Reasoning

Measures

Thinking about Area and Perimeter

To investigate Max's idea, we can analyse various rectangles and examine the relationship between their areas and perimeters. Let's start by exploring different rectangles and recording their area and perimeter values. We'll then analyse the data to determine if Max's observation holds true.

Here is a table representing the areas and perimeters of different rectangles:

Rectangle	Length	Width	Area	Perimeter
Rectangle 1	2 units	3 units	6 square units	10 units
Rectangle 2	4 units	5 units	20 square units	18 units
Rectangle 3	1 unit	6 units	6 square units	14 units
Rectangle 4	3 units	3 units	9 square units	12 units
Rectangle 5	5 units	2 units	10 square units	14 units
Rectangle 6	6 units	1 unit	6 square units	14 units

Based on this sample data, we can observe the following:

- Rectangle 1: The area (6 square units) is smaller than the perimeter (10 units).
- Rectangle 2: The area (20 square units) is larger than the perimeter (18 units).
- Rectangle 3: The area (6 square units) is smaller than the perimeter (14 units).
- Rectangle 4: The area (9 square units) is smaller than the perimeter (12 units).
- Rectangle 5: The area (10 square units) is larger than the perimeter (14 units).
- Rectangle 6: The area (6 square units) is the same as the perimeter (14 units).

From this sample data, we can conclude the following:

- Max's observation that "the area is always a smaller number than the perimeter number in these rectangles" is sometimes true. We have examples like Rectangle 1, Rectangle 3, and Rectangle 4 where the area is smaller than the perimeter.
- Max's observation that "as the area value increases, the perimeter number increases as well" is sometimes true. We can see this in Rectangle 1, Rectangle 3, and Rectangle 4, where the area and perimeter values increase together.

To convince someone who is not sure, we can provide additional examples or perform further calculations to reinforce our findings. The data presented above already demonstrates that Max's idea is sometimes true.
Regarding rectangles with the same area but different perimeters, we can see an example in Rectangle 6. It has an area of 6 square units and a perimeter of 14 units. The dimensions of this rectangle are 6 units (length) and 1 unit (width).

For rectangles with the same perimeter but different areas, the data provided doesn't include an example. However, we can easily find such rectangles. For instance, consider two rectangles with a perimeter of 12 units: Rectangle A with dimensions 3 units (length) and 3 units (width) has an area of 9 square units, while Rectangle B with dimensions 4 units (length) and 2 units (width) has an area of 8 square units. Therefore, the areas of these rectangles are different despite having the same perimeter.

In summary, Max's idea about the relationship between the area and perimeter of rectangles is sometimes true but not always true. The examples and analyses provided demonstrate this fact and can be used to convince others.

Element	f The Learner	g The learner	h The learner	i The learner	j The learner	k The learner
Reasoning	Estimates using base units with increasing accuracy. Evaluates the reasonableness of measurements with reference to estimations and personal benchmarks.	Explains and justifies the selection of unit of measure used to measure and/or compare things. Makes reasonable estimations using appropriate units of measurement. Explains and justifies the selection of appropriate instrument for a given situation, depending on the level of accuracy required.	Justifies the specific unit of measurement used to describe the attribute. Orders and compares non-equivalent units of measurements. Deduces formulae for measuring from experience with practical measurement tasks.	Uses smaller units of measurement where a more accurate measurements is necessary. Realises when a more accurate measurement is unhelpful to solving a problem. Tests and evaluates the reasonableness of measurements and numerical calculations of measurements.	Justifies the size of the unit selected when calculating measures and solving problems involving measures.	Deduces and uses formulae to find the perimeters and areas of polygons and the volumes of prisms. Justifies formula used for such cases.

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Element	f The Learner	g The learner	h The learner	i The learner	j The learner	k The learner
Reasoning	Verifies the relationship between area and perimeter from the given examples and states the relationship without considering any other cases.	Makes a prediction about whether or not the relationship will hold, and suggests how this might be tested (e.g. trying out other rectangles).	May notice that using squared paper, e.g. maths copies, will give you smaller shapes, but that the relationship between these shapes using the new unit will be the same.	Draws on the use of squares in the diagram and makes use of squared paper or maths copies to try out.	May use number sense approaches (counting in rows or columns, or doubling of known areas/ perimeters to help estimate values for new shapes).	May notice (in response to teacher questioning, or examination of multiple examples) that the area of a rectangle can be calculated by multiplying the units up by the units across (length x breadth).