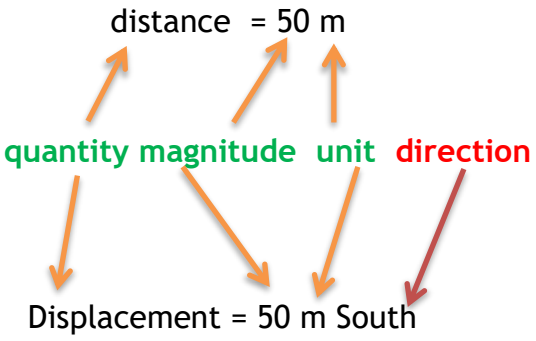
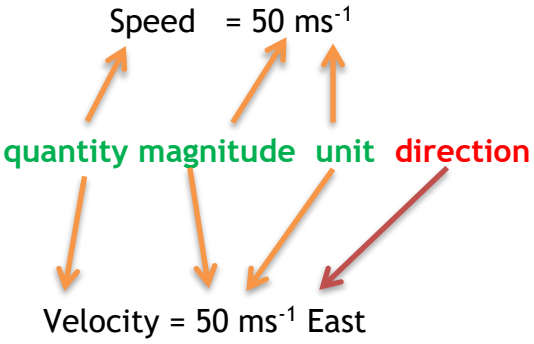
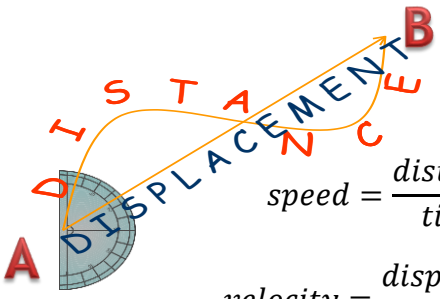
N5 Dynamics S3 Revision

Acceleration	Area	Current	Displacement	Distance
Energy	Force	Frequency	Gravitational field strength	Mass
Momentum	Pressure	Resistance	Weight/ friction etc	Temperature
Time	Velocity	Voltage	Volume	Speed

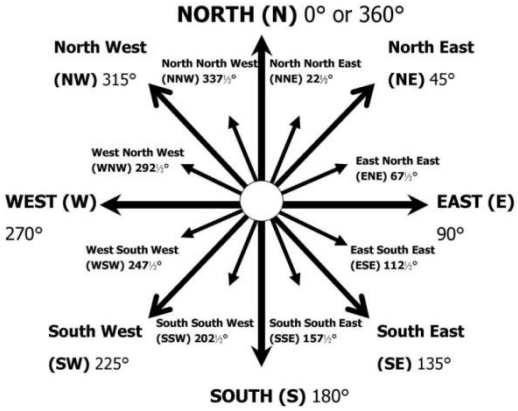




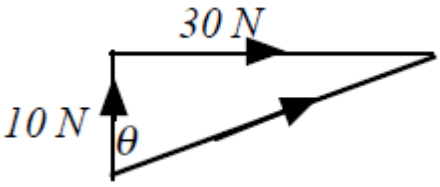


$$speed = \frac{distance}{time}$$

$$velocity = \frac{displacment}{time}$$



Method 2: Draw sketch of vector diagram, but not to scale.



Using Pythagoras

$$R^2 = a^2 + b^2$$

$$R^2 = 30^2 + 10^2$$

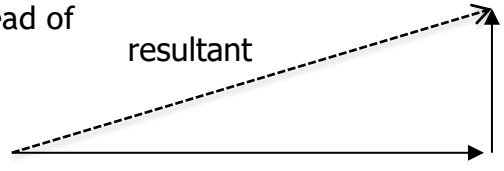
$$R = 31.6\ N$$

$$tan\theta = \frac{opp}{adj}, tan\theta = \frac{30}{10}$$

$$tan^{-1}\theta = 3, \theta \quad = 72°$$

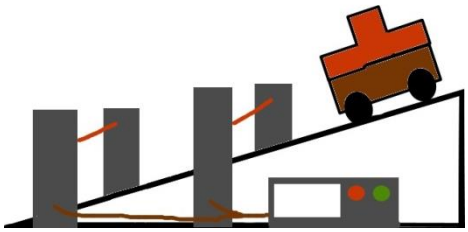
In some cases that means that the two vectors have to be redrawn so that they are being added "head to tail". See example below.

