Y9 - Forces

Types of Forces

push or pull

Forces can change
- speed
- direction
- shape

Non-contact forces
- Gravitational [b/w masses]
- Electrostatic [b/w charges]
- Magnetic [b/w poles of magnet]

Contact forces
- Tension (rope, spring, metal)
- Friction (b/w 2 surfaces)
- Normal contact (always ⊥ to surface)
- Buoyant Force

Weight and Mass

mass (amount of matter) → universal, constant

weight → Depends on gravitational field

$W = m g$ $\left(m = \frac{W}{g}\right)$ $\left(g = \frac{W}{m}\right)$

weight = mass × grav. field strength

N = kg × N/kg

(m/s^2)

$g = 10\ N/kg$

A text book has a mass of 2.2 kg

$W = mg$

What is the weight on the Earth? ($g = 10\ m/s^2$)

$W = mg = (2.2)(10) = 22\ N$

What is the weight on Mars ($g = 3.7\ m/s^2$)

$W = mg = (2.2)(3.7) = 8.14\ N$

g depends on mass of planet.

If the textbook weights 19.6 newtons on Venus, What is the strength of gravity on Venus?

$g = \frac{W}{m} = \frac{19.6}{2.2} = 8.91\ N/kg$

(m/s^2)

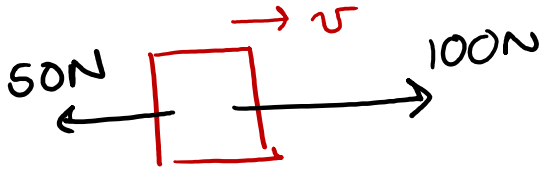
From Year 9

- **Newton's Laws**

1. An object's motion will not change unless there is a resultant force.

Forces Balanced → constant velocity
stationary

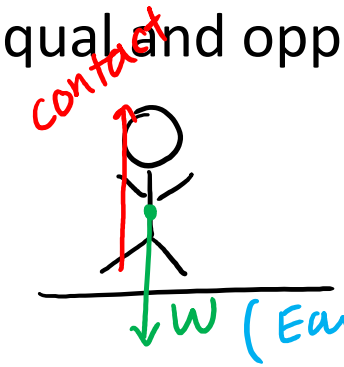
2. A resultant force causes an acceleration in the direction of the resultant force.



ΣF = 50N to the (R)

ΣF

3. For every action, there is an equal and opposite reaction.



contact → ground pushing up on you
(you push down on ground)

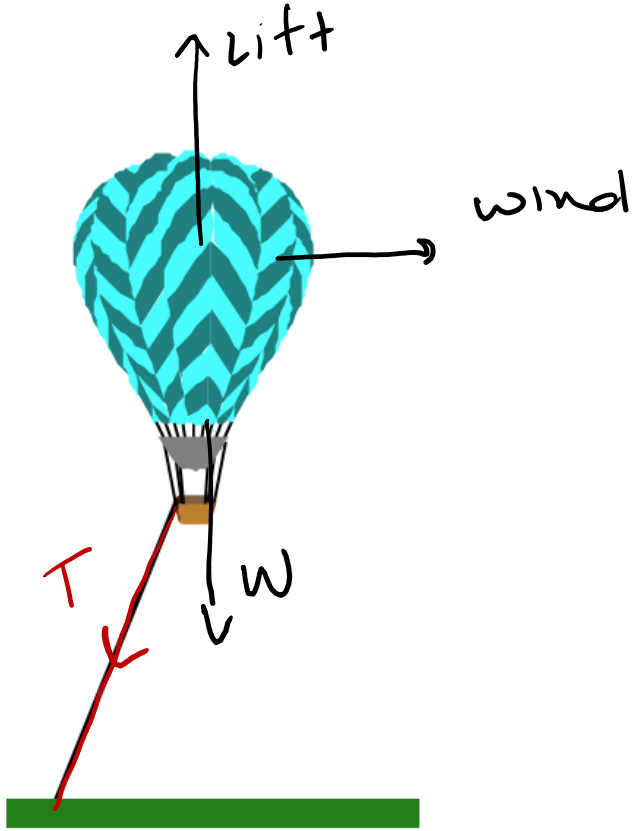
(Earth pulling you down)
(you pull Earth up)

