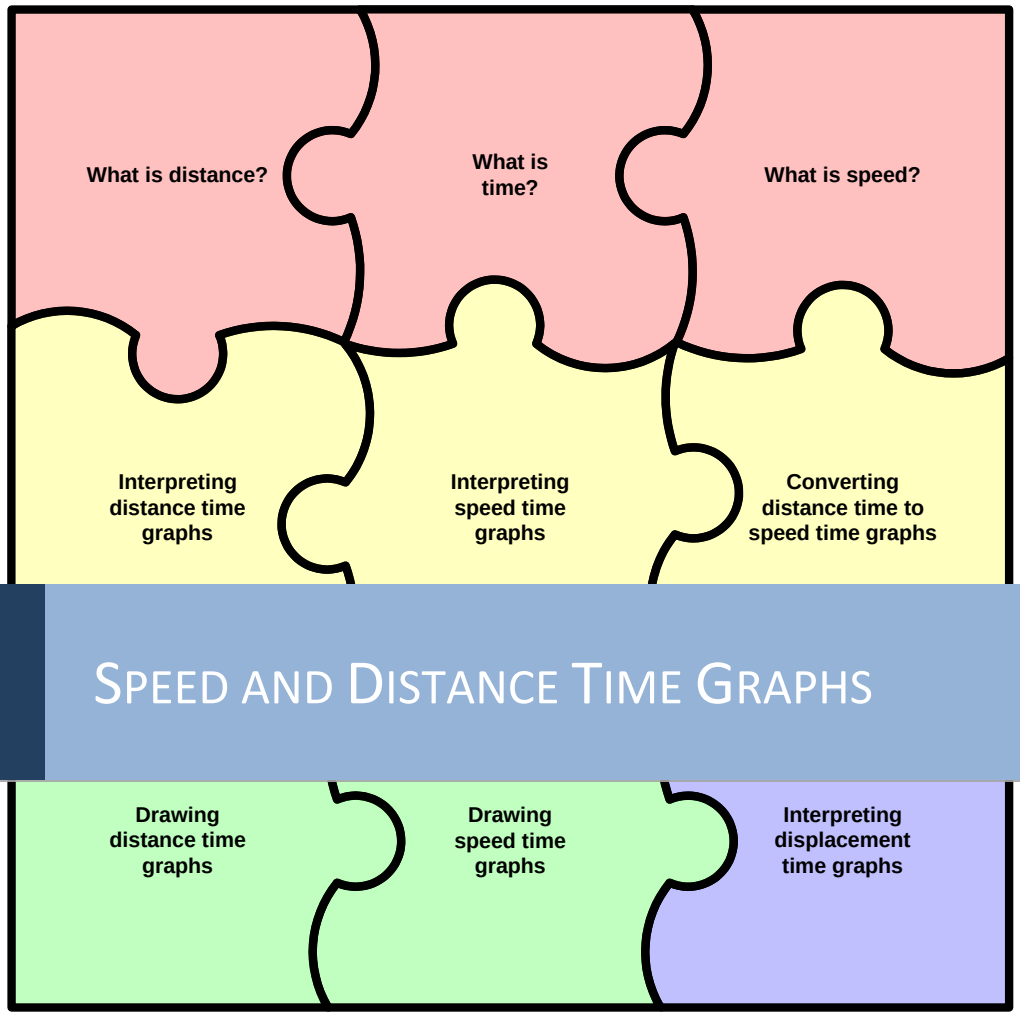
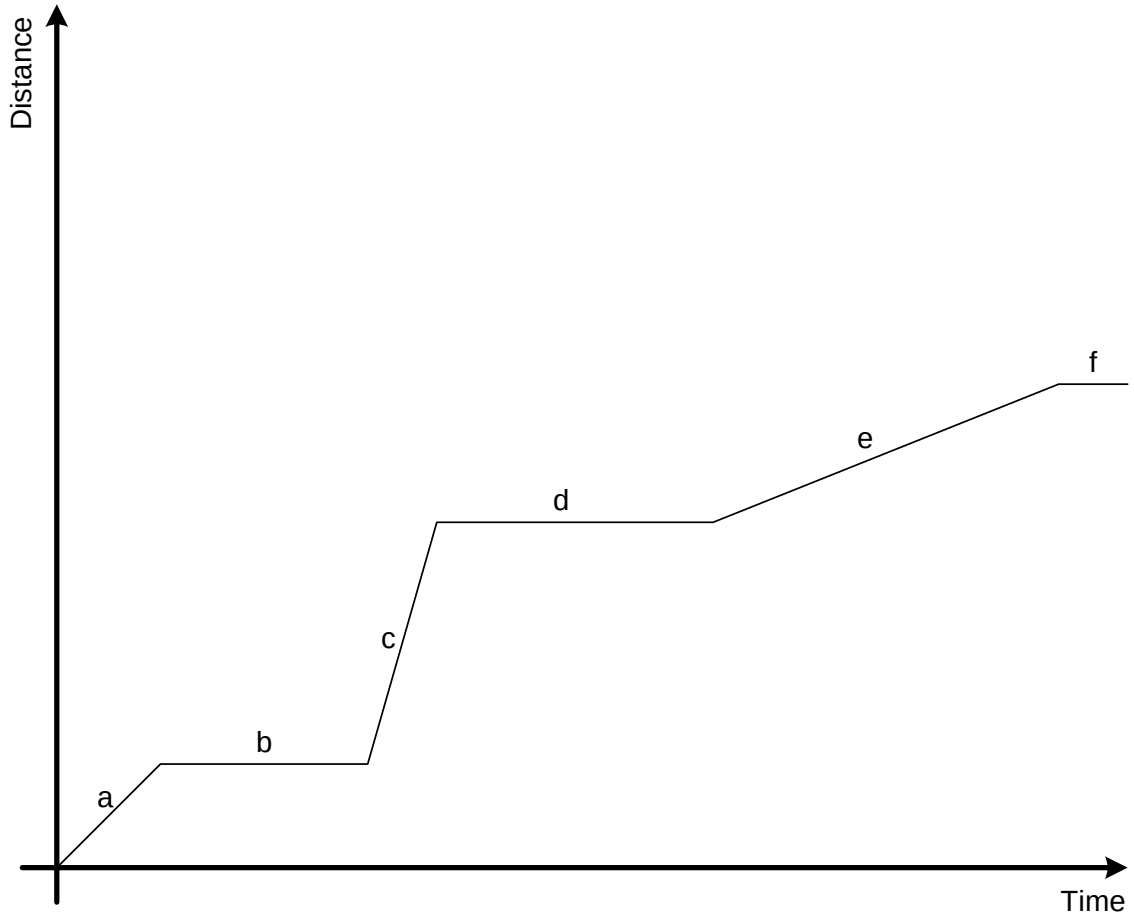


