Surface Area and Volume Project
What is the volume of your body?
You have been given all the resources required to build the pool of your dreams. Use your imagination, it could be in ground, above ground or a combination of both! It could be made of steel, plastic or concrete. The only requirements are that it is a composite shape comprised of at least three different sections and it must fit into your backyard which measures 40 ft by 20 ft.

Now it’s your turn. Use the attached grid paper to design your pool. Make sure to include all measurements. You will need to include a top down drawing (looking at your pool as if you were in a helicopter above), and it must include all needed measurements for building.

You will need to include a side view of the pool to show the depth below or above ground (or both). Remember to also include all measurements required here as well.

On the page following the grid paper, you will need to calculate the interior surface area of your pool so that the contractor will know what amount of supplies are needed. Make sure to show all your work and label all calculations clearly.
Side View of Your Pool
Surface Area Calculations
Remember to show all your work, and don’t forget the units!
VOLUME

We will return to your pool in a little while.

But first, we are going to ask, what is the volume of your body? Is this something that is easily calculated?

No, not really. But we are going to do it!

You will need a few materials for this portion of the project:

1. Access to a measuring tape. Not a construction measuring tape, but a cloth one used in sewing. If you don’t have access to this you can use a piece of string and a ruler.
2. A bath tub.

First things first. Let’s draw a rough sketch of your body. Provided for you is a page with room for you to sketch yourself.

Once you’ve completed your sketch there are a few questions for you to respond to. Please take the time to answer honestly and think about your methods.
Sketch Yourself #1
1. If you had to pick 1 shape to represent your body, what would it be?

2. Using your measuring tape, take the necessary measurements of that shape in relation to your body and calculate the volume:

<table>
<thead>
<tr>
<th>Required Measurements</th>
<th>Calculation of Volume</th>
</tr>
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</table>

3. Is this an accurate representation of the volume of your body? Why or why not? Explain.
Let’s do it again!

This time we want you to sketch yourself again but we are going to change the method to which we calculate the volume of your body. Now, we want you to break your body up into three to five different 3d geometric shapes (ones that you know how to calculate the volume of, rectangular prisms, cylinders etc).

Once you have completed your drawing, calculate the volume of the shapes you suggested by taking the required measurements and using your math skills to determine the total volume of your body.

Then answers the reflection questions that follow.
1. On the above diagram, draw in the different shapes you would choose to represent your body. Mark them in a different color so we can see them clearly.
2. Using your measuring tape, take the necessary measurements of that shape in relation to your body and the regions you’ve determined above and calculate the volume:

<table>
<thead>
<tr>
<th>Required Measurements</th>
<th>Calculation of Volume</th>
</tr>
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</table>

Calculate the total volume of your body:
3. Is this an accurate representation of the volume of your body? Why or why not? Explain.

4. Do you think this is a better or worse representation than the first time you sketched and estimated your volume? Why?
Third time’s a charm, right?

This time we want you to sketch yourself one more time, but we are going to change the amount of regions from three to at least ten different geometric shapes. That is, we want you to divide yourself into at least 10 different 3d geometric shapes and calculate the volume of those regions. Make sure you use shapes that you know how to calculate the volume of.

Once you have completed your drawing, calculate the volume of the shapes you suggested by taking the required measurements and using your math skills to determine the total volume of your body.

Then answer the reflection questions that follow.
1. On the above diagram, draw in the ten different shapes you would choose to represent your body. Mark them in a different color so we can see them clearly.
2. Using your measuring tape, take the necessary measurements of that shape in relation to your body and the regions you’ve determined above and calculate the volume:

<table>
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</table>

Calculate the total volume of your body:
3. Is this an accurate representation of the volume of your body? Why or why not? Explain.

4. Is this a better or worse representation that the first or second time you sketched and estimated your volume? Why?
Okay! This part of the project needs to be completed where you have access to a bath tub.

Now for the fun! Time to get your bathing suit on.

Did you think we were joking? I’m serious, put it on!

We are going to use the bathtub in order to figure out the volume of your body, to the best of our ability. Here are the required steps:

1. On the attached pages, you will need to sketch your bathtub. Label the measurements required in order for you to calculate the volume.
2. Fill the bath tub about 2/3’s full.
3. Measure the depth of the water.
4. Calculate the current volume of the bath tub.
5. Jump in!
6. Submerge yourself to the best of your ability, and with the assistance of goggles or another person have them mark the depth the water is after you are submerged.
7. Jump out! And dry off!
8. Measure the depth the water was when you were submerged.
9. Calculate the volume of the bath tub when you were submerged.
10. Take the submerged volume and subtract from it the volume of just the water. And voila! You have the volume of your body!
Sketch Your Tub:

You decide the views required, is one enough? Do you need more than one?
Calculations for the Volume of the Bath Tub with just Water
Calculations for the Volume of the Bathtub with You Submerged

Total Volume of Your Body:
Now, if you had your pool that you previously designed, and it was filled three-quarters of the way full. How many of you could you fit into your pool before it overflows?

Think about all the necessary calculations you will need to perform before you start!

Explain your steps to your calculations and your final result. Feel free to use additional pages if necessary.

Following those calculations is a chance for you to be able to reflect on the discoveries you’ve made and what you have learned. Please take the time to answer the questions thoughtfully and honestly.
1. How accurate were your estimates compared to the actual volume of your body?

2. Obviously our measurements are not perfect. In what ways could we have improved the accuracy of the submersion technique? List at least three improvements you could make.

**Suggested Improvements:**
3. Given the three methods we used to estimate the volume of your body, what would you suggest to someone who needed to get an accurate value of their volume (given that they weren’t able to submerge themselves to find it)?

4. Why might you ever need to know the volume of your body?

5. Where else could you use the submersion technique?

6. What was something you liked about this project? What was something you’d like to see changed?
**Self-Evaluation Rubric:**

**Students Name(s):**

**Part A:** Rate yourself on the relative contributions that were made in preparing and submitting your project. In rating yourself, use a one-to-five point scale, where

5 = superior; 4 = above average; 3 = average; 2 = below average; 1 = weak

<table>
<thead>
<tr>
<th>Category</th>
<th>Comments</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thoroughness of your calculations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Creativity brought to planning your pool</td>
<td></td>
<td></td>
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<tr>
<td>Completion of all assigned tasks on time</td>
<td></td>
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<tr>
<td>Your effort at all the different assigned stages of the project</td>
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Score for A: /20
Part B: Answer the following with complete sentences.

1. Describe your feelings about working on this project. Did you enjoy it? (2 marks)

2. What was the hardest part about working on this project? Explain. (2 marks)

3. List some of the things you learned while working on this project. (2 marks)

4. Were you satisfied with your final project? Elaborate. (2 marks)

5. What personal strengths did this project bring out in you? Elaborate. (2 marks)

6. If you had to do the project over again, what would you do differently? Explain. (2 marks)

Score for B: /12

Total for A & B: /32