



The Pizza Problem

A Lesson for Seventh and Eighth Graders

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The Pizza Problem *was presented as a Problem of the Week—a homework assignment given early in the week that the students had to solve by Friday. This assignment, which appeared in Marilyn Burns’s Writing in Math Class: A Resource for Grades 2–8 (Math Solutions Publications, 1995), pushed seventh and eighth graders to apply their understanding of area to a real-world situation, the pricing of pizza.*

When teaching a unit on the area of circles, I asked a class of seventh- and eighth-grade students to investigate the prices of different sizes of pizzas to see if the prices were related to the pizzas’ areas. “What you’re to do,” I said, “is to phone a pizza place and find out how big each size pizza is and how much it costs. Then figure whether the prices relate to their sizes. If they do, explain why. If not, explain what the prices would be if they were proportional to their areas.”

The students were used to getting Problems of the Week in written form, but I didn’t prepare these directions in writing. Instead, I asked that each student write the problem in his or her own words. In this way, I took the opportunity to give the students experience with formulating a problem in writing. I gave them time to do this and then had several students read what they had written.

Amanda wrote: *Call up a pizza place & ask the size of each of their pizzas in inches, small, medium, or large. Then ask the prices. See if the prices are proportional to the areas of the pizzas. If they are not, reprice them.*

Allison wrote: *Call or visit a pizza place. Find out the size and price of pizzas. Then decide whether it’s mathematically sensible or not. How much would you charge?*

Geoff wrote: *What are the prices of a small, medium, and large pizza? Do they make mathematical sense? If so, why? If not, what should they charge?*

Jennifer wrote: *What we are supposed to do is to call or visit a pizza place, and find out what the price of each pizza is and what size it is. We then have to decide whether or not the prices are acceptable. If they aren’t, what would we change them to?*

Most of the students figured the area of each size pizza in square inches and then figured out, for each size, the cost of one square inch of pizza. In most cases, the larger pizzas were less expensive per square inch. Some students decided the pizzas were well priced; others presented alternative pricing.

Jacob, for example, concluded: *The deference in price is minimal when you look at it on a small scale but if you were going to buy fifty thousand square inches of pizza for a big party you were having while you’re parents were away for the weekend then you would have to consider what size pizza would be the most economical.*

Mike had a different approach to economizing. He wrote: *Skimp on the toppings.*

The students' solutions and explanations revealed their understanding not only about the area of circles but also about other mathematical ideas. The students were interested in the different prices and sizes from different pizza places, and the problem was a good way to relate the mathematics they were learning to the world outside of school.

POW/PIZZA

The first thing I did was to call Primors Pizza. I found that their small pizza costs \$5.40 and it is 10 inches in diameter. I also found the medium is \$7.30 and 12 inches in diameter. Last but not least the large cheese pizza which costs \$8.75 and is 14 inches in diameter.

By dividing the diameter by 2 I got the radius. I multiplied this by π and got the total area or total amount of sq. ins.

For small I got 78.5 sq. in.

$$\frac{\$}{\text{sq. in.}} \frac{5.40}{78.5}$$

For medium I got 113 sq. in.

$$\frac{\$}{\text{sq. in.}} \frac{7.30}{113}$$

For large I got 153.86 sq. in.

$$\frac{\$}{\text{sq. in.}} \frac{8.75}{153.86}$$

Next I divided each cost by the area or sq. ins.

small - $78.5 \overline{) 5.40} = 6.878$ or 6.94 sq. in.

medium - $113 \overline{) 7.30} = 6.46$ or 6.54 sq. in.

large - $153.86 \overline{) 8.75} = 5.686$ or 5.74 sq. in.

The cost per square inch really surprised me because really all of the prices per sq. in. went down. Really the bigger a pizza gets the higher the price, along with the size.

Three pizzas went up 2 in. in diameter along with about 2 inches in price each time. When the final sq. in. price went down from small to large I thought it strange.

If I owned a pizza place I would make sure that there was a slight bargain for buying a large yet not a total decrease in price.

Figure 1. In her solution, Amanda discovered that the three different sizes of pizza weren't priced in proportion to their areas, but she didn't recommend prices.

POW

THE POW FOR THIS WEEK INSTRUCTED US TO CALL A PIZZA PLACE AND FIND OUT THE DIAMETER AND PRICE OF EACH OF THEIR PIZZAS. FROM THERE WE WERE SUPPOSED TO FIND OUT IF THE PRICES WERE PROPORTIONAL TO THE SIZES. IF THEY WERE NOT WE WERE TO MAKE UP OUR OWN PRICES FOR THE DIAMETER SO THEY WOULD BE PROPORTIONAL. I CALLED A DOMINOS IN GAS RAPID AND GOT THE FOLLOWING INFORMATION -

price	diameter
\$7.00	12 inches
\$9.75	16 inches

MY NEXT STEP WAS TO FIND OUT HOW MUCH EACH 50 INCH OF PIZZA COST.

PRICE	DIVIDED BY	PI R2
\$7.00	divided by	3.14×36
\$7.00	divided by	113.04

makes about 6¢ a 50 inch of pizza
 NOW I NEEDED TO SEE IF THE LARGER PIZZA ALSO COST 6¢ A 50 INCH OF PIZZA SO I DID THE SAME STEPS FOR THIS LARGER PIZZA.

PRICE	DIVIDED BY	PI R2
\$9.75	divided by	3.14×64
\$9.75	divided by	200.96

makes about 3¢ a 50 inch of pizza
 AS YOU CAN SEE THIS PIZZA PLACE IS GIVING YOU A DEAL WHEN YOU GET A LARGER SIZED PIZZA.
 BUT FOR THE SAKE OF ARGUMENT I'M SUPPOSED TO FIND A PRICE SO THAT THE PIZZAS WILL BE PROPORTIONAL TO THE SIZES.
 THE WAY TO DO THIS IS TO SET UP THE PROBLEM NEEDED TO BE SOLVED

PRICE	DIVIDED BY	PI R2
7	DIVIDED BY	3.14×36
7	divided by	200.96

I noticed that 200.96 is a little less than doubling 113.04 (the area of the smaller pizza) so I figured the price should be a little less than doubling the smaller pizza's price I THOUGHT \$13.00 AND DIVIDED IT BY 113.04 TO GET ABOUT 6¢ PER 50 INCH OF PIZZA.

IF THIS PIZZA PLACE WAS MINE THE 12 INCH PIZZA WOULD COST \$7.00 WHILE THE 16 INCH PIZZA COST \$13.00.

Figure 2. After analyzing the prices, Jennifer suggested a new price for a 12-inch pizza.