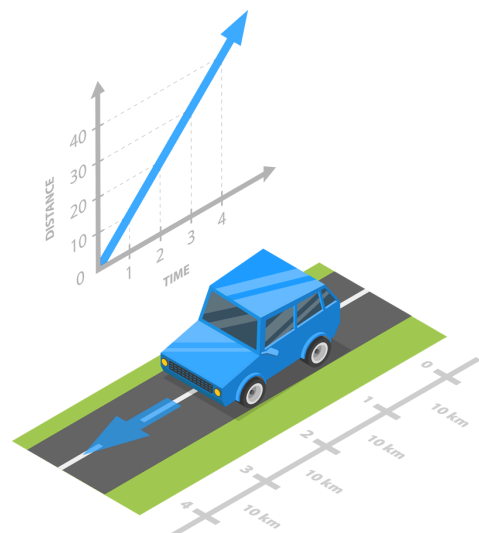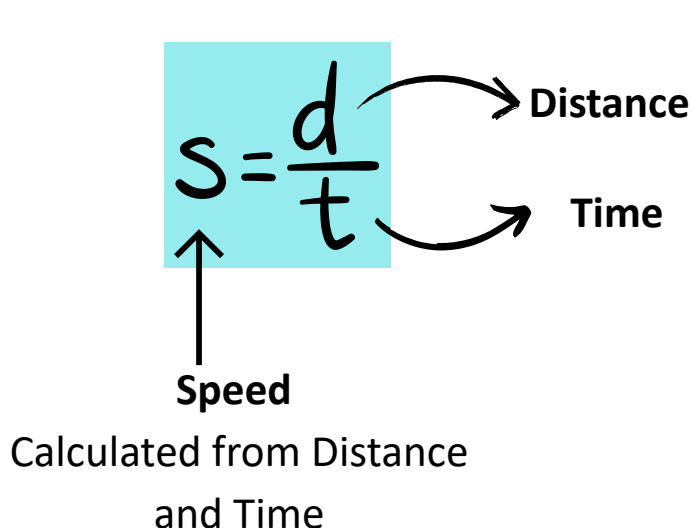# Compound Measures - GCSE Maths

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1. Introduction

- When **we calculate a quantity using other quantities** then it is called a **Compound Measure** which represents the **relationship between these quantities and the units used.**
- The Compound Measures are denoted as Ratio or **Rate** such as **"per" unit (km/h, m/s etc.).**
- **Examples** include- Speed, Density and Pressure.
- These Measures are widely used in Business, Engineering and Science and solving real-life problems.
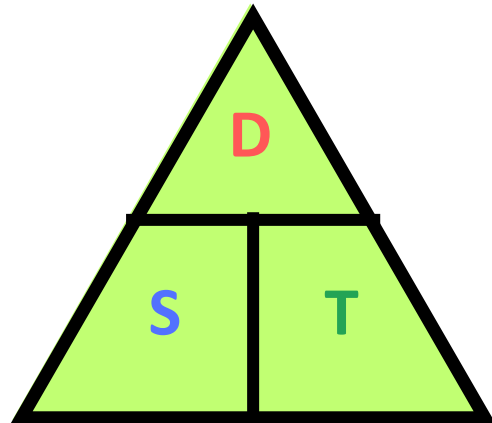
$$S = \frac{d}{t}$$

→ **Distance**

→ **Time**

Speed
Calculated from Distance
and Time

Compound Measures - GCSE Maths

2. Easy Way to Solve Problems

- We can make it easy to solve the problems related to Compound Measures by learning the Triangle method.
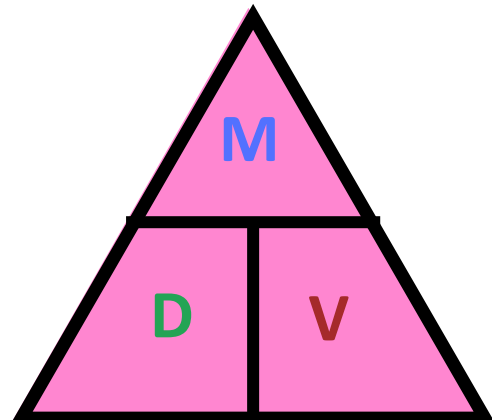- Consider following three Compound Measures -

