Speed, Displacement, Velocity

Distance Vs Displacement → Displacement is position relative to a fixed point – usually the position at $t = 0$

Distance: actual length travelled

Vernier calipers – accuracy 0·01cm micrometer accuracy 0·01m

SPEED: rate of change of distance w.r.t. time (REM Vernier scale **)

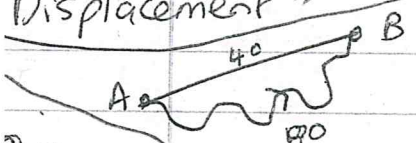
Average speed $= \frac{\text{Total Distance}}{\text{Total time}}$ m/s

VELOCITY = rate of change of displacement w.r.t. time

velocity = VECTOR

Speed, distance = SCALAR

Displacement =



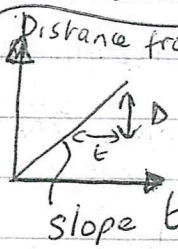
40_m = Displacement = Distance in a given direction

80m = Distance travelled

velocity is changing even if v is constant because direction changes which means velocity changes

Q9 p60

Exp to measure Velocity p61



of Distance, Time graph = Speed $\left(\frac{D}{t}\right)$

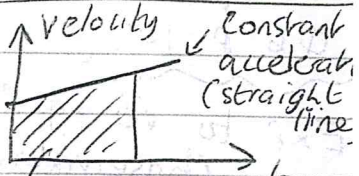
Acceleration = rate of change of velocity wrt time

$a = \frac{v - u}{t}$ (1)

v = new velocity
u = old velocity
t = time, a = acceleration

s = Distance $s = \left(\frac{u+v}{2}\right)t$ (2) Distance = average speed x time

from (1) and (2) you can derive $s = ut + \frac{1}{2}at^2$ and $v^2 = u^2 + 2as$



Measure constant acceleration using ticker timer p73

ACCEL due to gravity (g) → Weight = mg

F = ma

g = accn with which an object is pulled back to earth

Exp to measure g by freefall p79 book

VECTORS and SCALERS → Pressure, Mass, distance, time, area

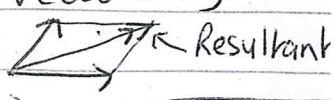
Force, Acceleration, Displacement, Velocity, Magnetic flux density

VECTOR QUANITY has Magnitude and direction

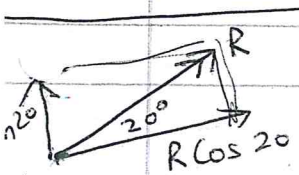
SCALAR QUANTITY has only direction

You can resolve 2 vectors using Newton balances Exp p85

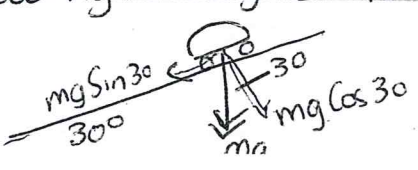
You can work out/resolve 2 vectors by drawing a scaled diagram and using parallelogram law

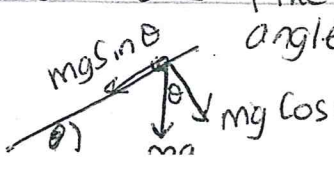


To resolve 3 or more vectors you resolve 2 into one, then 2 into one



You must be able to resolve a vector into 2 vectors at right angles to each other (the vector beside the angle = Cos)





Q5 p87 Q8; 9; 10 p88

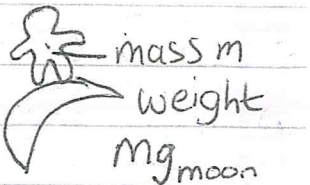
FORCE, MASS, MOMENTUM

Force - anything that causes the velocity of an object to change is called a force

NEWTON = force that causes a mass of 1kg to accelerate at $1 m/s^2$

mass → (m) amount of matter in an object

weight → force of gravity acting on the object ($W = mg$)



Exp to show $a \propto F$

p 91 (Rem keep mass being accelerated constant

Momentum of body = mass ~~of body~~ × velocity

Conservation of Momentum: Mom before = mom after interaction provided NO EXTERNAL forces act on system

NEWTONS 1st LAW: A body will remain in a state of rest or travelling with a constant velocity unless acted on by an external force

NEWTON'S 2ND LAW: Force ∝ rate of change of momentum $F \propto \frac{mv - mu}{t}$

$F = k\left(\frac{mv - mu}{t}\right)$ and the definition of the Newton is chosen s.t. $k = 1$

$F = \frac{mv - mu}{t} \Rightarrow F = m\left(\frac{v - u}{t}\right) \Rightarrow F = ma$

NEWTON'S 3RD LAW: every action has an equal and opposite reaction

Q12 p100 Q14 p100
Q6 p 100

Exp to verify Principle of Conservation of momentum

g 101

FRICTION = Force that opposes motion

Air friction → air resistance → terminal velocity ↕ overall $F = 0$, $V = \text{const}$

Air resistance ∝ v

Normal Reaction: R ↑ ○ ↓ mg otherwise ball would sink

Pg 97 Q6, Q5, Q1, Q2