

Leaves

Compare the area of these 2 leaves. Which one has a larger area?

Show the method you used to find the answer.

Exemplars

Grade Levels 6 - 8

Leaves

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Context

We had been exploring area in math and had been using a classification key to identify trees on the school grounds. This activity ties these two themes together.

What This Task Accomplishes

This task gives students a reason to calculate area as they need a basis for comparison of the two leaves. Somehow by having the two leaves to compare this becomes a more meaningful task than to find the area of a single leaf. It allows for a variety of methods for finding area and provides an opportunity for continued learning through the extension.

What the Student Will Do

Students may use a variety of methods to calculate the area of the two leaves. Many students traced the leaves onto graph paper, some asked to borrow transparencies of centimeter squared grids, which I had used on the overhead. Others used centimeter squared cubes, one resourceful student divided the leaves into triangles and found how these areas and compared. They should discover that there is only about one square centimeter difference between the two leaves. Those who opted for the extension were particularly challenged to try and find a leaf whose area fell between these two.

Time Required for Task

1 - 2 hours

One or two class periods for complete solutions, including graphic representations

Note:

It took several days for students to complete the extension. This could be assigned to be completed outside class time.

Interdisciplinary Links

This is a great link between math and science as it stands. It could be easily adapted to

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compare two flower petals, animals' ears, footprints or any other scientific topics you might be studying. It could be easily adapted to compare two countries, counties, bodies of water or other geographic regions.

Teaching Tips

You might want to consider using square centimeter graph paper. Some students used quarter inch paper, which gave them computation problems at the end. Providing overhead transparencies saved time and frustration. These can easily be copied afterward and put into portfolios if you want your transparencies back.

Have centimeter blocks available for students who want to use manipulatives to cover the leaves.

You can let students decide how they want to deal with the holes in the leaves.

Encourage students to try maple leaves in the extension. They will come closest to the area of the two leaves given.

Suggested Materials

- Transparent centimeter graph paper
- Overhead markers
- Graph paper
- Centimeter cubes
- Calculators

Possible Solutions

The beech leaf has an area of approximately 88 cm² and the red oak approximately 89 cm². This solution was arrived at by using transparent centimeter grid paper and tracing the leaf. Count all the squares totally inside the outline, add to that number the average of the number of squares touching the outside of the outline, and those squares touching the inside of the outline. This will give you an accurate estimate of each leaf.

Benchmark Descriptors

Novice

This student did not understand the concept of area and instead found the perimeter of the two leaves. Not understanding the problem or the math concept led to an inappropriate strategy.

Apprentice

This student understands area and used a grid to calculate the number of units in each leaf. S/he is confused about the size of the spaces on the grid paper and believes that each unit is one square centimeter. S/he also does not account for the partial units in any way. The diagram

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is not well labeled.

