

# Welcome to....

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Public Schools

## **Maximizing Critical Thinking with Volume**

# Group Task: Part 1

Design a cake that meets the following conditions:

- A serving size is 6 cubic inches.
- The whole cake must serve between 180 to 220 people.
- The cake must have at least two tiers.
- Tiers must be rectangular prisms with a square top face or cylinders.
- Each tier must be the same height.
- The cake must be visually appealing!

Create a poster which proves your cake meets the criteria.

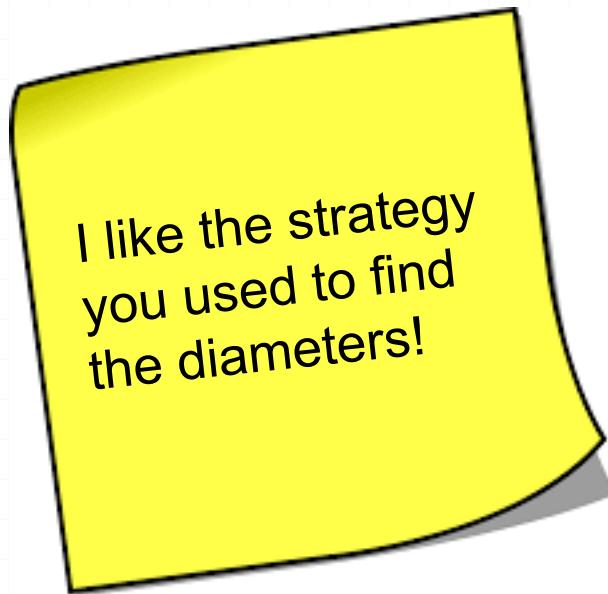
# Group Task: Part 2

- Create a virtual model of your cake on Tinkercad.
- You may choose to make changes to your cake design based on your virtual image. Remember to adjust your poster to match.



# Gallery Walk

- Observe the work of other groups.
- Leave a sticky note with your comments and/or questions.



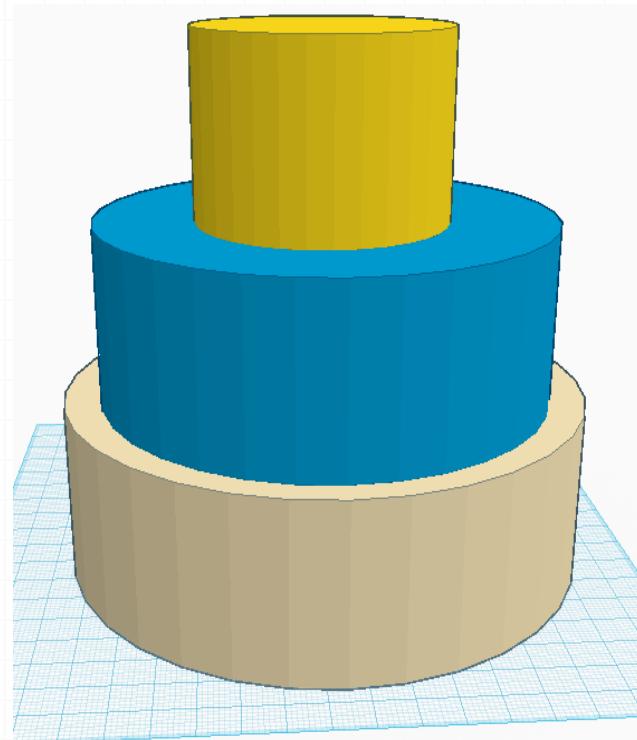
# Guess and Check

Cake Challenge!

