Moments "levers"

Turning effect of a force

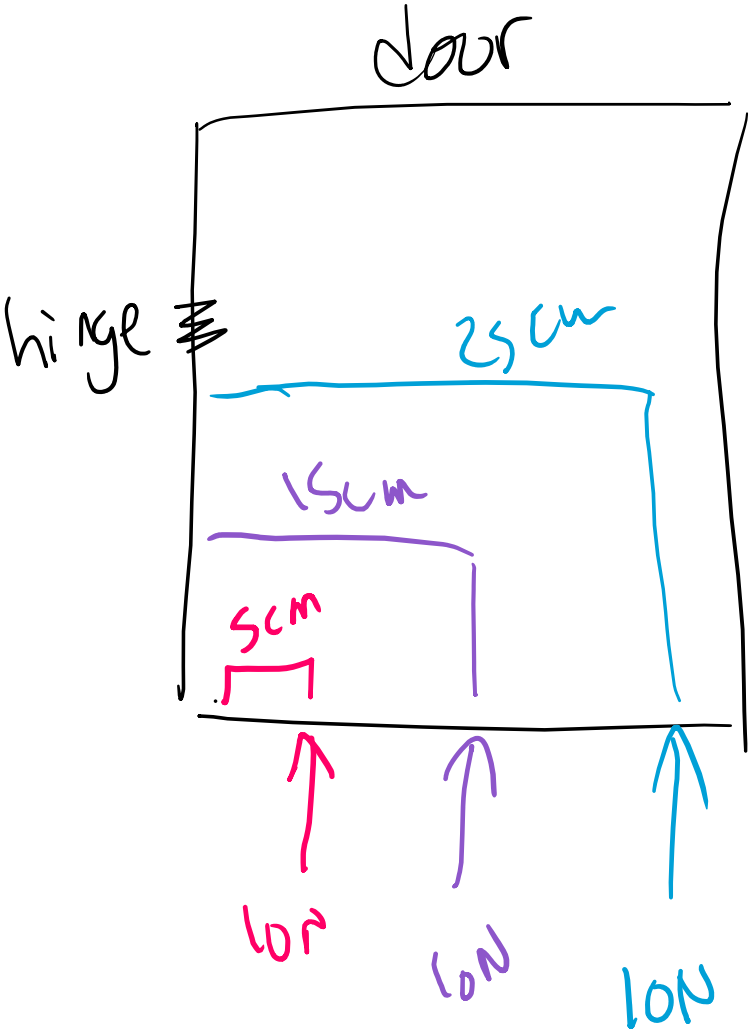
"torque" "power"

using the distance between the force & the fixed point.

