

How tall can you build a marshmallow structure that will support weight?



Explore structures by building a tall structure out of marshmallows and toothpicks to support a weight.

Setting: Indoors

Time: < 3 hours

Concepts: structures, stability

Skills: problem-solving, designing

Subject(s):

- ✓ Engineering & Technology

Ages:

- ✓ 6-8
- ✓ 9-11

Materials:

- Container of toothpicks
- Bag of marshmallows
- Various objects, from very light to heavy (books, blocks, containers, etc.)



Safety First!

Throw all used marshmallows away after you are finished building and testing your structure. Do not eat them!

What to do!

1. Using only 20 toothpicks and 10 marshmallows, build a **free-standing** (standing alone without being attached to or supported by something else) structure that is as tall and as big as possible, that can also support an object.
2. Try to have your structure support one object. If it can support this object, try adding another object.
[How many objects can your structure support?](#)
3. Now add another 20 toothpicks and 10 marshmallows to your structure, and see how many objects it can support.
4. Keep adding toothpicks and marshmallows, and seeing how many objects it can support. See how big you can make it!

What's happening?

There are numerous ways to build strong structures with objects that may appear weak. The idea is to recognize that certain shapes are very strong.

The C.N. Tower in Toronto, Ontario, Canada is one of the tallest free-standing towers in the world. Its base is actually triangular: there are ribs that go down the length of the tower, but, if you were to look down, and draw a line around the base, it would be a triangle.

Another very strong shape is the cylinder. A single cylinder can be very strong, just not stable. If the base of the C.N. Tower were cylindrical, it would fall over with the first wind gust. However, if you make the base of a structure out of four cylinders, positioned in a square about the base of the building, then it would be extremely strong and stable.

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Why does it matter?

All structures, even marshmallow towers, are built to support a certain **load**. There are two general categories of loads: **static loads** (that do not change) and **dynamic loads** (that change). Within static loads, there are two main subcategories: dead loads and live loads. The dead load of a structure is the weight of the structure itself or anything else physically attached to it. Live loads are subject to change, but are the loads expected to occur during the regular use of a structure, such as cars or trucks passing over a bridge. Dynamic loads are sudden impacts and can be unexpected. They may exert forces that are out of the ordinary like hurricanes, earthquakes and large waves. Engineers need to consider these dynamic forces and try to design and construct buildings that have the ability to withstand these unexpected loads as well as the expected static loads.



Investigate further!

Try building a new structure using the marshmallows. [How many types of structures could you make? Which of them are the strongest? Which ones are not so strong? What shapes work the best?](#)