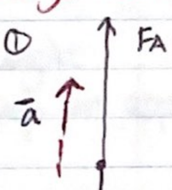
$\vec{F_A} - m\vec{a} = \vec{F_f}$

$140N - 20.0kg \times 5.5 = \vec{F_f}$

$\vec{F_f} = 30 N$

Always remember $\vec{a}$

12) ①



$\sum \vec{F} = m\vec{a}$

$\vec{F_A} - \vec{F_g} = m\vec{a}$

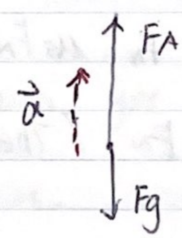
$\vec{F_A} - m\vec{g} = m\vec{a}$

$\vec{a} = \dfrac{\vec{F_A} - m\vec{g}}{m}$

$\therefore \vec{a} = \dfrac{(310{,}000 - 15{,}500\times(9.8))N}{15{,}500\,kg}$

$\therefore \vec{a} = 10.2 m/s$

②



$\sum \vec{F} = m\vec{a}$

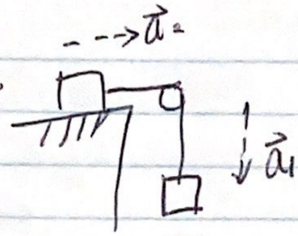
$\vec{F_A} - m\vec{g} = m\vec{a}$

$\vec{a} = \dfrac{\vec{F_A} - m\vec{g}}{m}$

$\vec{a} = \dfrac{310{,}000 - (15{,}500 - 4200)\times 9.8}{(15{,}500 - 4200)\,kg}$

$\therefore \vec{a} = 17.6 m/s$

example



$\vec{a}_2 = \vec{a}_1$

$\bar{a}$ is always positive

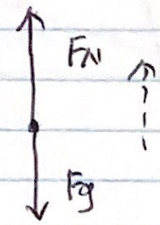
Elevators: ① Feel heavier: ($F_N > W$) (go up, speed up / go down, slow down)

② Feel lighter. ($F_N < W$) (go, up, slow dow / go down, speed up)

spring scale reads for F_N or F_T. (spring scale)
(bathroom scales)

ex A 75 kg man stands on a bathroom scale in an elevator. If the scale reads 920 N, determine acceleration.

Determine feels heavier or lighter. $75 \times 9.8 < 920N$ ∴ heavier. going up.



~~$\Sigma\vec{F} = F_N = F_g$~~

$\cancel{NF}$

$\Sigma\vec{F} = m\vec{a}$

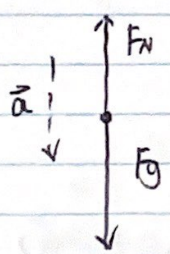
$\vec{F}_N - \vec{F}_g = m\vec{a}$

$\vec{a} = \frac{\vec{F}_N - \vec{F}_g}{m}$ $(m\vec{g})$

$\vec{a} = \frac{920 - 75 \times 9.8}{75kg}$

$\vec{a} = 2.47 m/s$

ex. A 45 kg woman on a scale accelerating down $2.5 m/s^2$. Find the reading on the scale in N, in kg



$\Sigma\vec{F} = m\vec{a}$

$\vec{F}_g - \vec{F}_N = m\vec{a}$

$m\vec{g} - F_N = m\vec{a}$

$m\vec{g} - m\vec{a} = F_N$

$45 \times 9.8 - 45 \times 2.5 = F_N$

$\therefore F_N = 328.5N$

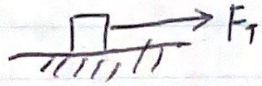
$F_N = mg$

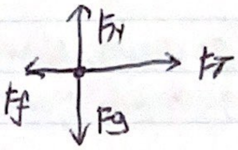
$\therefore m = \frac{F_N}{g}$

$m = \frac{328.5N}{9.8}$

$m = 33.5 kg$

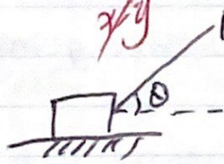
ex $\mu \neq 0$ $\dashrightarrow a$

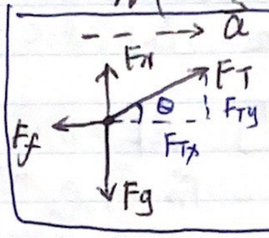




$$\Sigma \vec{F} = m\vec{a}$$
$$\vec{F_T} - \vec{F_f} = m\vec{a}$$
$$\vec{F_T} - \mu F_N = m\vec{a}$$
$$\vec{F_T} - \mu mg = m\vec{a}$$
$$\vec{a} = \frac{\vec{F_T} - \mu mg}{m}$$

