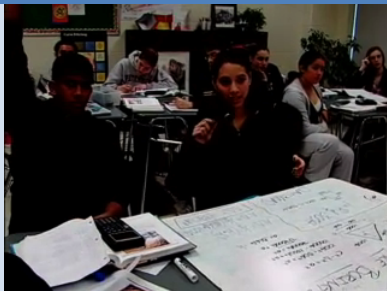


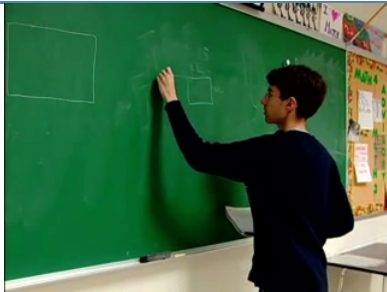


Relating Perimeter and Area — Video Analysis Guide

Segment Focus	Approximate time in video	Line numbers in transcript	Visual Cues	Narrative Summary	Salient quotes
The squaring rule	0:00 – 1:34	0 - 32		Mr. Albritton asks the class to generalize the pattern they have been exploring. Julia and Corey respond.	Julia: “The number you multiply the result perimeter by squared is how much the area increases” Corey: “Three to the power of itself is nine.”
Extending the squaring rule	01:34-02:35	33 - 46		Mr. Albritton asks the class to continue the pattern for a perimeter increased by a factor of four or by a factor of five. John and Michelle respond.	Michelle: “It will increase by ... twenty-five.”
Explaining the rule in terms of dimensions	02:35-5:20	47 - 84		Mr. Albritton asks why the pattern occurs. Jake, and then Riaz, suggest that because each dimension is increased by the same number, you square that number to find the factor by which the area is increased.	Jake: “When you multiply each of those dimensions by a certain number you’re gonna have to multiply that number by itself because you’re using both of those dimensions.” Riaz: “You have to square it because its this number times this number, which is essentially squaring.”

<p>Visual representations of the rule</p>	<p>5:20 – 6:36</p>	<p>85 – 105</p>		<p>Coleman draws a visual representation on the board to illustrate how doubling the perimeter of a square quadruples. (He draws a rectangle, then doubles the width and the height and draws the four rectangles it creates.)</p>	<p>Coleman: “When we double the length, like so, and double the width, like so, um, we basically create three more squares and thus have a square that’s quadruple the area of the previous one.”</p>
---	--------------------	-----------------	--	--	--

Relating Perimeter and Area

Video Analysis Guide

Topic A: Discussing Jake's Idea

Central Issues

What is Jake's idea? (lines 46-71)?

What role do the "dimensions" of a figure have in Jake's explanation?

Jake offers an explanation of where the "squaring" comes from. He explains that area is made up of two dimensions, so if each dimension is multiplied by a number, then to find the area, that number is multiplied by itself, or squared.

Relevant quotes

Lines 48-52

Jake: Um, because for both of the shapes you're looking at, uh, you find the area by using two dimensions for the triangle; it's the base and the height. And for the rectangle it's the length and the width. So when you multiply each of those dimensions by a certain number you're gonna have to multiply, you're gonna have to multiply that number by itself because you're using a, both of those dimensions.

Lines 59-65

Jake: Um, alright. So for both, for both of the shapes you look, you find the area by using two dimensions. For the triangle it's the base and the height and for the rectangle it's the length and the width. So if you multiply those two dimensions by a certain number you're gonna have to square the total area because you're using both of those dimensions. So it's not just like you're multiplying something, it's not like you're multiplying the shape by five times; you're multiplying it by five times by five times. So it's, that's why it's by 25 times.

What does Jake mean when he says: "...it's not like you're multiplying the shape by five times; you're multiplying it by five times by five times. So it's, that's why it's by 25 times."

Additional Issues

Is Jake's idea consistent across the two quotes?

Which part of these quotes most clearly illustrates his explanation for the "squaring?"

Are there part of the quotes that are more confusing? (e.g., Line 62, what does Jake mean when he says “you’re gonna have to square the total area...”)