- $\boldsymbol{W = mg}$

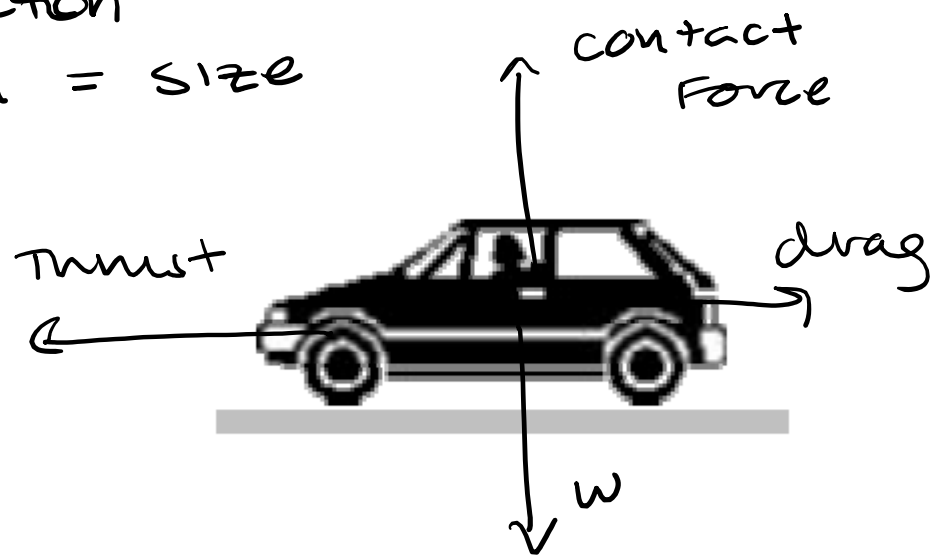
Arrows => Direction

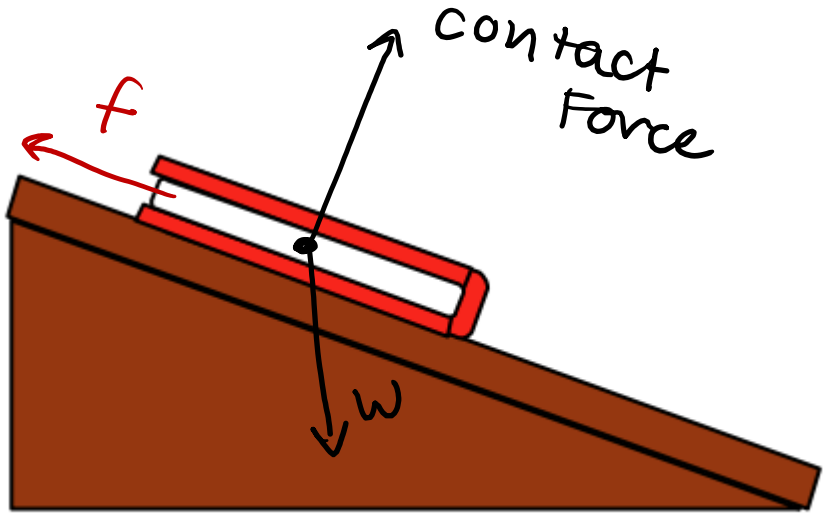
=> Length = size

Drawing Force Diagrams



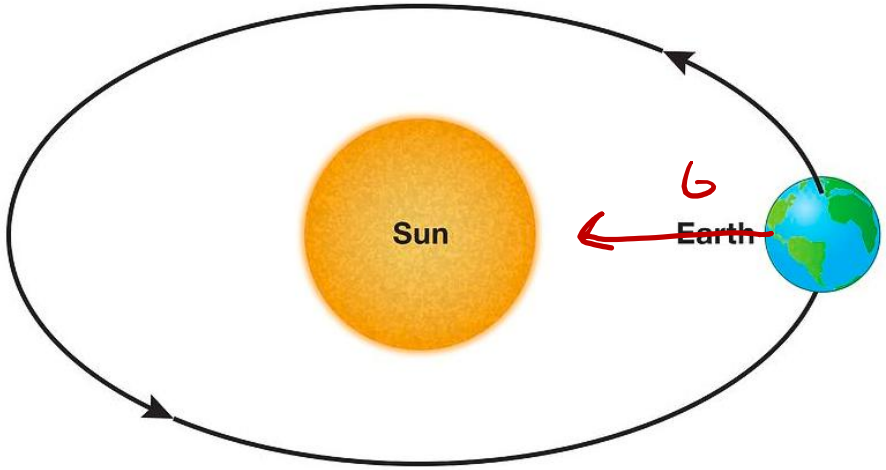
Balanced



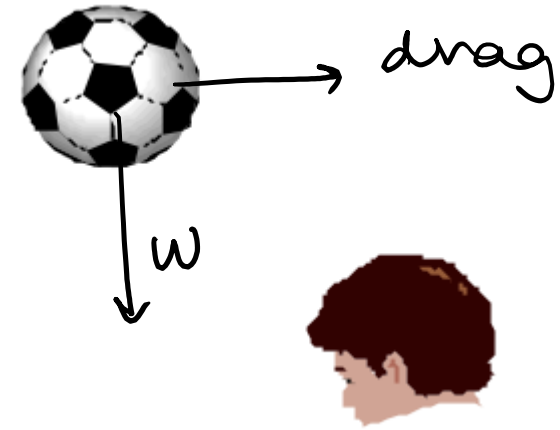