Speed and Distance Time Graphs

Interpreting Distance Time Graphs

1.



At the time where line a is being calculated, the object is moving at a constant speed. When the line flattens out along b, the object is no longer getting any further away from the abscissa (x-axis) and so is remaining still. Eventually, the object begins to move again but faster than last time (when it was being represented by line a) and consequently, it moves further. At line d, the object is still for about the same time as when it rested at b. Gradually, the object moves away at point e with a constant speed until it reaches f where it stops.

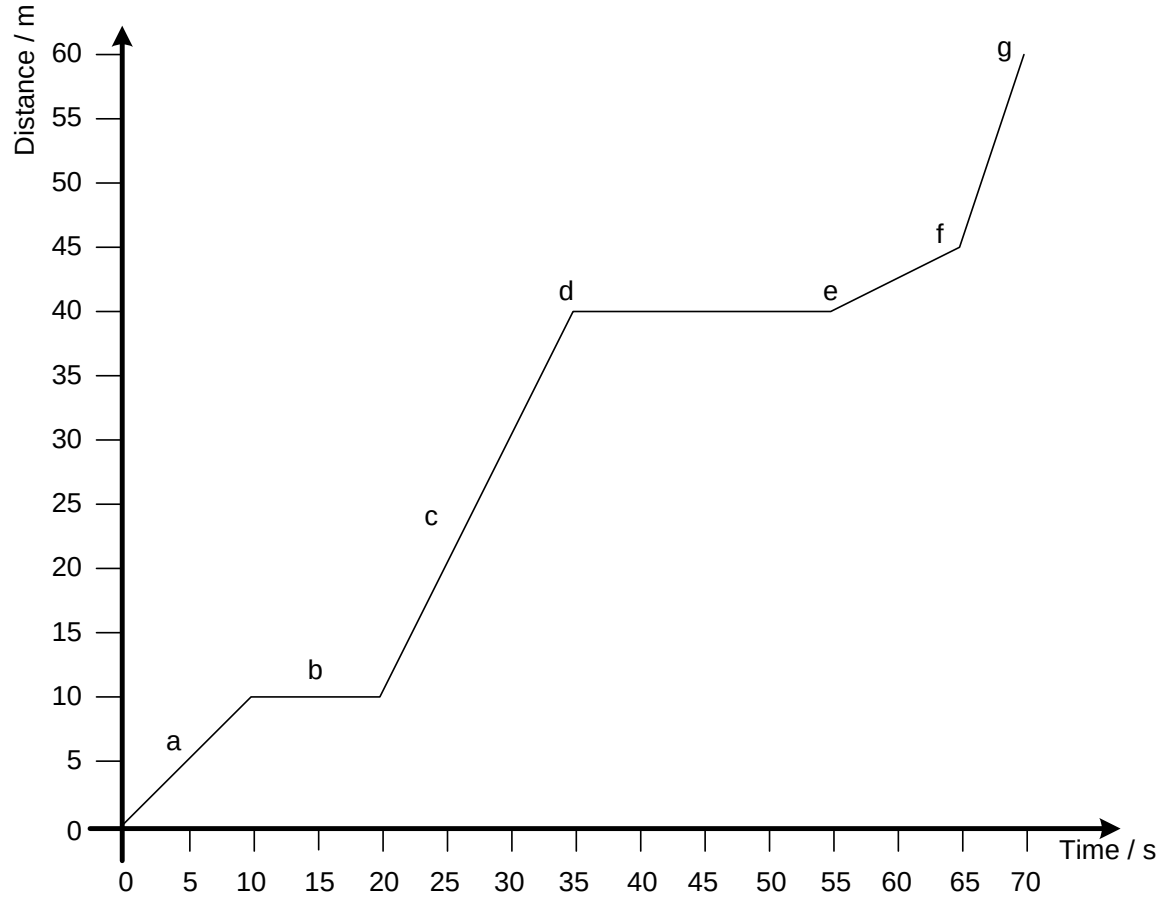
a. At which point is the object moving fastest? How do you know?

b. On how many different occasions in the object stationary? How do you know?

c. When, apart from when stationary, is the object moving slowest? How do you know?

d. Roughly, for what percentage of the time is the object stationary? How do you know?

2



The graph above shows the distance a dog moved over the period of just over a minute when his owner took him for a walk to the park. Line a shows the dog on a lead and the girl leading him into the park.

a. What do you think is happening at the point marked b? What makes you think this?

