CDC writing

By: Cannon Spidle Mrs. Joshi

Question:

Tracy said the volume of a 3-D shape was 3x3x3. Mark said the volume of the shape was 6x6x6x⅓. Who is correct?

Claim:

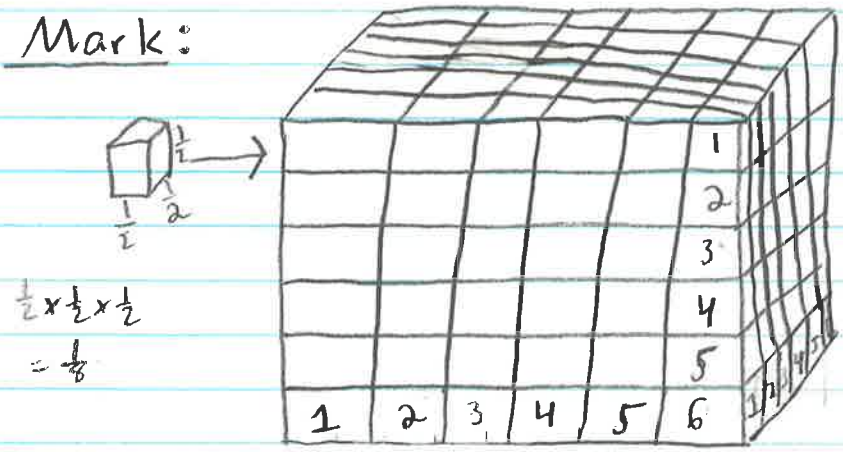
In this situation, there is a cube that has measurements of 6x6x6. Adding on, there are two individuals with different measurements set for this shape. One individual, named Tracy, had the measurements of 3x3x3. The other individual, named Mark, had the measurements of 6x6x6x⅓. Now, it is the same shape but why are their measurements different and how are their answers both correct? It is all because of fractional edge length.

The data is on the next page →

Data:

One Solution

Mark:



$\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}$

$= \frac{1}{8}$

$= 6 \times 6 \times 6 \times \frac{1}{8}$

36×6

$= 216$

27×1

$= 27 \text{ un}^3$

$\begin{array}{r} {}^{3}36 \\ \times \quad 6 \\ \hline 216 \end{array}$

Steps in order

1.) Creation of the 3-D figure.
2.) Numbering the shape.
3.) Finding the dimensions using fractional edge legnth.
4.) Calculating the measurements.

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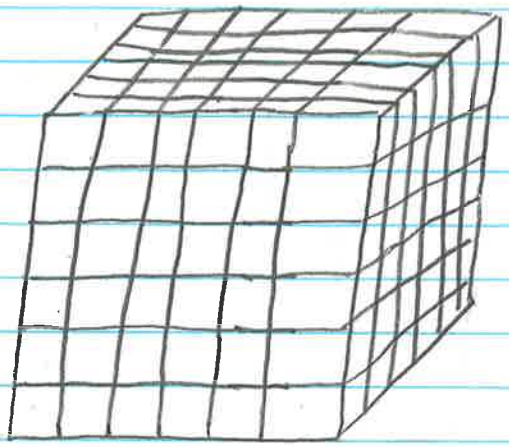
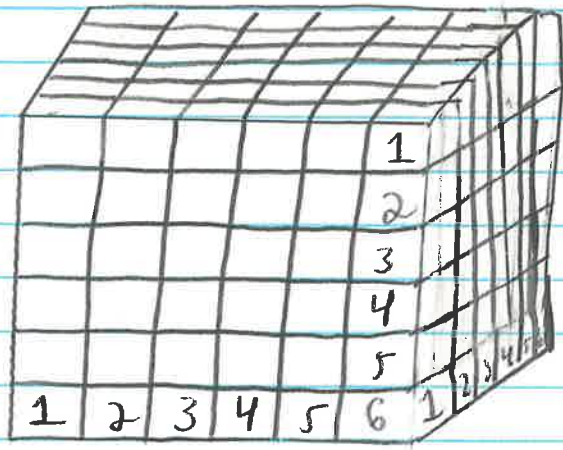
Data

Tracy:

1.)



2.)



