

Fencing

I have a miniature collection of farm animals and I would like to fence in a rectangular area to put them in. I have only 20 centimeters of fencing.

Find all the different rectangles that you can that have a perimeter of 20 centimeters.

Write or tell about any patterns you see about your rectangles.

Write or tell why you think you found all the ways to make the different rectangles.

Exemplars

Grade Levels Pre-K-2

Fencing

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Context

The second grade class I visited just finished working with non-standard and standard measure, finding perimeter and naming different shapes. I thought this problem would allow them to think about perimeter from a different perspective.

What This Task Accomplishes

This task assesses students' knowledge of perimeter in a non-routine way. Instead of measuring different shapes and adding the sides to find the perimeter, students have to think about the whole perimeter and try to break it up into its parts (length of sides). This task will not only assess their knowledge of perimeter, but will also assess their problem-solving and reasoning skills.

What the Student Will Do

Most students started to draw rectangles. Some students asked for and used centimeter rulers even though I gave them centimeter graph paper. Many started with the short side of about one, two or three centimeters and built the rectangle's base and top simultaneously counting as they went along. Most had to verify the perimeter many times by counting the lengths of the sides centimeter by centimeter. Some verified using the addition equation.

Time Required for Task

45 minutes

Interdisciplinary Links

This task could be used with a social studies unit or science unit on farming.

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Teaching Tips

I gave out centimeter graph paper so students could easily draw their rectangles. Review with your students that a square is a rectangle.

Suggested Materials

- Centimeter graph paper
- Centimeter rulers (available if asked for)

Possible Solutions

You can make five different rectangles (if you use whole number lengths for sides)

1 x 9
2 x 8
3 x 7
4 x 6
5 x 5

Benchmark Descriptors

Novice

This student was finding area and not perimeter. S/he also has 10 different rectangles each with an area of two square centimeters instead of one rectangle with a perimeter of 20 centimeters.

Apprentice

This student has found some of the rectangles, but not all of them. S/he used a strategy that is partially useful, but because the strategy is guess and check the student did not see any patterns and, therefore, did not find more solutions. There is some use of mathematical representation and mathematical terminology.

Practitioner

This student has a broad understanding of the problem. S/he uses a strategy that leads to a solution. The mathematical equations and representations help make a clear presentation.

Expert

This student has a deep understanding of the problem, including the ability to identify the appropriate mathematical concepts necessary to explain the solution. The student used an efficient strategy, first drawing a rectangle with the short side of one centimeter, then two, three, four and five centimeters. When asked about any patterns s/he made the comment about the short and long side adding to 10.

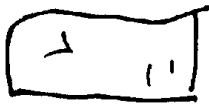
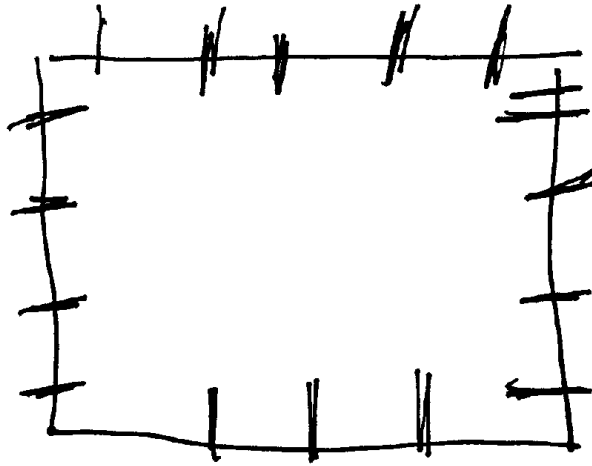
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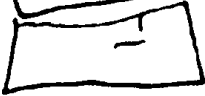
Novice



Diagrams lack labels.



