Problems for the Web

P4W10: Dissecting Triangles

Curriculum Areas: Spatial sense, Geometry, Problem solving

Introduction:

P4W10 is very similar to P4W2 (Dissecting Squares). Students generally find the identification of squares easier than the identification of triangles. For this reason, you may wish to retrieve P4W2 from the archives and use it before, or along with, P4W10.

For the Teacher:

P4W10 (a): Triangles in Triangles

Two important spatial abilities that students should be developing are eye-hand coordination and figure-ground perception. Both come into play here as students try to 'see' triangles within triangles and triangles on top of other triangles. Outlining different triangles in different colours will help students who have difficulty keeping track of their counting.

As students are counting the triangles, observe their strategies. Do they count all the triangles of one size first? Do they locate all the triangles caused by overlapping figures?

P4W(a) is a self-checking problem. If the students have counted triangles correctly, the decoded messages will read:

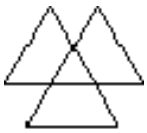
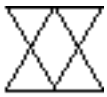
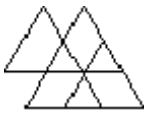
HOORAH! WELL DONE!

P4W10 (b): Drawing Triangles

This reverses the problem in P4W10 (a): the total number of triangles is given, but students must decide how to arrange their triangles to produce the required diagram. Some students find this reversed problem easier while others find it harder than P4W(a). Have students try to articulate their reasons for finding one easier than the other.

When students are counting the triangles formed, encourage them to count all triangles of one size first. This may help to organize their counting.

Sample solutions are given below. Note that all triangles are equilateral.

1.  2.  3.  4. 

Encourage students to find more than one solution for each problem.

The diagrams above are constructed with congruent equilateral triangles, but this is not an essential condition. For example, an alternate solution for problem 2 is shown here.

As an extension, have students make up ‘rectangle problems’ for each other. When counting the rectangles in a diagram, students may need to be reminded that squares are rectangles.

For the Students:

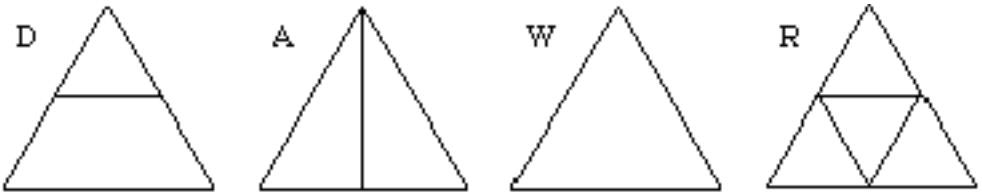
P4W10 (a): Triangles in Triangles

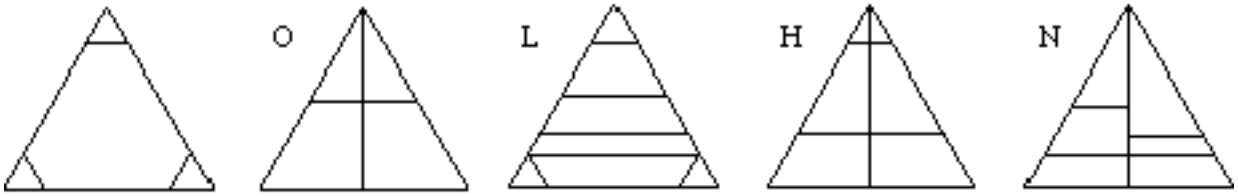
In each diagram there are a number of triangles — from 1 triangles to 9 triangles.

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

When you think you have counted all the triangles 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 W has only 1 triangle, so the W is written in the blank above the 1.

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





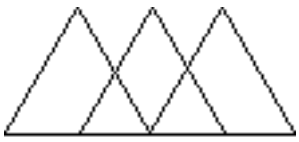
Message: ___ ___ ___ ___ ___ ___!
9 6 6 5 3 9

W
1 ___ 4 ___ 7 ___ 7 ___ 2 ___ 6 ___ 8 ___ 4 ___!

Did you use the numbers under the message to help you? If so, how?

P4W10 (b): Drawing Triangles

The diagram on the right was made by drawing three equilateral triangles. However, when the three triangles were drawn, there were 5 equilateral triangles in the diagram.



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

2. Draw three equilateral triangles connecting in such a way that the completed diagram has 4 equilateral triangles.

3. Draw two equilateral triangles connecting in such a way that the completed diagram has 6 equilateral triangles.

4. Draw four equilateral triangles connecting in such a way that the completed diagram has 8 equilateral triangles.

5. Suppose the triangles did not have to be equilateral. How would this change the problems? Would they be easier or harder? Why?