3D Printing Pentominoes

Look at a set of pentominoes.

What do you notice?

What do you wonder?

1. Calculate the volume and surface area of 2 or more pentominoes. What is similar? What is different? Is true of all pentominoes? Check with a third pentomino. What conclusion can you make about the volume and surface area of pentominoes.

2. Choose a pentomino. Create a scale diagram that is half the size (in all dimensions). How do you think the surface area and volume of your model will compare to the full sized pentomino?

3. Calculate the surface area and volume of your model pentomino. Are the surface area and volume what you expected? What is the relationship between the surface area of the scale diagram and the actual pentomino? What is the relationship between the volume of the scale diagram and the actual pentomino?

4. What do you think the surface area and volume would be if you tripled the dimensions of the original pentomino? Verify your hypothesis by calculating the surface area and perimeter.

5. PLA (polylactic acid) is a biodegradable plastic made from corn that is used in 3D printing. The filament comes in a spool that is approximately 198m long and 1.75mm in diameter. If each spool cost $36.61, how much will it cost to print one scaled down pentomino? How much would it cost to print an entire set?

6. Visit Tinkercad.com. Click Sign In at the top right. Below the Next button, click Sign In With Social Provider. Choose Google and sign in with your school Google account. Click on the new design button and design your half sized pentomino. Note that in the lower right corner of the screen you will see a Snap Grid menu. The default is 1mm meaning that each square is on the work surface is 1mm. When you're finished give it a title in the upper left hand corner (Pentomino might be a good one).

7. Once your design is finished Export it (top right) to a .stl file. The file will be downloaded to your computer. Transfer the file to a memory card and bring it to the printer then print it.

Teacher Notes

1. This activity could be used as is in an MPM1D1 class or an MFM2P1 class.

2. Here's a quick introductory video on how to use TinkerCAD.