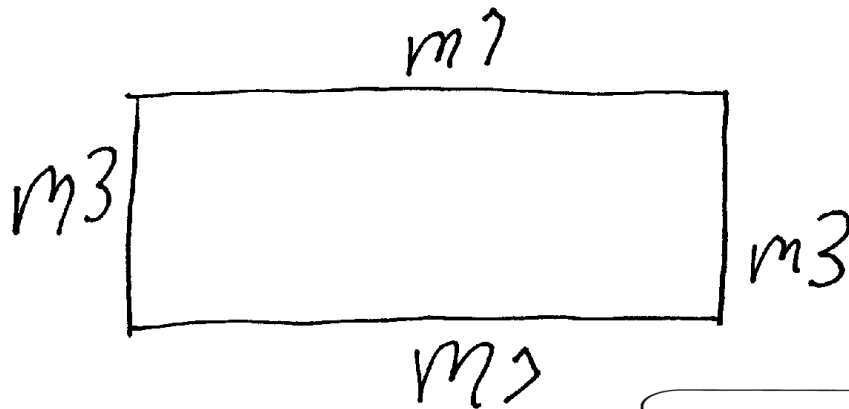
The student seems to confuse area with perimeter.



No math language is used.

Exemplars

Apprentice



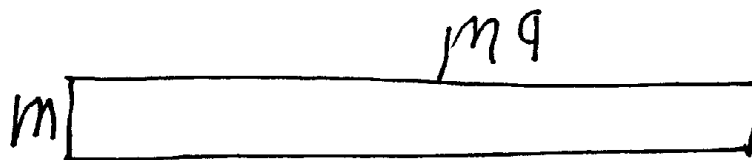
Diagrams lack some details.

First it was $2+7+2+7=18$
and that didn't work so
I added another cm. to

the short sides so it was $3+7+3+7=20$

$$7+7+3+3=20$$

The student is able to find some, but not all of the correct solutions.



$$1+1 \times 9 + 9 = 20$$

Some basic math language is used.

I used 1 cm. on each side and then I tried to figure out
(on back of paper)
what the long sides would be I tried $1+1+1+1=24$ but that
didn't work. So I tried 9 because it was smaller. It worked
I added it at the bottom.

Fencing

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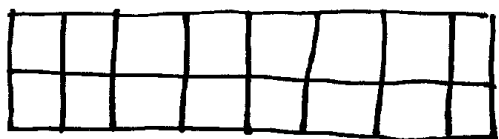
Practitioner

6×4 - thought of numbers that added up to 20
 2×8 - tried 2 and then counted long side
 1×9 - tried 1 and then counted 9 for long side
 7×3 - already tried 6×4 so thought should try 7×3

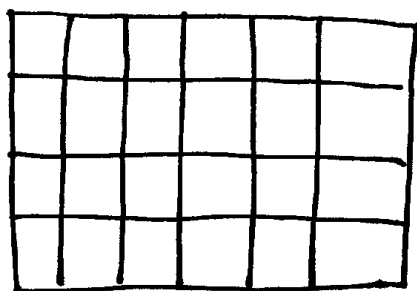
Approach and reasoning are explained.

Diagrams are labeled and accurate.

