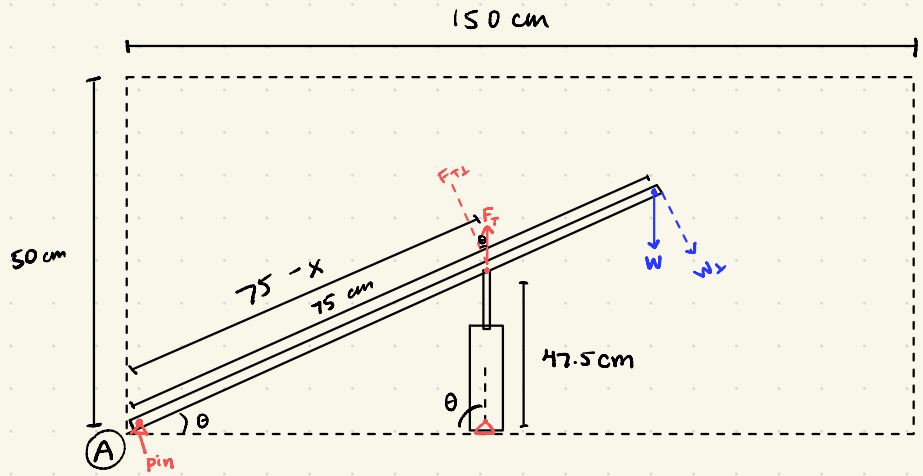
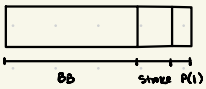
Portfolio



l = length of rod = 75 cm

Actuator: IMA22 (MV23/43)

Thrust ≤ 1446 N



total = 128.6 + 304.8 + 41.2 (P(i)) = 474.6 mm

75 - x = position of actuator

$$\vec{M}_A = 0 = (75-x)\left(\frac{F_T}{\cos\theta}\right) + (75)\left(-\frac{W}{\cos\theta}\right)$$

$$0 = 75\left(\frac{1446}{\cos\theta}\right) - \frac{1446}{\cos\theta}x - \frac{75W}{\cos\theta}$$

$$0 = 108450 - 1446x - 75W$$

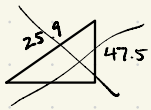
$$75W = 108450 - 1446x$$

Hypothetical max values:

if w = 500 :

$$75(500) = 108450 - 1446x$$

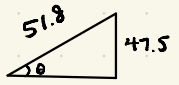
$$x = 49.1$$



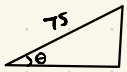
Not possible

if w = 1000:

$$x = 23.1$$



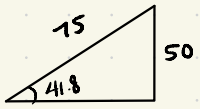
θ = 66.5°

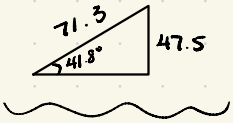


~~h = 68.8 cm~~ not possible w/in constraints

max h: 50 cm

max θ: 41.8°





If θ can change and L is not fixed to 75cm:

```
(base) michellexie@dhcp-vl2041-27251 a3_files % python portfolio.py
The optimal weight is 2311.907573208449, theta is 89.03284632873374, L is 50.056
94914323081, and x is 0.013014764216138432
```

where $F_{thrust} = 1446N$;

$W_{max} = 2311.9$

$\theta = 89.0°$

$L = 50.06$ cm

$x = 0.013$ cm

```python
import random
import math

F = 1446
weightmax = 0
thetamax = 0
Lmax = 0
xmax = 0

for i in range(100000):
    theta = random.uniform(0, (math.pi)/2)
    Ly = 50*math.sin(theta)
    Lx = 150*math.cos(theta)
    L = math.sqrt(Lx**2 + Ly**2)
    x = L*random.random()

    weight = (F * math.sin(math.pi-theta) * (L-x) * math.cos(theta) -
        F * math.cos(math.pi-theta) * (math.sin(math.pi-theta) *30))
        /(L * math.cos(theta))

    if weight > weightmax:
        weightmax = weight
        thetamax = theta*(180/math.pi)
        Lmax = L
        xmax = x

print("The optimal weight is " + str(weightmax) + ", theta is " + str(thetamax) +
    ", L is " + str(Lmax) + ", and x is " + str(xmax))
```