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This is an example of a real world application lesson that appears in Level D of Milestone Maths. Every milestone ends with a real world application lesson like this one to prove to students that the maths they are learning is relevant to the world around them transforming the, “Why do I have to do this?” into “Wow! Now I get it!”

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Lesson 16.6 Real World Application

Architecture and Engineering

Have you ever noticed that there are a lot of triangles in the Sydney Harbour Bridge?



Photo by Kevin Murray on Unsplash

Those triangles aren't there to make the bridge look pretty! They serve a very important engineering purpose. To find out what, try the simple experiments below to find why triangles are very useful to engineers and other designers.

EXPERIMENT 1

What you'll need:

Some scrap cardboard (up-cycle some packaging). You don't want corrugated cardboard - just the 'pasteboard' that things are packaged in at the supermarket.

A hole punch - or hammer and nail or some other means to put holes in the cardboard

Something to tie through the holes - brads would be ideal but twist ties or string will also work.

What to do:

1. Make several strips that are approximately the same length from the cardboard.
2. Punch a hole at each end of every strip.
3. Use the brads (string or twist ties) to join three of the the strips into a triangle

4. Use four more strips and more ties to make a square the same way.
5. Turn the square into a 'diamond' by holding the bottom still while 'sliding' the top of the square.
6. Try to 'deform' the triangle like you did the square. Could you do it?
7. Try making different types of triangle by using different length strips of cardboard. Can you make any of the triangles 'squish'?
8. Make your square, 'square' again and add a diagonal strip to it. Can you 'slide' the square into a diamond now?

EXPERIMENT 2

What you will need:

Some toothpicks or matchsticks (craft ones)

Some Plasticine, play-dough, blue tac or similar.

What to do:

1. Use the toothpicks and small balls of Plasticine to make the frame of a cube and the frame of a triangle pyramid (tetrahedron).
2. Gently push down and "wriggle" each of your structures. What happens?
3. Try making a square pyramid as well. Repeat step 2 with it.

Reflection

Both of these experiments show a key property of triangles known as rigidity. Virtually every structure ever built relies on triangles for rigidity to keep its shape and stop it falling down due to wind, earth movements or other causes.

Notice: The triangles don't even have to be there in the first place to do their job. Did you notice what happened when you added the diagonal to your square? Your square suddenly had two triangles inside of it! You should have found that it was nearly impossible to 'squish' it after you added the diagonal. In building and engineering, we call this 'bracing' and it's used everywhere! The brace doesn't even need to be made from a very strong material to work - try replacing your brace with paper to see what happens.