The original problem posed to class is about the relationship between perimeter and area. What assumptions must one make when talking instead about the relationship between the dimensions of a figure and its area?

What do you think Monica understands about Jake’s idea?

Topic B: Discussing Riaz’s Idea

Central Issues

What is Riaz’s idea? How does he explain where the squaring comes from?

Riaz attempts to restate Jake’s idea. He uses hand motions to illustrate the two dimension of a rectangle increasing.

Is Riaz’s explanation the same as Jake’s or different?

Jake talks both about triangles and rectangles, Riaz’s explanation focuses on rectangles. Both students suggest that because each dimension is multiplied by a number, the area is squared.

Relevant quotes

Lines 75-78

Riaz: I think I get what Jake’s tryin’ to say because like, like say when you’re increasing the area you’re multiplying both sides by a certain number. And so, um, you have to square it because it’s this number times this number, which is essentially squaring.

Lines 80-83

Riaz: You, you see where I’m getting like? You’ve got the, like say you’ve got the square and so you’re multiplying by one, ok? And then, or let’s say two. And you’re multiplying by two again over here. So it’s two by two on both sides. Just squaring it. Do you get it?

What does Riaz mean when he says “So it’s two by two on both sides. Just squaring it.”

Additional Issues

What movements does Riaz make with his hands as he explains his idea? What do his hand motions suggest about what he understands?

Topic C: Discussing Coleman's Idea

Central Issues

What is Coleman's idea? How does he explain where the squaring comes from?
Coleman offers a visual representation which illustrates that doubling the sides of a square results in the creation of four total squares, thus quadrupling the area.

How is Coleman's idea similar to or different from Riaz's and Jake's ideas?
Coleman's drawing is similar to the hand motions that Riaz made in that both are showing an increase in length and width. In contrast, though, Coleman's drawing emphasizes the physical area of the new figure. Also, while Jake focused on the relationship between the dimensions and the resulting area, Coleman's drawing highlights the relationship between the original and resulting areas.

Relevant quotes

Lines 85-87

Coleman: Alright, I think I can, I think I have a visual analogy for why when you double, for why when you double the um, length and width of a square, um, it would eventually quadruple itself in area.

Lines 95-99

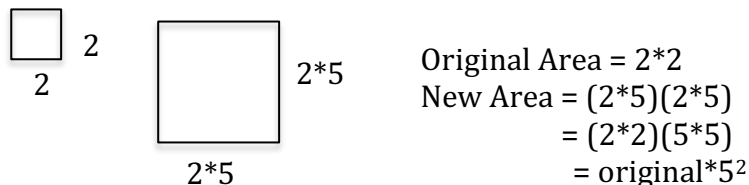
Coleman: (begins to draw) Ok, so we have a square. Alright. And we have the length and we have the width. And let's see...um, what was I doing? Ok. So um, when we double the length, like so, and double the width, like so, um, we basically create three more squares and thus have a square that's quadruple the area of the previous one. It's just, kind of an inevitable consequence.

How does Coleman's drawing illustrate the doubling of the perimeter and the quadrupling of the area?

Extensions

If Jake had drawn a diagram to explain his thinking, what might the diagram have looked like?

In thinking of scaling the sides by a factor of 5, perhaps Jake would have drawn something like this:



Jake would have emphasized the factor that was being multiplied, rather than the number of new squares being created.

Could you use Coleman's approach for doubling in the case of the equilateral triangle? In other words, can you draw a diagram which shows that doubling the sides of a triangle creates three more triangles (and thus quadruples the area)?

Topic D: Additional Topics

Can we unpack what Julia is saying? What does she understand about the pattern that the class has uncovered? What questions do you have about what Julia understands?

Relevant quotes

Lines 3-4

Julia: Um, couldn't you say that the number that you multiply the result perimeter by squared is how much the area increases?

How would you describe Cory's understanding of exponents?

Relevant quotes

Lines 6

Cory: Yeah. Like three to the power of itself is nine. So like three and like...

Line 18

Cory: ...with the little exponent of, of three.

Line 27

Cory: Three squared and then that's nine...