

# Is the Serpentine Lake really 40 acres?

## Teacher notes

### Why use this resource?

A 'practical' example to introduce the approximation of area using trapezia and the trapezium rule. It is claimed that the area of the Serpentine is 40 acres. Students are asked to test this claim by using a map of the lake and coordinates. This resource takes students through the process of approximating the area using trapezia and prompts them to think about how choosing different points on the lake boundary can affect the calculations.

### Preparation

- It will be useful to be able to project the original map to facilitate discussion.
- There is a copy of the map with axes overlaid, that students can use to approximate the area.

### Possible approach

- Discuss which part of the lake the claim is talking about as a class.
- Together, discuss what approaches you could take to approximating the area.
- Give students the map with axes and ask them to work individually or in pairs to get an approximation.
- Come together to discuss the methods and their accuracy and to think about how the calculations could be streamlined. (Discussed in the **Things you might have noticed** section.)
- This could lead on to the general case of approximating areas and coming up with a formula for the trapezium rule.

### Key questions

When students are approximating areas with trapezia, they may want to think about the following:

- Does it matter if the trapezia have different widths?
- What happens if the trapezia all have the same width?
- What happens if the upper and lower points occur in pairs with the same  $x$ -coordinate?
- How will the number of trapezia affect the approximation?

## Possible support

Once students have come up with suggestions for approximating the area, you may wish to give them the coordinate points they could use. This will make it easier to see what they do and support them in their calculations.

## Possible extension

Some students may naturally decide to start with equal spacing and simplify their calculations as much as possible. It might be that they could be given the image in the final section **Area under a curve** and asked to come up with the formula themselves.