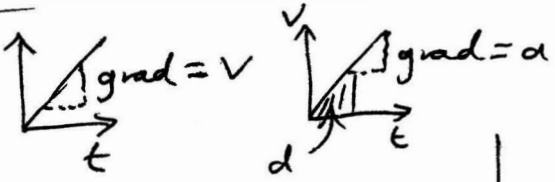
$$\text{speed} = \frac{d}{t}$$



a due to gravity = 9.8 m/s²

s : displacement
u : initial vel
v : final vel
a : acceleration
t : time

} use if object is accelerating

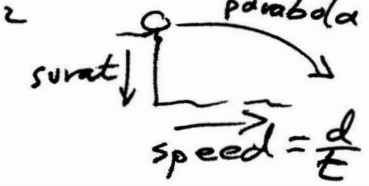
① $v = u + at$

② $s = ut + \frac{1}{2}at^2$

③ $s = \left(\frac{u+v}{2}\right)t$

④ $v^2 = u^2 + 2as$

Projectile:



NEWTON:
1st law: MOTION CONSTANT IF NO EXTERNAL FORCE
2nd law: $F = ma$
3rd law: TO EACH ACTION THERE IS EQUAL + OPPOSITE.

$$\text{WEIGHT} = mg$$

For EQUILIBRIUM (constant motion):
- NO RESULTANT FORCE (BALANCED)
- NO RESULTANT MOMENT/TORQUE

AIR RESISTANCE + FRICTION increase with SPEED.

- SCALARS just have mag → A, d, E, P
- VECTORS have mag + dir → F, a, V, s

$$KE = \frac{1}{2}mv^2$$
$$GPE = mgh \rightarrow \text{use if given } h$$

- If no E lost when falling: $mgh = \frac{1}{2}mv^2$
- If $mgh \neq \frac{1}{2}mv^2$, E lost (thermal)

$mgh = \frac{1}{2}mv^2 + E_{lost}$ (work done against frictional forces)

Work done: $E = Fd$

v×2 Braking d ×4 ($\frac{1}{2}mv^2$)
- road, weather, tyres

Thinking d:
- speed
- drugs
- distractions
- tiredness

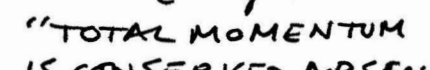
MECHANICS

momentum = mv (kgm/s)

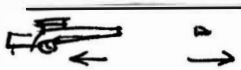
$$F = \frac{\Delta(mv)}{t}$$

- Crumple zones/airbags increase collision t, reduce F.

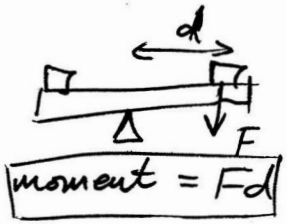
I Princ of cons of momn:
"TOTAL MOMENTUM IS CONSERVED ABSENT EXTERNAL FORCES"



$m_A u_A + m_B u_B = m_{AB} v_{AB}$



$m_G v_G = m_B v_B$



$$\text{moment} = Fd$$

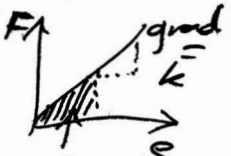
Principle of moments:
"FOR SYSTEM TO BE IN EQM, SUM OF ↻ = SUM OF ↺"

Hooke's law:

$$F = ke$$

spring constant (N/m)

extension



E stored

$$E = \frac{1}{2}Fe = \frac{1}{2}ke^2$$

Video