ex. $\cancel{x}$





$$F_{Ty} + F_N = F_g$$

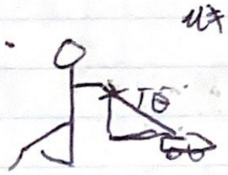
$$\Sigma \vec{F_x} = m\vec{a_x}$$
$$\vec{F_{Tx}} - \vec{F_f} = m\vec{a_x}$$
$$\vec{F_T}\cos\theta - \vec{F_f} = m\vec{a_x}$$
$$\vec{F_T}\cos\theta - \mu F_N = m\vec{a_x}$$

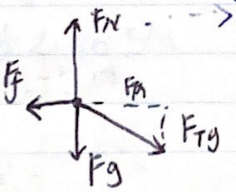
$\cancel{g}$ $g = \Sigma \vec{F_y} = m\vec{a_y}$

$$\vec{F_g} - \vec{F_{Ty}} - F_N = 0$$
$$F_N = W - F_{Ty}$$
$$\boxed{F_N = m\vec{g} - F_T\sin\theta}$$

$$\frac{\vec{F_T}\cos\theta - \mu(m\vec{g} - F_T\sin\theta)}{m} = \vec{a}$$

ex. $\mu \neq 0$





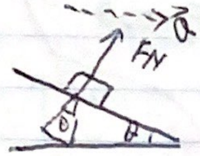
$$\frac{\vec{F_T}\cos\theta - \mu(\vec{F_T}\sin\theta + m\vec{g})}{m} = \vec{a_x}$$

$$\Sigma \vec{F_x} = m\vec{a_x}$$
$$\vec{F_{Tx}} - \vec{F_f} = m\vec{a_x}$$
$$\vec{F_T}\cos\theta - \vec{F_f} = m\vec{a_x}$$
$$\vec{F_T}\cos\theta - \mu\vec{F_N} = m\vec{a_x}$$

$$\Sigma \vec{F_y} = m\vec{a_y}$$
$$\vec{F_{Ty}} + \vec{F_g} - \vec{F_N} = 0$$
$$\vec{F_N} = \vec{F_{Ty}} + \vec{F_g}$$

$$\therefore \frac{\vec{F_T}\cos\theta - \mu(\vec{F_T}\sin\theta + \vec{F_g})}{m} = \vec{a_x}$$

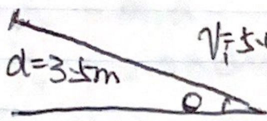
Incline Plane.



$$\boxed{\begin{aligned} F_{g\perp} &= F_g\cos\theta \\ F_{g\parallel} &= F_g\sin\theta \end{aligned}}$$

$$a_{\parallel} = \frac{F_g\sin\theta}{m} = g\sin\theta$$

ex. Kinematics of the inclined plane (no μ) - Determine angle of ramp if a box fired up ramp at 5.0 m/s reaches a distance of 3.5 m.



$\vec{v}_f^2 = \vec{v}_i^2 + 2\vec{a}\vec{d}$

$\therefore \vec{a} = \frac{\vec{v}_f^2 - \vec{v}_i^2}{2\vec{d}}$

$\therefore \vec{a} = \frac{0-(5.0)^2}{2\times 3.5}$

$\therefore \vec{a} = \cancel{2.5\,m/s^2}$ $-3.57\,m/s^2$

$a_{\parallel} = \frac{F_g\sin\theta}{m} = g\sin\theta$

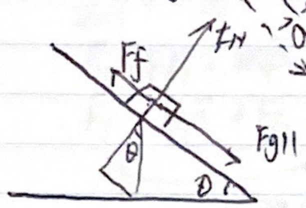
$\therefore \theta = \sin^{-1}\left(\cancel{\frac{g}{a_{\parallel}}}\right)\left(\frac{a_{\parallel}}{g}\right)$ 3.57

