Problems for the Web

P4W2: Dissecting Squares

Curriculum Areas: Geometry, Problem Solving

Introduction:

Two important spatial abilities that students should develop are eye-hand coordination and figure-ground perception. Both come into play here as students try to 'see' squares within squares and squares on top of other squares.

For the Teacher:

P4W2 a): Squares in Squares

Have students follow the instructions for counting and 'decoding' the message. As students are counting the squares, observe their strategies. Do they count all the squares of one size first? Do they locate all the squares caused by overlapping figures?

Hint: Outlining different squares in different colours will help children who have difficulty keeping track of their counting.

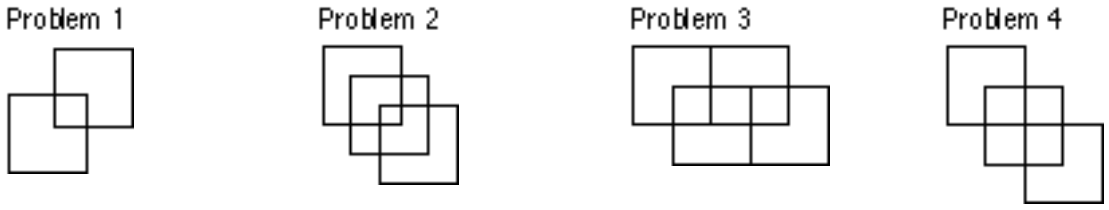
Solution: This is a self-checking problem. If the squares are counted correctly, the decoded message reads GOOD FOR YOU!

P4W2 b): Drawing Squares

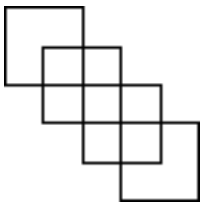
This reverses the problem: the total number of squares is given, but the student must 'design' the diagram given certain conditions. Some students find this 'reversed' problem easier while others find it harder.

Hint: When students are counting the squares formed, encourage them to count all the squares of one size first. The use of colour to outline the squares may help some students.

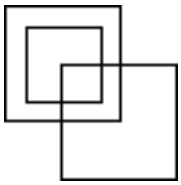
Solutions: There are many ways to draw the solutions. Here are some samples.



Problem 5:



The greatest number of squares possible is at least 11.



Comments: Although the drawn squares in the solutions above are all the same size, this is not a condition of the problem. Students may draw squares of different sizes. For example, an alternate solution for Problem 2 is shown to the right. This allows solutions with one or more squares nested one inside the other.

Challenge students to determine the greatest number of squares thay can make by drawing 3 squares, 4 squares, 5 squares, ... Is there a pattern?

For the Student:

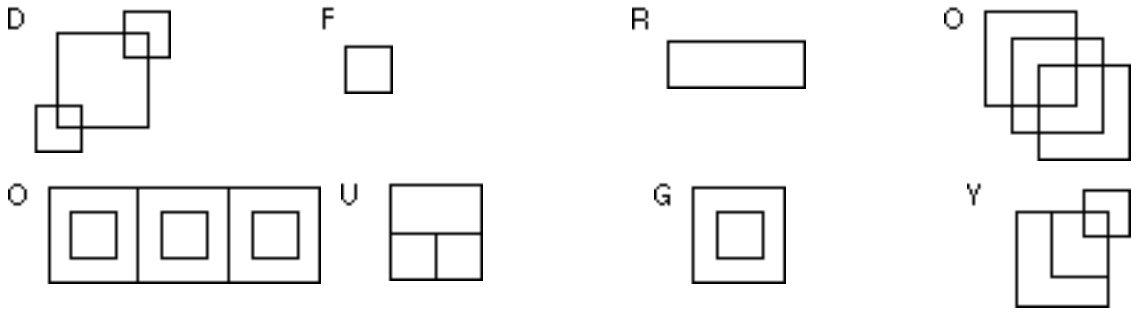
P4W2 a): Squares in Squares

In each diagram there are a number of squares -- from 0 squares to 8 squares.

Count the squares in each diagram. Be sure you look for squares of different sizes, and overlapping squares.

When you think you have counted all the squares in a diagram, go to the "Message" below the diagrams, and write the letter of that diagram in the blank above that number. For example, diagram F has only 1 square, so the F is written in the blank above the 1.

If you have counted all the squarers correctly, there will be a message for you when you are finished.



Message: ___ ___ ___ ___ F ___ ___ ___ ___ ___ !

2 6 8 5 1 8 0 4 6 3

Did you find it easier to find squares in some diagrams?

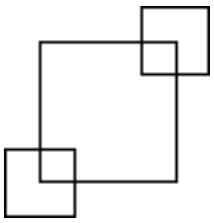
Which was the most difficult?

Which was the easiest?

Why?

P4W2 b): Drawing Squares

The diagram on the right was made by drawing 3 squares. However, when the 3 squares were drawn, there were 5 squares altogether in the diagram.



1. Draw two squares connecting in such a way that the completed diagram has 3 squares.

2. Draw 3 squares connecting in such a way that the completed diagram has 5 squares.

3. Draw 4 squares connecting in such a way that the completed diagram has 7 squares.

4. Draw 3 squares connecting in such a way that the completed diagram has 7 squares.

5. What is the greatest number of squares possible in a diagram formed by drawing 4 squares? Why do you think this is the greatest number possible?