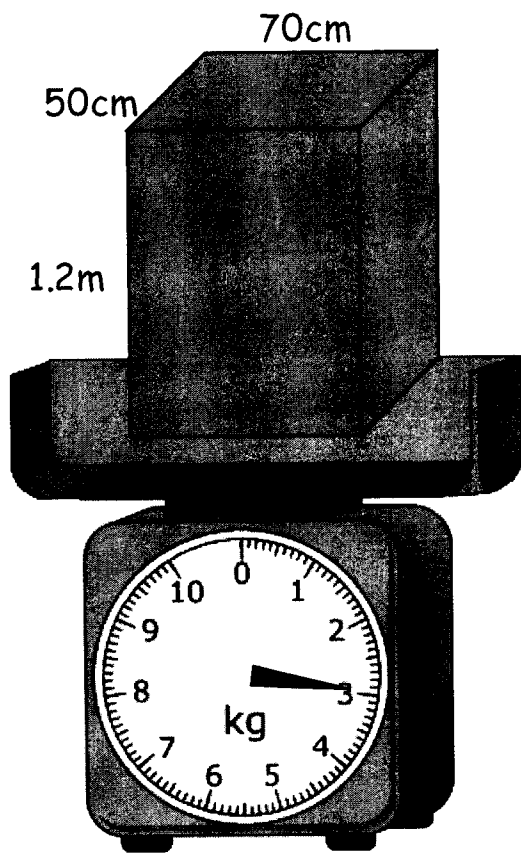


COMPOUND MEASURES

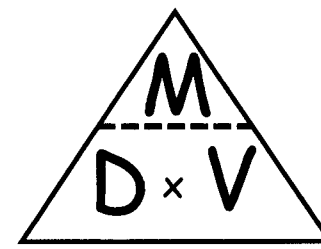
Page	Description
1	Introduction to Density
2	Further examples of density
3	Recap on density
4	Time. Converting from hours and minutes to decimals
5	Speed calculations
6	Speed problem
7	Distance time graphs
8	More distance time graphs
9	Distance time graphs and velocity time graphs
10	Converting between different units of speed
11	Interpreting graphs of rates including drawing tangents on curves
12	Population Density and Speed questions

Density



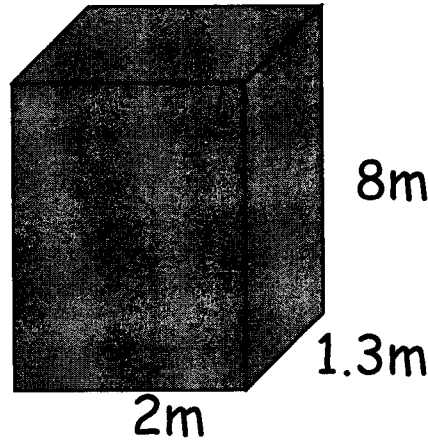
What is the density of the material the block is made from?

$$\text{Density} = \frac{\text{mass}}{\text{volume}}$$

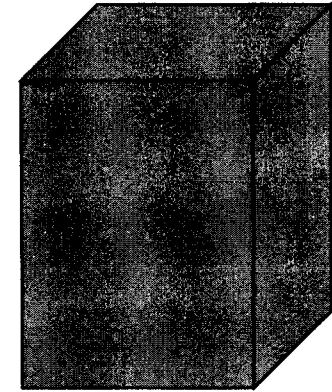


mass =

volume =



This block has a density of 5000 kg/m^3 .
How much does it weigh?



This block is made from a material with density 4000 kg/m^3 .

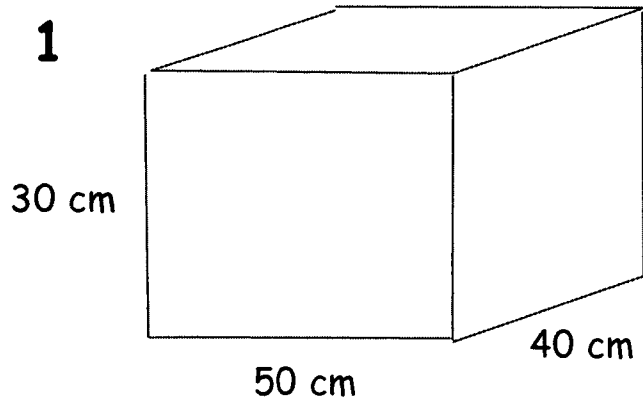
The weight of the block is 7500kg.

What is the volume of the block?

Calculate the missing quantity in each question.

