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Foster, Colin

Fitting shapes inside shapes: closed but provocative questions.

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From the text: Mathematics teachers are often encouraged to try to turn closed questions (such as 'What is 8×3?') into open questions (such as 'What numbers multiply to make 24?') because open questions are widely perceived to be richer and more productive. However, sometimes a question that is technically closed – even a dichotomous yes/no question – can lead to lots of interesting discussion and thought. Also at the level of school mathematics, the power of closed but provocative questions should not be underestimated. Recently in this journal Chris Pritchard has given us a fascinating series of articles on fitting shapes inside shapes. (November 2010 through to September 2013, with problem sets following to January 2015.) Continuing this theme, I offer here three questions – all of them closed – which I hope that you may find provocative: 1. Will a 1×6 rectangle fit completely inside a 5×5 square? 2. Will a 2×13 rectangle fit completely inside a 9×12 rectangle? 3. Will a $1 \times 4 \times 8$ cuboid fit completely inside a $6 \times 6 \times 6$ cube? Naturally, you are not allowed to break up the shapes in any way! Of course, there is an implicit invitation in these closed questions to justify your answers as well as to generalize and invent 'easy' and 'hard' problems along these lines.

Classification: G40 D50
Keywords: plane geometry; rectangles; squares; solid geometry; cubes; cuboids; problem posing; open-ended problems; open and closed questions