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

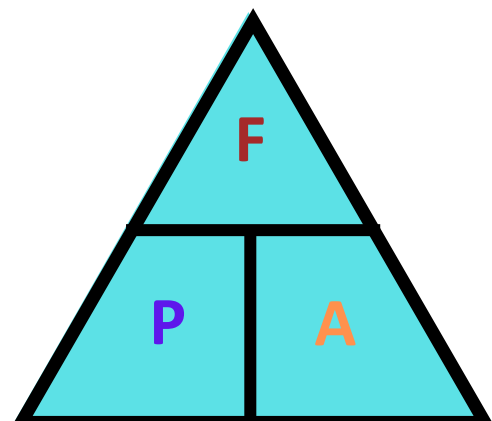**Units: Speed:** m/s or km/h
Distance: m or km
Time: h or sec

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$$

Units: Density: g/cm^3 or kg/m^3
Mass: g or kg
Volume: cm^3 or m^3

$$\text{Pressure} = \frac{\text{Force}}{\text{Area}}$$

Units: Pressure: N/m^2
Force: N (Newton)
Area: m^2

How to Use Triangle Method?

- Let us see the use of triangle to find one quantity if the other two are known.
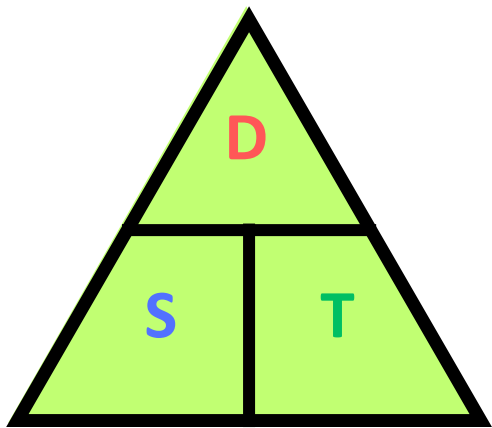
D = **Distance**
S = **Speed**
T = **Time**

- **To find Speed:** Hide Speed in the Triangle, formula for calculating Speed is -

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

_____

- **To find Distance:** Hide Distance in the Triangle, formula for Distance is -

$$\text{Distance} = \text{Speed} \; X \; \text{Time}$$

_____

- **To find Time:** Hide Time in the Triangle, formula for Time is -

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$$

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3. Step by Step Solved Examples

(1) Example: If a distance of 50m is travelled in 10 seconds then what is the speed of the vehicle?

Solution: Formula:

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

Substituting the known values -

$$\text{Speed} = \frac{50}{10}$$

$$\text{Speed} = 5\text{m/sec}$$

(2) Example: If mass of a liquid is 1kg and the volume is 200cm^3, then find out its Density.

Solution: Formula:

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$$

Substituting the known values -
We know that 1kg = 1000g ;

$$\text{Density} = \frac{1000}{200}$$

$$\text{Density} = 5\text{g/cm}^3$$

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(3) Example: If Olivia runs at a speed of 20km/h, then how far will she run in 5 hours?

Solution: Formula:

$$\text{Distance} = \text{Speed} \times \text{Time}$$

Substituting the known values -

$$\text{Distance} = (20 \times 5)\text{km}$$

$$\text{Distance} = 100\text{km}$$

(4) Example: Suppose a block of 100cm^2 area is lying on the table and Peter starts lifting it with force of 10N. Then find our the Pressure applied in the process?