$\therefore \theta = \sin^{-1}\left(\cancel{\frac{9.8}{2.0}}\right)\left(\frac{3.57}{9.8}\right)$

$\therefore \theta = \cancel{24.1}°$ 21.4°

一, ∥/⊥ sliding down

ex. with friction



① ∥ $\sum\vec{F}_{\parallel} = m\vec{a}_{\parallel}$

$F_{g\parallel} - F_f = m\vec{a}_{\parallel}$

$F_g\sin\theta - \mu F_N = m\vec{a}_{\parallel}$

② ⊥ $\sum\vec{F}_{\perp} = m\vec{a}_{\perp}$

$F_{g\perp} = F_N$

$F_g\cos\theta = F_N$

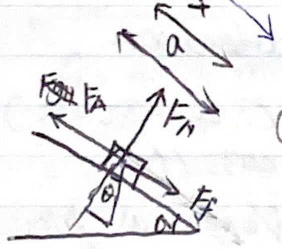
$F_g\sin\theta - \mu(F_g\cos\theta) = m\vec{a}_{\parallel}$

$\cancel{m}\vec{g}\sin\theta - \mu\cancel{m}\vec{g}\cos\theta = \cancel{m}\vec{a}_{\parallel}$

$\boxed{\vec{g}\sin\theta - \mu\vec{g}\cos\theta = \vec{a}_{\parallel}}$

or $\vec{g}(\sin\theta - \mu\cos\theta) = \vec{a}_{\parallel}$

二,



① $\sum\vec{F}_{\parallel} = m\vec{a}_{\parallel}$

$\vec{F}_f + \vec{F}_{g\parallel} - \vec{F}_A = m\vec{a}_{\parallel}$

$\mu\vec{F}_N + \vec{F}_g\sin\theta - \vec{F}_A = m\vec{a}_{\parallel}$

② $\sum\vec{F}_{\perp} = m\vec{a}_{\perp}$

$\vec{F}_{g\perp} - \vec{F}_N = 0$

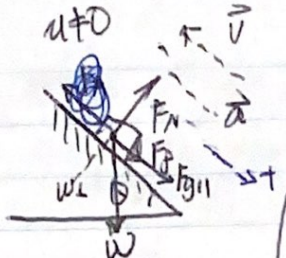
$\vec{F}_{g\perp} = \vec{F}_N$

$\vec{F}_g\cos\theta = \vec{F}_N$

$\frac{\mu(F_g\cos\theta) + \vec{F}_g\sin\theta - \vec{F}_A}{m} = \vec{a}_{\parallel}$

$\hookrightarrow \frac{\mu(m\vec{g}\cos\theta) + m\vec{g}\sin\theta - \vec{F}_A}{m} = \vec{a}_{\parallel}$

Guess



$\Sigma \vec{F}_{\parallel} = m\vec{a}$

$\vec{F}_A - \vec{F}_f - F_{g\parallel} = m\vec{a}_{\parallel}$

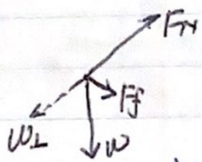
$\vec{F}_A - \mu F_N - F_g \sin\theta = m\vec{a}_{\parallel}$

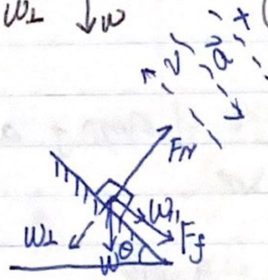
$\vec{F}_A - \mu mg\cos\theta - mg\sin\theta = m\vec{a}_{\parallel}$

