

Picturing Motion

STUDENT INTRODUCTION

- ▶ Motion is in action everywhere at the Isle of Wight Steam Railway.
- ▶ This activity enables you to build on what you have already learned about distance time graphs, and to learn about displacement, velocity and acceleration.

Prior Learning

Students need to have learned the following to make use of this resource on site:

- ▶ Distance - time graphs
- ▶ Displacement - time graphs
- ▶ Speed - time graphs

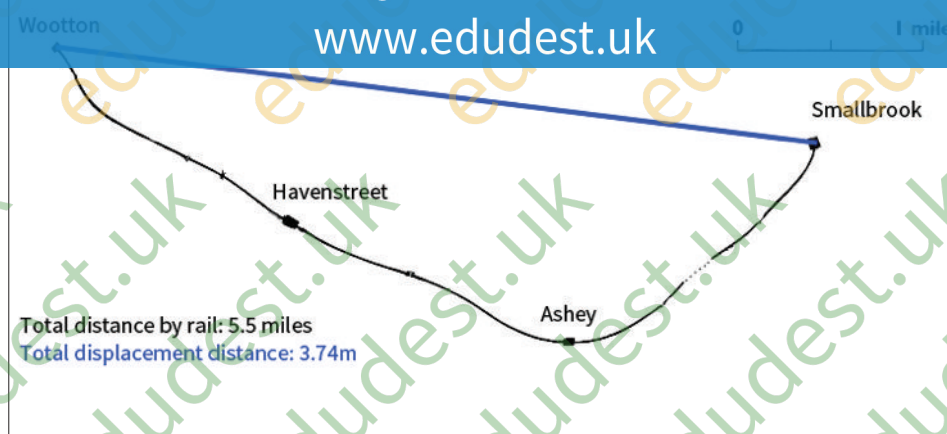


Note: To convert from mph to kph = mph x 1.609344

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Look at the diagram below. The first question you might ask about the motion of a train is 'how far did it move?' Curriculum relevant materials supporting school trips to the Isle of Wight

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However this could mean two different things:

1. If the track distance is 5.5 miles, then one way of looking at it is to say that the train has travelled 5.5 miles
2. Another answer could be that the train has travelled 3.74 miles East

This is called '**displacement**' - the straight-line distance and direction from the train's starting point.

Task

- ▶ During your journey, record the times for each section on the table provided on page 2
- ▶ You will need to work in pairs or small groups - one person timing / calling out the measurements, and another person writing them down
- ▶ Use this information to work out the average speed for each section of the journey
- ▶ Remember to do this both for the outward and return journey in order to calculate the average speed using the formula

$$\text{Average speed} = \text{distance travelled} \div \text{time taken}$$

Stage	Description	Distance	Time (outward)	Time (inward)	Av. journey time	Average speed
1	Wootton station -> under road bridge at Briddlesford Copse	0.9 miles				
2	Road bridge -> Havenstreet station	0.6 miles				
3	Havenstreet station -> over road bridge at Havenstreet	0.1 miles				
4	Over road bridge -> under road bridge at Rowlands Wood	0.6 miles				
5	Under road bridge -> Asheby station	1.0 miles				
6	Asheby station -> start of tunnel	0.7 miles				
7	Start of tunnel -> end of tunnel	1.1 miles				
8	End of tunnel -> Sandown station	1.5 miles				

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Note: Depending on your specific journey today, you may not travel through all of the 8 stages.

Questions

1. What was the fastest part of the journey?
2. What was the slowest?
3. Why is there a difference in speed?

Using the information in the table, answer the following:

4. What is the total distance travelled (remember to include the return journey)?
5. What was the total time for the journey?

Your journey

- ▶ In your journey, the speed of the train changes gradually
- ▶ In a **distance – time graph**, the gradient of the graph tells you the speed of the train. If the gradient gets steeper, the train is speeding up, or accelerating
- ▶ If the gradient is getting less steep, then the train's speed is decreasing



TASKS

6. Can you show this journey in a **distance – time graph** (on the graph paper provided) annotating it to show where the train is:

- Gradually speeding up
- Slowing down
- Stopped
- Steady slow speed
- Steady speed but faster

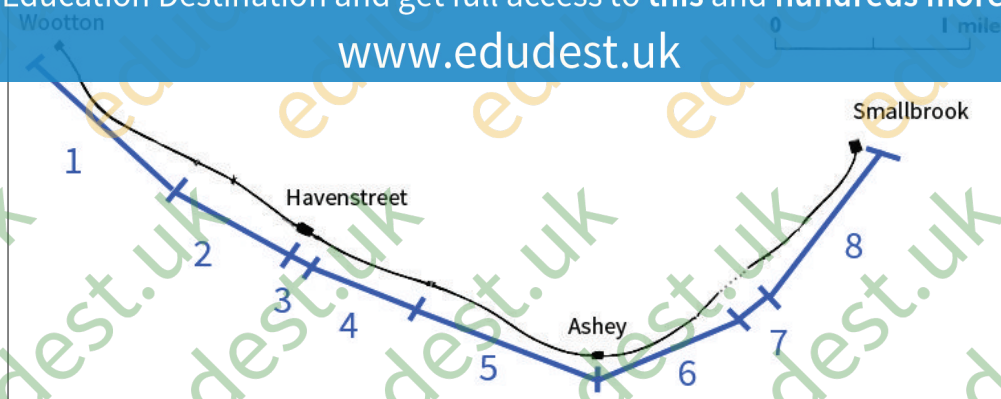
7. Using the map provided below, which shows the same 8 stages as the table on page 2, can you draw a **displacement – time graph** (on the graph paper provided)

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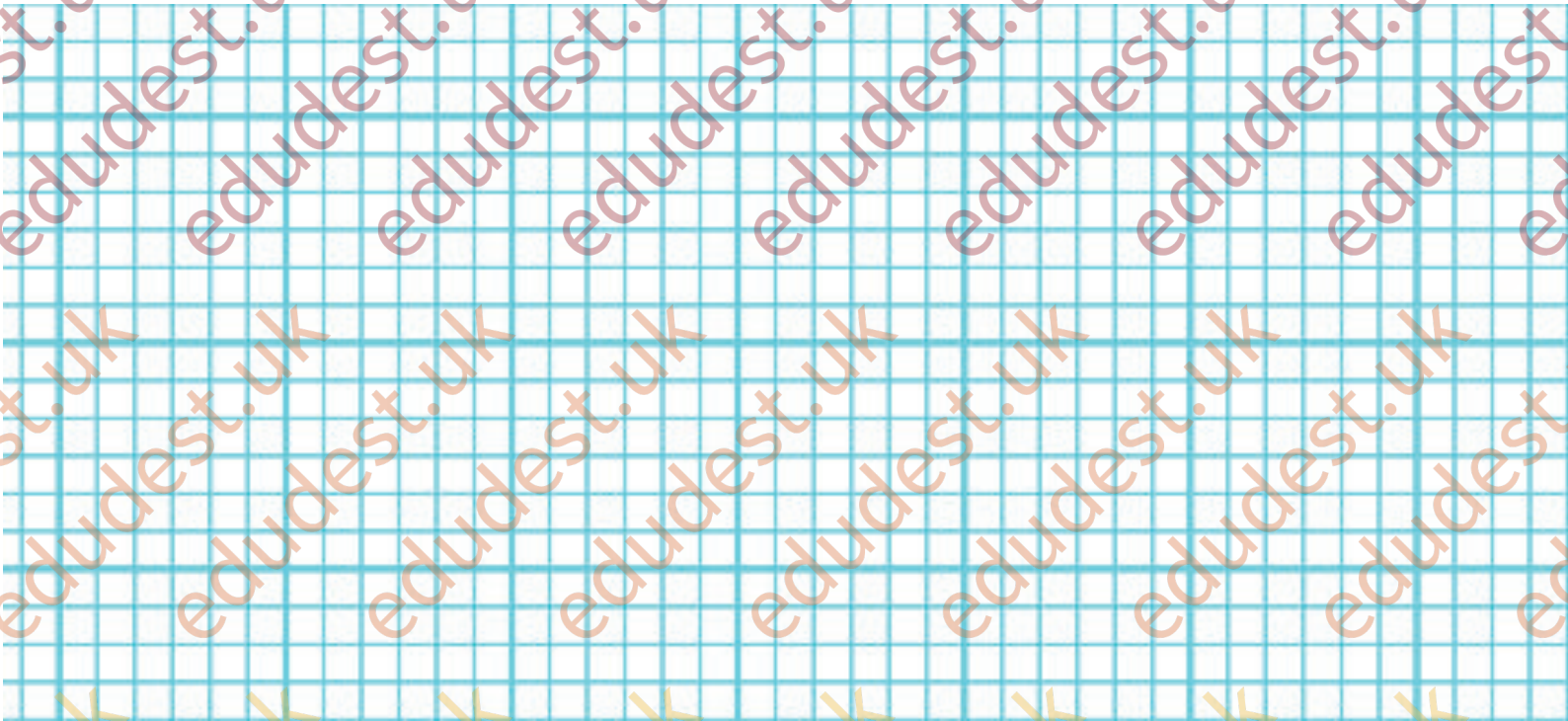
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8. How do the two graphs differ?

9. Explain why the **displacement – time graph** turns down whereas the **distance – time graph** continues to go up.



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