





**What do these structures have in common?**

**How are they different?**





# Steel, iron, and cement transformed construction







# Smith Tower

Completed in 1914

484 feet tall

38 floors

It was the tallest building  
in Seattle for a long time!



# Empire State Building

Completed in 1931

1,454 feet tall

102 floors

It held the record for almost 40 years!



# One World Trade Center

Completed in 2013

1,776 feet tall

Currently the tallest building in the USA





# Burj Khalifa

Located in Dubai

2,772 feet tall

163 floors

Currently the tallest building in the WORLD



**How do skyscrapers  
remain standing?**

**How do they handle  
additional weight?**

**Withstand  
earthquakes? What  
about wind?**

# The Marshmallow Challenge!





**The Marshmallow  
Challenge!**

**What is the tallest  
structure *you* can  
build?**



## Toothpicks



## Marshmallows\*



*\* for science, not for food!*

# Structure

A set of connected elements that form a system that can support an external weight\*

\* including its own weight!





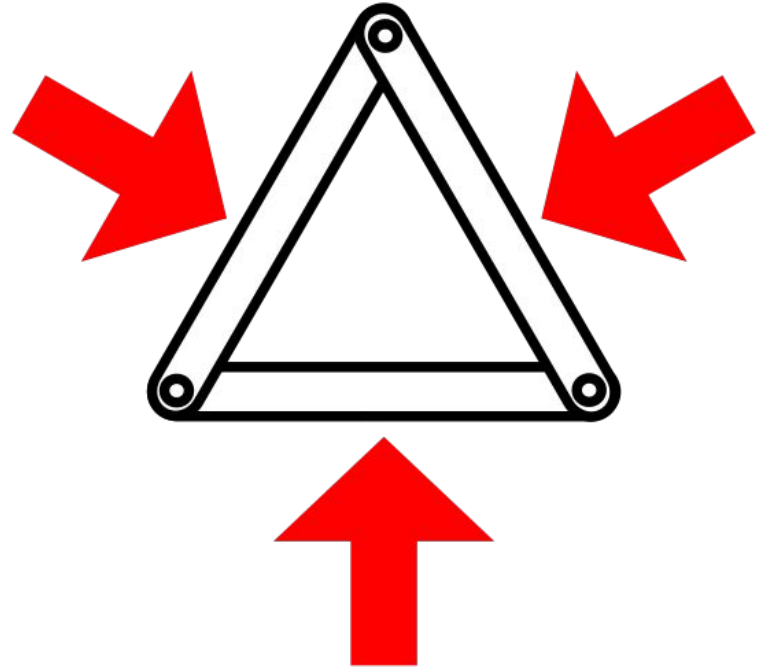


# Freestanding

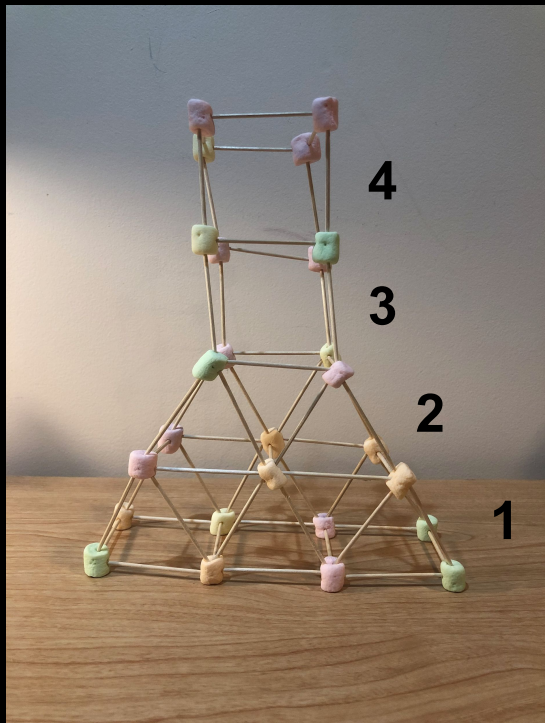
The ability to remain upright without additional support

