MATHS INVESTIGATION 2019

In the 2009 World Championships in Berlin, Usain Bolt set the World Record for the Men's 100 m sprint, running it in 9.58 seconds. The table shows Usain Bolt's times during the race with a breakdown to 10 m sections

Distance(m)	10	20	30	40	50	60	70	80	90	100
Time(s)	1.89	2.88	3.78	4.64	5.47	6.29	7.10	7.92	8.75	9.58

1. How fast do you think Usain Bolt ran during the race? Give your answer correct to three significant figures.
2. Do you think he ran at this speed the entire race? Give at least two reasons.
3. What does the answer for question 1 represent?
4. Use the above information from the table to draw a graph, label the axes.
5. Join the points (1.89, 10) and (5.47,50) on the graph.
6. Find the slope of the line
7. The line that joins (1.89, 10) to (5.47,50) has a special name.
   It is called a *secant line* to the above curve. What observation can you make about the slope of this secant line?
8. We want to know what Usain's speed is at exactly 1.89 seconds into the race. To help answer this question do the following:
   a. Draw the secants pass through : i)(1.89, 10) and (4.64,40)
   $\qquad\qquad\qquad\qquad\qquad\qquad$ ii) (1.89, 10) and (3.78,30)
   $\qquad\qquad\qquad\qquad\qquad\qquad$ iii) (1.89, 10) and (2.88,20)
   b. Fill in the following table.Answers correct to three significant figures.

Slope of the secant (1.89, 10) and (5.47,50) =	Average speed between (1.89, 10) and (5.47,50) =
Slope of the secant(1.89, 10) and (4.64,40) =	Average speed between (1.89, 10) and (4.64,40)
Slope of the secant (1.89, 10) and (3.78,30)	Average speed between (1.89, 10) and (3.78,30)
Slope of the secant (1.89, 10) and (2.88,20)	Average speed between (1.89, 10) and (2.88,20)

9. Comment on the gradient of secants as x gets closer to 1.89.
10. What do you suspect will be the slope of the line at x = 1.89?
11. Estimate Usain's speed at 1.89 seconds into the race.