forces CHANGES

- speed → velocity → $\Delta v \Rightarrow$ acc
- direction → change direction → circular motion; rotate → moment ⇒ turning effect
- shape / size → springs

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objects in equilibrium → at rest / moving at constant speed in 1 direction

1. net force = 0
2. net moment = 0

Newtons laws of motion

1. Everything doesnt want to change unless forced
2. if forced, it will accelerate or rotate
3. it will also push back.

(1) Every object remains at rest or moving at const. speed & in a straight line unless a force acts on it

(2) If a force is applied, it will change the speed or direction or shape of the object.

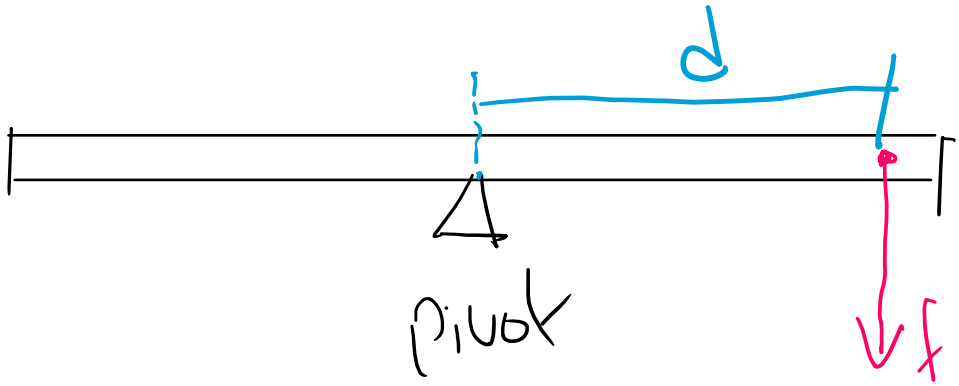
$$\text{net force} = m\,a$$

$$\text{spring constant } k = \frac{\text{force}}{\text{ext.}}$$

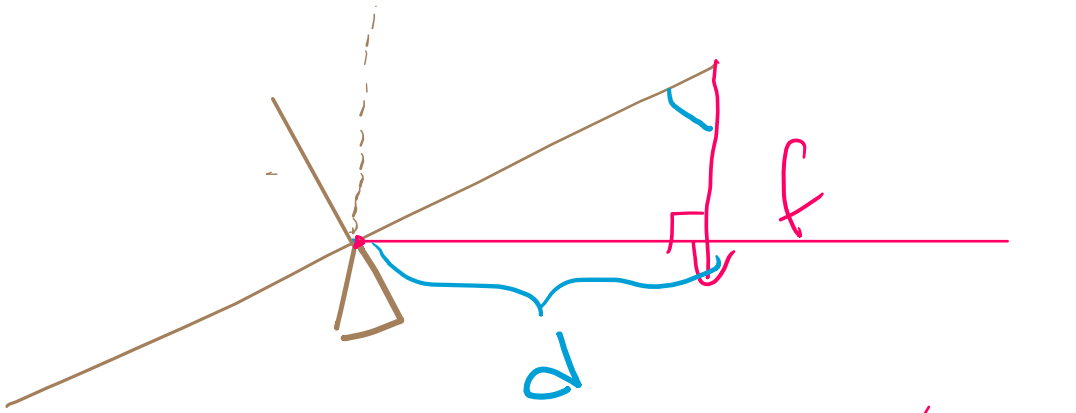
(3) For every force there is an equal & opposite force

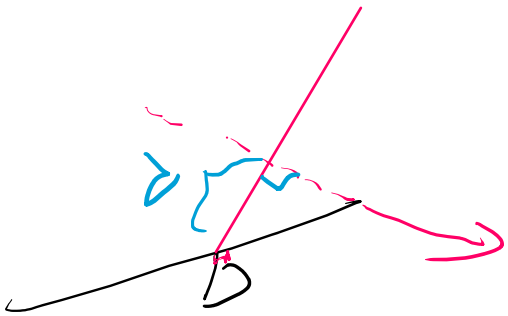
moments

turning effect of a force



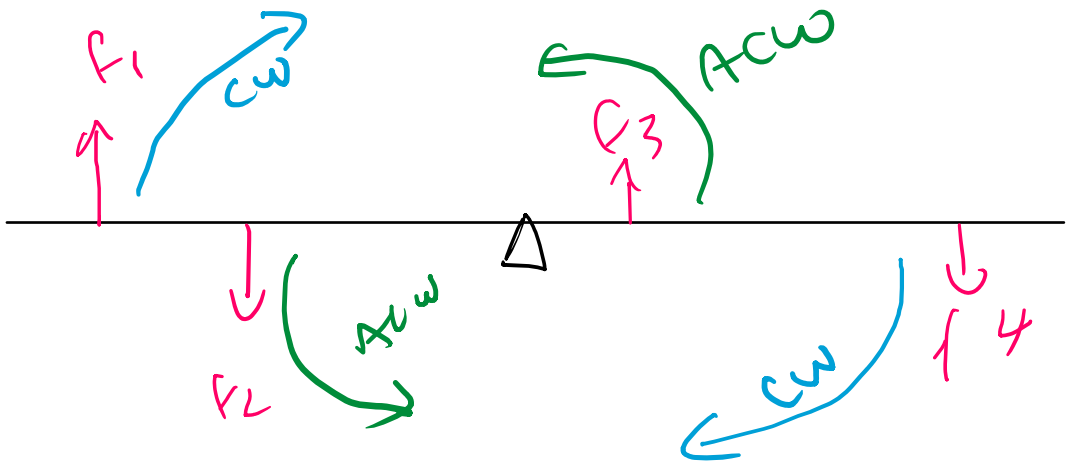
moment = force x perpendicular distance





When in equilibrium "balanced"