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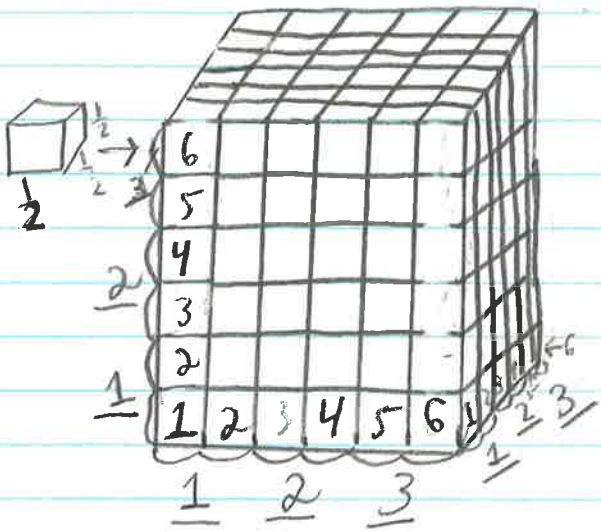
Data

3.)



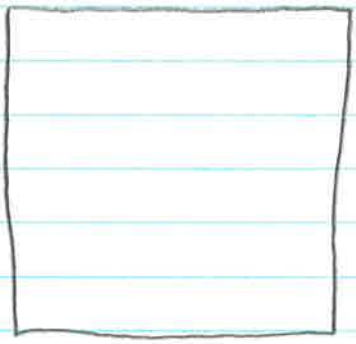
$3 \times 3 \times 3$

$= 9 \times 3$

$= 27 \text{ un}^3$

Commentary

So, what is fractional edge legnth? Well, first we have to create a 3-D figure. So, the first thing you do is create the front face of the figure. It should look something like this:



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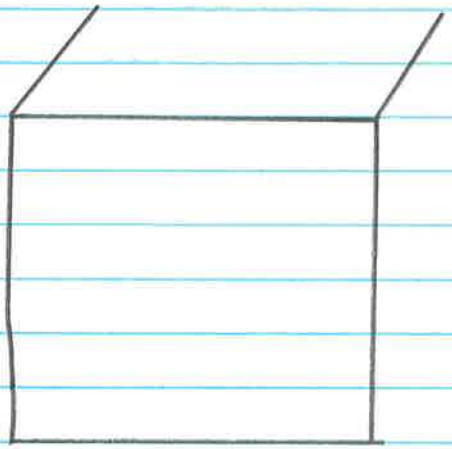
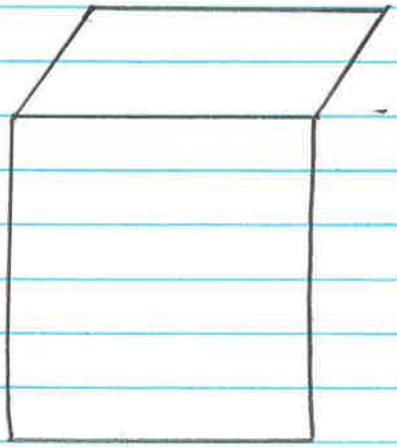
(You can use a ruler for more precise lines but that is optional.) Commentary

The next thing you do is you add lines to the back of the shape. That will look like this:



If you now look at it closely, you can start to see the formation of the 3-D figure. Now the next thing you do is connect the two back lines. This is simple enough as shown.



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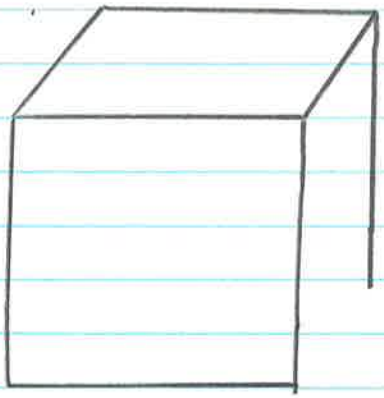
Commentary

After that, the next thing you do is also very simple.

The next thing to do is to draw another line from the two back lines. This line, however, goes vertically while the previous line went horizontal.



Be cautious though, for this line does not go all the way down to line up with the bottom line. Moving on, the next thing to do is to draw another line. This line meets up with the bottom line and the line you just drew. The completion of this will result in the figure looking like this.

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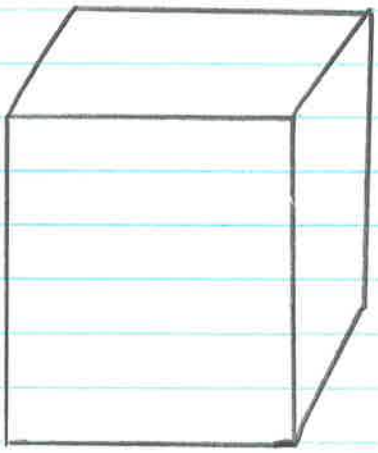
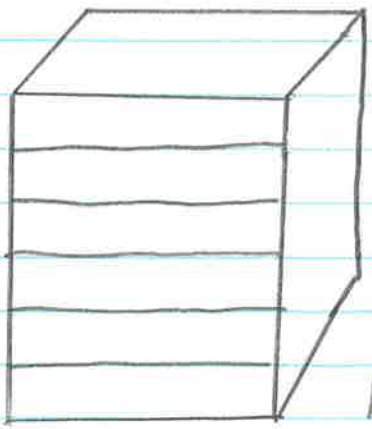


Congratulations! You have now completed the main body of your 3-D figure. But wait, there's more! Now, after that, we have to put the outlines of the cubes on the figure. A good place to start with this is to put horizontal lines across the front side of the shape. That will look like this. (You can use the blue lines as a guide to help you.)



