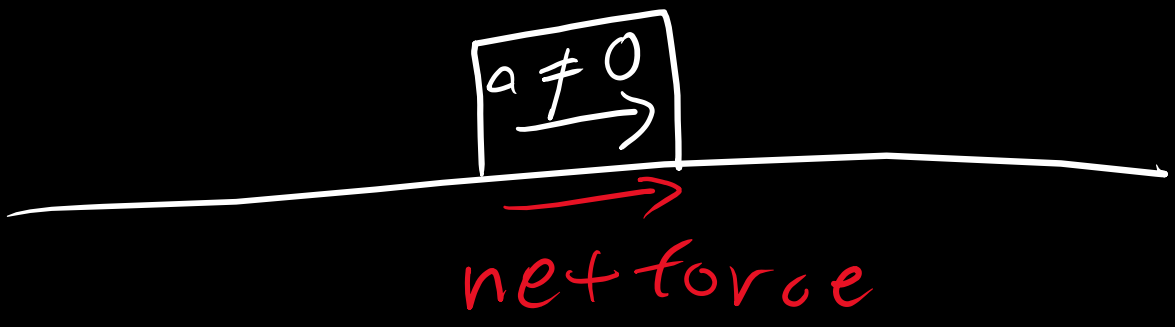
Newton's second law

It states that The acceleration of an object is directly proportional to the net force acting on the object and inversely proportional to the object's mass.

F = ma

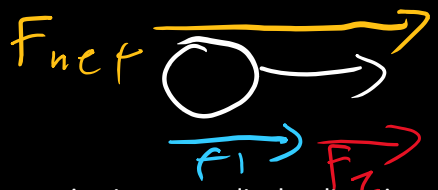
If a body moves in a straight line with a non-uniform motion (meaning there is an acceleration)

Then the resultant force from the acting forces on it, is parallel to the straight line

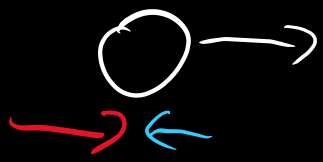


So, if the body moves with non-uniform motion in a straight line, then:

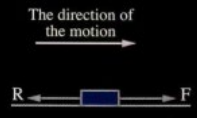
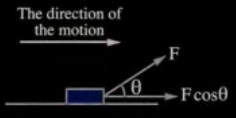
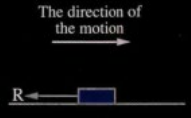
- The resultant force from forces acting in the same direction as the motion is F, where F = ma



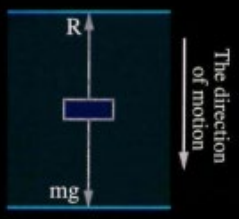
- The resultant force from forces acting in perpendicular direction to the body's motion, is 0



APPLICATIONS IN HORIZONTAL MOTION

1. The motion of a body under action of a horizontal force (F) and resistance (R)	2. The motion of the body under action of a force inclines to the horizontal at an angle θ	3. The motion of a body as firing a bullet, using brakes or stopping the engine , then F = 0
		
F – R = m.a	F cos θ = m.a	– R = m.a

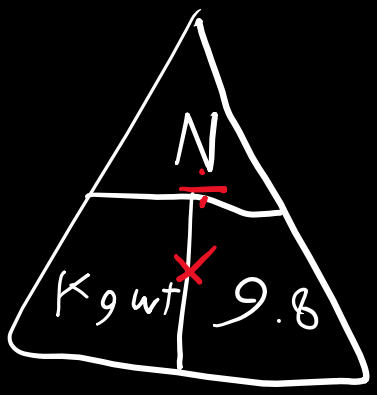
APPLICATIONS IN VERTICAL MOTION

1. Falling a body vertically downwards inside sandy soil	2. The moving of an aeroplane , balloon or aircraft vertical motion upwards	3. The moving of an aeroplane , balloon or aircraft vertically downwards
		
$mg - R = m.a$	$F - R - mg = m.a$	$mg - R - F = m.a$

What is kilogram-force

the force needed to make one kilogram of mass accelerate by 9.8 m/s^2

its unit is **Kg.wt**



EXAMPLE ON KILOGRAM-FORCE

A horizontal force of magnitude 700 kg.wt. acted on a car of mass 1.5 ton moving on a horizontal road. If the car started its motion from rest and its velocity became 19.6 m./sec. in 5 seconds. Find the magnitude of resistance in kg.wt.

$mass_{(in\ Kg)} = 1.5 \times 1000 = 1500\ Kg$

$force_{(in\ N)} = 700 \times 9.8 = 6860\ N$

$acc = \frac{u+v}{t} = \frac{19.6}{5} = 3.92\ m/s^2$

$F_{net} = F - R = ma$

$6860 - R = 1500 \times 3.92\ m/s^2$

$|R| = 980\ N \rightarrow 100\ Kg.wt$

resistance force $\rightarrow R$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