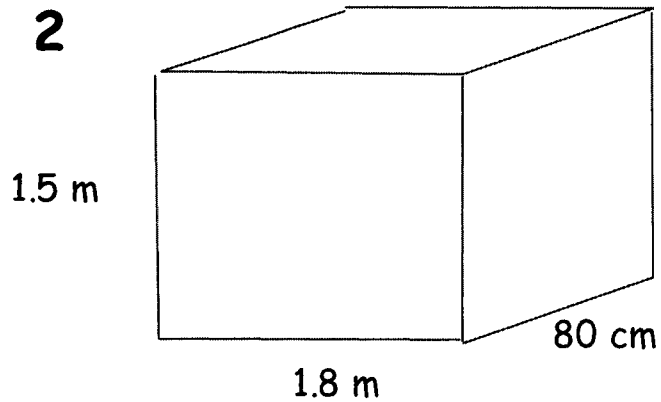
Density = mass/volume
Mass = density x volume
Volume = mass/density

1



Calculate the volume of this block in m^3 .
The block weighs 474 kg. What is the density of the material it is made out of?

2



Calculate the volume of this block in m^3 .
The density of the material the block is made out of is 500 kg/m^3 .
What is the weight of this block?

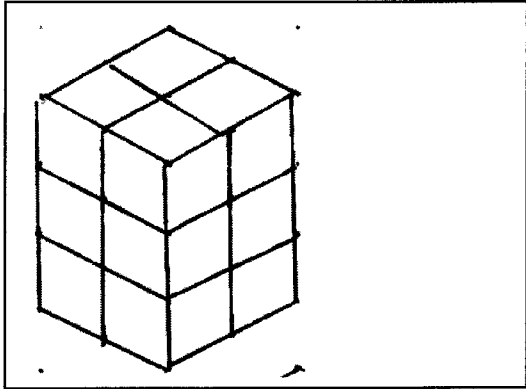
- 3 A cuboid of material has a mass of 30kg. The density of the material the block is made from is 150 kg/m^3 .
What is the volume of the block?
- 4 Questions 1 to 3 contain 3 blocks, they are made from steel, wood and polystyrene. Match the material to the question number.

Density Each shape is a prism made from 1cm^3 cubes

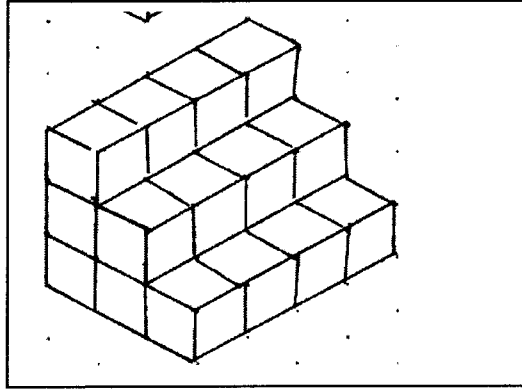
The density of Iron = 7.8 g/cm^3 Aluminium = 2.7 g/cm^3 Gold 19.3 g/cm^3

1) What is the weight of each of these prisms?

a) A Cuboid made of Gold

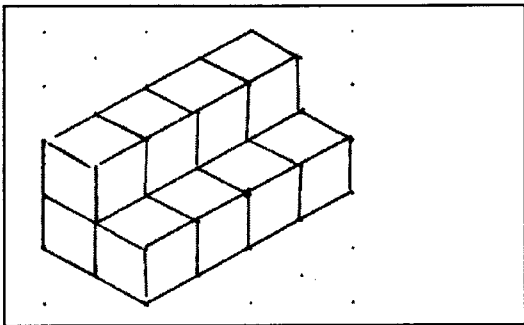


b) A Prism made of Aluminium

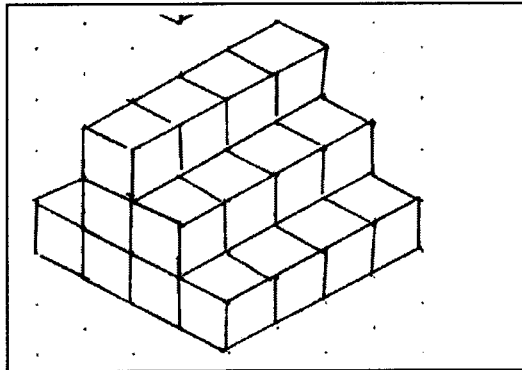


2) Which material is each prism made of?

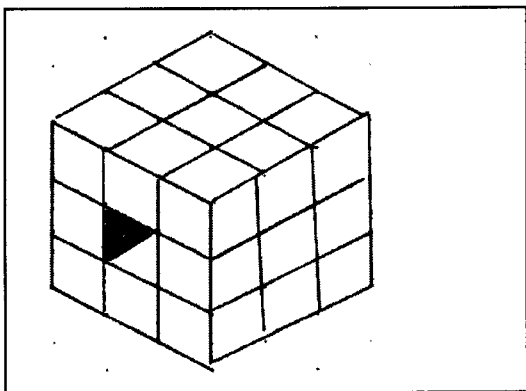
a) Mass = 32.4 g



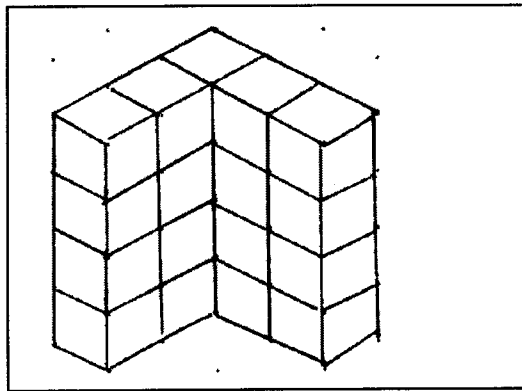
b) Mass = 218.4 g



c) Mass = 463.2 g



d) Mass = 156 g



3) Calculate the volume of each block. a) Block A is made of aluminium and weighs 135g.