$\Sigma \vec{F}_{\perp} = m\vec{a}$

$\vec{F}_{N\perp} = F_g \cos\theta$

$\dfrac{\vec{F}_A - \mu mg\cos\theta - mg\sin\theta}{m} = \vec{a}_{\parallel}$





$\Sigma \vec{F}_{\parallel} = m\vec{a}_{\parallel}$

$F_f + w_{\parallel} = m\vec{a}$

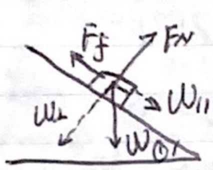
$\mu F_N + mg\sin\theta = m\vec{a}$

$\mu \overset{mg}{\cos\theta} + mg\sin\theta = m\vec{a}$

$\boxed{\mu g\cos\theta + g\sin\theta = \vec{a}}$

$F_N = w_\perp = w\cos\theta$

$a = 0$



$\theta = 15.4°$

$\Sigma \vec{F} = \cancel{m\vec{a}}^{\,0}$

$\vec{F}_f - w_{\parallel} = 0$

$\therefore \vec{F}_f = w_{\parallel}$

$\vec{F}_f = w\sin\theta$

$\mu F_N = mg\sin\theta$

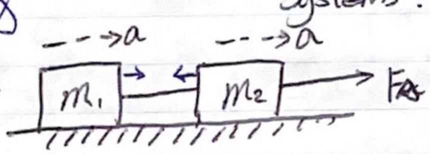
$\mu mg\cos\theta = mg\sin\theta$

$\therefore \mu\cos\theta = \sin\theta$

$\therefore \mu = \dfrac{\sin\theta}{\cos\theta} = \tan\theta \quad \therefore \theta = 0.28$

Systems: Two or more masses acceleration.

ex.



string: doesn't stretch ($\therefore a_1 = a_2 = a$)

doesn't have mass (0)

Has no internal/external friction ($\Rightarrow \vec{a}$)

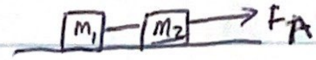
绳子上的力处处相等

pulleys: Frictionless

no mass

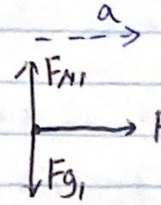
② $\mu \neq 0$

$\mu = 0$ $\quad \vec{a}_1 = \vec{a}_2 = \vec{a}$



① Method one: Two FBD ~~and~~ in isolation.

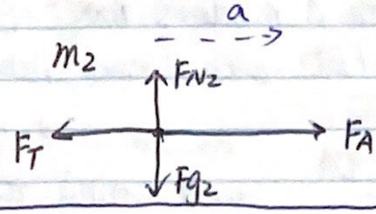
m_1



$\Sigma\vec{F} = m\vec{a}$

① $\vec{F}_T = m_1\vec{a}$

m_2



$\Sigma\vec{F} = m\vec{a}$

② $\vec{F}_A - \vec{F}_T = m_2\vec{a}$

put ① in ② $\quad \vec{F}_A - m_1\vec{a} = m_2\vec{a}$

$\boxed{\dfrac{F_A}{m_1+m_2} = \vec{a}}$

① Acceleration $\quad \dfrac{F_A}{m_1+m_2} = \dfrac{45N}{2.0+1.0kg} = 15 m/s^2$

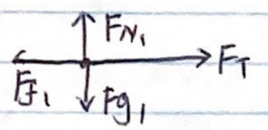
② Determine tension in the string.

$\vec{F}_T = m_1\vec{a}$

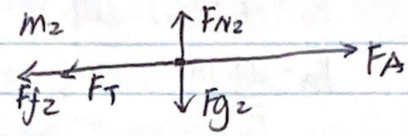
$\vec{F}_T = 2.0 \times 15 m/s^2 = 30N$

② $\mu \neq 0$ $\quad \vec{a}$ is the same

m_1



m_2



$\Sigma\vec{F} = m\vec{a}$

$\vec{F}_T - F_{f1} = m\vec{a}$

$\vec{F}_T = m_1\vec{a} + F_{f1}$

$\Sigma\vec{F} = m\vec{a}$

$\vec{F}_A - \vec{F}_{f2} - \vec{F}_T = m\vec{a}$

$\vec{F}_A - \vec{F}_{f2} - m\vec{a} - \vec{F}_{f1} = m_2\vec{a}$

$\vec{F}_A - \mu F_{N2} - m_1\vec{a} - \mu F_{N1} = m_2\vec{a}$

$\vec{F}_A - \mu F_{N2} - \mu F_{N1} = \vec{a}(m_2+m_1)$

$\dfrac{\vec{F}_A - \mu(F_{N2}+F_{N1})}{m_2+m_1} = \vec{a}$

$\therefore \dfrac{\vec{F}_A - \mu(m_2 g + m_1 g)}{m_2+m_1} = \vec{a}$

$\therefore \dfrac{\vec{F}_A - \mu g(m_2+m_1)}{m_2+m_1} = \vec{a}$

$F_A = 45N$ $\quad m_1 = 2.0kg$, $m_2 = 1.0kg$,

$\mu = 0.10$

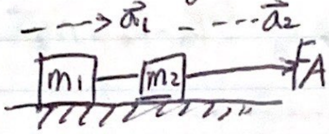
$\vec{a} = \dfrac{\vec{F}_A - \mu g(m_1+m_2)}{m_1+m_2}$