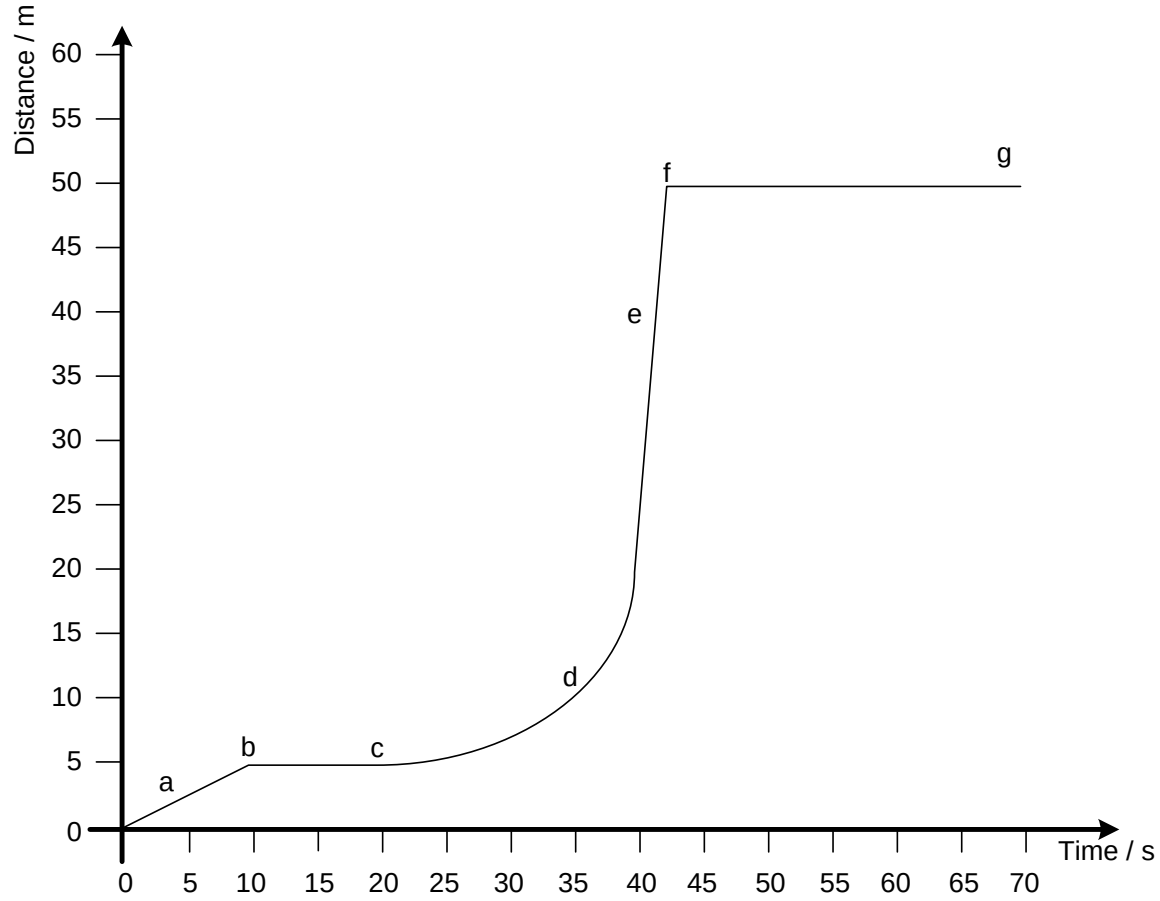
b. Does the dog move quicker or slower between $20 \leq t \leq 35$ (between 20 and 35 seconds) when compared to $t < 10$ (less than 10 seconds)?

c. For how long is the dog being shown as being still on the graph above?

d. The girl threw a ball for the dog to retrieve. At what point do you think the girl through the ball and why do you think this?

e. How far did the dog move altogether in the time shown on the graph?

3.



The above graph shows an object moving along.

a. At t<10s, marked with the letter a, approximately how fast is the car going? How did you work this out?

b. What is happening between 10 and 20 seconds into the graph?

c. The line at point d is curved. What does this signify?

d. What do you think happens at the end of the object's journey? How do you know?

e. How far has the object moved?

f. What is the mean average speed of the object taken over the entire graph?

My journey to school

Highlight the distances, speeds and times given in the description below.

This morning, I was quite nervous as I had an interview that would signal a change in direction in my life. I walked the ten metres in about ten seconds from the front door to my car and then drove it out of my garage and into the street. It was clear so I did not have to wait. I put my foot down and within ten seconds, I had accelerated to 10m/s. This took me about 35m in the car.

After a further 50 seconds, I came to some traffic lights. The lights changed to red just before I reached them and so I had to slam my brakes on to stop myself from crashing. The lights seemed to take forever to change, but in actual fact only took about 30 seconds.

I set off and within 10 seconds, I had reached a speed of 10m/s. Again, this took me about 35m. I maintained this speed until I reached a mini-roundabout - you know, one of those annoying blobs of paint that some council official has plastered in the middle of the road that drivers find so frustrating! At the mini-roundabout, I had to wait for two cars to go through before I could turn left. Altogether, it took about 15 seconds to begin moving again.

It took me 35m or 10 seconds of moving before I was travelling at 10 m/s and I travelled at this speed for 130m until I reached a road junction where I stopped and waited for 12 seconds before proceeding. Along this new road, I was able to travel at 20 m/s and this took me about 10 seconds or 40m to reach. I drove for a total of 460 metres at this speed before I had to stop in order to turn right. I had to wait for 15 seconds for the traffic to be clear enough for me to turn. I turned right and pulled into a parking space.

I walked for twenty seconds to the park and ride bus stop as it was about 20m away from where I had parked. I had to wait for two minutes until my bus came and I boarded it and sat down. My bus journey lasted four minutes as it was straight down the road. I estimate that I was travelling at about 5m/s on the bus. I got off the bus outside school and walked 80m to reception where I was met and brought into the building. The walk from the bus took me 2 minutes.

Time	Distance	Total Distance	Total Time	Comments
10	10	10	10	Walked to my car
10	35	45	20	Accelerating to 10m/s
50	500	545	70	Driving to traffic lights at 10m/s. 50s at 10m/s gives me 500m altogether (and that is where I get the distance).