Group Members: Alesia, Bella, Robert, Rachel

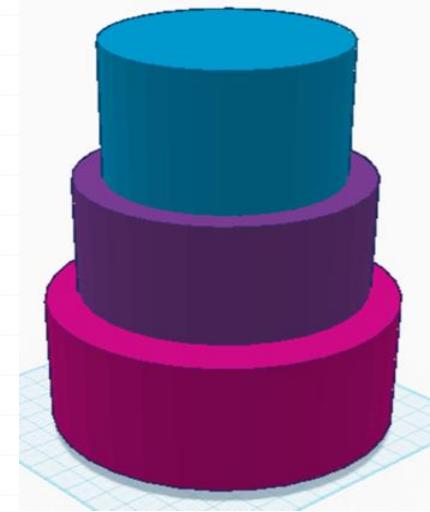
Math Work:

1. Step -  $6 \times 200 \text{ people} = 1,200 \text{ in}^3$
- 2 Step - we did guess and check  
 $\pi \times 7^2 \times 4 = 615.44 \text{ in}^3$  (first layer)
- 3) Step -  $\pi \times 6^2 \times 4 = 452.16 \text{ (2nd layer)}$
- 4) Step -  $\pi \times 3.25^2 \times 4 = 132.7 \text{ (3rd layer)}$
- 5.) Step - we added them all up and  
got  $1,200.14 \text{ in}^3$



# Making Modifications

Middle Cylinder	top Cylinder	Bottom Cylinder
$D = 10$	$D = 8$	$D = 12$
$H = 5$	$R = 4$	$R = 6$
$R = 5$	$H = 5$	$A = 113$
$C = 31.4$	$C = 25.1$	$C = 37$
$A = 78.5$	$V = 251.3$	$V = 565$
$V = 392.75$	$A = 50.2$	$H = 5$
Serves = 105.4	Serves = 12	Serves = 94
201 people		

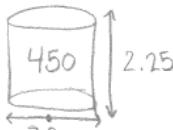


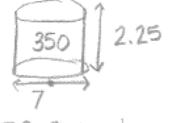
# Working Backwards

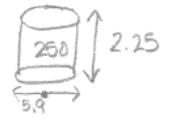
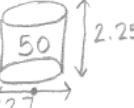
**Cake Challenge!**

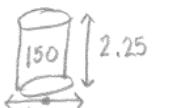
Group Members: Emma and Nicole

Math Work: (cubic inches for all measures)

<b>Tier 1 (bottom)</b>  $450 \times 2.25 = 1012.5$ $1012.5 \div \pi \times 7.9^2 = 446.81$ $446.81 \times 2.25 = 446.81$ $446.81 + 350.80 = 797.61$ $797.61 + 249.21 = 1046.82$ $1046.82 + 151.49 = 1198.31$ $1198.31 \text{ inches}^3$	$\begin{array}{r} 200 \text{ people} \\ \times 6 \text{ cubic inches} \\ \hline 1200 \text{ cubic inches} \end{array}$ Switched to: $\begin{array}{r} 210 \text{ people} \\ \times 6 \text{ cubic inches} \\ \hline 1260 \text{ cubic inches} \end{array}$
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<b>Tier 2</b>  $350 \times 2.25 = 787.5$ $787.5 \div \pi \times 7^2 = 350.8$ $350.8 \times 2.25 = 350.8$ $350.8 + 249.21 = 600.01$ $600.01 + 151.49 = 751.50$ $751.50 \text{ inches}^3$	$\begin{array}{r} 1260.00 \\ -1198.31 \\ \hline 61.69 \end{array}$
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<b>Tier 3</b>  $250 \times 2.25 = 562.5$ $562.5 \div \pi \times 5.9^2 = 249.21$ $249.21 \times 2.25 = 249.21$ $249.21 + 151.49 = 400.70$ $400.70 \text{ inches}^3$	<b>Tier 5 (on top of tier 4)</b>  $50 \times 2.25 = 112.5$ $112.5 \div \pi \times 2.7^2 = 51.50$ $51.50 \times 2.25 = 51.50$ $51.50 + 151.49 = 202.99$ $202.99 \text{ inches}^3$
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**Tier 4 (top)**  

  
 $150 \times 2.25 = 337.5$   
 $337.5 \div \pi \times 4.6^2 = 151.49$   
 $151.49 \times 2.25 = 151.49$   
 $151.49 + 151.49 = 302.98$   
 $302.98 \text{ inches}^3$