$= \dfrac{45N - 0.1 \times 9.8(2.0+1.0)}{2.0+1.0}$

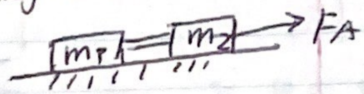
$= 14.02 \, m/s^2$

Method 2: Converting system into one "object".

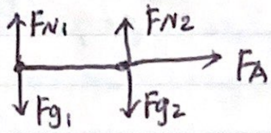
- Align the $\vec{a}$s
- Replace the string with a massless rod.
- Draw a modified FBD with distinct mass nodes.



as are lined up, therefore done "$\longrightarrow \vec{a}$"
turn string to rod

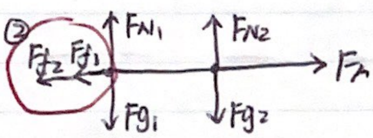


① FBD $\dashrightarrow \vec{a}$ (without friction)



$$\Sigma \vec{F} = m\vec{a}$$
$$\vec{F}_A = (m_1+m_2)\vec{a}$$
$$\frac{\vec{F}_A}{m_1+m_2} = \vec{a}$$

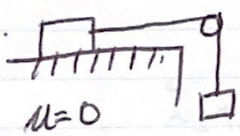
②



$$\Sigma \vec{F} = m\vec{a}$$
$$\vec{F}_A - (F_{f1}+F_{f2}) = (m_1+m_2)\vec{a}$$
$$\vec{F}_A - \mu g(m_1+m_2) = (m_1+m_2)\vec{a}$$
$$\therefore \frac{\vec{F}_A - \mu g(m_1+m_2)}{m_1+m_2} = \vec{a}$$

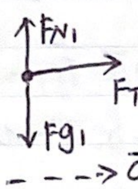
---

ex.



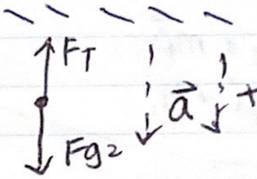
$\mu = 0$

m_1



$\dashrightarrow \vec{a}$

m_2

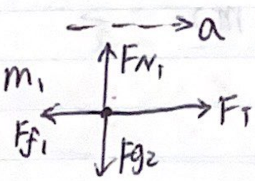


$$\Sigma \vec{F} = m\vec{a}$$
$$\vec{F}_T = m_1\vec{a}$$

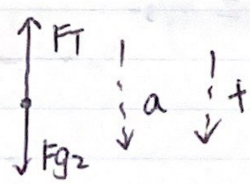
$$\Sigma \vec{F} = m_2\vec{a}$$
$$F_{g2} - F_T \quad F_{g2} = m_2\vec{a}$$

$$\therefore F_{g2} - m_1\vec{a} = m_2\vec{a}$$
$$\therefore \vec{a} = \frac{F_{g2}}{m_2+m_1} = \frac{m_2 g}{m_2+m_1}$$

$\mu \neq 0$ m_1



m_2



$\Sigma\vec{F} = m\vec{a}$

$\vec{F}_T - \vec{F}_{f_1} = m_1\vec{a}$

$\Sigma F = m_2\vec{a}$

$F_{g_2} - F_T = m_2\vec{a}$

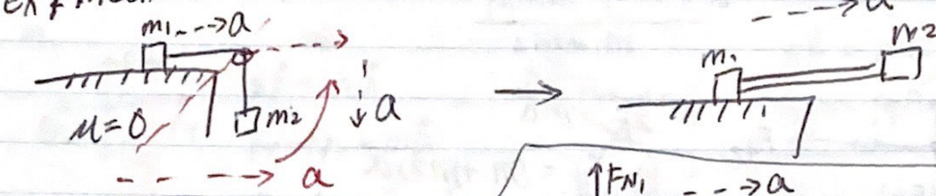
$\therefore F_{g_2} - m_1\vec{a} - \vec{F}_{f_1} = m_2\vec{a}$

