**Exploring Rectangular Figures**

**Vocabulary:**

**Area**- amount of space inside a figure

**Perimeter-** distance around a figure

**Important Questions:**

How can you make a figure have the smallest perimeter without changing the area?

How can you make a figure have the greatest perimeter without changing the area?

How can you create a formula to find the area of a rectangle?

**Instructions:**

1. Go go <https://phet.colorado.edu/en/simulation/area-builder>
2. Download the “Area Builder” simulation

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**Exploration Phase (5 to 7 minutes):**

1. Click on the “Explore” section of the Area Builder simulation
2. Click each of the boxes in the bottom left hand corner and write down what happens when clicked “on” and “off” below:



1. Click the “minus” sign in the top center of the screen and write down what happens when clicked “on” and “off” below:



1. When done, leave it with the area and perimeter not shown like:



1. Take 3 tiles and put them next to one another to form a rectangle
2. What do you notice about the area and perimeter after each time you add a tile to the rectangle?
3. Click the tab to the bottom right to show a green figure and a purple figure:



1. Create a rectangle with the green tiles and a rectangle with the purples tiles and write down what you notice about the areas and perimeters

**Explanation Phase (25 to 30 minutes):**

Answer the following:

* What is your definition of a rectangle? **(hint: use the picture below to help)**

An example of a rectangular figure is in green and an example of a non rectangular figure is in purple:



1. Click on the “Explore” section
2. Click the tab on the bottom right to show green tiles and purple tiles
3. Click the two “minus” signs so that the two “plus” signs are shown:



1. Click the label box like so:



1. Create two different rectangles with an area of 12 square units

Answer the following:

* **Predict:**
* Which figure will have the larger perimeter? Why?
* **Observe:**
* What is the perimeter of the green rectangle?
* What is the perimeter of the purple rectangle?
* Which figure has a larger perimeter? What do you notice?
* **Explain:**
* Were you correct or incorrect? Why?
* How could you make a figure with an area of 12 sq units with the largest possible perimeter? Refer to the “explore” simulation to help explain. **(hint: you will need to use the orange tiles)**
* How could you make a figure with an area of 12 sq units with the smallest possible perimeter? Refer the “explore” simulation to help explain. **(hint: you will not need to use the orange tiles)**
* How are the length and width related to the area of the figure?
1. Create two different rectangles with an area of 18 square units

Answer the following:

* **Predict:**
* Which rectangle will have the larger perimeter? Why?
* **Observe:**
* What is the perimeter of the green rectangle?
* What is the perimeter of the purple rectangle?
* Which figure has a larger perimeter? Why?
* **Explain:**
* Were you correct or incorrect? Why?
* How could you make a figure with an area of 18 sq units with the largest possible perimeter? Refer to the “explore” simulation to help explain. **(hint: you will need to use the orange tiles)**
* How could you make a figure with an area of 18 sq units with the smallest possible perimeter? Refer the “explore” simulation to help explain. **(hint: you will not need to use the orange tiles)**
* How are the length and width related to the area of the figure?
* How are the length and width like factors?
* How is the area like a product?
* How can you create a formula to find the area of a rectangular figure without ever having to count tiles on a grid?

**Application Phase (10 minutes):**

1. Click the grid box off so that it is unchecked as shown:



2. Use your understanding of the area formula to fill in the blank boxes below:

1. Take a screenshot of each rectangular figure you make in the simulation and insert each one accordingly into the last column.
2. The bottom row is empty so that you may create your own rectangle and fill in the boxes based on your creation.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Length** | **Width** | **Length x Width** | **Area (sq. units)** | **Picture** |
| 2 | 3 | 2 x 3 | 6 |   |
|   | 5 |   | 40 |   |
| 9 |   |   | 27 |   |
| 4 | 7 |   |   |   |
|   | 6 |   | 36 |   |
| 1 |   |   | 36 |   |
|   |   |   | 36 |   |
|   |   |   | 36 |   |
|   |   |   |   |   |
|   |   |   |   |   |

**Reflection Phase (5 to 10 minutes):**

Answer the following:

* Has your definition of a rectangle changed? Why or why not?
* How did what you learned in the “Explanation Phase” help you during the “Application Phase”?
* How could the application of the area formula be useful in the real world?