Average speed

Teacher notes

Why use this resource?

This resource has two situations that require students to think carefully about how average speed is calculated. The first situation should help reinforce the connection between average speed and gradient, whereas the second situation highlights the difference between driving different speeds for the same amount of time, compared to the same distance.

Possible approach

In the first situation, the solution emphasises using graphs to help you understand the problem. Although you can use algebra or ratios to solve it, encouraging the use of graphs should help students use a similar approach in the second situation. This is where sketching the graphs can help provide real insight into what is happening, without needing to rely on algebra.

Key questions

Once students have completed the first situation you may wish to ask:

- Can you sketch a different journey on the graph, that would also give an average speed of $50\,\mathrm{mph}$?
- Can you sketch a more realistic journey that would also give an average speed of $50\,\mathrm{mph}$?

This could pave the way for discussions about knowing the average speed but not the instantaneous speed.

For the second situation you may wish to ask:

- Can you also explain graphically why the average speed for each situation does not depend on the total distance?

The solution offers an algebraic way of showing that the average speed is not constrained by the distance travelled, and it might be interesting to see if the students can offer a graphical explanation to the same question.

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Possible extension

The second situation naturally gives rise to the idea of different types of average. To build upon this pervasive idea, the Averages section asks students to take what they learned in the second situation and generalise it even further, leading to the formulas for the arithmetic and harmonic mean and the AM-GM inequality. This could be used in class, but questions are used to structure the piece, so that students would also be able to tackle this by themselves if interested.

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