Practitioner

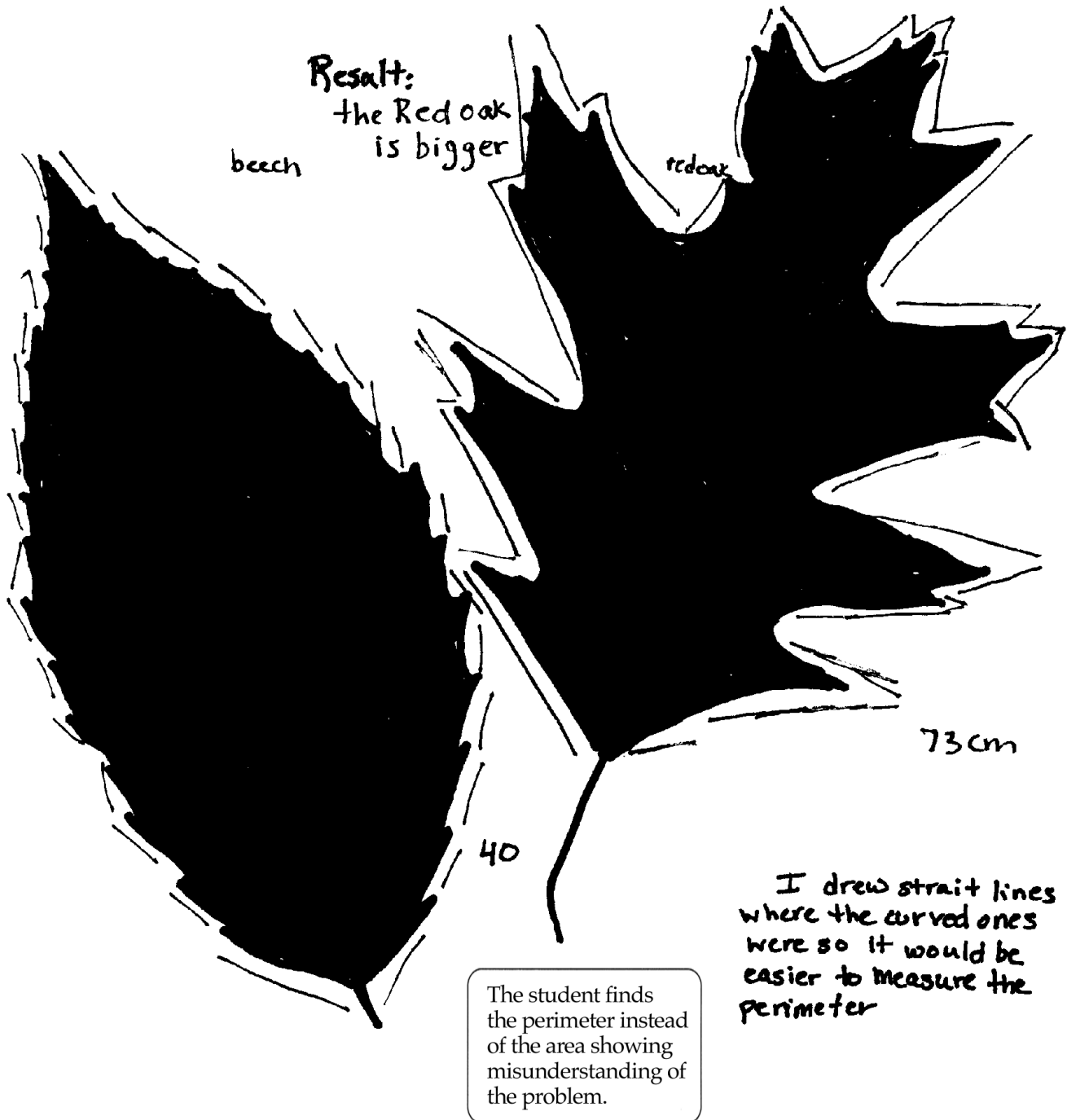
This student has a clear understanding of the requirements of the task. S/he used a workable strategy. S/he takes into account partially filled squares and deals with them appropriately. S/he could have translated the square units into square inches, but was able to determine which had the largest area. S/he did not tackle the extension, but it was not a requirement of the assignment.

Expert

This student identified a variety of strategies and then selected one from the list. S/he identified the size of the spaces on the grid paper and reported on the number of squares covered by each leaf. S/he accounted for partially filled spaces accurately. S/he accurately attempted the extension even though his/her choice of leaves was not a great one. S/he could have searched for another.

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Novice



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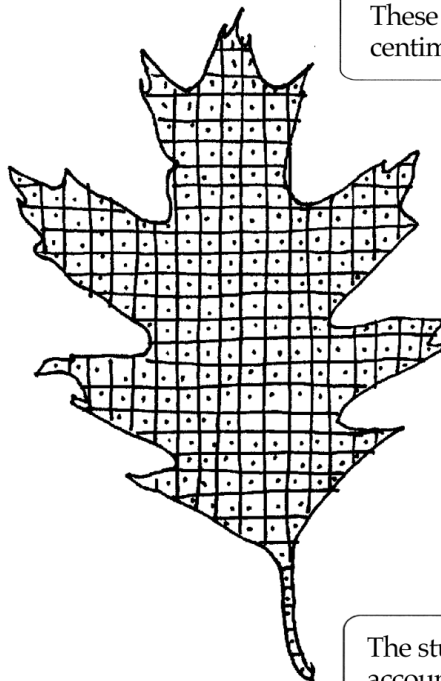
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Apprentice

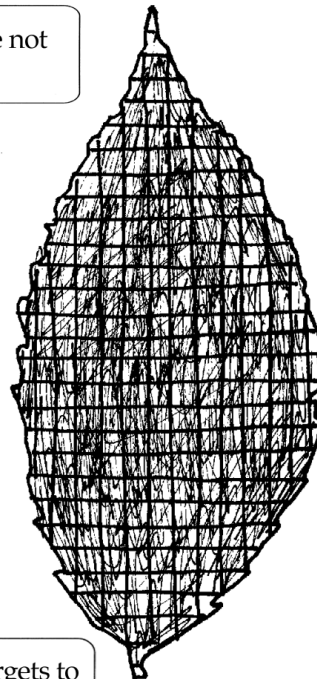
Leaf Comparison

The student explains his/her approach.

