How long is a piece of string?

Teacher notes

Why use this resource?

In this resource students can use their prior knowledge of calculus from first principles to find a formula for arc length on both Cartesian and parametric curves. They then use these to find lengths on two specified curves. Students might go on to use this result in some of the other resources at this station, such as Rolling parabolas or From parabolas to catenaries.

Preparation

A printout of the problem for each student or pair of students might be helpful.

The printable of the Structured prompts may also be required (see Possible approach and Possible support below.

Possible approaches

Students might immediately start to work on this problem in small groups, drawing on their experience to model the curve as a series of straight lines and use Pythagoras' theorem. After some initial time spent grappling with the problem, the Structured prompts could be offered to support students' thinking.

Alternatively, a think-pair-share model could be used so that groups can support each other to get started.

Key questions

- How can we simplify or model the length of this curve?
- Which curves do you already know the length of?
- Would it help to think about a specific curve?
- Can you use any techniques from calculus to improve your model?

Possible support

If a student or group of students is struggling to get started then the Structured prompts printout might help by giving some specific models to think about and questions to lead into a general model.

Possible extension

There are several interesting ideas in the Taking it further section

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