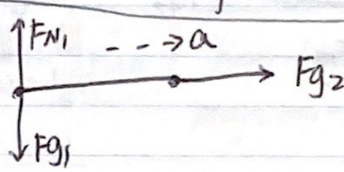
$\therefore m_2 g - m_1\vec{a} - \mu m_1 g = m_2\vec{a}$

$\therefore m_2 g - \mu m_1 g = \vec{a}(m_2 + m_1)$

$\therefore \vec{a} = \dfrac{g(m_2 - \mu m_1)}{m_2 + m_1}$

ex method 2.



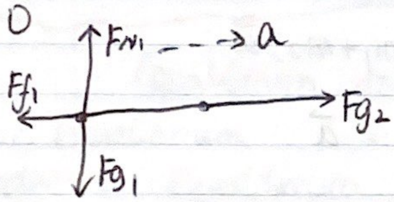


$\Sigma\vec{F} = m\vec{a}$

$\vec{F}_{g_2} = (m_1 + m_2)\vec{a}$

$\therefore \vec{a} = \dfrac{m g_2}{m_1 + m_2}$

$\mu \neq 0$



$\Sigma\vec{F} = m\vec{a}$

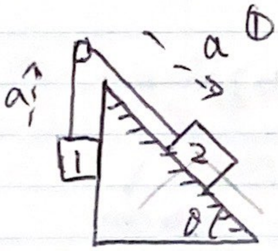
$\vec{F}_{g_2} - \vec{F}_{f_1} = (m_1 + m_2)\vec{a}$

$m_2 g - \mu m_1 \vec{g} = (m_1 + m_2)\vec{a}$

$\therefore \vec{a} = \dfrac{g(m_2 - \mu m_1)}{m_1 + m_2}$

Method 3: Guess and checking.

① $\vec{a} = f(m_1, m_2, g, \theta)$

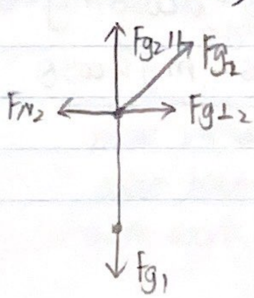


$\mu = 0$

ex. $m_2 = 2.0\,kg$

$m_1 = 1.0\,kg$

$\theta = 42°$



$\Sigma\vec{F} = m\vec{a}$

$F_{g_2\parallel} - F_{g_1} = (m_1 + m_2)\vec{a}$

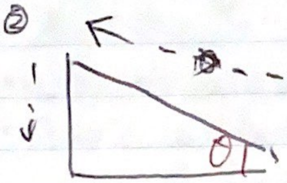
$F_{g_2}\sin\theta - m g_1 = (m_1 + m_2)\vec{a}$

$m g_2 \sin\theta - m g_1 = (m_1 + m_2)\vec{a}$

$g(m_2\sin\theta - m_1) = (m_1 + m_2)\vec{a}$

$\dfrac{g(m_2\sin\theta - m_1)}{m_1 + m_2} = \vec{a}$

②



$$\frac{m_1 g - m_2 g\sin\theta}{m_1+m_2} = \vec{a}$$ / difference by -1.

plug in numbers.

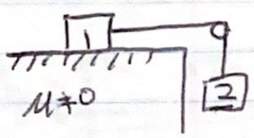
$$\frac{1\times 9.8 - 2.0\times 9.8\times \sin 42°}{3} = \vec{a}$$

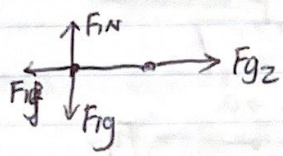
$$\vec{a} = -1.105\, m/s^2$$

since $\vec{a}$ is negative, therefore the m_2 is down the ramp.

