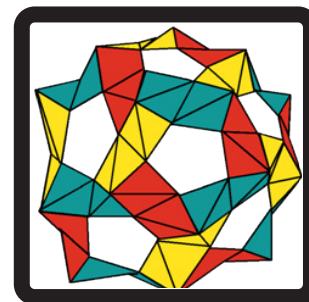


Buckyballs

In September 1985, a new kind of carbon family was discovered by three innovative chemists, Robert F. Curl, Sir Harold W. Kroto, and Richard E. Smalley. They were working together at Rice University in Houston, Texas to perform a set of experiments that were integral discoveries in Nanoscience. The discovery made by these three men was of a spherical, 60 carbon containing molecule very different from graphite and diamond. It was officially named Buckminster fullerene in honour of R. Buckminster Fuller who designed and built the first geodesic dome.



Did you know?

Different forms of an element are known as allotropes; carbon exists in nature as amorphous (no patterned structure), graphite, diamond, and the new Nano discovery. This new carbon allotrope was named the fullerenes, soccer ball shaped, cage-like molecules dubbed buckyballs for short. The smallest buckyball structure consists of 20 carbon atoms bonded together in pentagonal units. Individual buckyballs are quite hard, and yet in bulk are relatively soft and slippery. Potential applications for buckyballs, include their potential use as lubricants and even superconductors. Further research has found cylindrical structures since named carbon Nanotubes and have extended the definition of a fullerene from just spherical structured carbon to cylindrical as well.

Challenge: Create an origami buckyball

What you need

- Square pieces of paper (sticky notes are a perfect size)
- Time, this is indeed a challenge

What to do

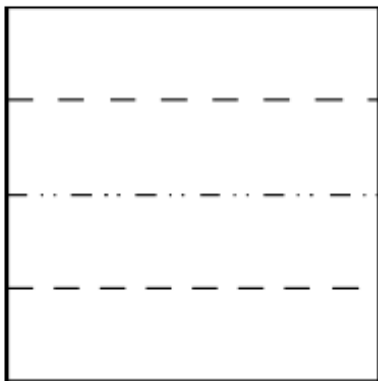
1. Follow the instructions on page 2 to fold a PHiZZ unit.
2. Follow the instructions on page 3 to build a 'carbon' represented by a pyramid made of three PHiZZ units.
3. Use these pyramids to build a 20 carbon origami buckyball.

REMEMBER

Creating the first couple PHiZZ units and connecting them, may be a challenge, practice will make things faster.

What is a PHiZZ unit and how do I make one?

Tom Hull is an associate professor of mathematics at Western New England College and is best known for his expertise in the mathematics of paper folding. He has named this unit the Pentagon-Hexagon Zig-Zag unit or PHiZZ for short, because you can make pentagon or hexagon faces where the corner is made by three edges meeting it. Because you use this to make pentagon or hexagon faces, it is perfect for putting together a buckyball. Try to make your own PHiZZ unit!



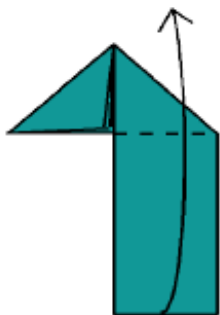
1) Take a square piece of paper, white side up, and accordion pleat it into fourths.



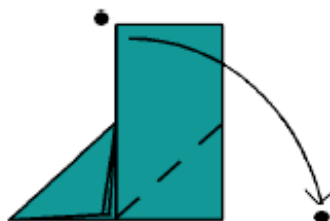
2) Fold the top left corner down.



3) Fold the right end of the strip down to meet the folded edges.



4) Now fold the strip up, making the bottom flush.



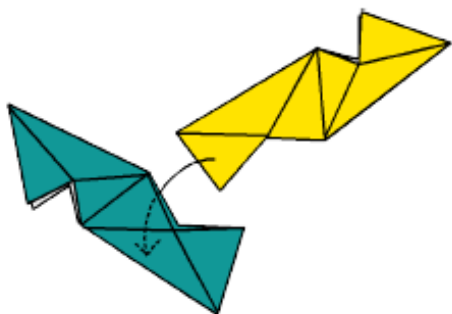
5) Fold the strip down to the right.



6) Mountain-fold the upper right corner behind, and you're done with a unit!

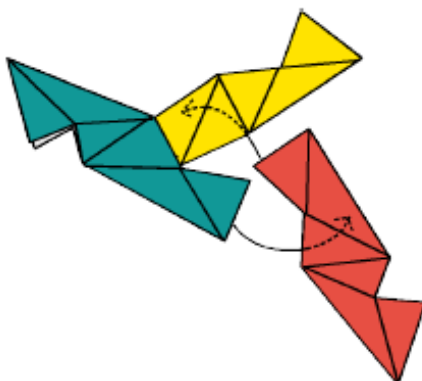
How do I make a buckyball?

We are making a 20 carbon buckyball represented by the pyramid formed by three PHiZZ units. This is a geometrical structure called a dodecahedron dodeca is Greek for 12, and hedron is Greek for a face or side of an object. You will need 30 PHiZZ units. Make a pyramid and then keep adding units onto your first three, when you see five pyramids going around a face (touching) link them up to complete the pentagon face.



- 1) Slide the end of one unit into the side of another, as shown.

The flap should go in between the layers of paper, and crease lines should line up.



- 2) It takes three units to make a corner of the polyhedron.

Slide the third unit into the second unit, and slide the first into the third.



- 3) This is what you should see. Notice how exactly half of each unit was used to make this pyramid

Continue adding units to this to make your buckyball