Use the blue lines to help.

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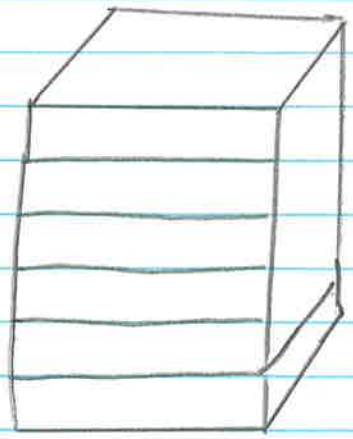
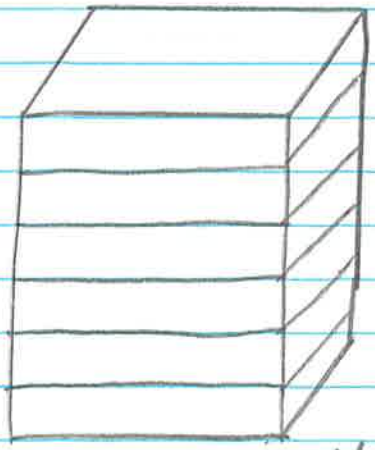
After that step, you then create a line that is slanted upward from the line you just created. For technical purposes this line should be at about a 50° angle. The line should look like this.



(This step can then be repeated for every other line.)



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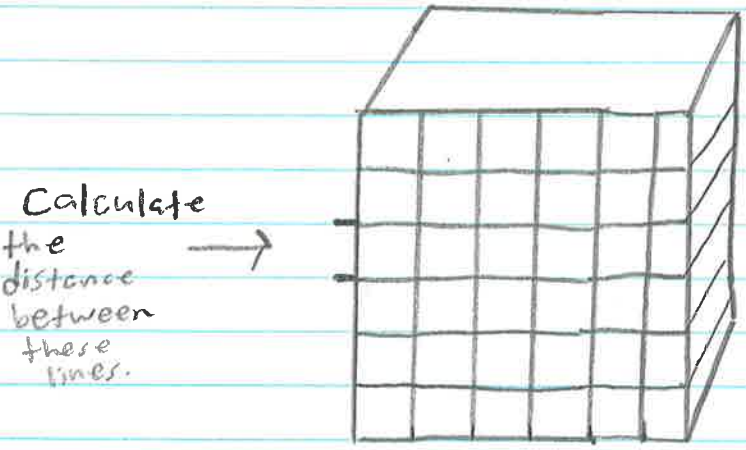
Now, after you have done that, you need to add vertical lines. For this, I recommend using a ruler to calculate the space between the horizontal lines. Then, with that distance you calculated, you put that distance between your vertical liner. (This method may not work if you have a wonky figure. So, be sure your figure is precise with its lines and size.) This step should look like this. (You can also just infer where the lines should be.)



One very important tip to use is to calculate the height of the figure using a ruler. After you did that, you then need to make the bottom the same distance. Moving on, you now need to add the same type of lines

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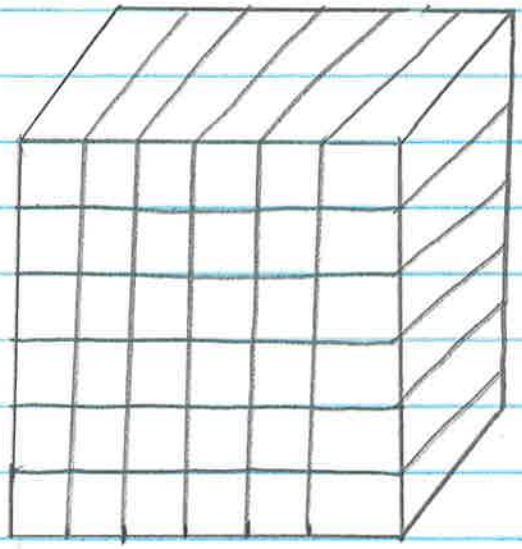
to the vertical as the horizontal lines. These upward lines should be at about a 50° angle. These lines should look like this on your figure.