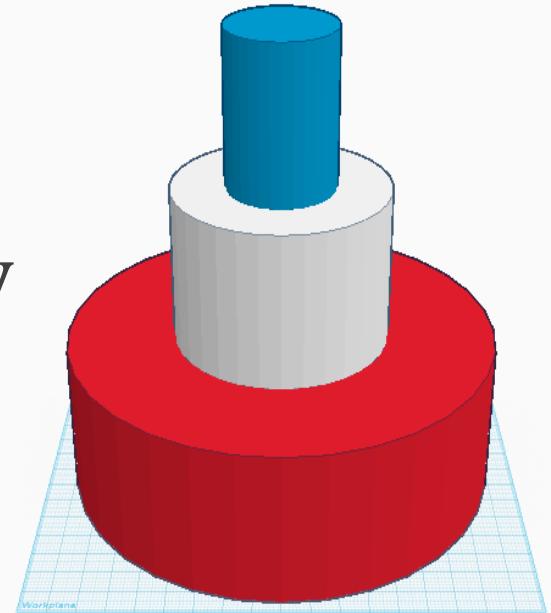
**Total:**  $1198.31 + 751.50 + 400.70 + 202.99 + 302.98 = 3254.58$  total

Aimed for 1260 cubic inches



# *Estimation*

Leah explained, “I just thought about how big a real cake would be,” holding her hands out to approximate the size. The other group members showed me how they used rulers to measure the height of the tier Leah was representing with her hands.



Note: Leah's mom is a pastry chef who often bakes at home!

# Multiple Math Concepts

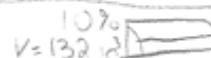
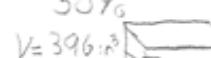
**Cake Challenge!**

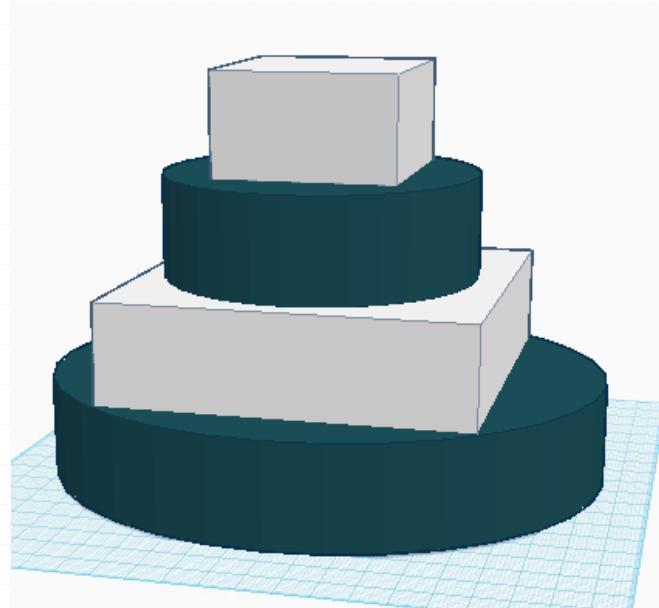
Group Members: Sabir, Dayanna, Tim, Stephanie

Math Work:

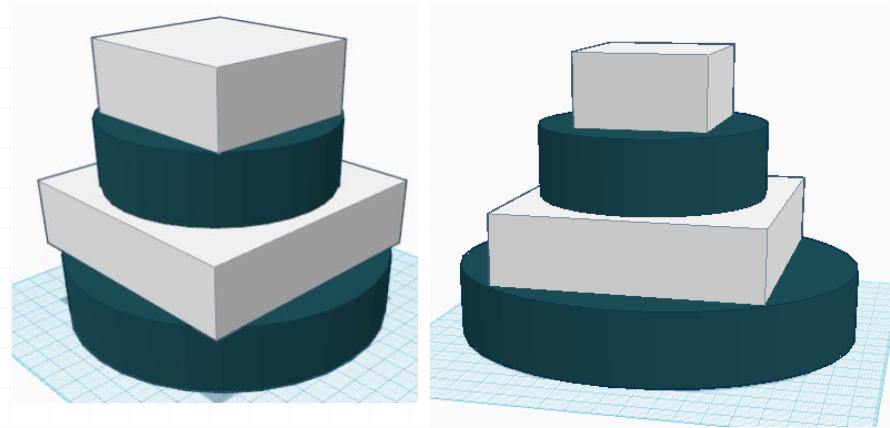
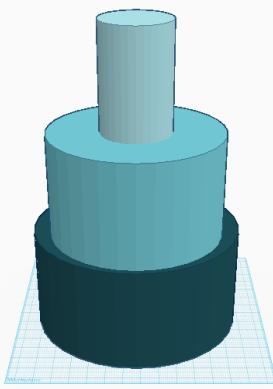
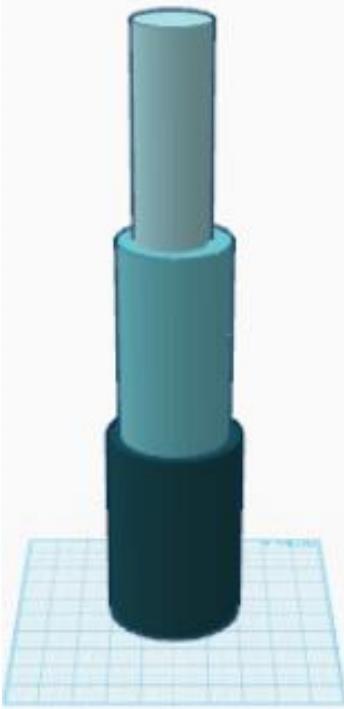

  
 Square = 10% of the cake =  $132 \text{ in}^3$   
 Cylinder = 20% of the cake =  $264 \text{ in}^3$   
 Square = 30% of the cake =  $396 \text{ in}^3$   
 Cylinder = 40% of the cake =  $528 \text{ in}^3$

Serving 220 people =  $1320 \text{ in}^3$  of cake  
 Our height will be 3 in./tier

 $V = 132 \text{ in}^3$ $H = 3 \text{ in}$ $L \cdot W = 6.63 \text{ in}$	To find length + width: $3 \times n = 132$ , so $132 \div 3 = 44$ $44 = A \text{ of base shape, so}$ $\sqrt{44} = L \cdot W$ , so $6.63 = L \cdot W$
 $V = 264 \text{ in}^3$ $H = 3 \text{ in}$ $R = 5.29 \text{ in}$	To find radius: $3 \times n = 264$ , so $264 \div 3 = 88$ $88 = A \text{ of base shape, so}$ $\sqrt{88} = r$ , so $9.38 = r$
 $V = 396 \text{ in}^3$ $H = 3 \text{ in}$ $L \cdot W = 11.48 \text{ in}$	(Did same thing as top tier) $396 \div 3 = 132$ $\sqrt{132} = 11.48$ $11.48 = L \cdot W$
 $V = 528 \text{ in}^3$ $H = 3 \text{ in}$ $R = 7.48 \text{ in}$	(Did same thing as 2nd to last tier) $528 \div 3 = 176$ $176 \div \pi = 56.02$ $\sqrt{56.02} = 7.48 \text{ in}$



# Virtual Models



# Cake Decorating



# Connecting to the Standards

- **5.MD. 5** - Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume.
- **6.G.2** - Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas  $V = l w h$  and  $V = b h$  to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.
- **7.G.6** - Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.
- **8.G.9** - Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

# Differentiating Instruction

1. Vary the number of people.
2. Allow a wider (or narrower) range.
3. Assign a height for each tier.
4. Change the number of tiers required.
5. Assign the types of solids to be used.

# Thank you for coming!

I hope you decide to try the Cake Contest with your students.  
Please feel free to email me if have any questions.

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