net moment = zero

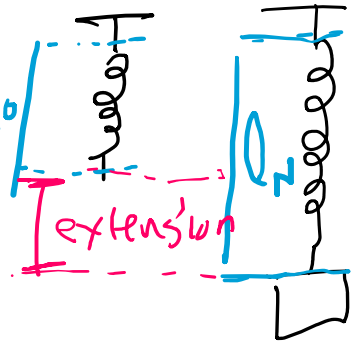


total clockwise moments
= total anti clockwise m-

$$F_1 d_1 + f_4 d_4 = f_2 d_2 + f_3 d_3$$

Hookes law

$$K = \frac{f}{x}$$



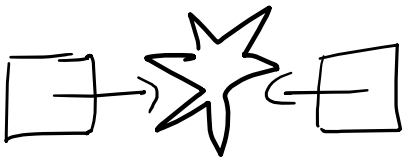
x = new length - original length

$x = l_N - l_o$

momentum (m x v)

collision

explosion



collision

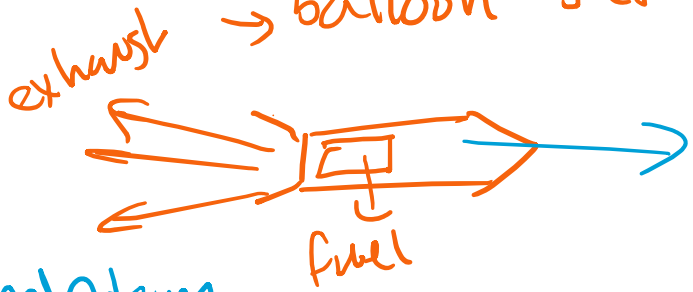
Explosion

fuel & exhaust

→ Rocket jet

→ plane jet

→ balloon - jet



conservation of momentum

Total momentum before = total momentum after.

$$m_1u_1 + m_2u_2 = m_1v_1 + m_2v_2$$

m_1 / m_2 → mass of the 2 objects

u = initial v = final

falling bodies

$W = mg$

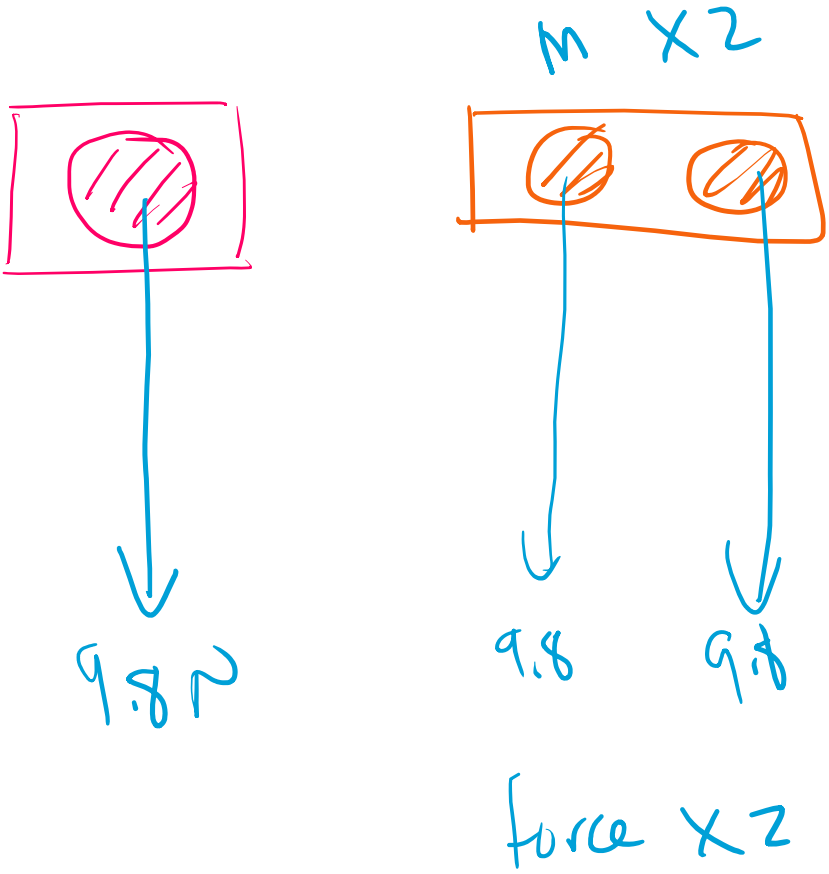
$g = \frac{W}{m} = \frac{\text{force}}{\text{mass}}$

gravitational field strength = force per unit mass

$m = 90\,kg$ $W = 90 \times 9.8 = 882\,N$

$g = \frac{882}{90} = 9.8$ (force / mass)

$= \frac{88.2}{9} = 9.8$



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net force = m x a

98N = 10 x 9.8

x2 196N = 20 x2 x 9.8

net force

g - Air Resistance = m a ↓

9.8 - 2 = 7.8

9.8 - 4 ↑ = 5.8 ↓

$F = ma$ $a = \frac{v-u}{t}$

$F = 500\ N$ $m = 100$ $t = 10\ s$

$v = 2u$

$a = \frac{2u-u}{t}$

$a = \frac{u}{t}$

$500 = 1000\ a$

$a = \frac{500}{1000} = 0.5\ m/s$ $0.5 = \frac{u}{10}$

$u = 5\ m/s$