How does your rectangle grow?

Teacher notes

underground mathematics

Why use this resource?

This task offers a first introduction to the Product Rule. By working through the steps, students are guided to derive the algebraic rule for themselves whilst having it represented as the area of a rectangle.

Possible approaches

The first part, Sideways, may seem straightforward, but it forms the basis for the second part, Both ways, which is where the product rule is derived.

The two steps of the task could be given to students on paper to work through individually or in pairs.

Alternatively, you could project the sections and lead the class through the steps together with lots of discussion.

Key questions

- The change in area is that shaded rectangle - what is its area?
- What is the relationship between speed, distance and time?
- Can you explain where the two terms in the final formula come from?

Possible support

You might find it helpful to start the first section with a scenario where $\dot{u} = 2$ (or some other constant) and the question, 'how far does it move in one second?'.

Some students may need coaxing to remember that speed can be written as distance divided by time, which is a key to getting started.

Another possible sticking point is differentiating with respect to t rather than the more familiar x. Reassure students that changing the symbol doesn't change the mathematics.

Students may need help with the idea of a "small time interval" during which we can treat all the rates of change as constant.

Possible extension

The resource doesn't explore why we can ignore the $\delta u \times \delta v$ area, though it is posed as a question in the solution. Some students might like to think further about why this area is small enough that it can be ignored.

Last updated 20-Sep-17
https://undergroundmathematics.org/product-rule/how-does-your-rectangle-grow