Drawing Force Diagrams

circular motion.
→ unbalanced F towards center of path.

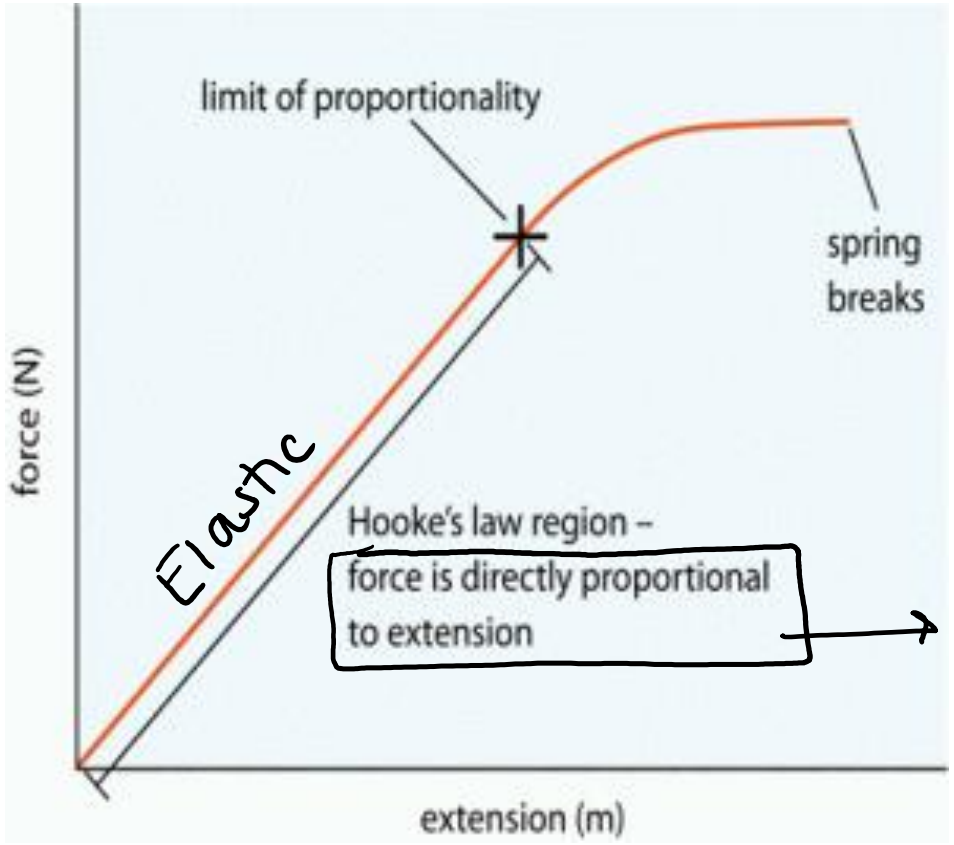


moving



From Year 9

- **Hooke's Law**



Elastic → returns to original shape when Fore is removed

gradient => stiffness of sprig

→ until it reaches elastic limit