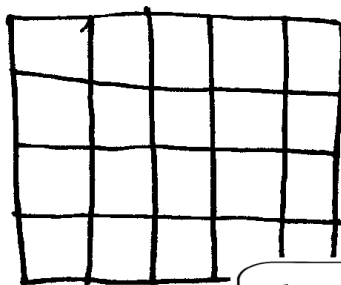
$$9 + 1 + 9 + 1 = 20$$



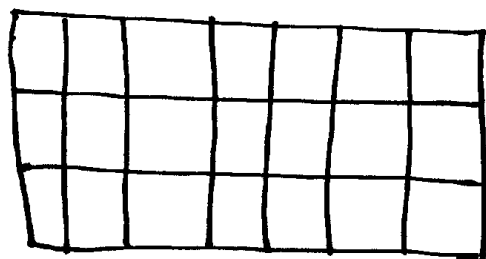
$$8 + 2 + 8 + 2 = 20$$



$$6 + 4 + 6 + 4 = 20$$



$$5 + 5 + 5 + 5 = 20$$

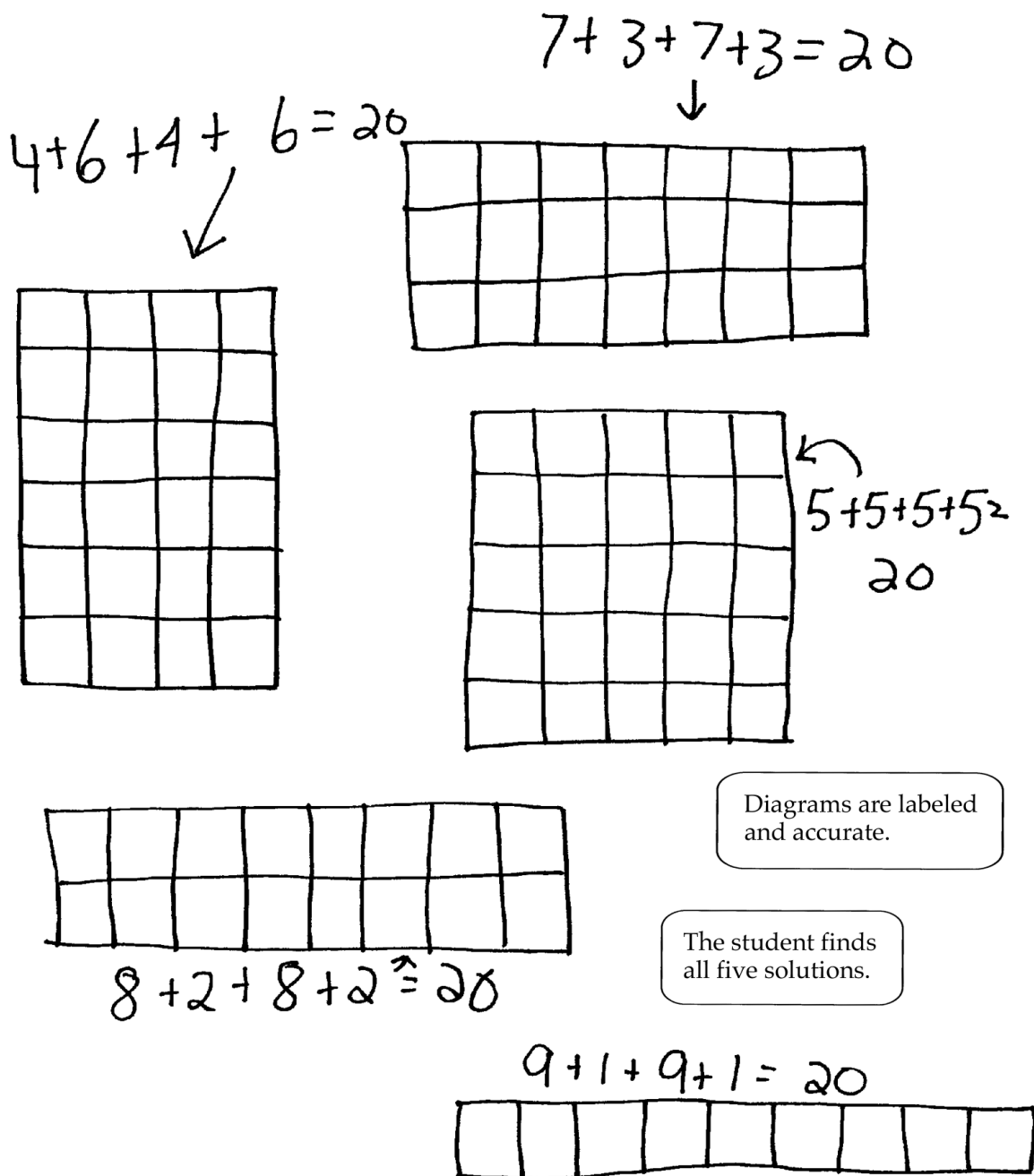


$$7 + 3 + 7 + 3 = 20$$

The student finds all five correct solutions.

Exemplars

Expert



Fencing

Exemplars

Expert

The student makes a mathematically relevant observation.

I know I got all the possibilities because I started with one and then two then three then four and last is five cause its a square

If you take the shorter side and add it to the longer side its 10 cm

Accurate math language used.