A product of imathgination

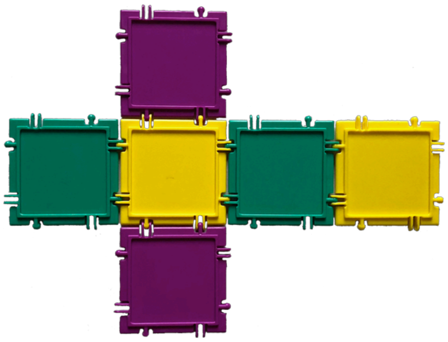
# GEOMETILES®

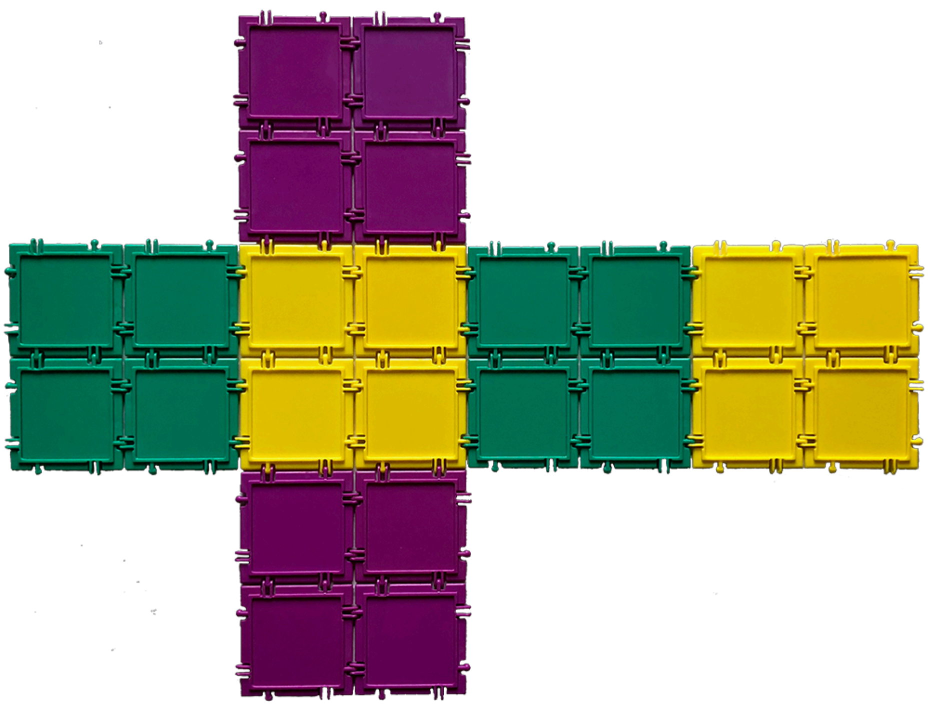
## Middle School Sample Lesson

Solve real-life problems involving surface area and volume; analyze proportional relationships and use them to solve real-life problems

**How does scaling lengths affect surface area and volume?**

Start out with the smallest cube. Then build a cube with side lengths that are twice those of the original cube. Make the nets first:

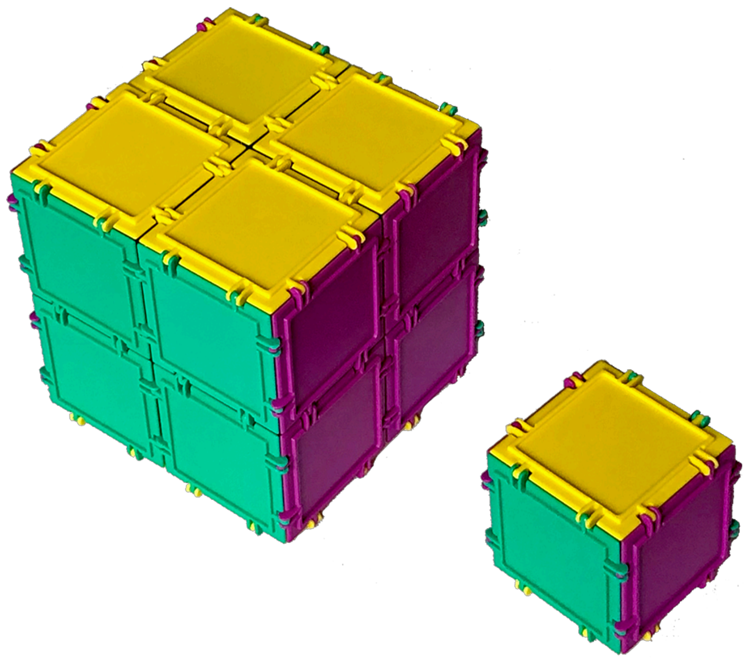




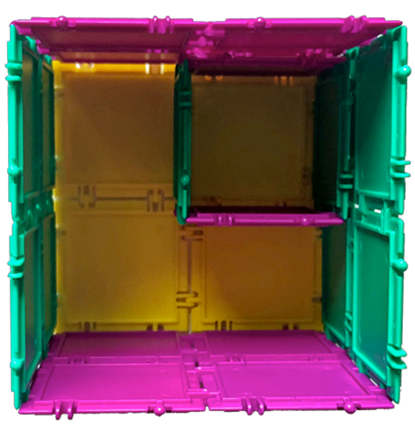
Note that the side of the large cube is twice the side of the small cube. What can you say about the relationships of the surface area (i.e. the number of squares used in building) the large and the small cube?

We find that the small cube is made of 6 squares, but the large cube is made of 24 squares. So when the length gets doubled, the area gets quadrupled.

Now fold:



The large cube is how many times the volume of the small cube? In other words, how many small cubes can you fit inside a large cube?



You can see from the above picture that **8 small cubes fit inside a large cube**: 4 on the bottom and 4 on the top. Summary: when you double the length, the surface area gets multiplied by a factor of $2^2 = 4$, and the volume gets multiplied by a factor of $2^3 = 8$. How does this generalize when you scale the length by a factor other than 2? What if you scale pyramids instead of cubes?

Materials needed: