



Name Class Date

INEOS TEAM UK is the British Challenger for the 36th America's Cup – the oldest international sporting competition in the world. There are only eleven crew on the boat, but a hundred experts back on the team base working hard to help INEOS TEAM UK design the most technically advanced and innovative foiling boat to win the America's Cup.

Beating your competitors is about one thing – speed! To get faster, the team measure a lot of variables, and looks at the effect they have on their speed using equations and graphs!

1 Use these equations to answer the following questions.

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}} \quad \text{Acceleration} = \frac{\text{Change in speed}}{\text{Time}}$$

- a** The INEOS TEAM UK boat travels 140 m in 16 seconds. What is its average speed?
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- b** The INEOS TEAM UK boat travels at 10 m/s for 30 seconds, then immediately accelerates to 20 m/s and travels for another 20 seconds. What is the total distance it has travelled?
.....
- c** How long would it take the crew to sail the boat around a 3.6 km course at a speed of 24 m/s?
.....
- b** The INEOS TEAM UK boat starts at 15 m/s and accelerates to 20 m/s over a period of 10 s. What is its acceleration?
.....
- c** The crew are sailing back to the base after a training session. From sailing at 30 m/s, after 12 seconds they are sailing at 6 m/s. What is the acceleration? What other term could we use to describe this change in movement?
.....

Challenge  $\text{Distance} = (\text{Initial Speed} \times \text{Time Taken}) + \left(\frac{1}{2} \text{Acceleration} \times \text{Time Taken}^2\right)$

- f** The boat rises up onto its hydrofoils and accelerates from 10 m/s to 20 m/s over 10 s. What distance does it travel?
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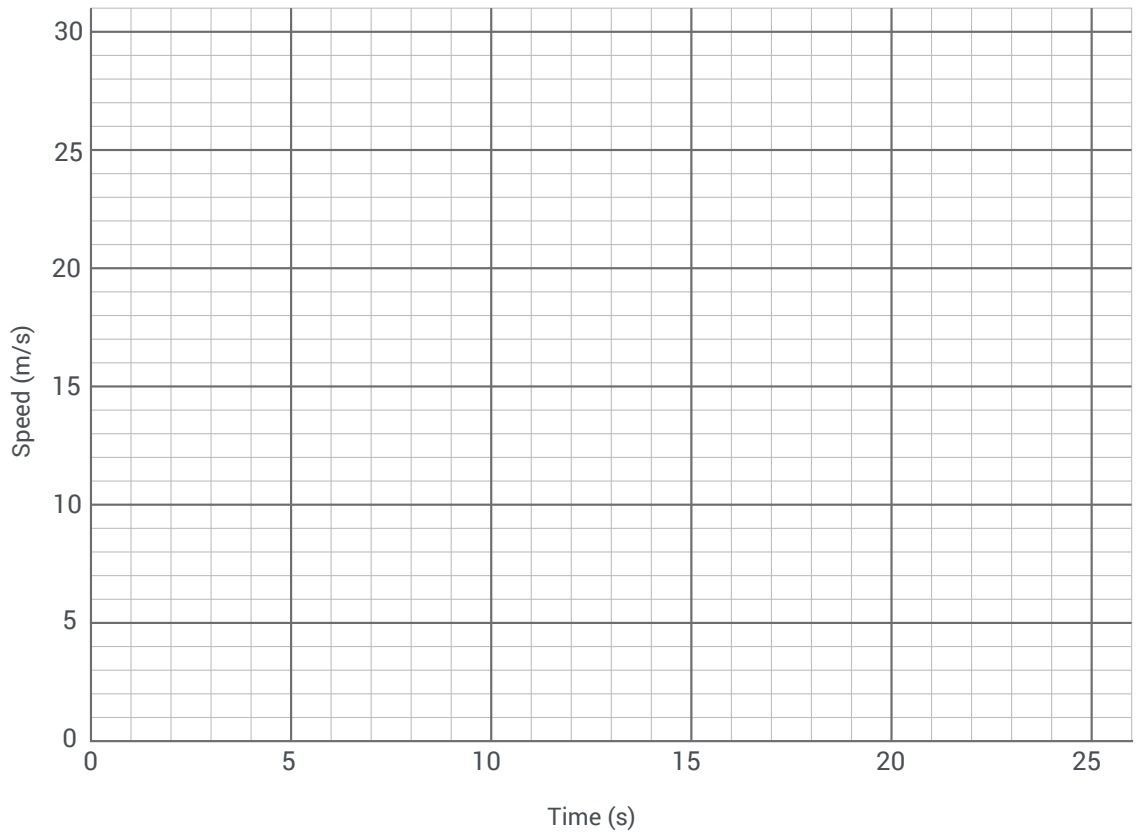
2

a

Plot a speed–time graph for the journey shown in the table on the left using the grid on the right.

Time (s)	Speed (m/s)
0	0
1	2
2	4
3	6
4	8
5	10
6	10
7	10
8	10
9	10
10	10
11	15
12	20
13	25
14	25
15	25
16	22
17	19
18	16
19	13
20	10

Speed–Time Graph for INEOS TEAM UK Boat



b

Describe the motion of the boat including values where the motion changes.

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c

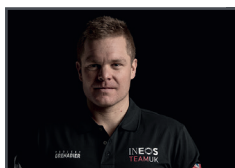
Calculate the boat’s acceleration for each segment.

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b

Calculate the total distance travelled using the equation on the previous page.

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David ‘Freddie’ Carr – Grinder/bow

His favourite piece of advice: “ If you think practice and training are hard? Try losing.”