Defining a rhombus

Colin Foster, Jeremy Hodgen and Dietmar Küchemann explore how the use of examples and counter-examples can support students' developing understandings of definitions.

Is "telling" the only way to teach definitions in mathematics? How can pupils possibly know what something like a rhombus is, unless we tell them explicitly? We would suggest there is another way. We have recently been working on a guidance report on mathematics teaching for the Education Endowment Foundation, entitled *Improving mathematics in key stages two and three,* which makes eight recommendations. Recommendation 6 is to, "Use tasks and resources to challenge and support pupils' mathematics." One way to do this is to explore examples and non-examples of concepts. The task below shows how this strategy might be used to engage pupils in defining a rhombus, without the teacher having to present a definition at the start.

Suppose the teacher asked for some possible definitions of rhombus, noting them on the board. The shapes shown in figure 1 could then be revealed, one at a time, with the teacher each time asking, "Hands up if you think it's a rhombus", recording the number of votes underneath the respective shape.

The class could be given periodic feedback. For example, after the first two shapes have been revealed the teacher could say that the first shape is not a rhombus but the second is. This process could be repeated after the next two shapes have been revealed and again after the next two. Finally, the teacher could ask for definitions again, which the class could discuss.

Here, the examples and non-examples have been carefully chosen, in terms of both shape and orientation, in order to highlight common misunderstandings, such as that a square is not a rhombus. The examples chosen by the teacher span variation of angles, side lengths and orientation, so as to draw pupils' attention to features that are important, or irrelevant, for deciding whether a shape is a rhombus. On the one hand, this task enables pupils to identify minimal and necessary criteria for a rhombus and on the other hand it expands their example space of shapes that qualify as rhombuses.

Reference

Education Endowment Foundation (2017). *Improving mathematics in key stages two and three.* London: Education Endowment Foundation. Available from: https://educationendowmentfoundation.org.uk/public/files/Publications/Campaigns/Maths/KS2_KS3_Maths_Guidance_2017.pdf.

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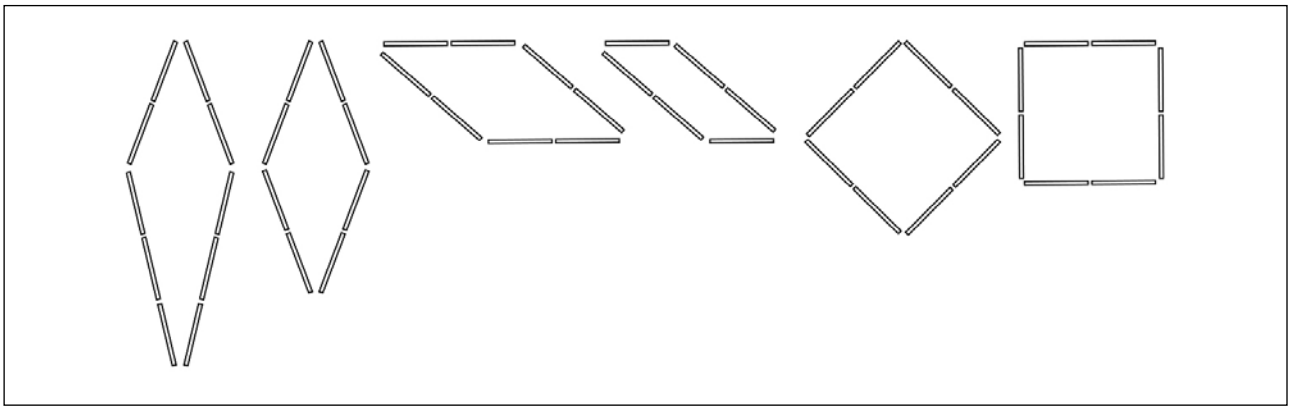

Figure 1: A rhombus or not?