The problem we had to solve was that we had to compare the area of the beech leaf to the red oak leaf. I had to figure out the area of each, first I got centimeter graph paper and traced one leaf of one sheet of graph paper and the other leaf on the other. one measure I got from the beech leaf was 229 cm^2 and the area of the red oak was 211 cm^2 I subtracted them and found that the red oak's area is about 20 cm^2 more area



These units are not centimeters.



The student forgets to account for partial square units.

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Practitioner

Leaf Comparison

When I compared these two leaves I found out that there is only about 1 square more on the beech tree leaf than there was on the red oak tree leaf.

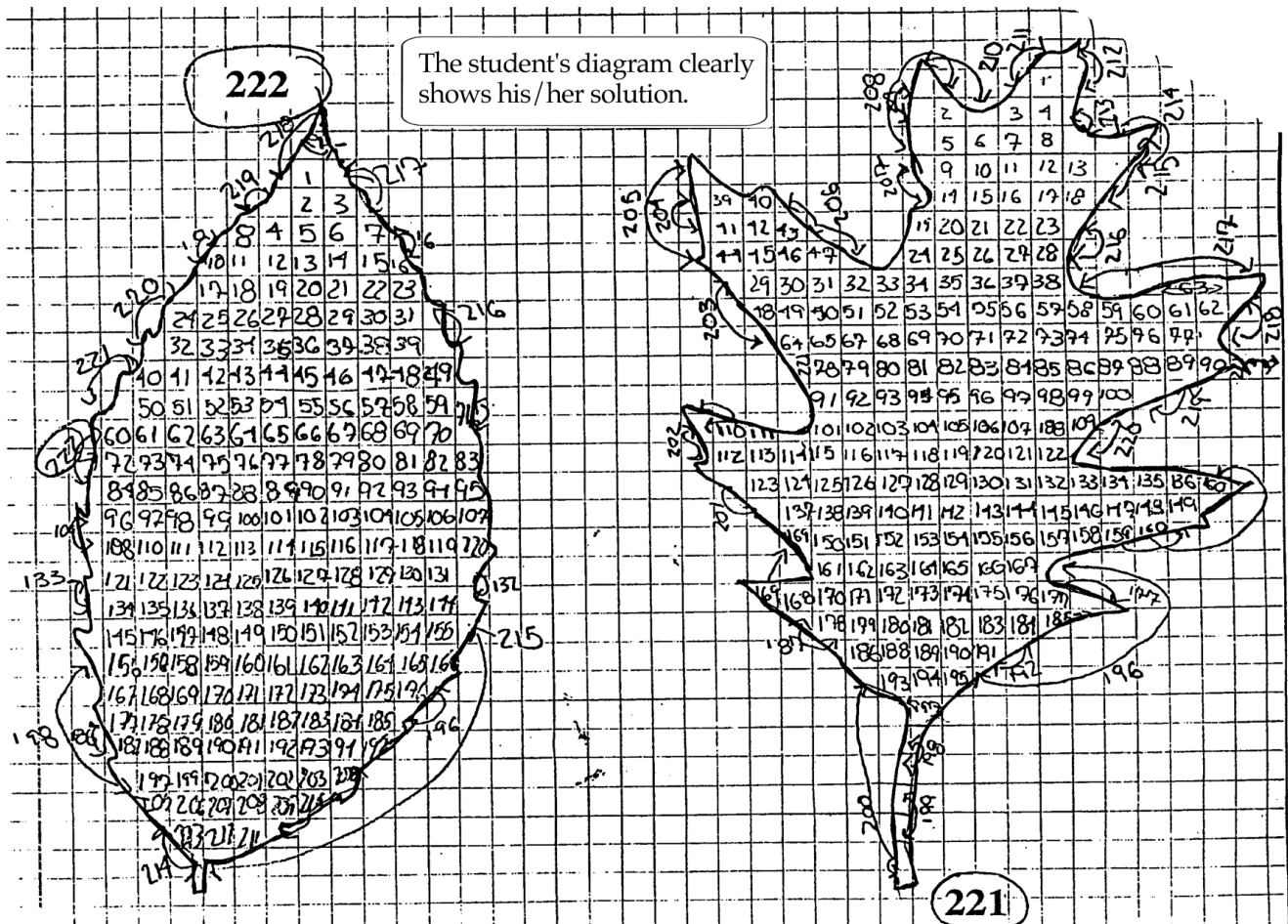
The student explains his/her workable approach and reasoning.

I tried to solve this work by tracing the 2 leaves onto a piece of Graph paper and add up the squares by writing the numbers on them and the ones that were not a full square and tried to add them to another square that was not full so that they would add up to one full square.

The student clearly states his/her conclusion.

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Practitioner



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Expert

In the leaf comparison portfolio problem we had to decide what kind of leaf had a larger area. We know that we are able to use graph paper, a pencil/pen, scissors, and we were able to cut out, or trace the leaves onto graph paper or transparency. I needed to know if an oak leaf has a larger area than a beech tree leaf. I didn't identify any special factors at the beginning.

The strategy I used was to look or use a pattern. I chose this because it seemed to be the only logical way to solve the problem. But now I know there are other ways, like guess and check.

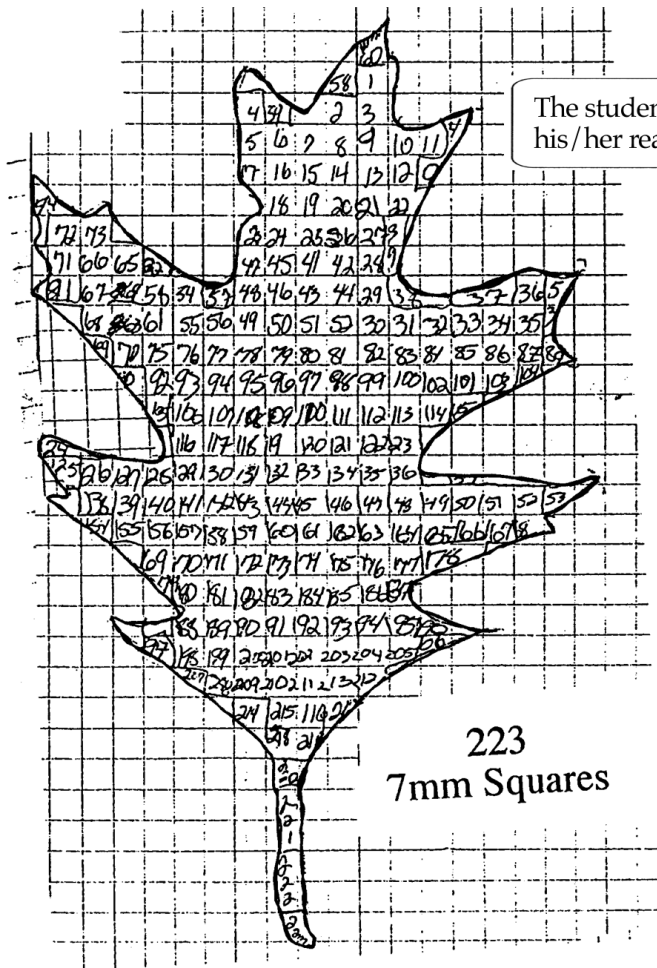
I solved the problem by cutting out the red oak leaf and tracing it on to 7mm graph paper and counting all the whole squares then counting all the half pieces, a quarter piece, and some pieces. Then I estimated how they would fit together. For the answer I got was 223 7mm squares. The beech was $\frac{2}{3}$ 7mm squares.

extension: I found a leaf I thought was between 223 units² and 216 units². The leaf I found was 192 units.

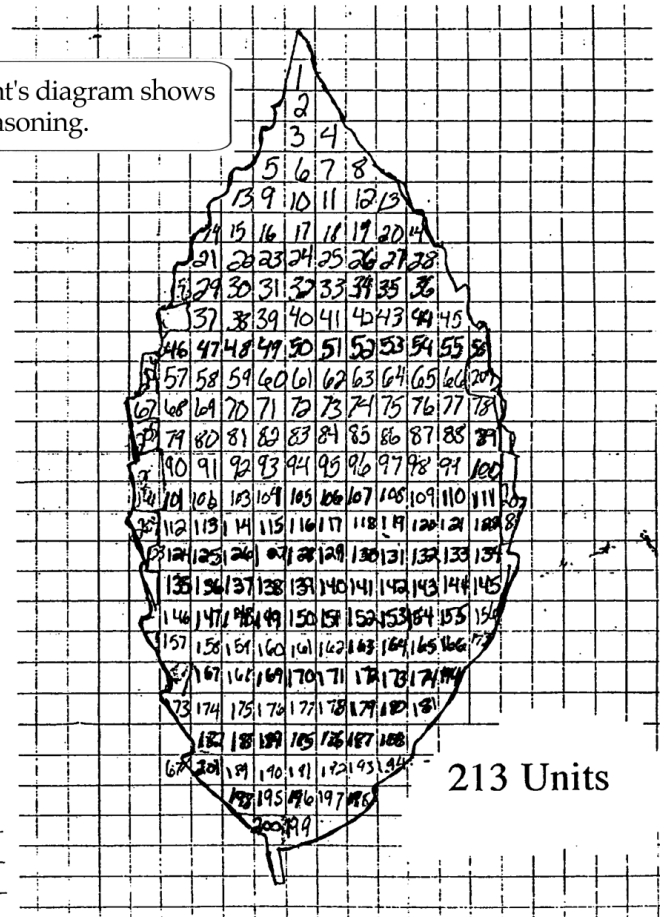
The student communicates approach and reasoning precisely with detail.

