Name: _____ Period: _____ Date: _____

Text Tags	
?	I am confused about … / I have a question about …
⬭	This vocabulary word means …
!	This is interesting/ surprising because …
√	This is important because …

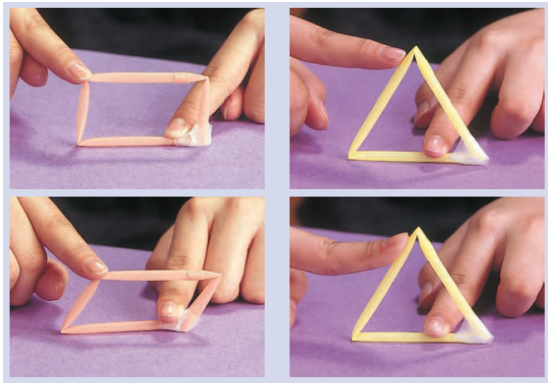
Directions: You are going to research how to improve your Marshmallow Challenge structure by reading the article below. Use the "Text Tags" to remember important information for your redesign!

You need to include at least FIVE Text Tags. Highlight or underline the sentence you're talking about in the article. Then write the Text Tag sentence on the side of the article.

Creating Great Buildings

Triangles in Architecture

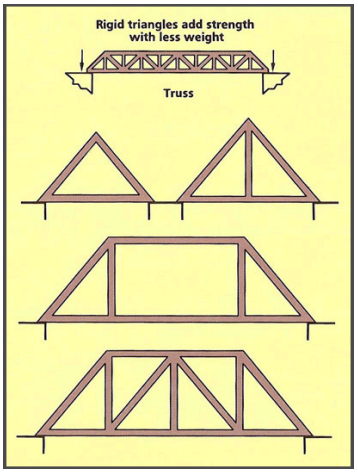
The shapes of buildings and other structures are usually no accident. Engineers and architects go to great lengths to ensure that structures will be able to serve their intended function and that they will be stable. Often, the shape of a structure and its parts determine that structure's strength.



Rectangles are common in all types of structures, especially buildings. Windows and doorways nearly always take the form of rectangles. However, this shape is generally chosen for how it looks and to make buildings look the same, not because it is actually strong. In fact, without support along its vertical sides or the strengthening of its joints, a rectangle is highly unstable. When you push the side, it flops into a slanted parallelogram. This happens without any of the rectangle's sides changing length.

If there is a single most important shape in engineering, it is the triangle. Unlike a rectangle, a triangle cannot change its shape without changing the length of one of its sides or breaking one of its joints. In fact, one of the simplest ways to strengthen a rectangle is to add supports that form triangles at the rectangle's corners. This is called "bracing the sides", in other words, putting a diagonal stick from corner to corner in the square. A single support between two diagonal corners greatly strengthens a rectangle or square by turning it into two triangles. Now when you push the side, the diagonal brace gets squeezed, preventing the rectangle from flopping over.

Most buildings are not made from just one triangle. They are usually made up of many beams (a flat structure supported at each end) joined together to make it much stiffer and stronger. The frameworks in which the beams meet form multiple triangles. Such an arrangement is called a "truss."



Making Tall Buildings Stable

Tall structures are the best-known and most spectacular human-made landmarks in the world. From the Great Pyramid of Cheops in Egypt to the Empire State Building in New York City, they impress anyone who looks at them.

But tall buildings also serve an important practical purpose today. By spreading upward instead of outward, a skyscraper makes the best possible use of limited space in the center of a city. For example, the 100-story John Hancock Building in Chicago provides homes for 1,500 people and work space for a further 3,500.

Weight is the biggest problem in the construction of high buildings. As with all structures, a skyscraper must be designed so that the weight of the upper parts is properly supported by the parts underneath. One way to do this is to build a very strong central "core," like the trunk of a tree. The floors of the building are then held up by powerful arching beams that stick out from this core like a tree's branches.

After weight, the next greatest force acting on a tall structure is the pressure of moving air. Winds tend to blow much harder on the upper floors of a skyscraper than on those lower down. As a result, there is a powerful bending force on the base.

To resist wind pressure and prevent the top of a building from moving too much, thick steel beams are used to stiffen the outer walls. These may consist of heavy beams that run right across and around the skyscraper or diagonal beams that make an X-shaped pattern. Diagonal beams were originally used to stiffen just the central core of tall buildings, but now they are also found on the outside walls.

Another way to reduce sway is to make a skyscraper narrower at the top than at the bottom. This lessens the area of the walls where the wind speeds are highest, so that the sideways force on the top parts of the building is lowered.

Even the strongest skyscrapers, however, sway to some extent. The wind force acting over one face of a tall building may be as much as two thousand tons. This can cause the top of a building to sway back and forth by as much as three feet.

Resources:

- http://www.pbslearningmedia.org/resource/phy03.sci.phys.mfe.triarch/triangles-and-arches-in-architecture/
- http://www.daviddarling.info/childrens_encyclopedia/structures_Chapter4.html
- http://www.exploreideapark.org/WebsofWonder/ShapesOfStructuresAndMaterials.aspx#stha sh.MahNcW0A.A0qXX9vW.dpbs
- http://myclass.peelschools.org/ele/7/18927/Lessons/Structures%20chapter%202.pdf
- http://www.pbs.org/wgbh/buildingbig/lab/shapes.html