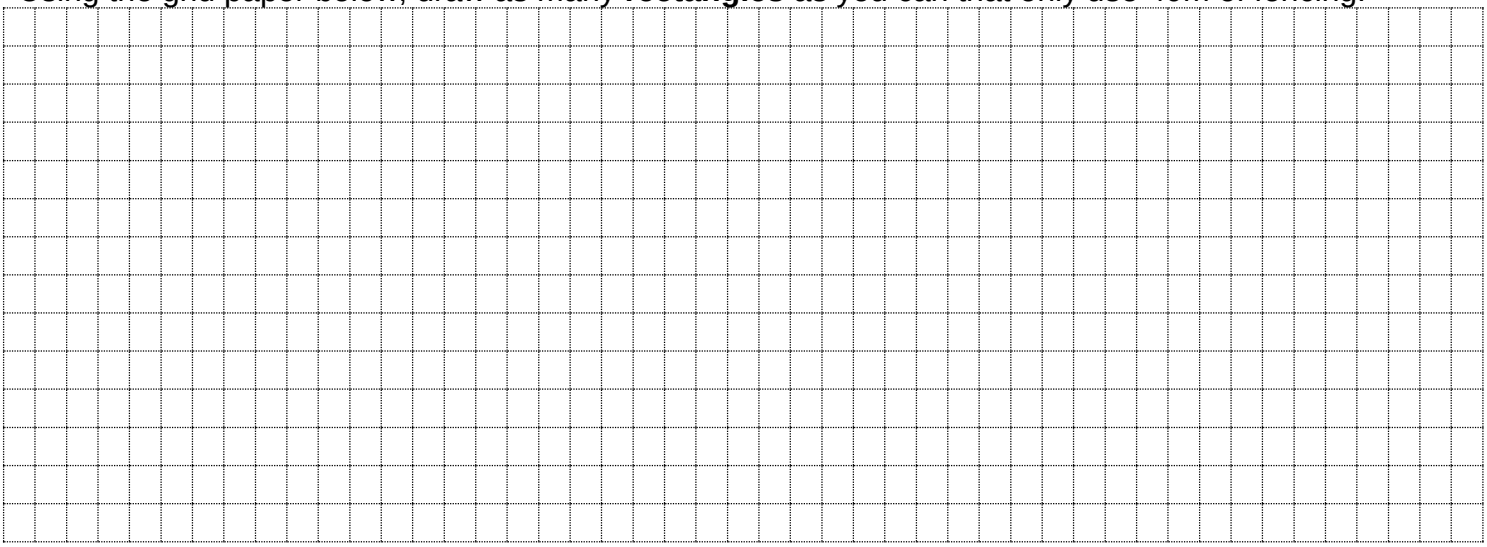
Applications of Perimeter and Area---Optimization Investigation

Maximizing Area for a Given Perimeter

Example 1: Farmer Pooley wants to buy some pigs. He needs to build a fenced area for the pigs and only has 40m of fencing. He wants to build a rectangular pen that will give the pigs the maximum amount of space. What dimensions should the pen be?

Solution:

Using the grid paper below, draw as many **rectangles** as you can that only use 40m of fencing.



For each drawing, fill in the chart below:

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

Conclusions:

What is the greatest area for the pig pen that has a perimeter of 40m? _____

What are the dimensions of the rectangle with the greatest area? _____

What shape is the pig pen? _____

Formula: Dimensions of the shape with **Maximum Area given a set Perimeter**:

Length = _____

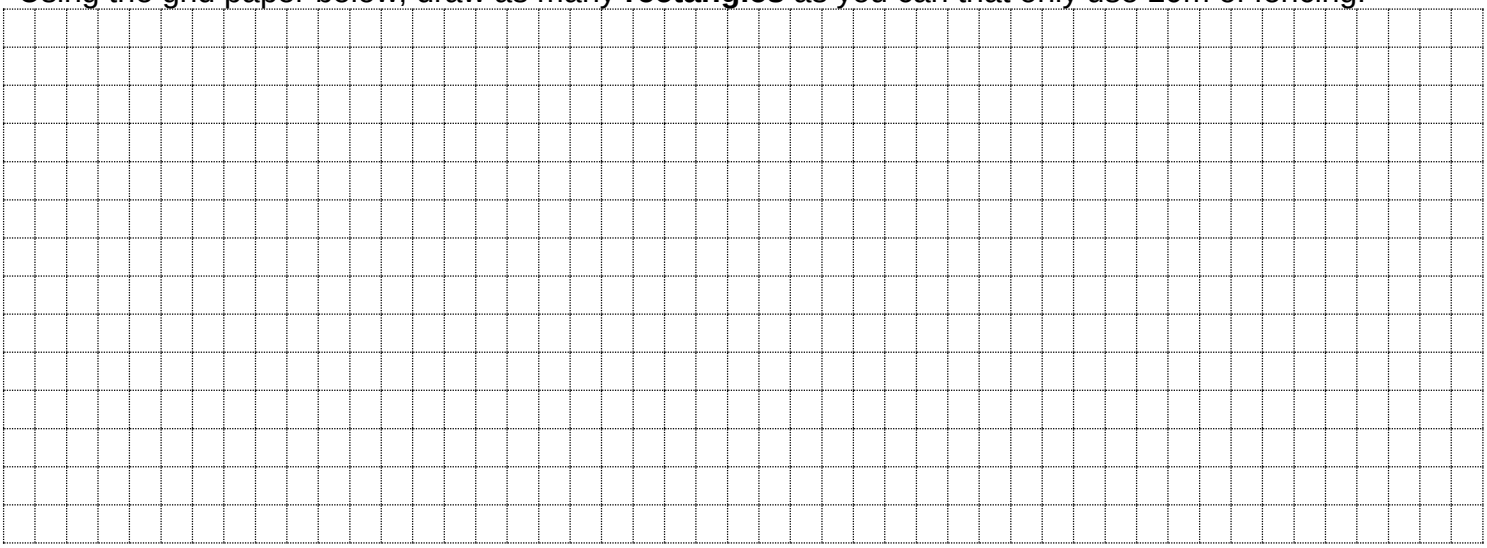
Width = _____

Maximizing Area for a Given Perimeter – 3 sided

Example 2: Farmer Pooley wants to fence off a rectangular area beside the chicken coop. He only needs to put up 3 sides of fencing since the chicken coop will act as the fourth side. He has 20m of fencing and wants to maximize the space for the chickens. What dimensions should the pen be?

Solution:

Using the grid paper below, draw as many **rectangles** as you can that only use 20m of fencing.



For each drawing, fill in the chart below:

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

Conclusions:

What is the greatest area for the 3 sided pen that has a perimeter of 20m?_____

What are the dimensions of the rectangle with the greatest area? _____

What shape is the chicken pen? _____

Formula: Dimensions of the shape with **Maximum Area given a set 3 sided Perimeter**:

Length = _____

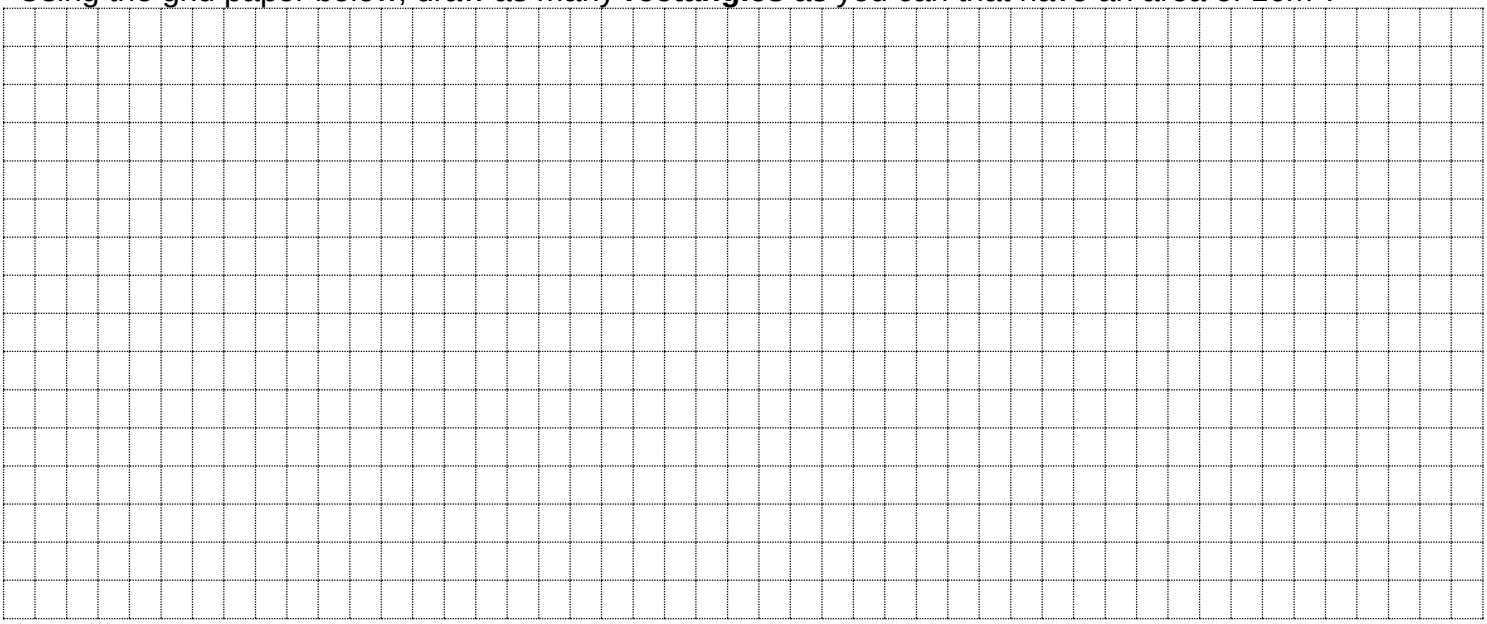
Width = _____

Minimizing Perimeter for a Given Area

Example 3: Farmer Pooley is running out of money. He needs to build a fenced area for his pigs and wants to spend as little as possible on fencing. He wants to build a rectangular pen with an area of $16m^2$. What dimensions should the pen be?

Solution:

Using the grid paper below, draw as many **rectangles** as you can that have an area of $16m^2$.



For each drawing, fill in the chart below:

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

Conclusions:

What is the least amount of fencing needed for a $16m^2$ pen? _____

What are the dimensions of the rectangle with the least perimeter? _____

What shape is the pig pen? _____

Formula: Dimensions of the shape with **Minimum Perimeter given a set Area**:

Length = _____

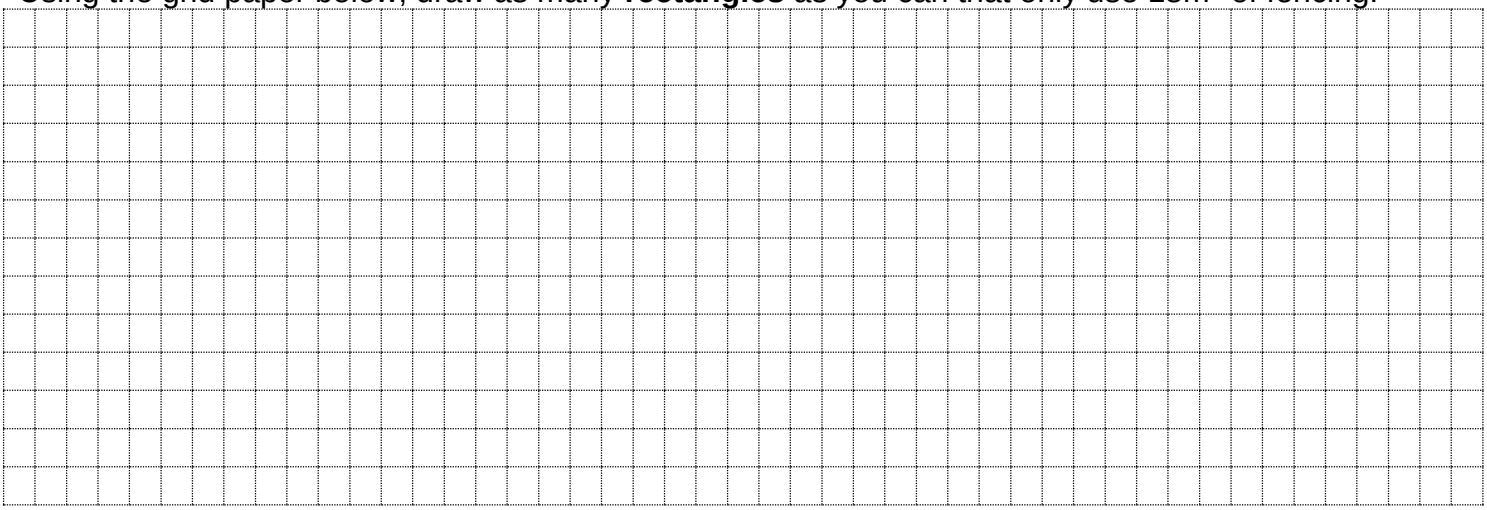
Width = _____

Minimizing Perimeter for a Given Area – 3 sided

Example 4: Farmer Pooley wants to fence off a rectangular area beside the chicken coop. He only needs to put up 3 sides of fencing since the chicken coop will act as the fourth side. He wants the pen to be $18m^2$. What dimensions should the pen be in order to minimize fencing costs?

Solution:

Using the grid paper below, draw as many **rectangles** as you can that only use $18m^2$ of fencing.



For each drawing, fill in the chart below:

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

Conclusions:

What is the least amount of fencing for the 3 sided pen that has an area of $18m^2$? _____

What are the dimensions of the rectangle with the least perimeter? _____

What shape is the chicken pen? _____

Formula: Dimensions of the shape with **Minimum 3 sided Perimeter given a set Area**:

Length = _____

Width = _____