b) Block B is made of iron and weighs 234g. c) Block C is made of gold and weighs 386g.

Time conversion calculations

- 1) 2.5 hours = _____ hours _____ minutes
- 2) 1.2 hours = _____ hours _____ minutes
- 3) 0.7 hours = _____ hours _____ minutes
- 4) 3.12 hours = _____ hours _____ minutes
- 5) 4.8 hours = _____ hours _____ minutes
- 6) 3 hours 24 minutes = _____ hours
- 7) 4 hours 15 minutes = _____ hours
- 8) 1 hours 48 minutes = _____ hours
- 9) 1 hours 45 minutes = _____ hours
- 10) 2 hours 54 minutes = _____ hours

A car starts a journey at 3.12 pm. The journey finishes at 6.30 pm.

- 11) How long did the journey take in hours and minutes? _____
- 12) How long did the journey take as a decimal? _____

A car starts a journey at 4.22 pm. The journey finishes at 6.07 pm.

- 13) How long did the journey take in hours and minutes? _____
- 14) How long did the journey take as a decimal? _____

A car starts a journey at 1.56 pm. The journey finishes at 3.20 pm.

- 15) How long did the journey take in hours and minutes? _____
- 16) How long did the journey take as a decimal? _____

A car starts a journey at 1.56 pm and took 4 hours 15 minutes.

- 17) At what time did the journey finish? _____
- 18) How long did the journey take as a decimal? _____

A car starts a journey at 3.47 pm. The journey took 3.35 hours.

- 19) How long did the journey take in hours and minutes? _____
- 20) At what time did the journey finish? _____

Speed

- 1) A car sets off at 8.45 am and arrives at 10.09 am. It travels a distance of 84 miles.
 - a) How long does the journey take, in hours and minutes?
 - b) How will you enter this time in hours on your calculator?
 - c) What is the average speed of the car for the journey?

- 2) A car is travelling at 65 mph. It travels 143 miles.
 - a) How long does the journey take, in hours and minutes?
 - b) The car set off at 10.50 am. What time did arrive?

- 3) A car is travelling at 40 mph. It set off at 7.55 am and arrives at 9.04 am.
 - a) How long does the journey take, in hours and minutes?
 - b) How will you enter this time in hours on your calculator?
 - c) What is the length of the journey?

- 4) A train sets off at 8.45 am and arrives at 11.25 am. It travels a distance of 320 miles.
 - a) How long does the journey take, in hours and minutes?
 - b) How will you enter this time in hours on your calculator?
 - c) What is the average speed of the train for the journey?

- 5) A car is travelling at 40 mph. It travels 74 miles.
 - a) How long does the journey take, in hours and minutes?
 - b) The car set arrived at 22:15. What time did it leave? Give your answer in am/pm time

- 6) A cyclist is travelling at 20 mph. They set off at 7.55 am and arrive at 5.40 pm.
 - a) How long does the journey take, in hours and minutes?
 - b) How will you enter this time in hours on your calculator?
 - c) What is the length of the journey?

Car travelling at 40 mph

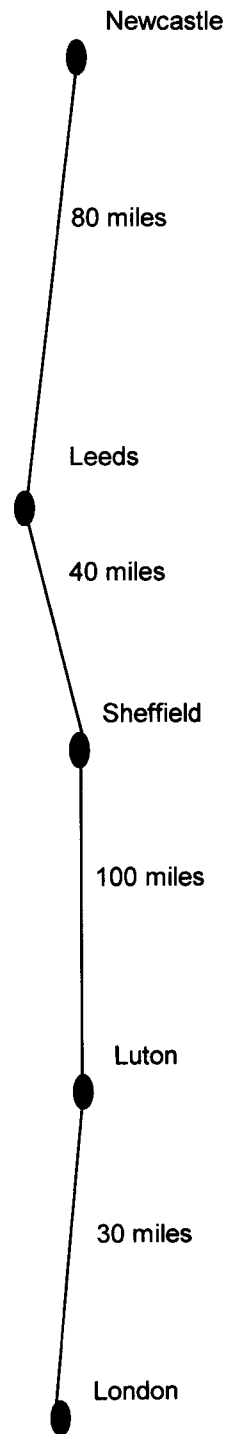
	time taken	am/pm	24h
Newcastle	X	11 am	11:00
Leeds			
Sheffield			
Luton			
London			