to multiply the effect of the force

$$m = f \times d$$

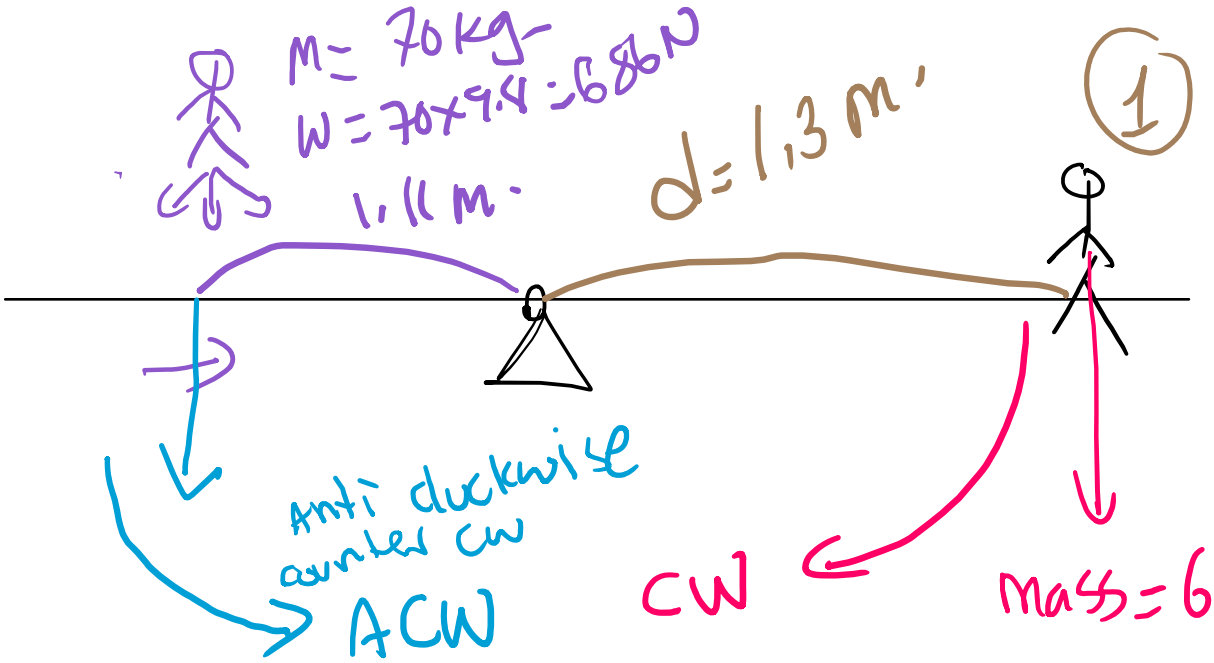
perpendicular distance



$M_1 = 10 \times 0.05 = 0.5$ Nm

$M_2 = 10 \times 0.15 = 1.5$ Nm

$M_3 = 10 \times 0.25 = 2.5$ Nm



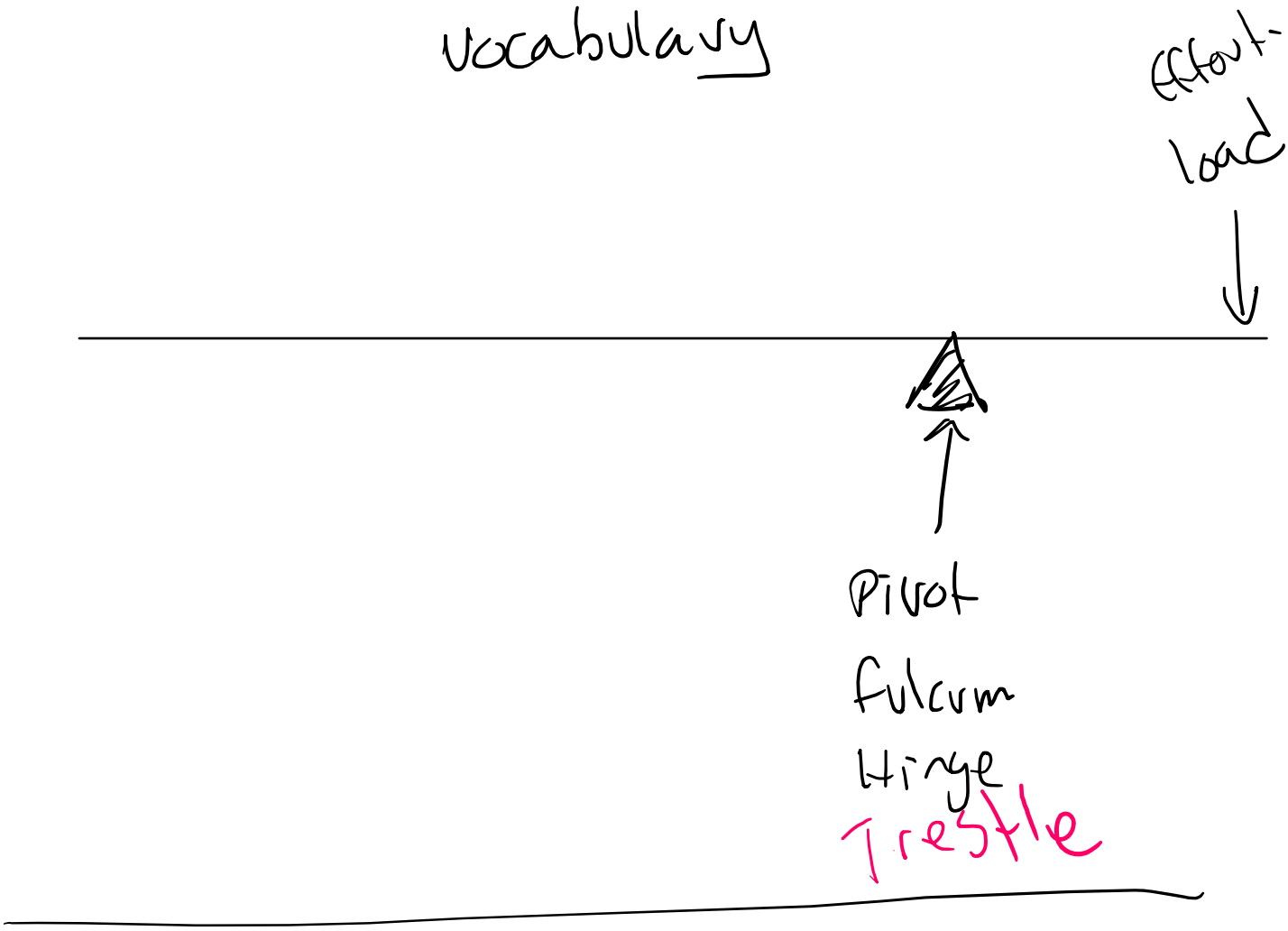
moment$_1$ = 588 x 1.3 = 764.4 Nm

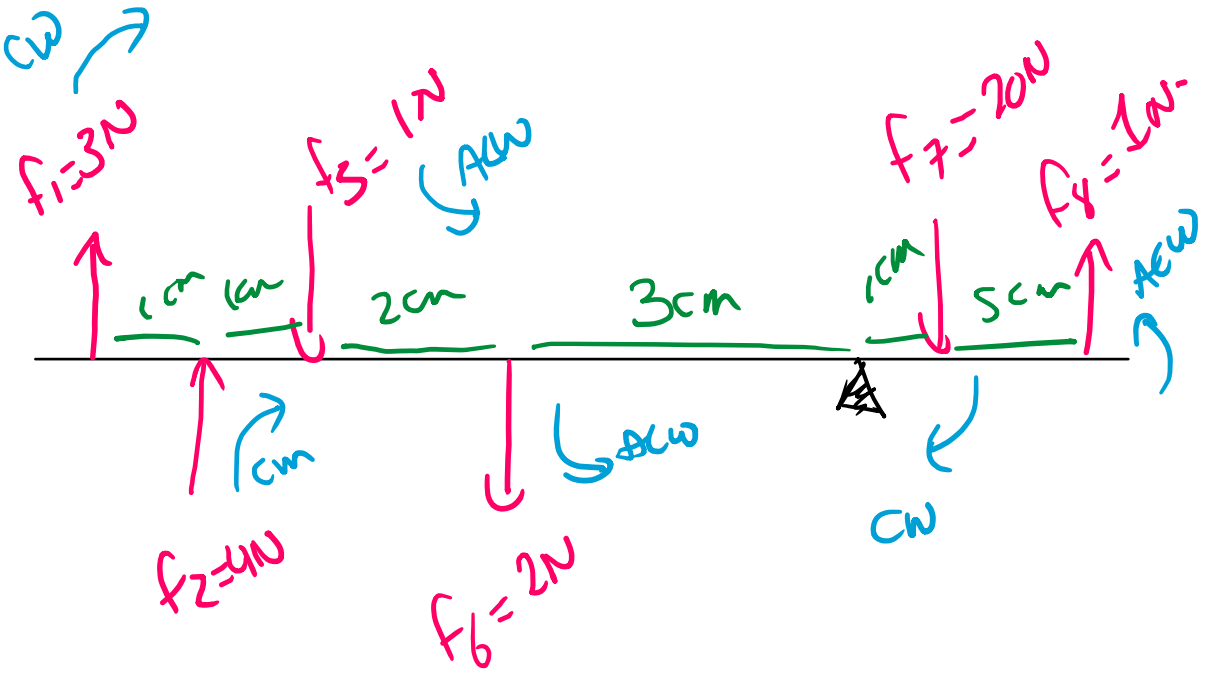
moment$_2$ = F x d = 686 x d

764.4 = 686 d d = 1.11 m

for equilibrium:

total CW moments = total ACW moments


vocabulary
effort
load
Pivot
fulcrum
Hinge
Trestle



If in equilibrium then total CW = total ACW

CW

$(3 \times 7) + (4 \times 6) + (20 \times 1) = 65$ Nm

ACW

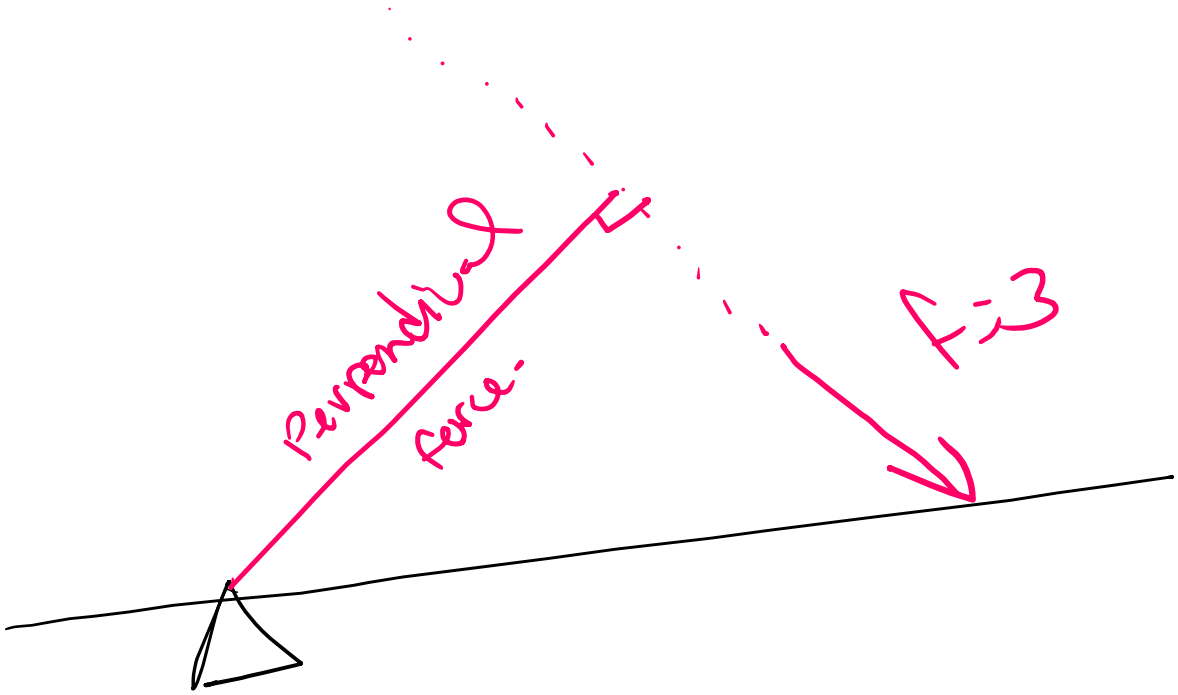
$(1 \times 5) + (2 \times 3) + (1 \times 6) = 17$ Nm

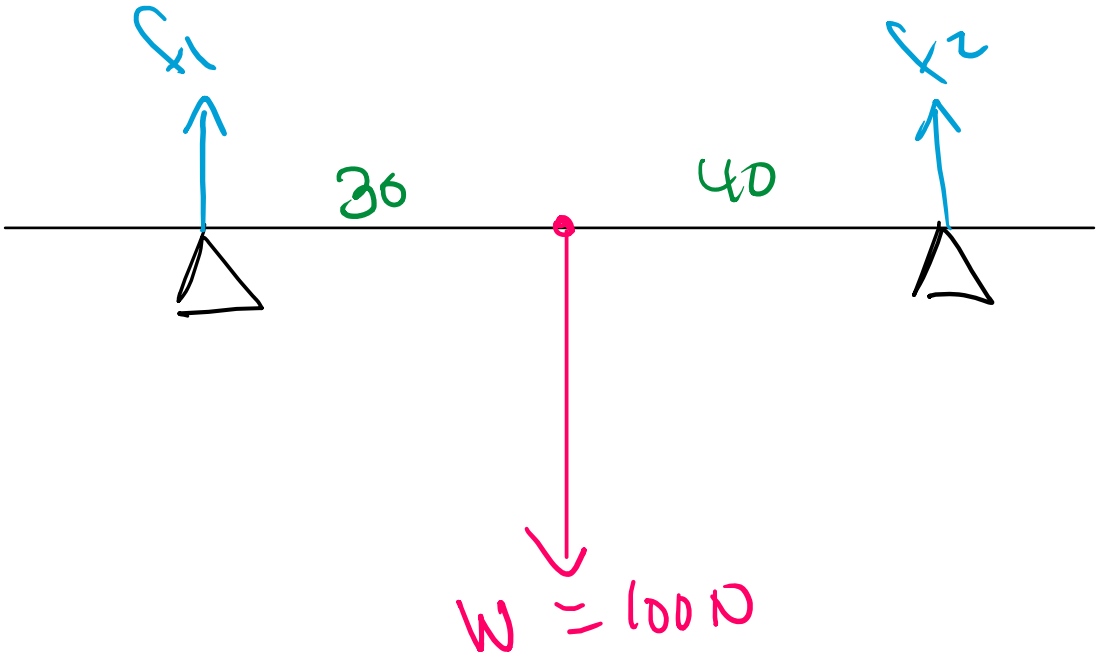
Not in equilibrium.

