PROBLEM SOLVED
MAKING SENSE OF MATHEMATICS

Fixed Perimeter, Changing Area

Video Script

Scene		Full Transcript
1	**Nate:**	Stella? Stella? Where is that dog? Stella? I found her Al! Hey what's up it's Nate! This is Stella; she belongs to my neighbor, Al. She likes to wander. Al asked me to help him install an underground dog fence. He wants to provide Stella with plenty of room to run, but still keep her within his yard. Come on, we could use this to learn about finding the maximum area of the fixed perimeter and unleash another problem solved.
2	**Voice-Over Nate:**	Here, is the system Al purchased. It includes five hundred feet of fence. So, five hundred feet is the perimeter, or the total length of the fence. He wanted to fence in a rectangular region and he wanted Stella to have as much area as possible.
	Nate:	That's where I come in. Earlier today I helped Al find the maximum area of a rectangle using five hundred feet of wire. We started by exploring some possible rectangles with a fixed perimeter of five hundred feet.
	Voice-Over Nate:	First we made the width fifty feet. These two sides will use one hundred feet of fencing. With four hundred feet of fencing left, each of these sides **must** be two hundred feet. Together, these two sides measure two hundred fifty feet, which is half the perimeter.
	Nate:	As you know, the area of a rectangle is found my multiplying width and length. Fifty feet times two hundred feet equals ten thousand square feet. Still, we thought we could do better.
3	**Voice-Over Nate:**	Next, we tried making the width twenty-five feet. We know that half the perimeter is two hundred fifty feet. So, the length must be two hundred fifty feet minus twenty-five feet. Or, two hundred twenty-five feet! The area is five thousand six hundred twenty-five square feet. Interesting! The perimeter is still five hundred feet, but the area is smaller than the area of the first rectangle. What if the width is seventy-five feet and then length is one hundred seventy-five feet? The area is thirteen thousand one hundred twenty-five square feet. This is considerably larger!
	Nate:	But was this the largest possible area? Stella could be full-grown before we figure out the fencing. No worry, we found another way to make sense of it.

MakingSense

4	**Voice-Over Nate:**	We organized our work by putting the information into a table. The next rectangle we tried measured one hundred feet by one hundred fifty feet. Do you notice the pattern? The closer the measurements of the width and the length are to each other, the larger the area. What would happen if the width and length were equal? That would be a square. Is a square a rectangle? A rectangle is a quadrilateral with four ninety-degree angles. A square has four ninety-degree angles, so a square is also a rectangle! The area of the square is the largest we've found. Could there be a rectangle with a larger area?
5	**Nate:**	Al and I decided to continue our table to find out for sure.
	Voice-Over Nate:	We tried a width of one hundred twenty-six feet and the area was smaller than the area of the square. Then we tried one more rectangle measuring one hundred twenty-four feet by one hundred twenty-six feet. It has the same area! This rectangle is congruent to the one measuring one hundred twenty-six feet by one hundred twenty-four feet. Switching the dimensions of a rectangle does not change the area. We can also make sense of this by looking at a graph. The X-axis is the width of the rectangle, and the y-axis is the area. Graphing the results allows us to see how the total area increases as the width increases. To the point of maximum area. After that point, the total area decreases even though the width increases. Our graph just shows some triangles with a perimeter of five hundred feet. If we show all possible rectangles, this is what our graph looks like. For example, we could have a rectangle that measures ten and one half feet by two hundred thirty nine and one half feet. There are actually an infinite number of rectangles possible. All of these rectangles have the same perimeter, but different areas. The area of our fenced in yard gets larger as we make it more like a square. The longer and thinner the rectangle, the smaller the area.
	Nate:	Now that we have found the largest area for Stella, we just need to show her the new limits. Problem solved! Good girl!