Car travelling at 60 mph

	time taken	am/pm	24h
Newcastle	X	11 am	11:00
Leeds			
Sheffield			
Luton			
London			

Car travelling at 80 mph

	time taken	am/pm	24h
Newcastle	X	11 am	11:00
Leeds			
Sheffield			
Luton			
London			



Time = distance ÷ speed

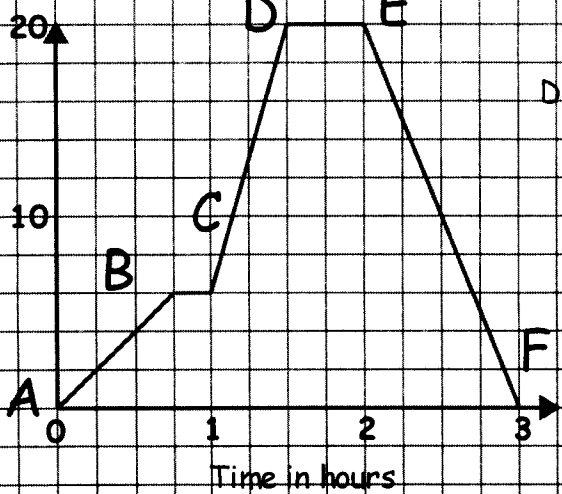
The car travelling at 80 mph is the first car to arrive at London.

How long is it before the other two cars arrive.

The 60 mph car.

The 40 mph car.

Distance in km

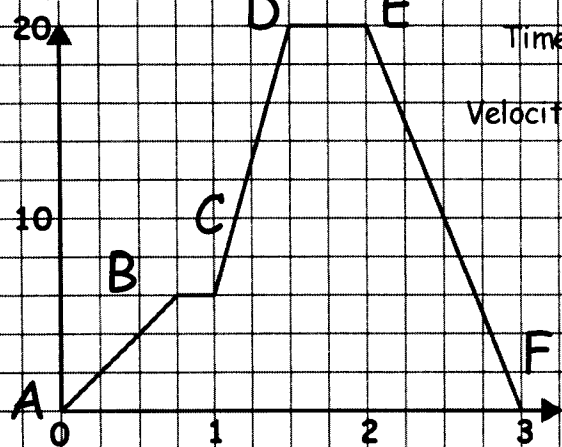


Time 0 0.25 0.5 0.75 1 1.25 1.5 1.75 2 2.25 2.5 2.75 3

Distance

Section	Distance	Time	Velocity	Description
A to B	5	0.5	10	
B to C	0	0.5	0	
C to D	15	0.5	30	
D to E	0	0.5	0	
E to F	20	1.0	-20	

Velocity km/h

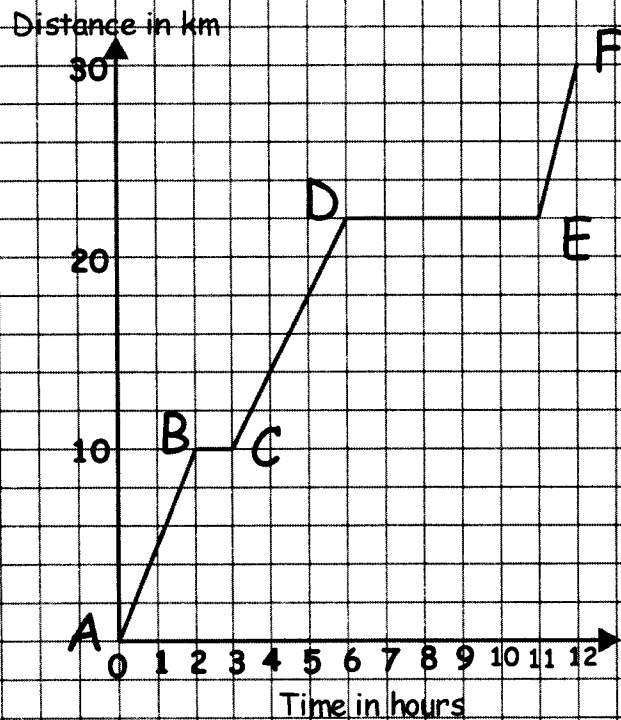


Time 0 0.25 0.5 0.75 1 1.25 1.5 1.75 2 2.25 2.5 2.75 3

Velocity

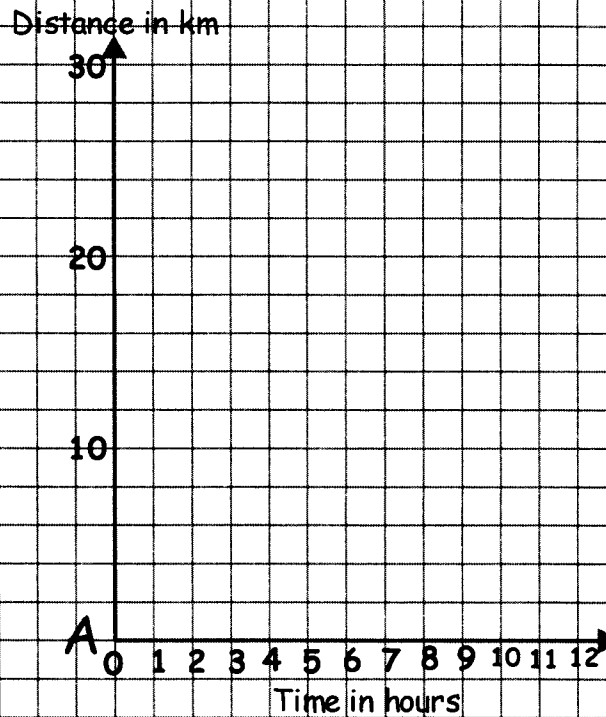
Section	Acceleration	Description
A to B	20	
B to C	0	
C to D	20	
D to E	0	
E to F	-20	

1) Fill in the table from the graph



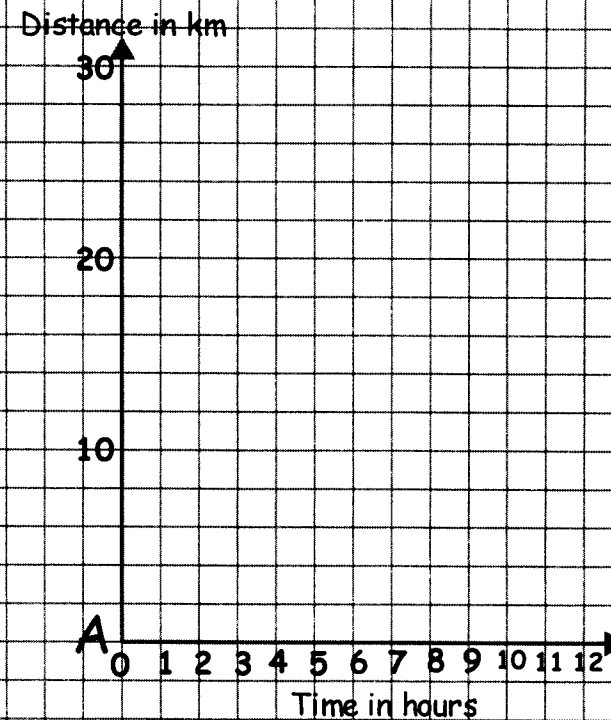
Section	Distance	Time	Speed
A to B			
B to C			
C to D			
D to E			
E to F			

2) Fill in the graph from the table
Complete the table

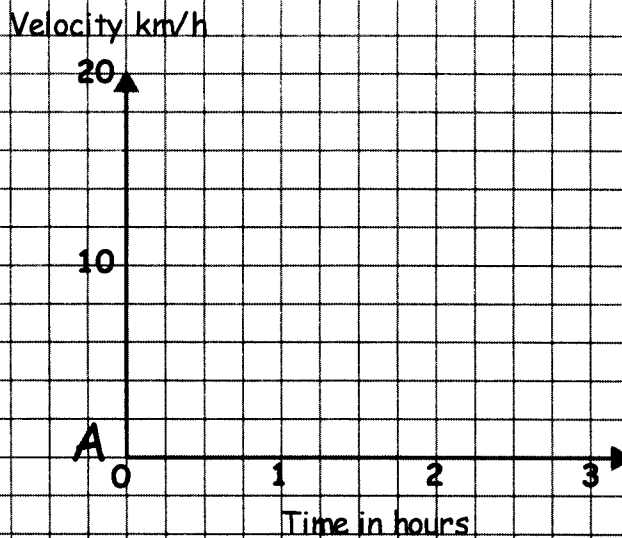
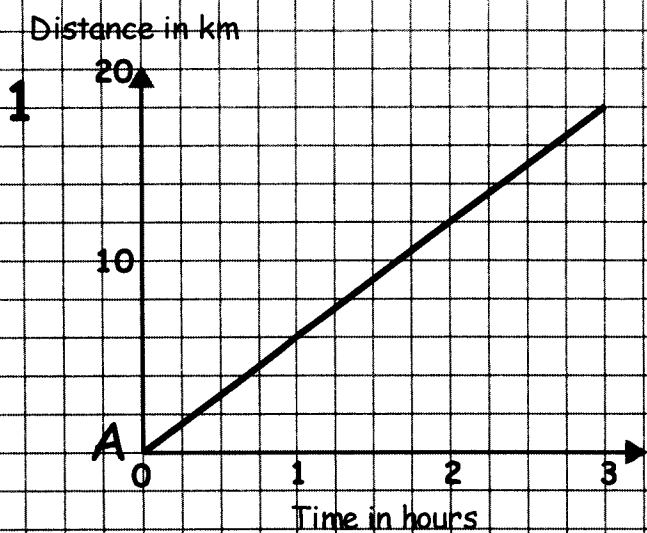


Section	Distance	Time	Speed
A to B	6 km	4 hours	
B to C	0 km	2 hours	
C to D	8 km	1 hour	
D to E	0 km	1 hour	
E to F	16 km	4 hours	

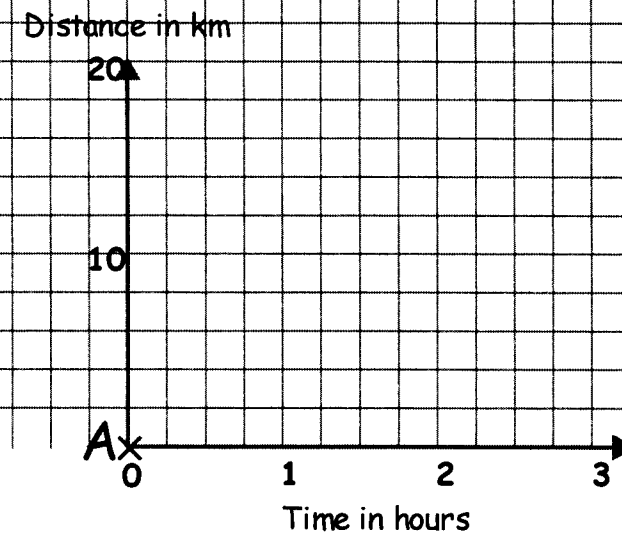
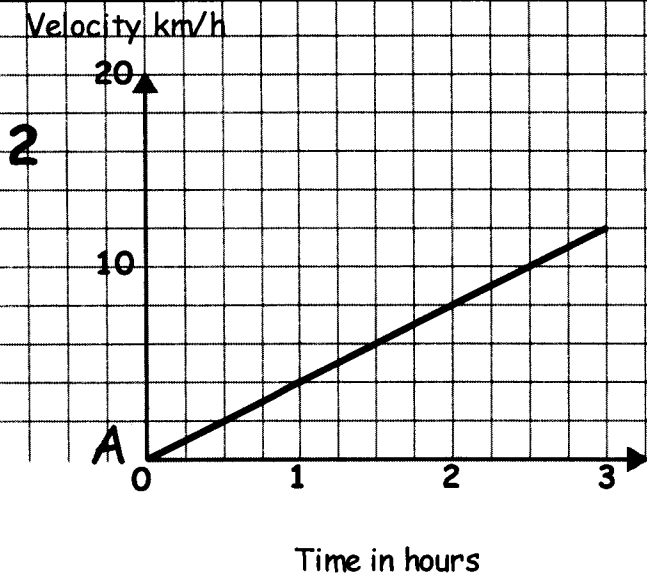
3) Fill in the graph from the table
Complete the table



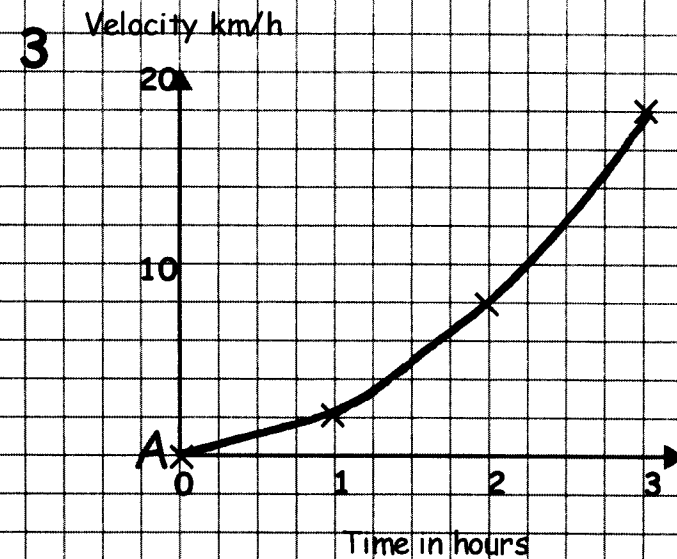
Section	Distance	Time	Speed
A to B	12 km	6 hours	
B to C	0 km	2 hours	
C to D	6 km	3 hours	
D to E	12 km	1 hour	



Complete the velocity time graph by using the distance time graph.



Complete the distance time graph by using the velocity time graph.



Complete the two tables by using the velocity time graph

Time (hours)	0	1	2	3
--------------	---	---	---	---

Acceleration (km/h^2)				
----------------------------------	--	--	--	--

Time (hours)	0	1	2	3
--------------	---	---	---	---

Distance (km)				
---------------	--	--	--	--

Remember

Distance/time graph the gradient is the velocity

Velocity/time graph the gradient is the acceleration

Velocity/time graph the area under the graph is the distance

1 km = 1000 m

1 hour = _____ minutes = _____ seconds

Converting from m/s to km/h

30 m/s means 30 metres in 1 second.

In 1 minute this would be _____ m.

In 1 hour this would be _____ m.

In 1 hour this would be _____ km.

So 30 m/s is _____ km/h.

Converting from km/h to m/s

72 km/h means 72 km in 1 hour.

In 1 hour this would be _____ m.

In 1 minute this would be _____ m.

In 1 second this would be _____ m.

So 72 km/h is _____ m/s.

Converting from mph to m/s

1 mile is 1.61 km

1 km = 1000 m

30 mph means 30 miles in 1 hour.

30 miles is _____ km, is _____ m

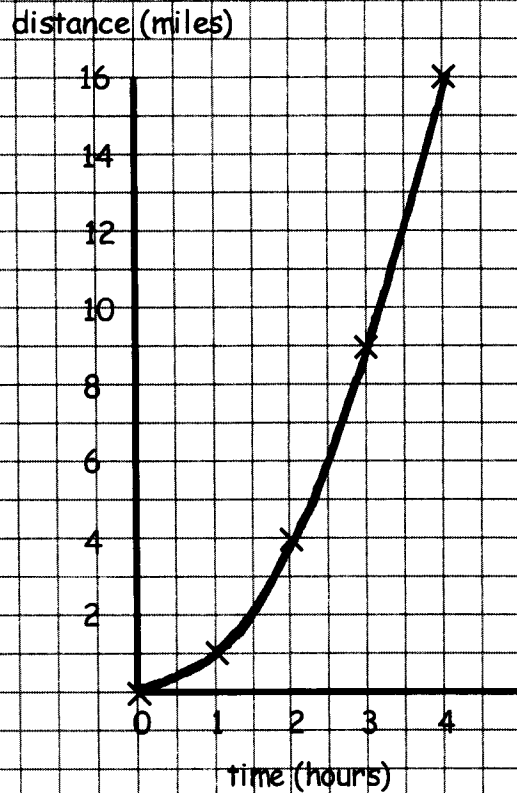
In 1 hour this would be _____ m.

In 1 minute this would be _____ m.

In 1 second this would be _____ m.

So 30 mph is _____ m/s.

Speed



Speed is the gradient of the graph.

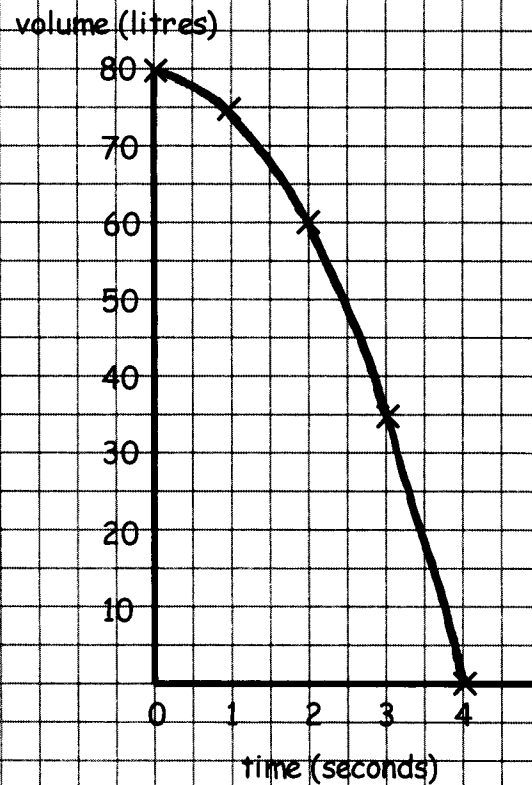
By drawing tangents find the speed at these times. (remember to use the scale)

$t = 1$

$t = 2$

$t = 3$

Draining a tank of water



Rate of flow is the gradient of the graph.

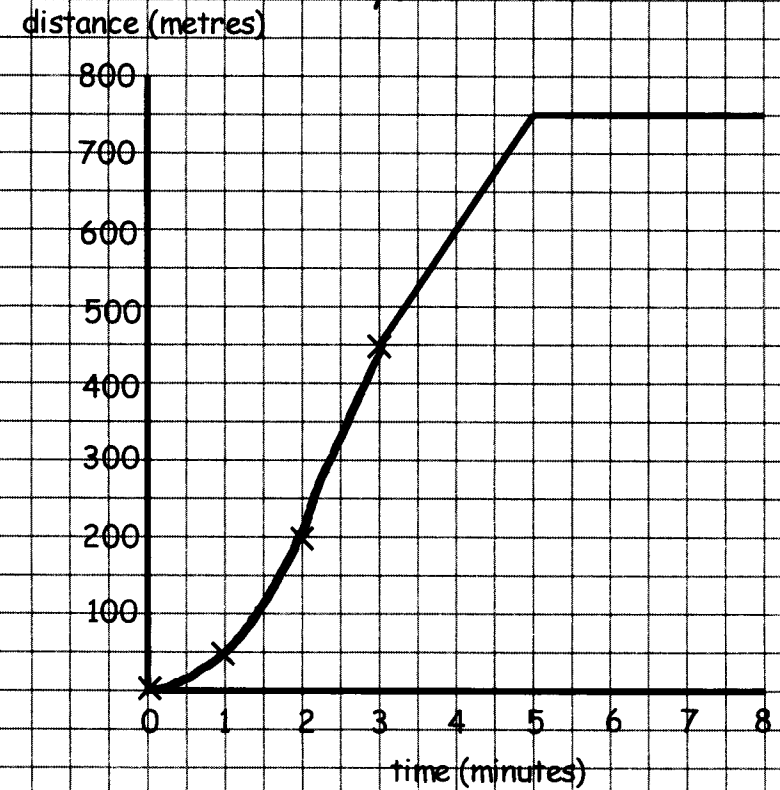
By drawing tangents find the speed at these times. (remember to use the scale)