the seesaw will rotate

in CW direction

with a moment = 65 − 17 = 48 Nm



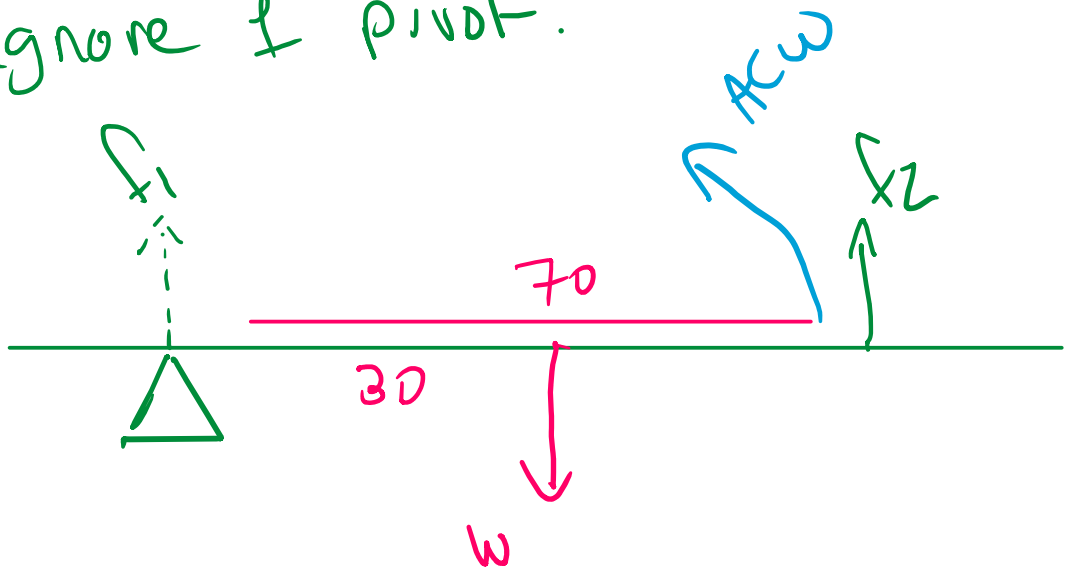


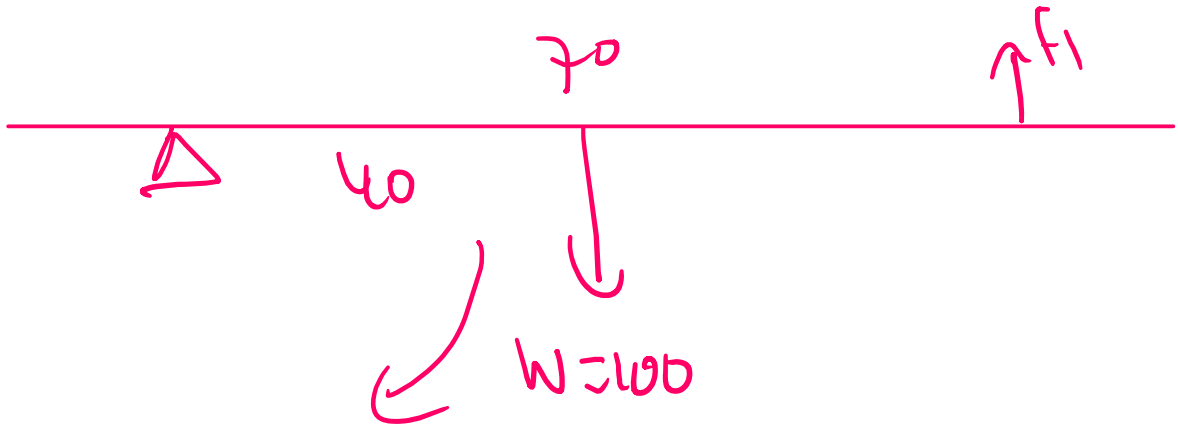
* $F_1 + F_2 =$ weight

$F_1 + F_2 = 100$

$F = 100 - F_2$

* ignore the pivot.