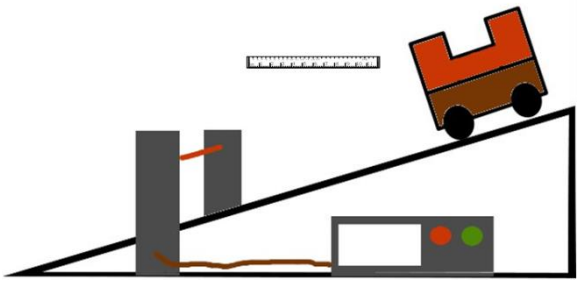
Then join a line from the tail of the first vector to the head of the second vector. This is the resultant vector.

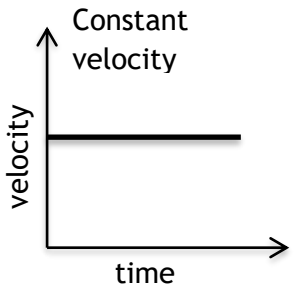


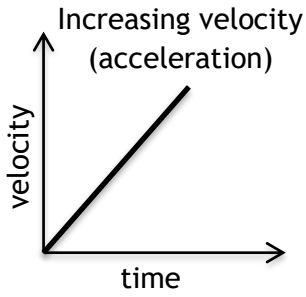
Acceleration is the change in **velocity** per unit time.

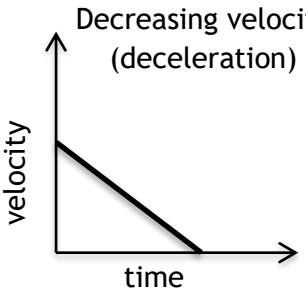
$$a = \frac{v-u}{t} = \frac{\Delta v}{t} \qquad \Delta v = v - u$$











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Gradient= rise/run

Or v/h

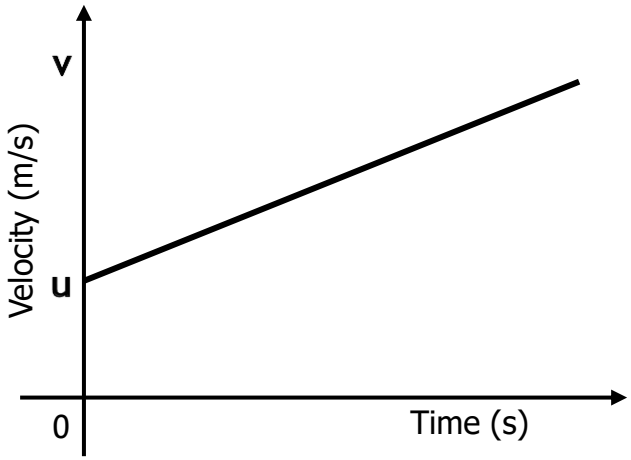
In our case that is

vertical = (v-u)

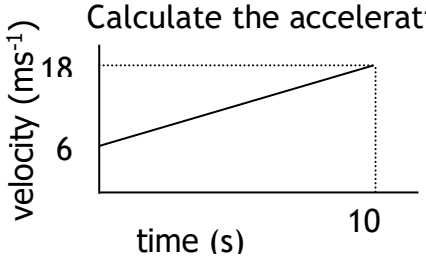
horizontal = t

gradient =(v-u)/t

gradient = acceleration



Calculate the acceleration shown in the graph below:



SOLUTION

v=18; u=6; t=10

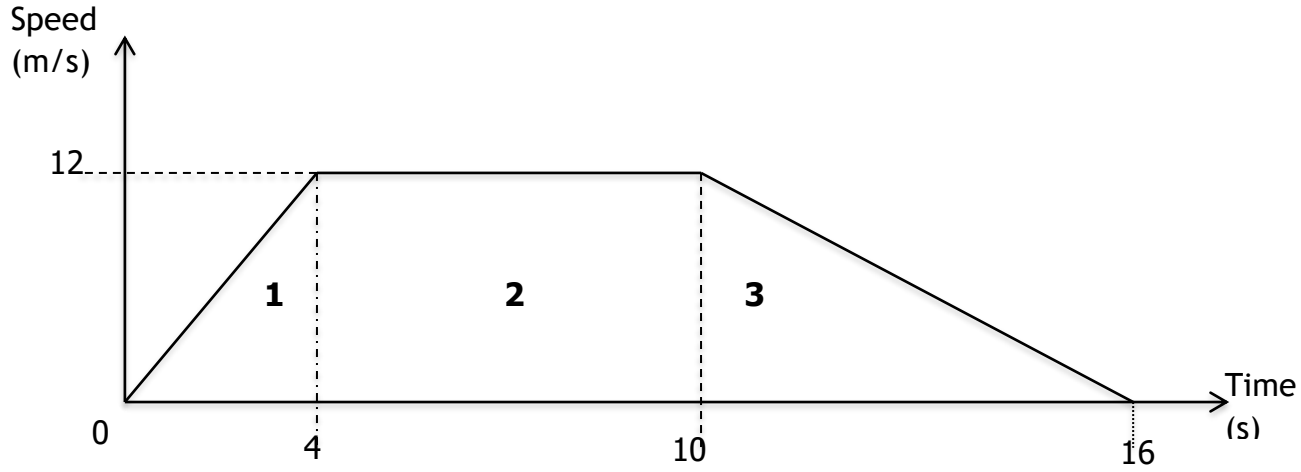
$$a = \frac{v-u}{t}$$

$$a = \frac{18-6}{10} = 1.2\ ms^{-2}$$

SOLUTION USING GRADIENT

$$m = \frac{y_2 - y_1}{x_2 - x_2}$$

$$\mathrm{m} = \mathrm{a} = \frac{18-6}{10-0} = 1.2\ \mathrm{ms}^{-2}$$



It is best to split the area under the graph into rectangles and triangles. Calculate the area of each and then add them together. [Area of a triangle is ½ base x height]

$$\text{Distance travelled} = \text{area } 1 + \text{area } 2 + \text{area } 3$$

$$\text{Distance travelled} = (½ \times 12 \times 4) + (12 \times 6) + (½ \times 6 \times 12)$$

$$\text{Distance travelled} = 24 + 72 + 36 = 132 \text{ m}$$

Mass is a measure of the amount of matter (stuff) in an object. It is measured in kilograms (kg). Weight is a force and it is the pull of gravity acting on an object. It is measured in Newtons. on Earth g is equal to 9.8 Nkg-1

$$Weight = mass \times gravitational\ field\ strength$$

$$W = m\,g$$

"g" is the gravitational field strength. It is measured in NEWTONS PER KILOGRAM. It is the WEIGHT PER UNIT MASS (force of gravity on every kilogram)

A force can change an object's:

- direction of motion (an acceleration)
- shape
- speed (cause an acceleration)
- start a mass moving (cause an acceleration)

Newton's First Law : A body will remain at rest or travel at a constant speed in a straight line, unless acted upon by an unbalanced force.

Newton's Second Law *we normally write as a formula:*

$$F_{un} = ma$$

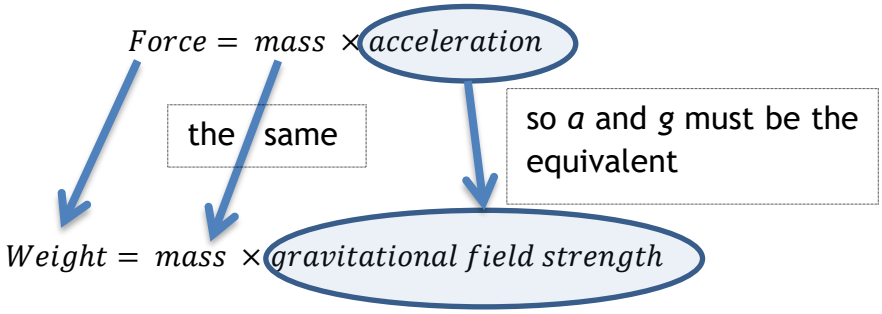
$$\text{Unbalanced Force} = \text{mass} \times \text{acceleration}$$

$$(\text{Newtons}) = (\text{Kilogram}) \times (\text{metres per second squared})$$

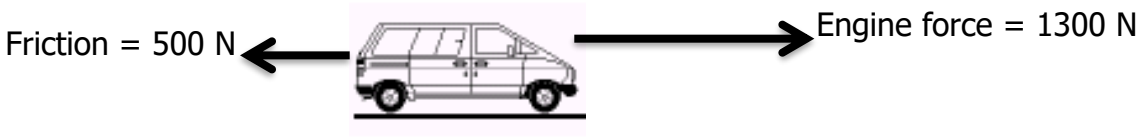
Newton's Third Law states: *For every action there is an equal but opposite reaction.*

Or If A exerts a force on B, B exerts an equal but opposite force on A.

Difference between N1 and N3 Laws



1. A car of mass 1 000 kg experiences friction equal to 500 N. If the engine force is 1 300 N, what will be the car's acceleration?



Resultant or unbalanced force = 1300 – 500 = 800 N

F = ma

800 = 1000 x a

$a = \frac{800}{1000}$

a = 0.8 ms^{-2}

Difference between Newton's first and third laws

Skydiving