After you have done that, you now need to create the outline of the cubes on the top and the side. To do this, I usually start on the top left.

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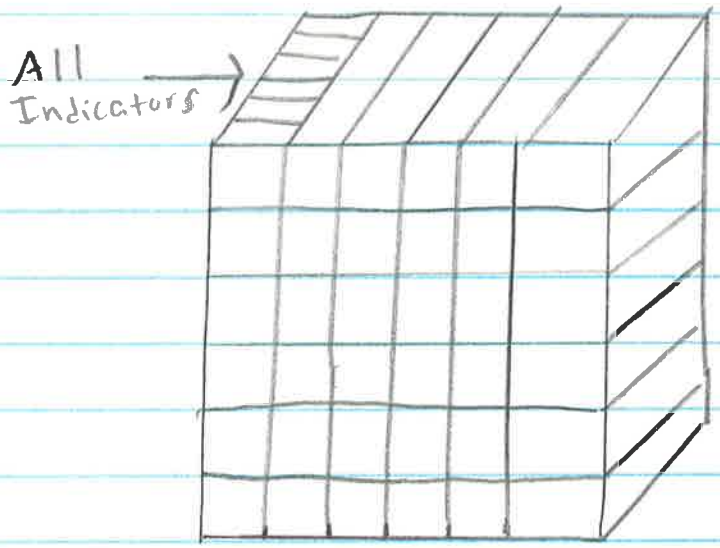
After you locate the top left of the figure, you then need to put a line there. This line is used as an indicator. When you do this, you then need to put two other indicators beside the main indicator.



After you put down all of the indicators, you then need to stretch them out horizontally. This horizontal line will stretch out to the far right of the top.

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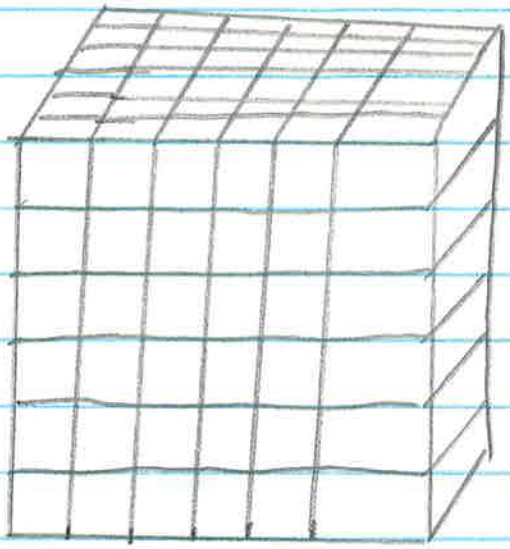
This step completed will look like this on the figure.



Moving on, you are now on the last step of creating your figure. The last step of the completion of this figure is very simple. The last thing you have to do is just make a vertical line from where you left off from the last step.

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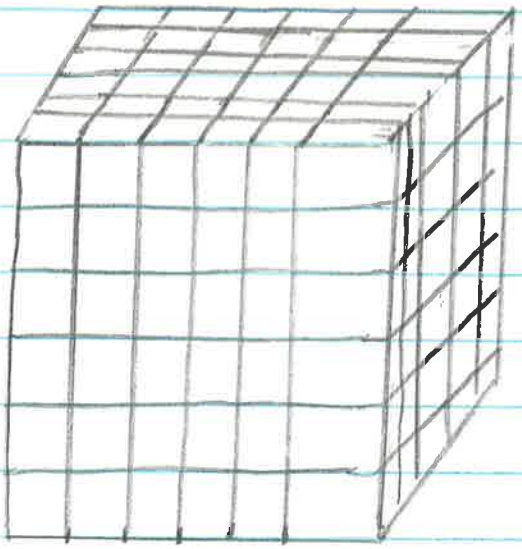
This final step should look like this.



To continue forward, in the claim, I stated something about fractional edge legnth. What is fractional edge legnth? Fractional edge legnth is the fraction or whole of smaller cubes that compose a larger cube. (Or a rectangular prism.) If one smaller cube has an

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edge length of one, then you just have to find the volume of the whole figure itself. (The way you find volume is by counting the cubes in the length, then the width, and then the height according to a cube or rectangular prism. You then multipy the length, width, and height using the formula $V = lwh$.) As another example, imagine a smaller cube has a length of $\frac{1}{2}$, a width of $\frac{1}{2}$, and a height of $\frac{1}{2}$. With these measurements, you multipy them with eachother. So, that will be $\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}$. These measurements then result in being the product of $\frac{1}{8}$. Now, imagine you had a cube with the measurements of $6 \times 6 \times 6$. You would then multipy these numbers and you will result in getting 216.