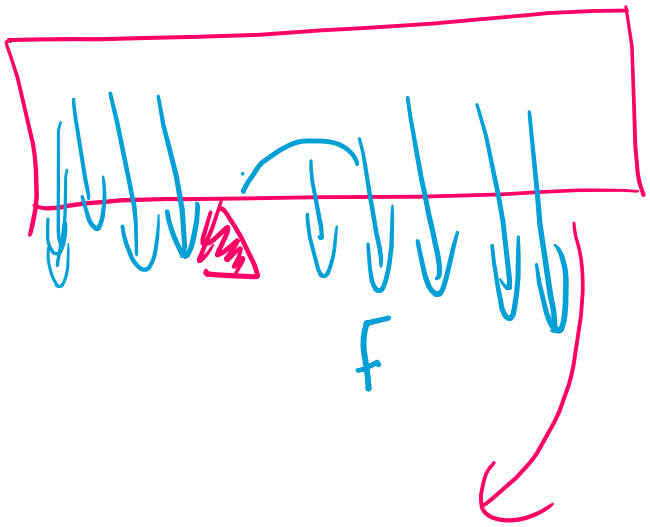
total cw = total Acw

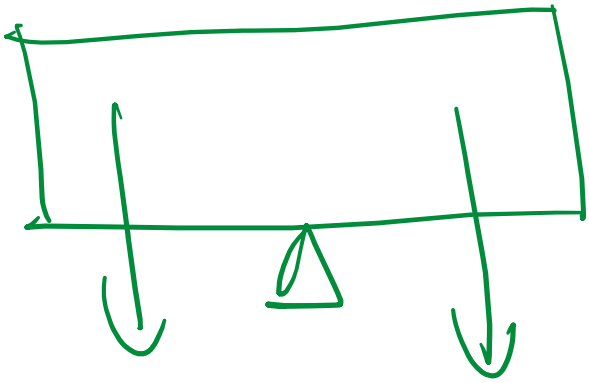
$100 \times 40 = f_1 \times 70$

$f_1 = \frac{100 \times 40}{70} = 57.14\ N$

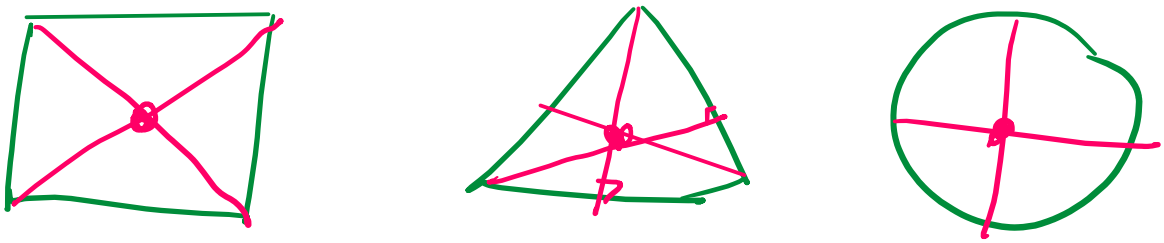
$f_2 = 100 - f_1 = 42.8\ N$

Center of mass



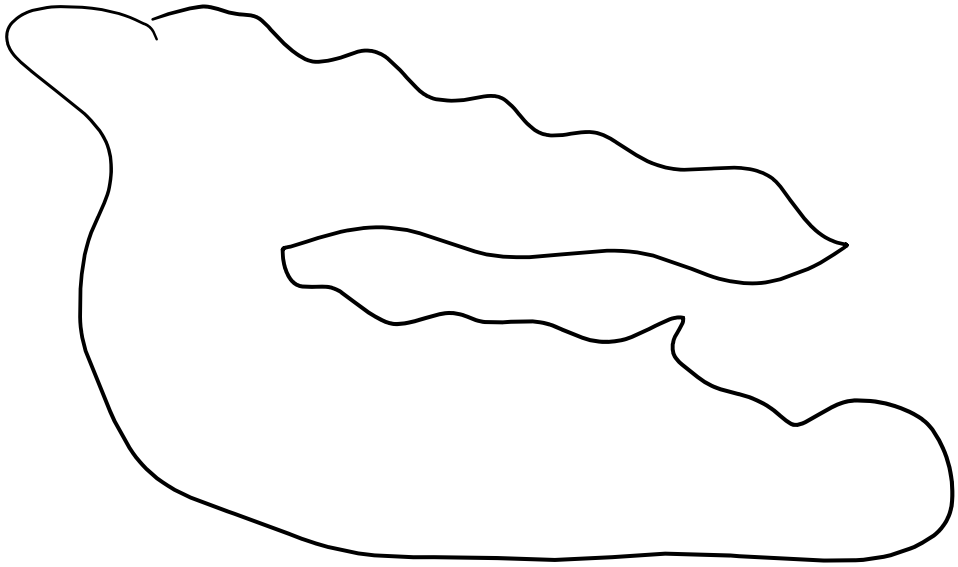


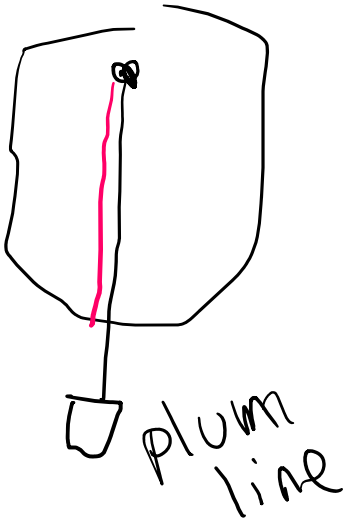
Moment 1 = Moment 2