---

① ① $\mu \neq 0$ formula: $\vec{a} = \dfrac{m_2 g - \mu m_1 g}{m_1+m_2}$





$\Sigma\vec{F} = m\vec{a}$

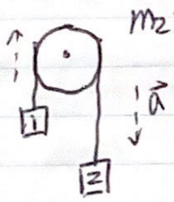
$Fg_2 - F_f = (m_1+m_2)\vec{a}$

$mg - \mu m_1 g = (m_1+m_2)\vec{a}$

$\dfrac{m_2 g - \mu m_1 g}{m_1+m_2} = \vec{a}$

② ② $\mu \neq 0$, formula = $\dfrac{m_1 g - m_2 g}{m_1+m_2}$

$m_2 > m_1$

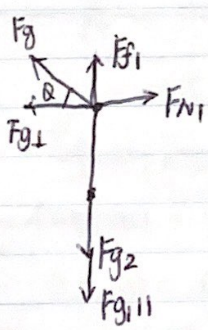


$\Sigma\vec{F} = m\vec{a}$

$Fg_2 - Fg_1 = (m_1+m_2)\vec{a}$

$\dfrac{m_2 g - m_1 g}{m_1+m_2} = \vec{a}$

③ ③ $\mu \neq 0$ $\vec{a} = \dfrac{m_2 g + m_1 g\sin\theta - \mu m_1 g\cos\theta}{m_1+m_2}$



$\Sigma\vec{F} = m\vec{a}$

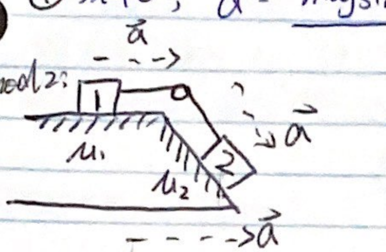
$Fg_2 + Fg_{1\parallel} - F_{f_1} = (m_1+m_2)\vec{a}$

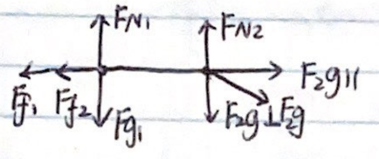
$m_2 g + m_1 g\sin\theta - \mu\cos\theta\, m_1 g = (m_1+m_2)\vec{a}$

$\dfrac{m_2 g + m_1 g\sin\theta - m_1 g\mu\cos\theta}{m_1+m_2} = \vec{a}$

④ $\mu \neq 0$, $\vec{a} = \dfrac{m_2 g \sin\theta - \mu_2 m_2 g \cos\theta - \mu_1 m_1 g}{m_1 + m_2}$

method 2:





$\Sigma \vec{F} = m\vec{a}$

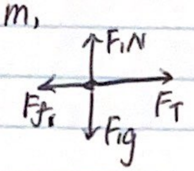
$F_{2g\parallel} - \vec{F}_{f_1} - \vec{F}_{f_2} = (m_1 + m_2)\vec{a}$

$m_2 \vec{g} \sin\theta - \mu_1 m_1 \vec{g} - \mu_2 m_2 g \cos\theta = (m_1 + m_2)\vec{a}$

$\dfrac{m_2 \vec{g} \sin\theta - \mu_1 m_1 g - \mu_2 m_2 g \cos\theta}{m_1 + m_2} = \vec{a}$

method 1:

m_1

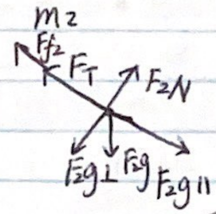


$\Sigma \vec{F} = m\vec{a}$

$F_T - F_{f_1} = m\vec{a}$

$F_T = m_1\vec{a} + F_{f_1}$

m_2



$\Sigma \vec{F} = m\vec{a}$

$F_{2g\parallel} - F_T - F_{f_2} = m\vec{a}$

$F_{2g\parallel} - (m_1\vec{a} + F_{f_1}) - F_{f_2} = m_2\vec{a}$

$m_2 g \sin\theta - \mu_1 m_1 g - \mu_2 m_2 g \cos\theta = (m_1 + m_2)\vec{a}$

$\dfrac{m_2 g \sin\theta - \mu_1 m_1 g - \mu_2 m_2 g \cos\theta}{m_1 + m_2} = \vec{a}$

Equalibrium dynamics. / not accelerating

① Static Equalibrium

T: Translational Equalibrium

$\Sigma \vec{F} = 0$

R: Rotational Equalibrium

$\Sigma \tau = 0$

ex.

FBD where forces meet.

$\theta_1 = 50°$

$\theta_2 = 30°$

What is F_{T_1} / T_{T_2}

more vertical cable having more work.