

Washing Windows with Riemann Sums



At the Henry B.Gonzalez Convention Center in San Antonio, Mrs. VanderBee noticed someone washing these windows one frame, by one frame, by one frame.... Being that she was at the NCTM 2017 Conference and had math on her brain, she began to wonder...

What are some of your wonderings?

What information do you need to know to answer your questions?

What assumptions do you need to make?

1. Construct a graph of the windows on graph paper. Label your axes with appropriate units. Each window pane is 4 feet high and 8 feet wide.

2. The top of the window creates a curve. What are some different ways to find the area under this curve? What units would you use?

3. Use rectangles to approximate the area of each vertical section of windows. (RAM - rectangular approximation method)

a. What would be the area if you used the left side of the windows for the height of each rectangle? (LRAM)

b. What would be the area if you used the right side of the windows for the height of each section? (RRAM)

c. What would be the area if you used the middle of the windows for the height of each section? (MRAM)

4. Is there another geometric shape that might give you a better estimate? What is the formula for the area of this shape? What is the approximation for the full area of the windows using this shape?

5. Now let's compare the estimates.

a. Which of these is an overestimate and why?

b. Which is an underestimate and why?

c. Which one do you think is most exact and why?

6. Using this most exact value and knowing that it takes 10 seconds to clean a window that is 1 foot by 2 feet, how long will it take for one person to clean all of those windows pictured?