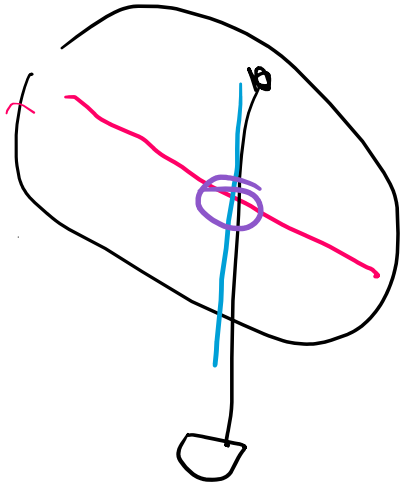


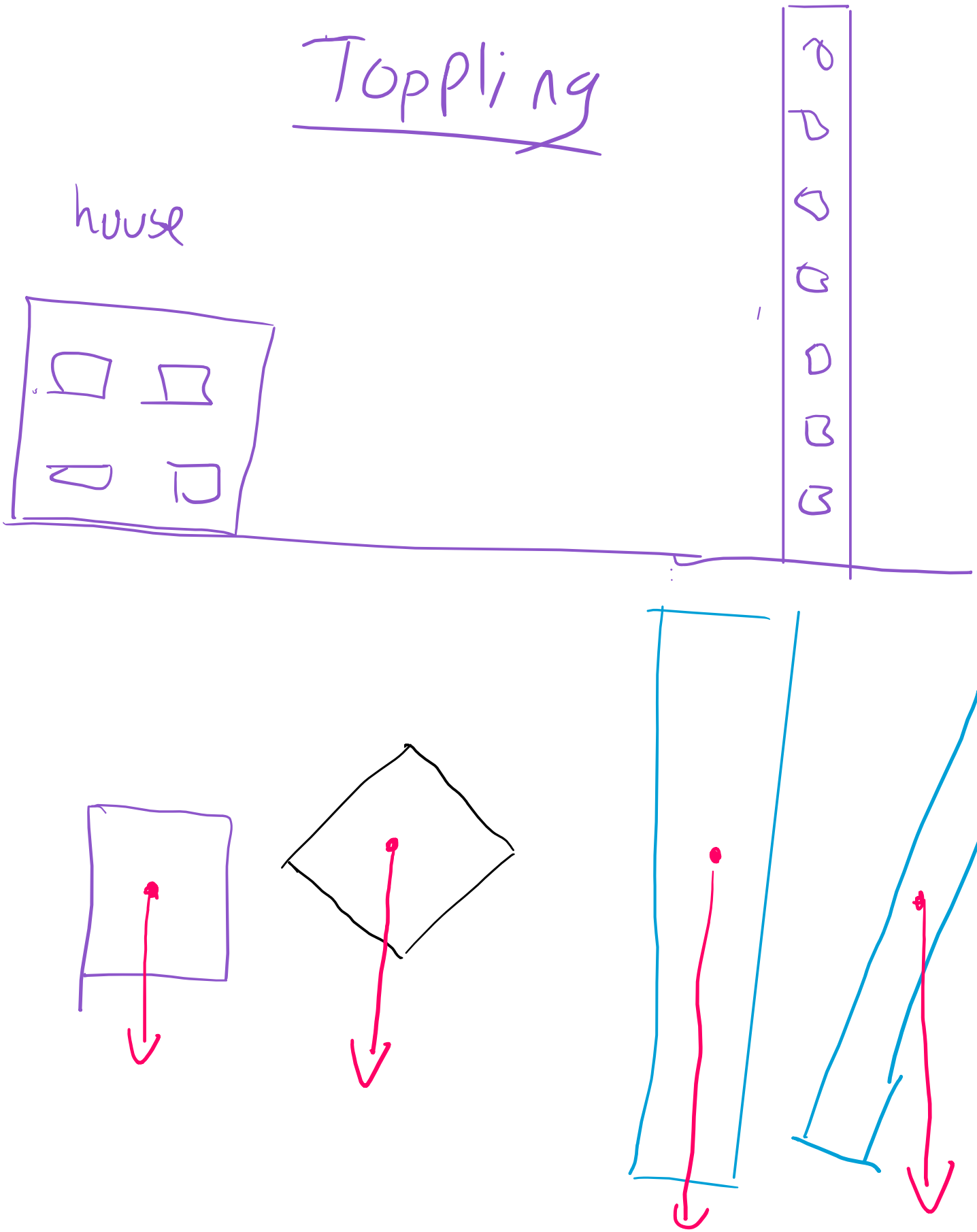
Regular Shape

Irregular









To increase stability

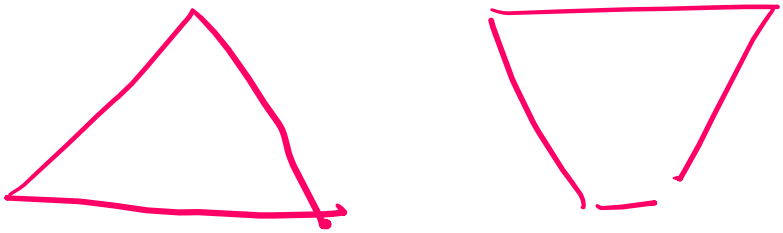
(1) Lower center of mass

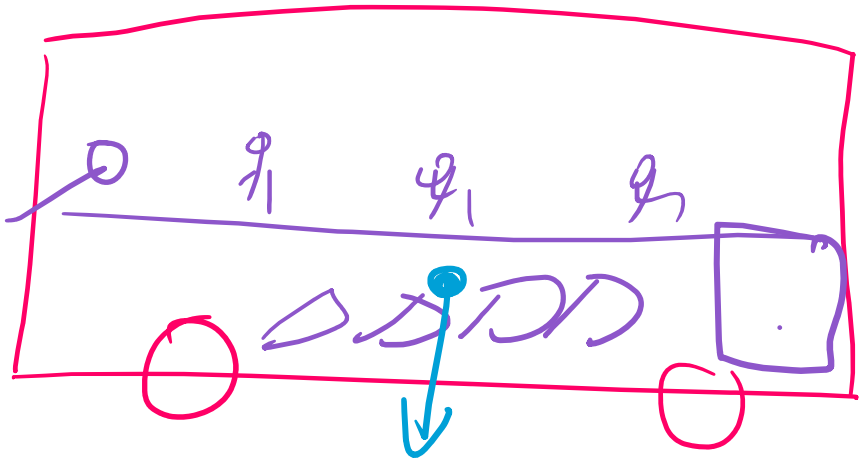
⇒ move mass lower

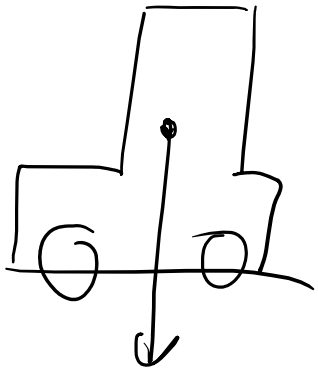
or

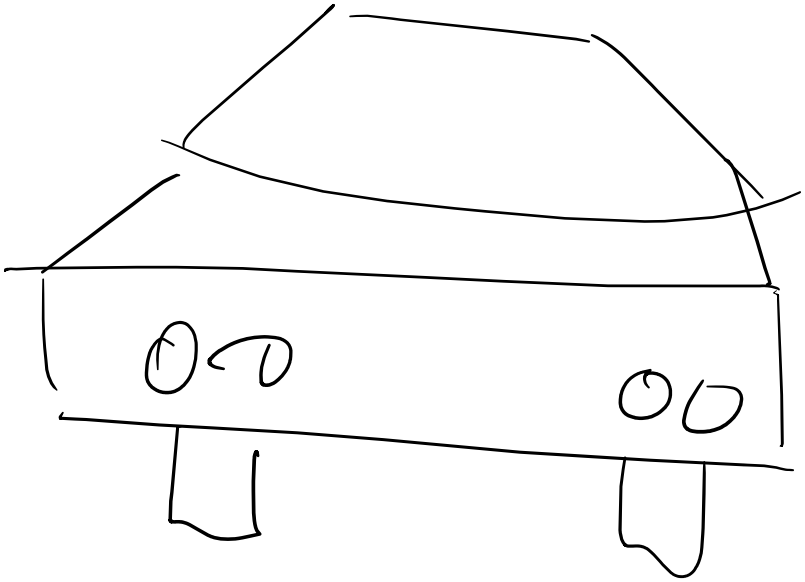
⇒ increase mass

(2) wider base.



