

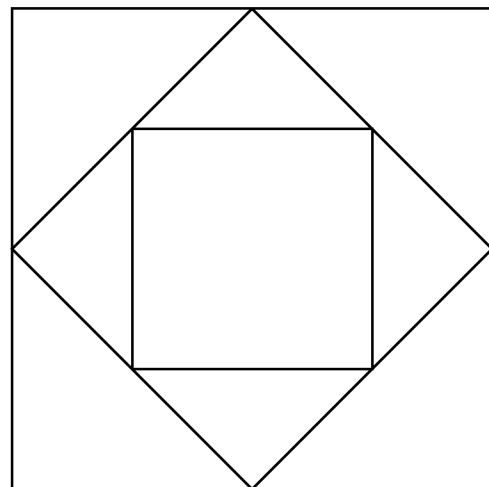


# Upper Level PoW Sample

The Math Forum's Problems of the Week provide non-routine constructed response problems. The Upper Level problems target concepts typically learned in Algebra 2 through Calculus. Memberships and mentoring are available at the individual, class, school, and district levels.

## Squares Inside Squares

A few weeks ago I was Christmas shopping in my favorite toy store. I wandered through the aisles and noticed a toy made of boxes inside of boxes. As I looked at the toy, I noticed that the top view was a set of nested squares. It looked as if the original square was 6 inches long on one side. It also looked as if the corners of the next smaller square were at the midpoints of the original square (see diagram below).



1. Find the sum of the perimeters of the three squares in the figure.
2. Imagine that the process of nesting squares continues forever. The sum of the perimeters approaches a finite number. What is that number?

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Learn more about the Problems of the Week at <http://mathforum.org/>

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# Upper Level Problem of the Week Scoring Rubric for Students

For each category, choose the level that *best describes* your work.

	Novice	Apprentice	Practitioner	Expert
<b>Problem Solving</b>				
<b>Interpretation</b>	I don't understand any of the math concepts in the problem.	I don't understand all of the math concepts in the problem.  I didn't attempt to solve all of the parts.	I understand all of the math concepts in the problem.  I attempted to solve all parts of the main problem.	I solved the main problem and the Extra correctly.  I am at least a Practitioner in Strategy.
<b>Strategy</b>	I didn't know how to set up the problem.  I didn't really have any ideas that will lead me to the correct solution.	I picked an incorrect strategy, or relied on luck to get the right answer.	I picked a sound strategy and solved the problem with skill, not luck.	I used two separate strategies. —or— I used an unusual or sophisticated strategy.
<b>Accuracy</b>	My work contains many errors.	My work is mostly accurate, with a few errors.  I used incorrect units.  I didn't leave things in exact form when required.	My work is accurate and contains no arithmetic mistakes.  I used appropriate units.  I formatted the mathematics correctly.  I kept things in exact form when required.	[not possible for most problems]
<b>Communication</b>				
<b>Completeness</b>	I didn't write much, if anything, about how I found my answer.	I didn't explain where my equations and expressions came from.  I showed my work but didn't explain it —or— I explained what I did without showing any of the actual work.	I explained all of the steps I took to solve the problem, including defining any variables I used.  I included the calculations and answers I got along the way.  I stated any important theorems that I used.	I added some extensions and further explanation of some of the ideas involved.  I proved one of the theorems that I used.
<b>Clarity</b>	My explanation is very difficult to read and follow.	My explanation isn't entirely unclear, but another student wouldn't be able to follow it.  My explanation is long and is written entirely in one paragraph.  My explanation contains many spelling and typing errors.	I explained all of the steps in such a way that another student would understand.  I made an effort to check my formatting, grammar, spelling, and typing, though there still may be a few small mistakes.	I formatted things very clearly.  My answer is very readable and it looks good!
<b>Reflection</b>	<i>The items in the columns to the right are considered reflective. They could be in the solution or the comment left after viewing the Math Forum's answer.</i>  I did nothing reflective.	I checked my answer is some way (in addition to viewing the answer provided by the Math Forum).  I reflected on the reasonableness of my answer.  I did one reflective thing.	I connected the problem to prior problems or experiences.  I explained where I'm stuck.  I summarized the process I used.  I did two reflective things.	I commented on and explained the ease or difficulty of the problem.  I revised and improved my work.  I did three or more reflective things or I did an exceptional job with two of them.