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Expert

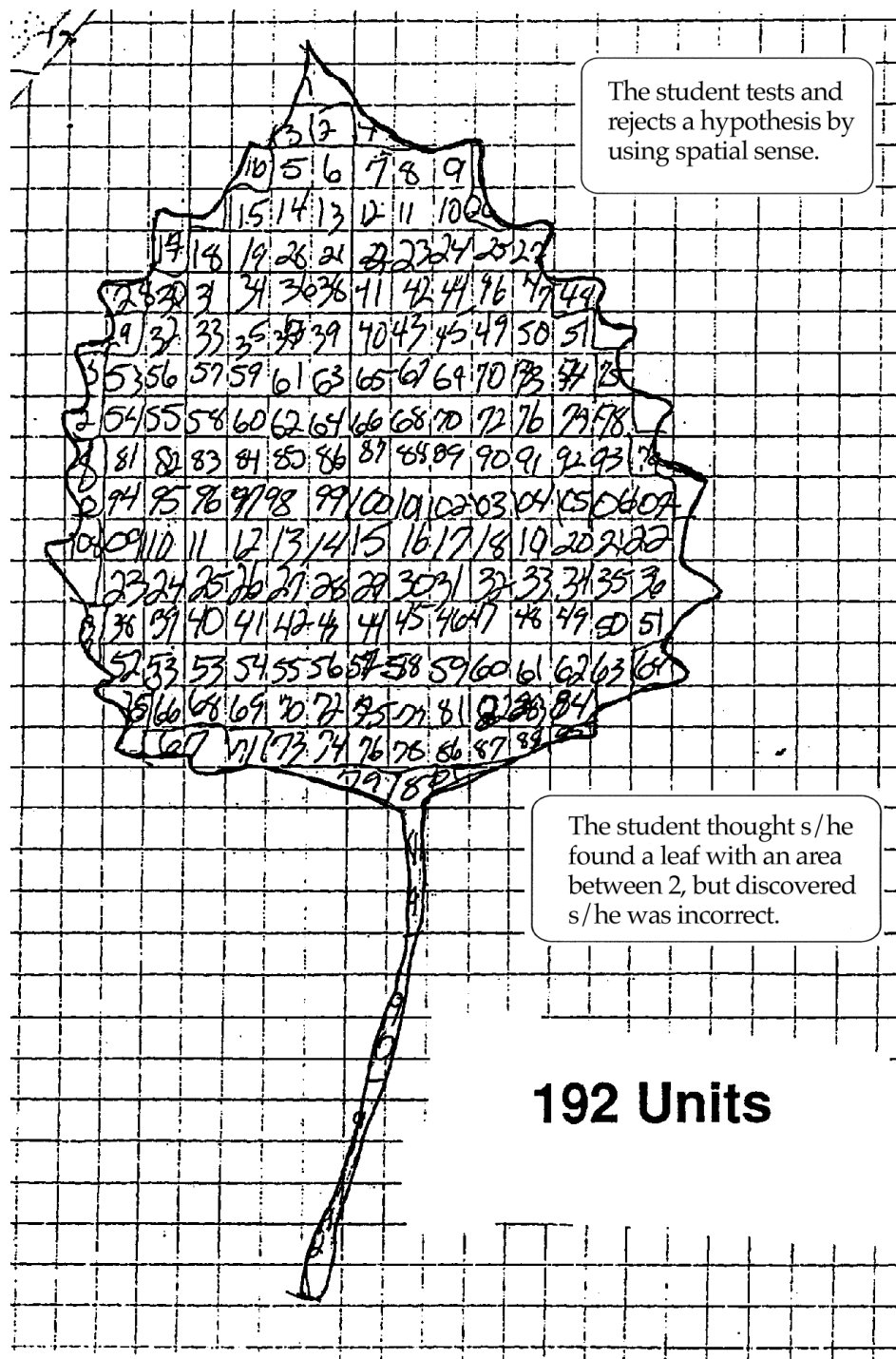


The student's diagram shows his/her reasoning.



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Expert



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