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After you get this product, you then need to multipy 216 and $\frac{1}{8}$. This is how it should look.

$$\frac{216}{1} \times \frac{1}{8}$$

Next, we need to simplify the 8 and the 216. The long division is shown below.

$$\begin{array}{r} 27 \\ 8\overline{)216} \\ -16 \\ \hline 56 \\ -56 \\ \hline 0 \end{array}$$

The quotient then comes to a 27. Now, your expression should look like this.

$$\frac{27\cancel{216}}{1} \times \frac{1}{\cancel{8}_1}$$

What we did was we divided 8 by 8 and then 216 by 8 to simplify it.

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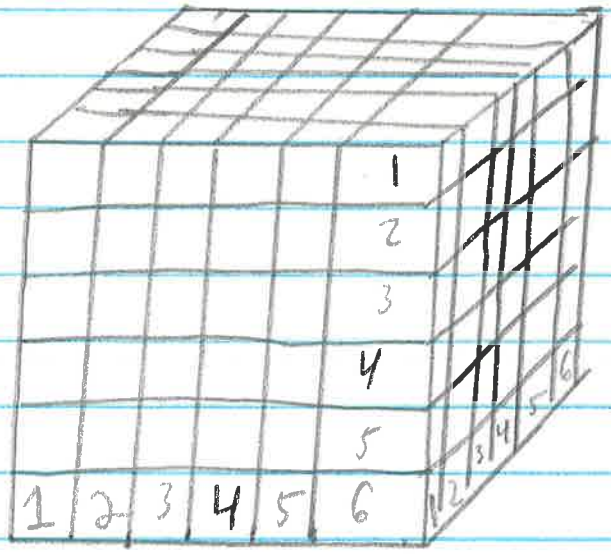
Then, all you do after that is you multipy them.

$$\frac{27}{1} \times \frac{1}{1} = \frac{27}{1} = 27$$

That was one of two ways you can do that. I will now show you the second way.

The second way has you map out the figure like this.



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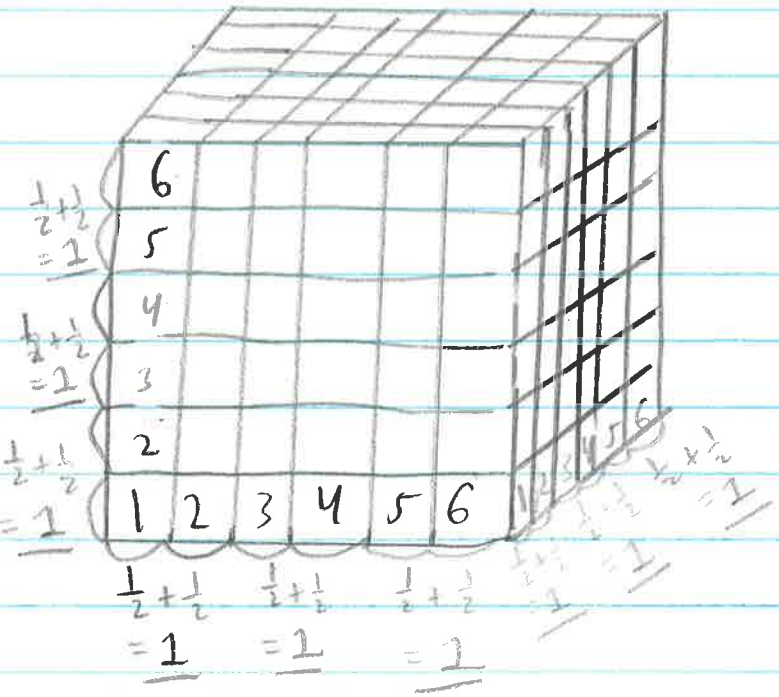
This is done so you know the measurements of the cube. Moving on, you know that 1 small cube is worth $\frac{1}{2}$. So, you implement the smaller cubes into the larger figure. This is how it should look.



After that, you add each 1 coordinating to its side. So, the length would be 3un, the width would be 3un, and the height will be 3un.

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Then, you will use the formula of $V = lwh$. This will result in the expression of $3 \times 3 \times 3$. So, you know 3×3 is 9. You also know that 9×3 is 27. So the answer will be $27 un^3$.

This proves my point of their being two ways to do this because both ways resulted in the same answer.

To sum it all up, I hope you now know how to make a 3-D figure. I also hope that you now know what fractional edge length is. Finally, I hope that I have proven my point well on how both of their measurements are correct.

Ending