Lesson Plan

Grade 9 Academic **Lesson: ___49__**

Unit/Chapter: Measurement **Topic: Optimum Area and Perimeter**

- ***homework check:*** **NPM 9 p. 424 # 1 – 6, 8**

- ***note:*** **Optimum Area and Perimeter**

Designers may want to minimize perimeter to save the costs of construction and maximize area to have the largest space possible. Rectangles with the same perimeter can have different areas and rectangles with the same area can have different perimeters. By collecting data and constructing graphs, we can find the minimum perimeter and the maximum area. On a graph, the highest point will be the maximum while the lowest point will be the minimum. Solution set data helps investigators to optimize necessary measurements.

Recall that the minimum perimeter and maximize area of a rectangle happens when side measurements are equal. Therefore, to maximize area and minimize the perimeter of any rectangle, we construct a square.

Your task is to find the maximum area and minimum perimeter of a rectangle that needs only three sides of fencing constructed. The fourth side of fencing already exists. You will complete the investigation "Fence Me In".

- ***homework assignment:*** **Fence Me In Investigation**

Name: ________________________________ Mark(/54):____________

“Fence Me In” Investigation:

Part A:

A farmer can only afford to construct 600 m with his current fencing supplies. The farmer and his neighbor agree to share the fourth side of the new fence. What is the maximum area he can surround if he only needs to construct three sides?

Thinking About the Problem:

Hypothesize about the relationship between the length and width of a rectangular field when only 3 sides require fencing. Remember to include your reasoning about why these dimensions make a maximum area.

(2)

The Investigation

Use the following chart to organize your data. Remember, a complete solution will include both significant and extreme data. **(10)**

Length (m)	Width (m)	Perimeter (m)	Area (m^2)

Name: ___________________________________ Mark(/54):_____________

Based on your data, what is the maximum area for the farmer's field? Was your hypothesis correct?

(2)

Is your conclusion supported by the graph? **(5)**

What is the shape of your graph?

(1)

Name: _________________________________ Mark(/54):_____________

What is the relationship between the length and width when area is maximized here?

(1)

Knowing the geometric relationship you found in the previous question, write a new simplified version of the formula for perimeter. Use x to represent the unknowns.

(2)

You want to build a fence for your yard by adding onto your neighbour's fence. You only have 16 m of fencing material. How large a yard could you enclose? Use algebra to find your conclusion using the relationship you established in this investigation.

(4)

Part B:

The same farmer also wants to build a fence around a vegetable garden. The vegetable garden must enclose $32m^2$ of space. The lattice work he wants to use around the garden is very expensive so he wishes to minimize the amount used. What is the minimum perimeter in order to enclose the space required?

Thinking About the Problem:

Hypothesize about the relationship between the length and width of a rectangular field when only 3 sides require lattice work. Remember to include your reasoning about what these dimensions make a minimum perimeter.

(2)

Name: ___________________________________ Mark(/54):_____________

Investigation:

Use the following chart to organize your data. Remember, a complete solution will include both significant and extreme data. **(10)**

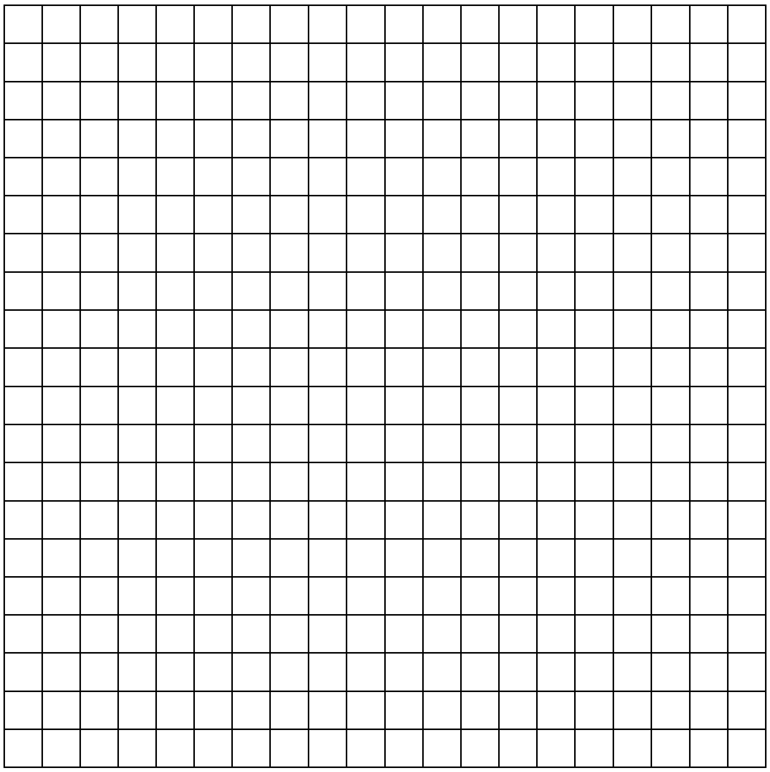
Length (m)	**Width (m)**	**Perimeter (m)**	**Area (m^2)**

Based on your data, what is the minimum perimeter for the farmer's field? Was your hypothesis correct?

(2)

Name: ___________________________________ Mark(/54):_____________

Is your conclusion supported by the graph? **(5)**



What is the shape of your graph?

(1)

What is the relationship between the length and width when perimeter is minimized here?

(1)

Name: ___________________________________ Mark(/54):_____________

Knowing the geometric relationship you found in the previous question, write a new simplified version of the formula for area. Use x to represent the unknowns.

(2)

You want to build a fence for your garden by adding onto your neighbour's fence. The planting instructions require 24 m^2. What is the minimum perimeter to enclose this space? Use algebra to find your conclusion using the relationship you established in this investigation.

(4)