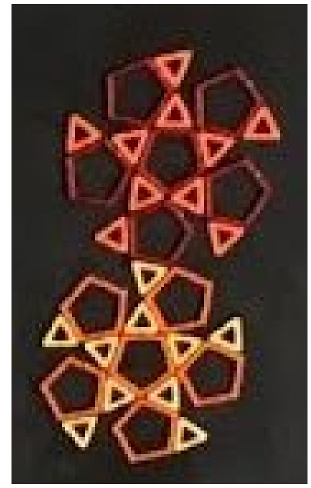
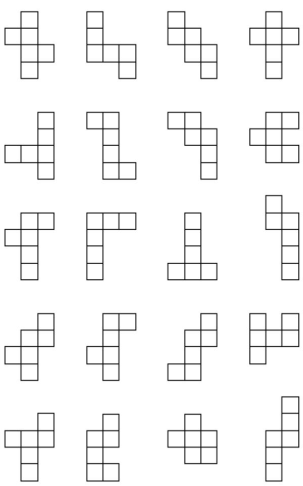
Math Club 2. Lesson # 20. **March 17, 2019**

Flatten the cube!

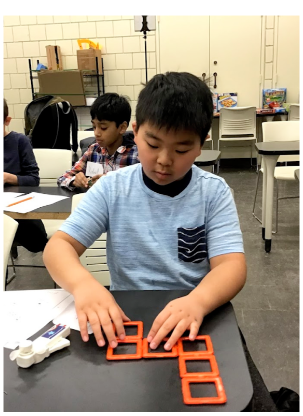


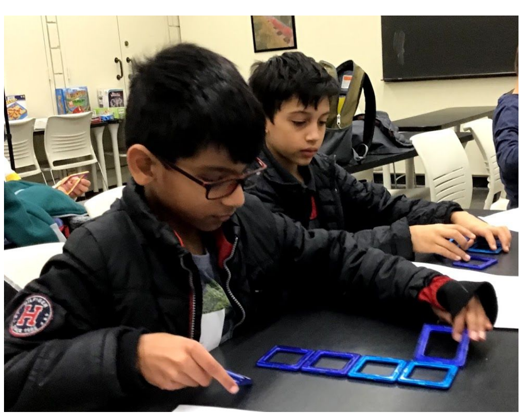
What is this shape called? The magical spherical ball? Just a soccer ball? It has a very long name (icosidodecahedron), but we will learn what it means and where it came from later. What do I get if I make this ball completely flat? Do I get a disk, or something else? Maybe a shape like this below?

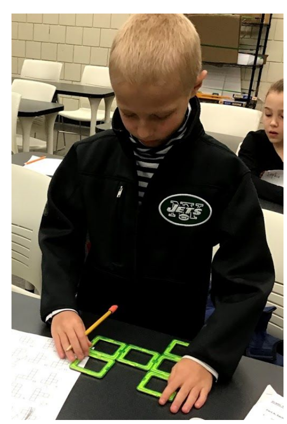
Well, guys, we will start from a very object first. Everybody imagine a cube. How many squares do I need to make a cube? 4? 5? Or 6? Six squares would be my best guess! But how should I arrange my squares so that I get a cube when I assemble them together? Does it turn into a cube if I string all 6 of them together into a line? It won't work without breaking! How about putting them into a cross-like arrangement? Then it looks like we can turn it into a cube without breaking anything.



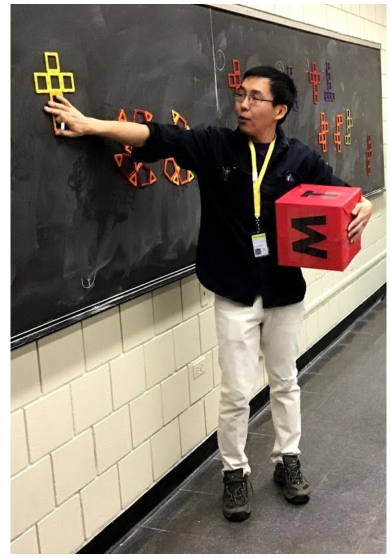
But is that the only way to make a cube from a net? Can you come up with another arrangement of the 6 squares so that they still make a cube when assembled? Let us find and color all the correct arrangements of 6 squares that can be a cube's net. Who can list all the distinct nets of a cube and count them? It turns out there are 11 distinct ways in total that 6 squares can be made into a cube!

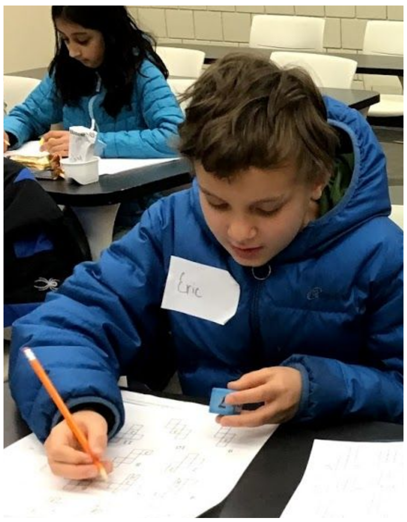


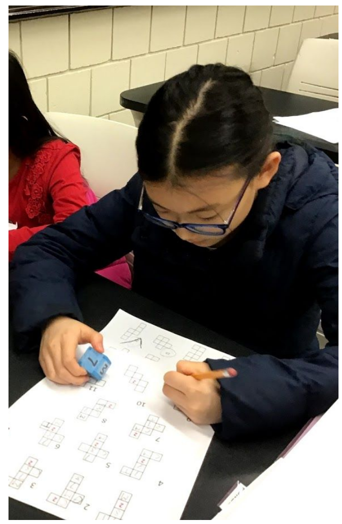


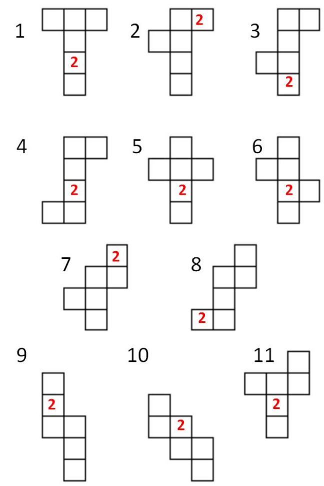


Let us now do something more challenging: we have a net of a cube given. And we also have a cube with 3 letters and 3 numbers on its 6 faces: C, M, T, 2, 3, and 7. Our task is to write the correct letter or number into each of the squares in the net. If we take the net 1 in the picture, and position the cube so that the face with number 2 is facing us as shown, what should be in the square above the number 2? Number 3 should be above the 2. What should be below 2? That would be letter M. Now we will fill in the letters and numbers into all the squares. Make sure that all letters and numbers are oriented correctly inside the squares.









Let us next look at an open box! How many squares does an open-top box need? Since the only difference between a cube and an open-top box is that the top is missing for the open-top box, we must need 5 squares. Our task now is different than before: by looking at the net of a box, can we figure out which of the squares is the bottom face of the box? Let us try! In the net A, there are 5 green squares numbered 1-5. If we imagine building the box from this net, can we tell which square will end up at the bottom? Number 2 will be the bottom! How about in the net C? Can square 2 be the bottom again? Looks like square 4 is the bottom!