Use the table above to make notes to help you to draw a distance time graph of my journey to school.

Literacy Activity

Write a paragraph about a journey you have made (real or imagined) recently. You will need to include details of distance and times. Try to include the following types of transport:

- walking;
- running;
- cycling;
- car journey;
- bus journey.

Draw a distance time graph about your journey. Use the following rules:

1 You can walk at 1 m/s.

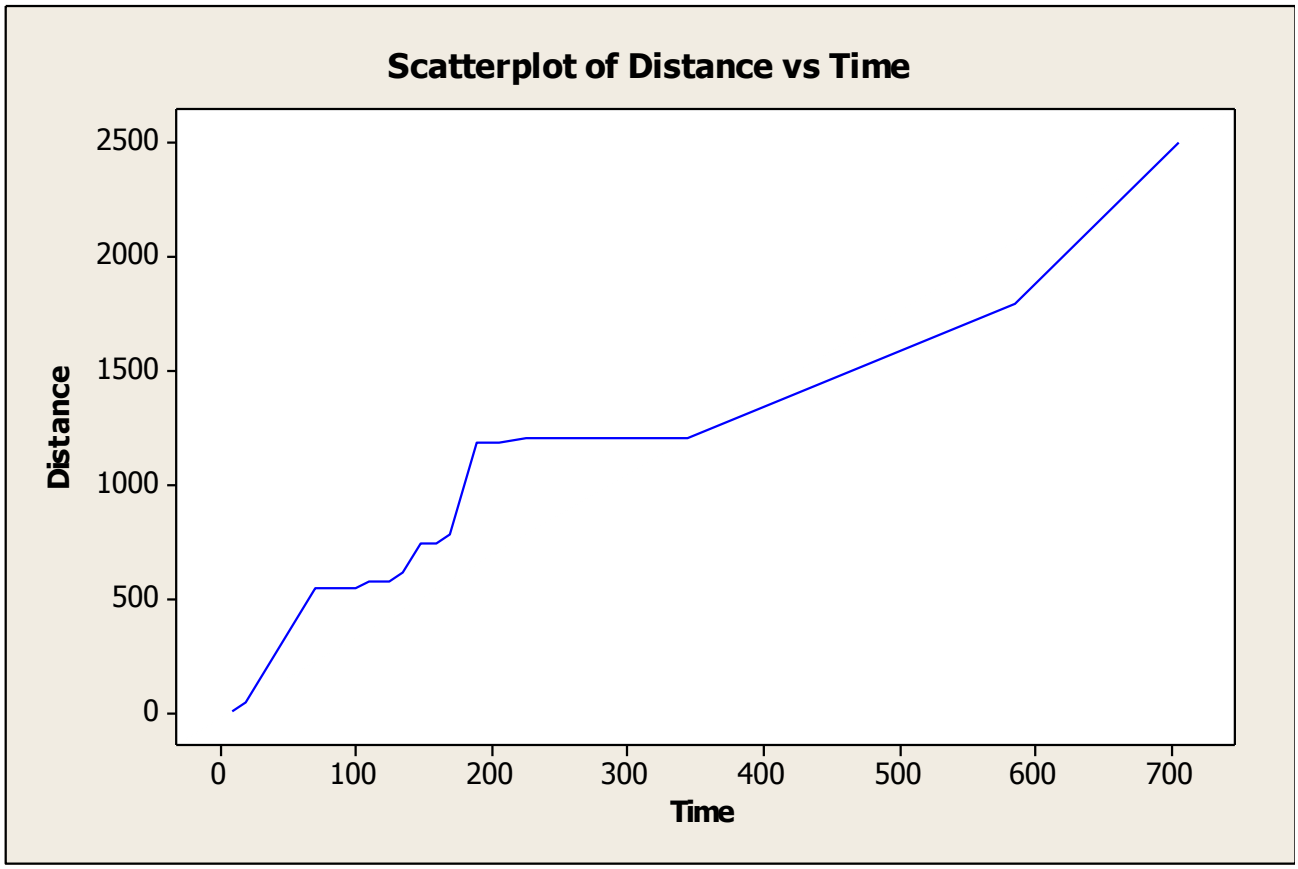
2 You can run at 3 m/s.