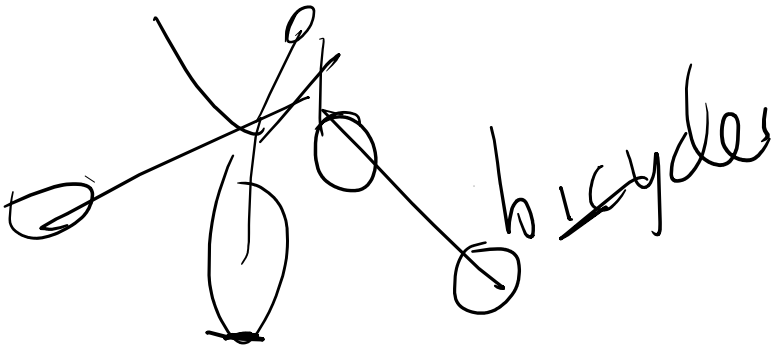




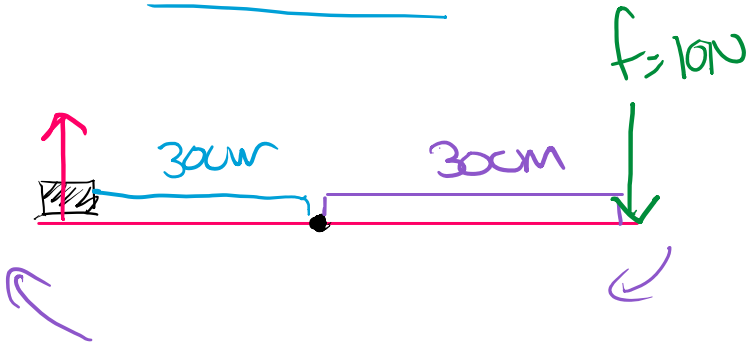


wide

more stable.



