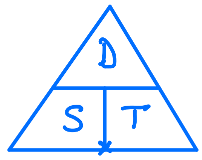
Compound Measures

Speed

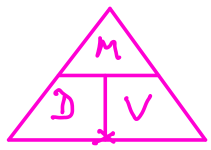


$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

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

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

Density

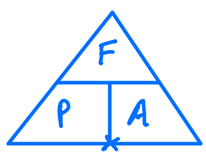


$$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$$

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

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

Pressure



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

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

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

Speed, Time, Distance

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

Example

John drives for 2 hours at 40 km/hr from A to B. He then drives 120 km from B to C at 30 km/hr.

What is John's average speed for the whole journey from A to C?

	Speed	Time	Distance
A to B	40 km/h	2 hrs	80 km
B to C	30 km/h	4 hrs	120 km
		6 hrs	200 km

$$\text{Average Speed} = \frac{\text{Total Distance}}{\text{Total Time}} = \frac{200}{6}$$

$33\frac{1}{3}$ km/hr

Ex 2 Bill travels 100 km from P to Q at 25 km/h. He then travels for 3 hours at 30 km/h from Q to R. He then travels from R to S at 40 km/h for $1\frac{1}{2}$ hrs.

Work out his average speed from P to S.

	Speed	Time	Distance
P to Q	25 km/h	4 hrs	100 km
Q to R	30 km/h	3	90 km
R to S	40 km/h	$1\frac{1}{2}$	60 km
		$8\frac{1}{2}$ hrs	250 km

$$\text{Average Speed} = \frac{\text{Total Distance}}{\text{Total Time}} = \frac{250}{8.5}$$

$$= 29.4 \text{ km/hr}$$

Density , Mass, Volume

A has density 4 g/cm^3

B has density 6 g/cm^3

A compound C is made from 200 cm^3 of A and 150 cm^3 of B. Find the density of C

	Density	Mass	Volume
A	4 g/cm^3	800g	200 cm^3
B	6 g/cm^3	900g	150 cm^3
		1700g	350 cm^3

$$\text{Density of C} = \frac{\text{Total Mass}}{\text{Total Volume}} = \frac{1700}{350}$$

$$= 4.86 \ g/cm^3$$

Ex 2 T is made from P, Q, R

P has density 7 g/cm^3 and mass 56g

Q has density 10 g/cm^3 and volume of 8 cm^3

R has mass of 80g and volume 16 cm^3

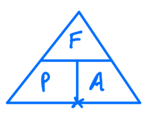
Find the density of T

	Density	Mass	Volume
P	$7\,g/cm^3$	$56g$	$8\,cm^3$
Q	$10g/cm^3$	$80g$	$8\,cm^3$
R		$80g$	$16cm^3$
		$216g$	$32\,cm^3$

$$\text{Density of } T = \frac{\text{Total Mass}}{\text{Total Volume}} = \frac{216}{32}$$

$$= 6.75\ g/cm^3$$

Pressure



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

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

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

Examples

1) Find the pressure when a Force of 100N is exerted over an area of $20m^2$ $\quad \text{Pressure} = \frac{100N}{20m^2} = 5\ N/m^2$

2) A Force of 80N applies a pressure of $4N/m^2$ on a floor. What is the area of the floor? $\quad \text{Area} = \frac{80}{4} = 20m^2$

3) A pressure of $6\,N/m^2$ is applied across an area of $3\,m^2$. What is the force applied? $\quad \text{Force} = 6 \times 3 = 18N$

1 A cyclist travels a distance of 90 miles in 5 hours. What is her average speed? $\frac{90}{5} = 18$ mph

2 I drive to Bude in Cornwall from Sheffield in about 6 hours. The distance from Sheffield to Bude is 315 miles. What is my average speed? $\frac{315}{6} = 52.5$ mph

3 The distance from Leeds to London is 210 miles. The train travels at an average speed of 90 mph. If I catch the 9:30 am train in London, at what time would you expect me to get to Leeds?

$\frac{210}{90} = 2\frac{1}{3}$ hrs $= 2$ hr 20 min so 11.50 am

4 Complete the following table.

	Distance travelled	Time taken	Average speed	
a	150 miles	2 hours	75 mph	
b	260 miles	6 hr 30 min	40 mph	
c	175 miles	5 hours	35 mph	
d	240 miles	3 hours	80 km/h	
e	544 km	8 hours 30 minutes	64 km/h	$544 \div 8.5$
f	325 km	3 hours 15 minutes	100 km/h	100×3.25
g	215 km	4 hrs 18 min	50 km/h	$215 \div 50 = 4.3$

HINTS AND TIPS

Remember to convert time to a decimal if you are using a calculator. For example, 8 hours 30 minutes is 8.5 hours.

5 A train travels at 50 km/h for 2 hours, then slows down to do the last 30 minutes of its journey at 40 km/h.

a What is the total distance of this journey? $50 + 50 + 20 = 120$ km

b What is the average speed of the train over the whole journey? $\frac{120}{2.5} = 48$ km/h

Exercise

1) John drives from A to B at 50 mph for 2 hrs. He then drives from B to C a distance of 120 miles in 3hrs. He then drives from C to D a distance of 80 miles at 20 mph.

What was his average speed for whole journey from A to D

	Speed	Time	Distance
A to B	50 mph	2 hrs	100 miles
B to C	20mph	4 hrs	80 miles
		6 hrs	180 miles

$$\text{Average Speed} = \frac{\text{Total Time}}{\text{Total Dist}} = \frac{180}{6} = 30 \text{ mph}$$

2) Compound A has density $6\ g/cm^3$

Compound B has density $8\ g/cm^3$

50g of A are mixed with 120g of B to make a compound C

What is the density of C?

	Density	Mass	Volume
A	$6 g/cm^3$	$50g$	$50 \div 6 \quad 8\frac{1}{3} cm^3$
B	$8 g/cm^3$	$120g$	$120 \div 8 = 15 cm^3$
		$170g$	$23\frac{1}{3} cm^3$

Density of compound $= \dfrac{\text{Total mass}}{\text{Total vol}} = \dfrac{170}{23\frac{1}{3}}$

$= 7.29 cm^3$