3 You can cycle at 6 m/s.

4 You can drive in a car at 10 m/s.

5 You can ride on a bus at 5 m/s.

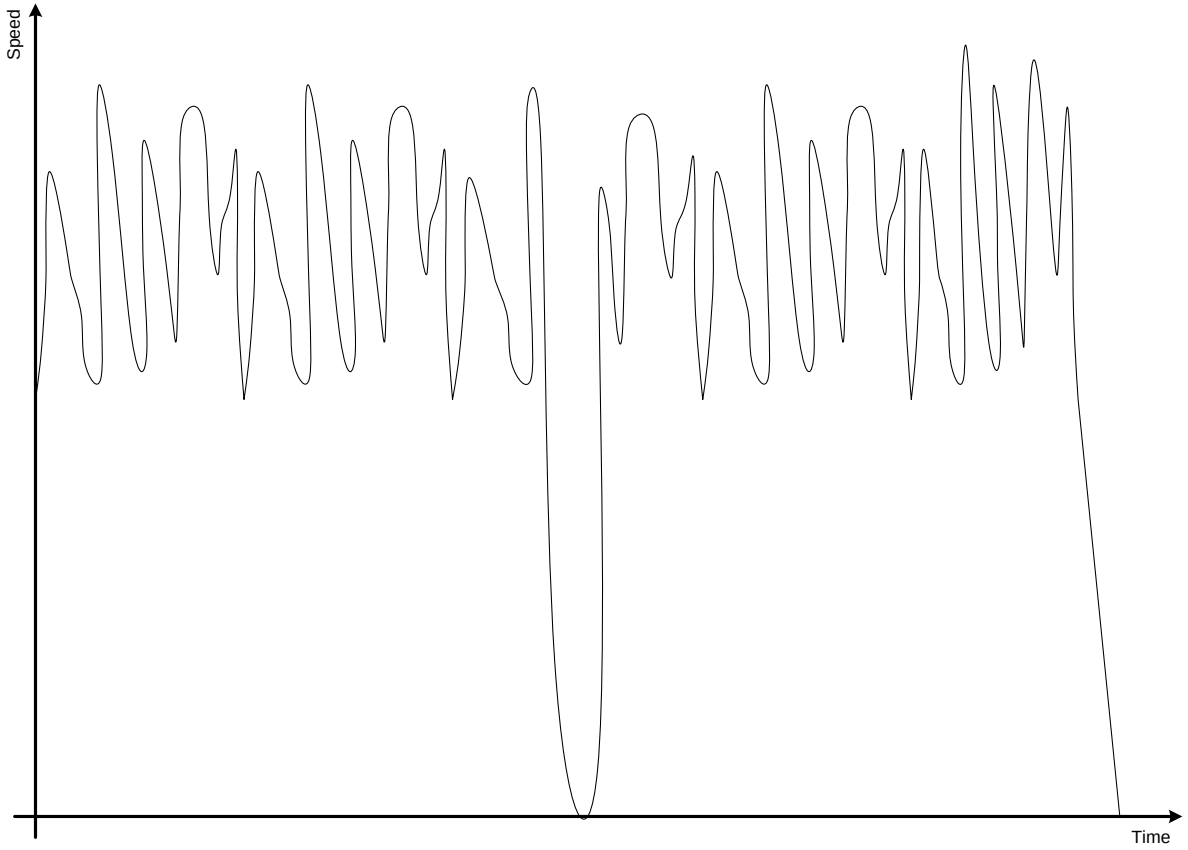
Converting a Distance Time Graph to a Speed Time Graph



Time	Distance	Speed	Total Time	Total Distance
10	10	1	10	10
10	35	3.5	20	45
50	500	10	70	545
30	0	0	100	545
10	35	3.5	110	580
15	0	0	125	580
10	35	3.5	135	615
13	130	10	148	745
12	0	0	160	745
10	40	4	170	785
20	400	20	190	1185
15	0	0	205	1185
20	20	1	225	1205
120	0	0	345	1205
240	1200	5	585	2405
120	80	0.666666667	705	2485

Analysing a Speed Time Graph

Below is a speed-time graph of Lewis Hamilton's times during an actual race.



a. How many laps is this section of the graph showing?

b. How many curves were there on the race track?

c. At what point did Hamilton call in at the pits? How do you know?

d. Which of the laps shown was his fastest lap? How do you know?

e. Are there any other questions you could answer from this data?