Gears



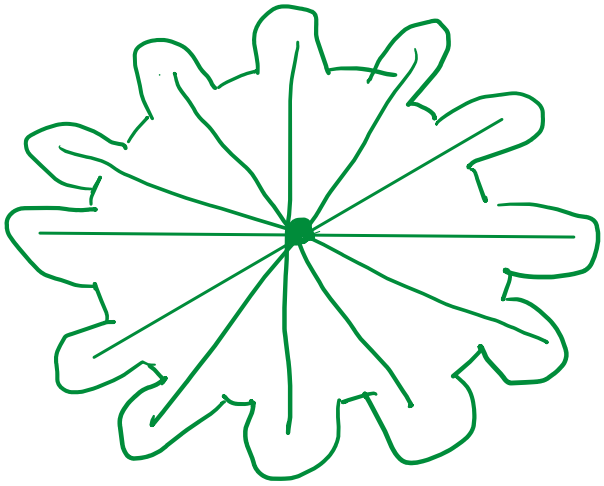
$m_1 = m_2$

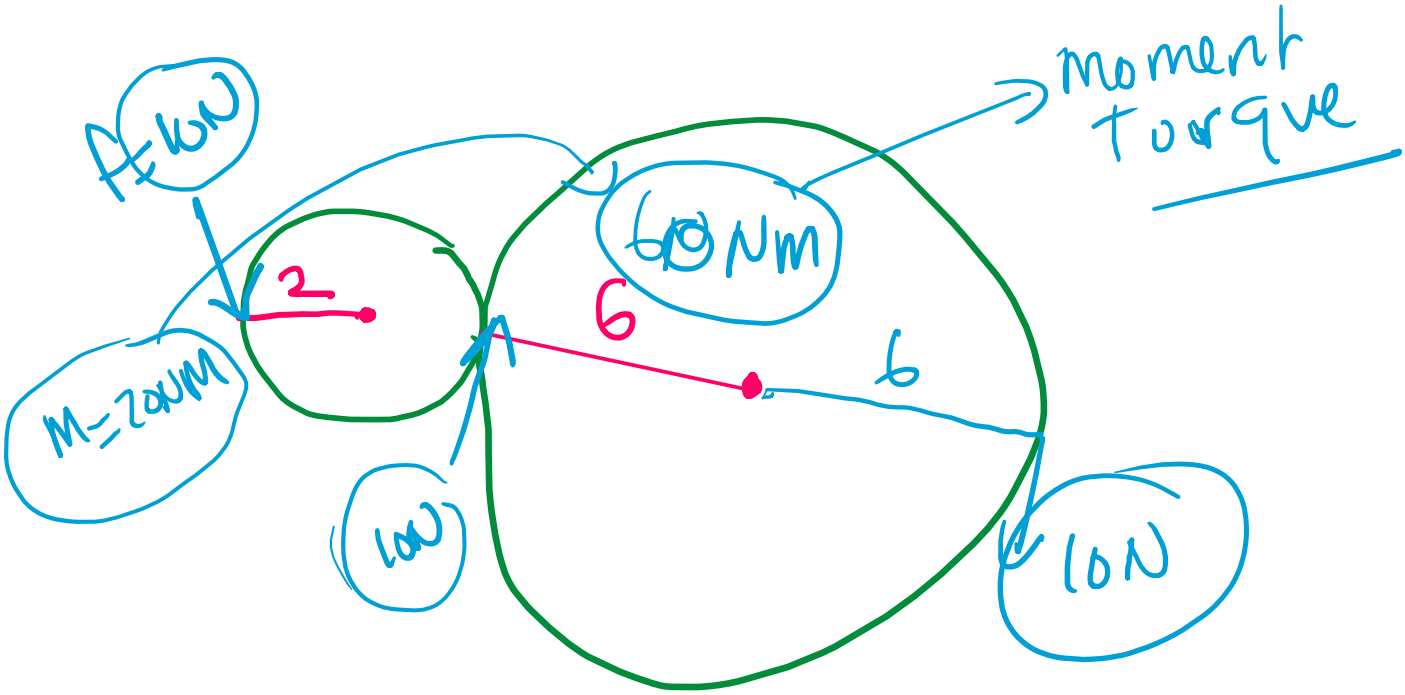
$m_2 = f \times d$

$300 = f \times 30$

$10N$

$m_1 = f \times d = 10 \times 30 = 300$



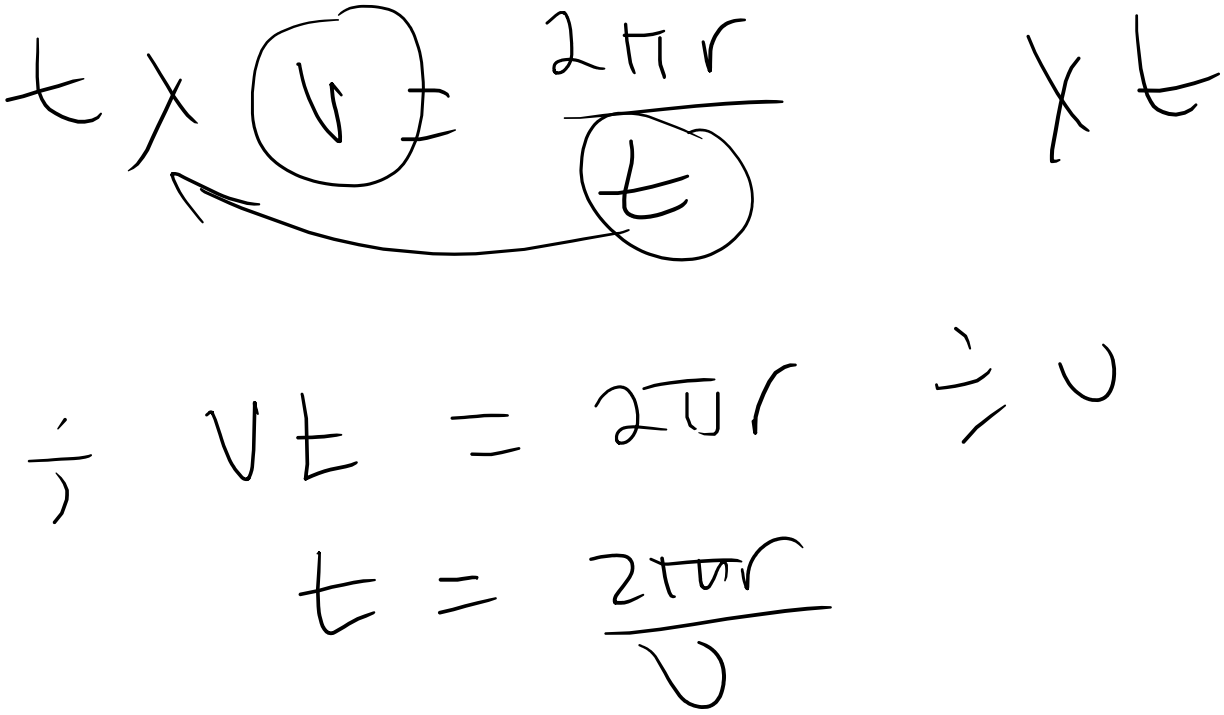


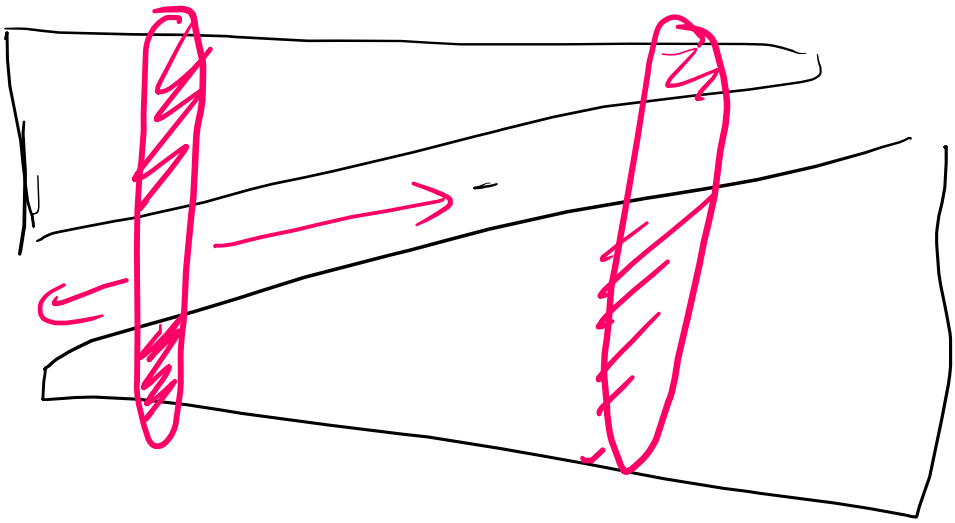
Speed

$$\text{Gear 1} = \frac{2\pi r}{t} = \frac{4 \times 3.14}{1} = 12 \text{ m/s}$$

$$12 = \frac{2 \times \pi \times 6}{t}$$

$$t = \frac{2 \times 3 \times 6}{12} = 3 \text{ sec}$$





CVT

Continuous Variable transmission