$t = 1$

$t = 2$

$t = 3$

Cyclist



Speed is the gradient of the graph.

The graph is split into three sections in terms of the speed of the cyclist.

Minutes 0 to 3 the speed is increasing/decreasing constant/zero

Minutes 3 to 5 the speed is increasing/decreasing constant/zero

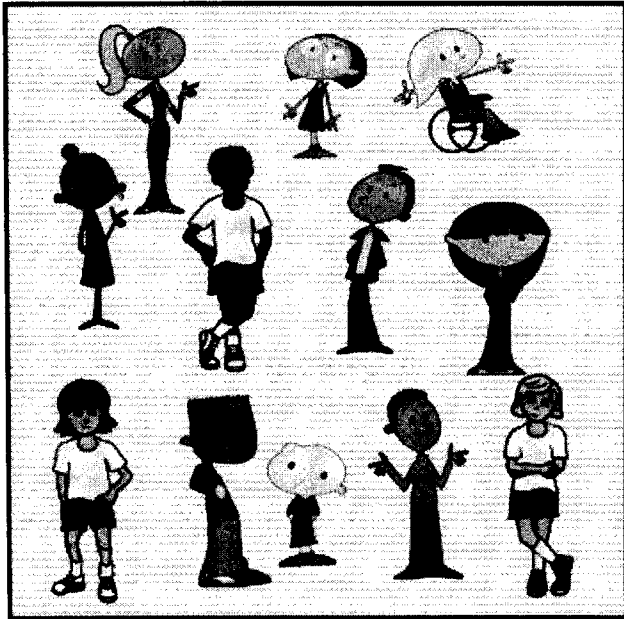
Minutes 5 to 8 the speed is increasing/decreasing constant/zero

Find the speed at $t = 2$ and $t = 4$



$\text{Population Density} = \text{Population} \div \text{Area}$

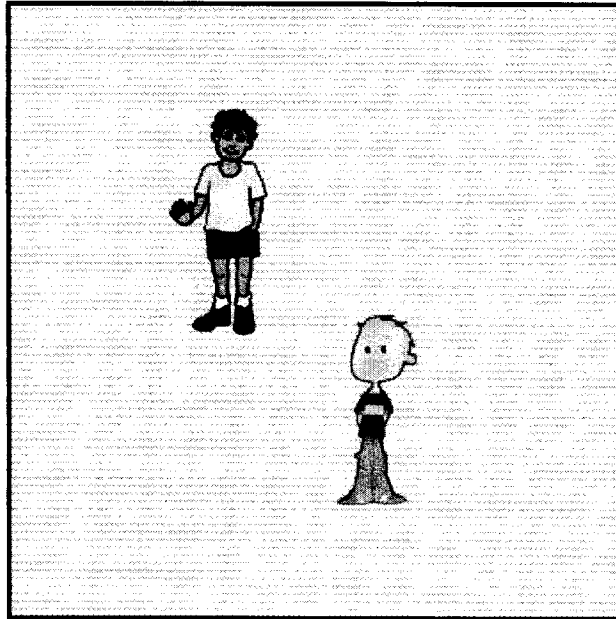
Town A



5 m

5 m

Town B



Find the population density of each town.
What do the answers show?

5 m

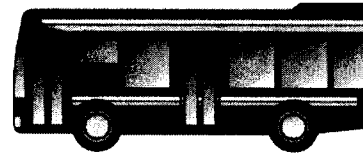
5 m

London 200 miles

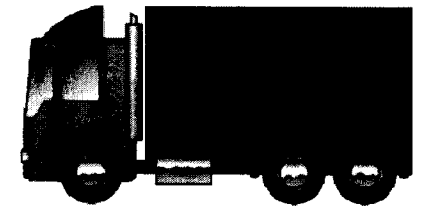
They all set off at 11.30 am.
What time do they arrive?
What is the difference
between the fastest and
the slowest?
Round times to the nearest
minute.



travels at 70 mph



60 mph



50 mph