Solution: Formula -

$$\text{Pressure} = \frac{\text{Force}}{\text{Area}}$$
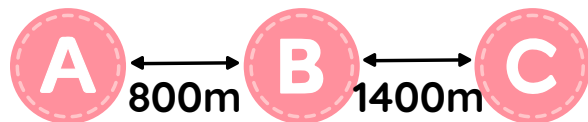
Substituting the known values -

$$\text{Pressure} = \frac{100}{10}$$

$$\text{Pressure} = 10\text{N/m}^2$$

4. Reasoning problems

(1) Suppose a train travels with the speed of **100km/h** and the distance between two stations **(A to B)** is **400 meters** and third station**(from B to C)** is **500 meters** then find out the total time taken by the train to travel the distance from **first to third station(A to C)?**

Solution:

First we need to convert the units of speed which are in km/h into m/sec by multiplying it with $\dfrac{5}{18}$ --

$$\text{Speed} = (100 \times \dfrac{5}{18})\text{m/sec}$$

$$\text{Speed} = 27.78 \text{ m/sec}$$

Total distance from A to C is -

distance from A to B + distance from B to C
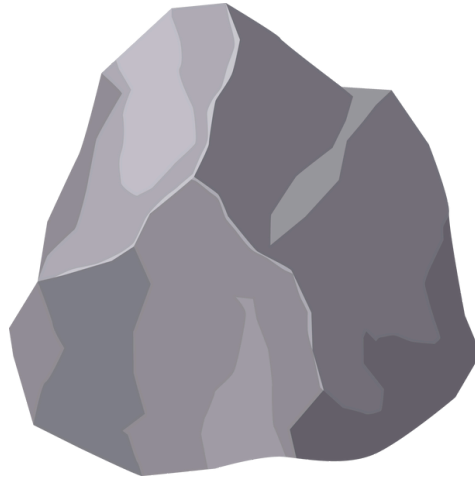
800 + 1400 = **2200 meters**

$$\text{Time} = \dfrac{\text{Distance}}{\text{Speed}}$$

$$\text{Time} = \dfrac{2200}{27.78}$$

$$\text{Time} = 79.1 \text{ seconds}$$

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(2) A rock weighs **18g** and its volume is found to be **24cm³**, then find out the **density** of the rock?

Solution: The mass and and volume of the rock are given as -
Mass = 18g, Volume = 24cm³
The formula to find density of rock -

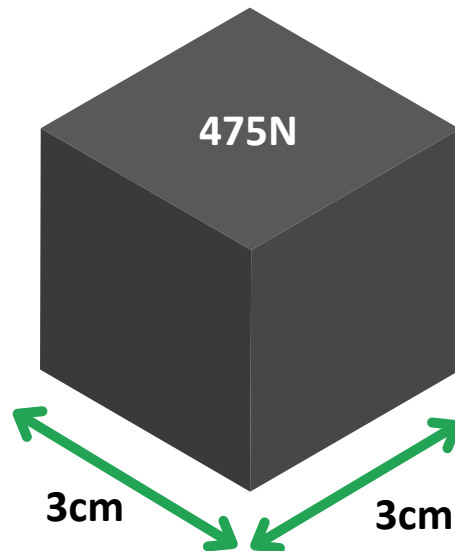$$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$$

Substituting the known values -

$$\text{Density} = \frac{18}{24}$$

$$\text{Density} = 0.75 \text{g/cm}^3$$

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(3) Calculate the pressure exerted by the block shown in diagram ?

475N

3cm   3cm

Solution:

$$\text{Pressure} = \frac{\text{Force}}{\text{Area}}$$

(a) The force applied by block is 475N and area -

$$\text{Area} = 6 \times (\text{side})^2$$

$$\text{Area} = 6 \times (3)^2$$

$$\text{Area} = 54\text{cm}^2 = 0.0054\text{m}^2$$

$$\text{Pressure} = \frac{\text{Force}}{\text{Area}}$$

$$\text{Pressure} = \frac{475\text{N}}{0.0054\text{m}^2}$$

$$\boxed{\text{Pressure} = 87963 \ \text{N/m}^2}$$