# Rigidity

Resistance of a structure to bending



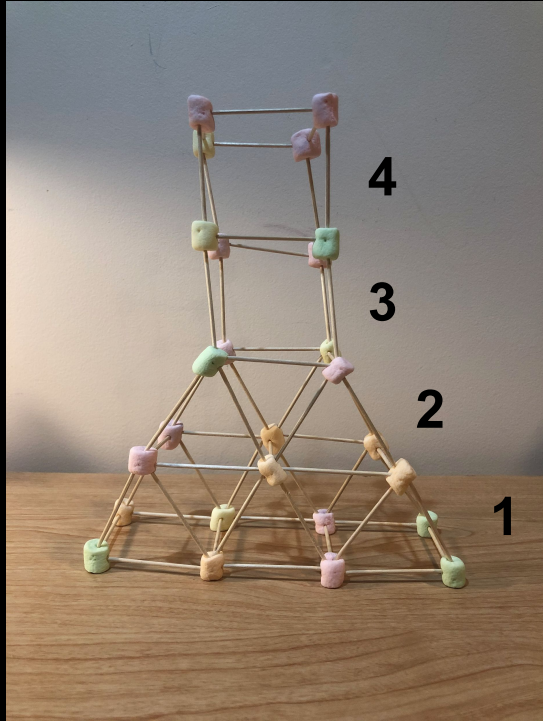
# 1. Build your tower



4 floors high

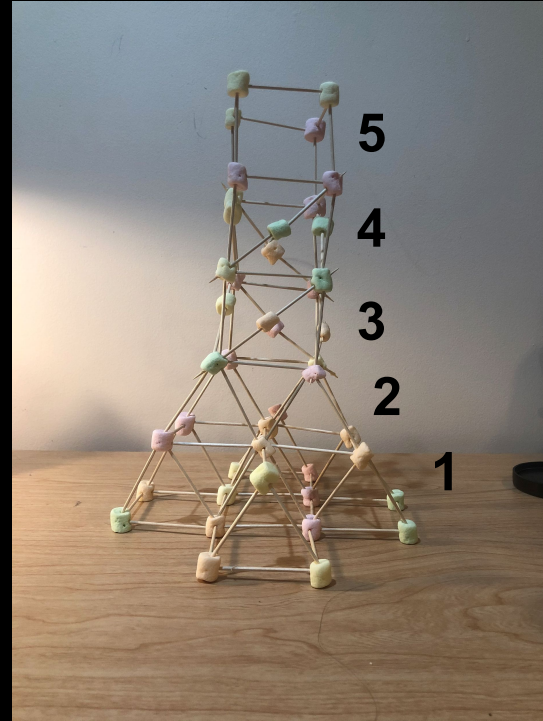


# 1. Build your tower



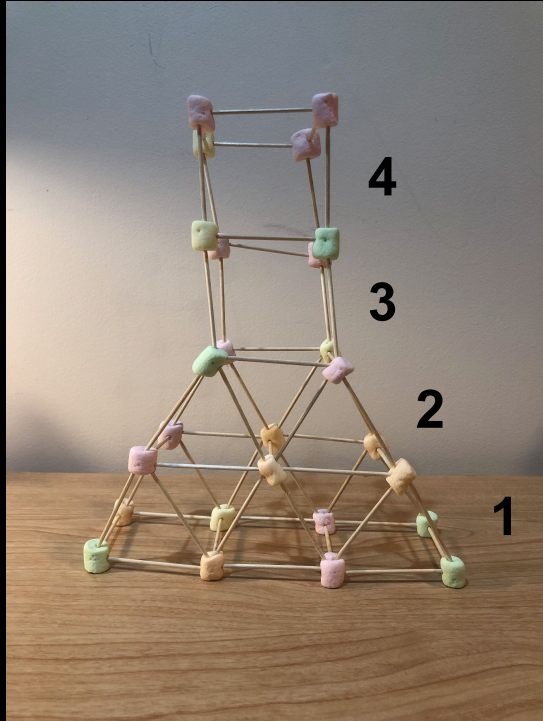
4 floors high

# 2. Reassess your design



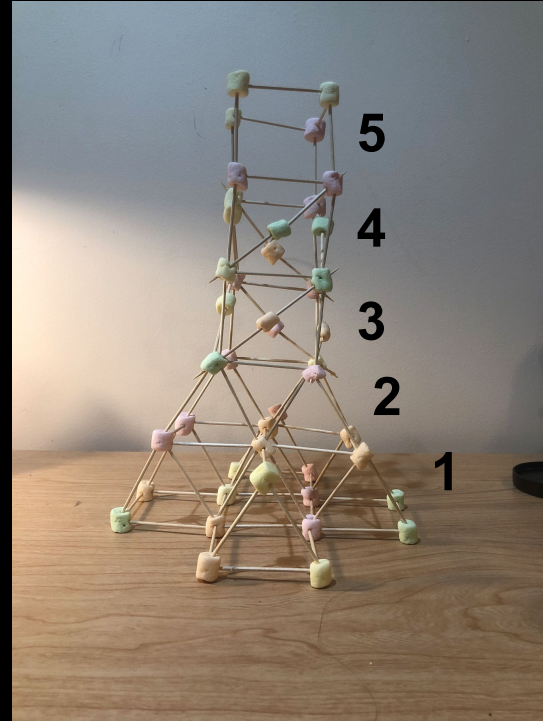
5 floors high!

# 1. Build your tower



4 floors high

# 2. Reassess your design



5 floors high!

# 3. Test your design



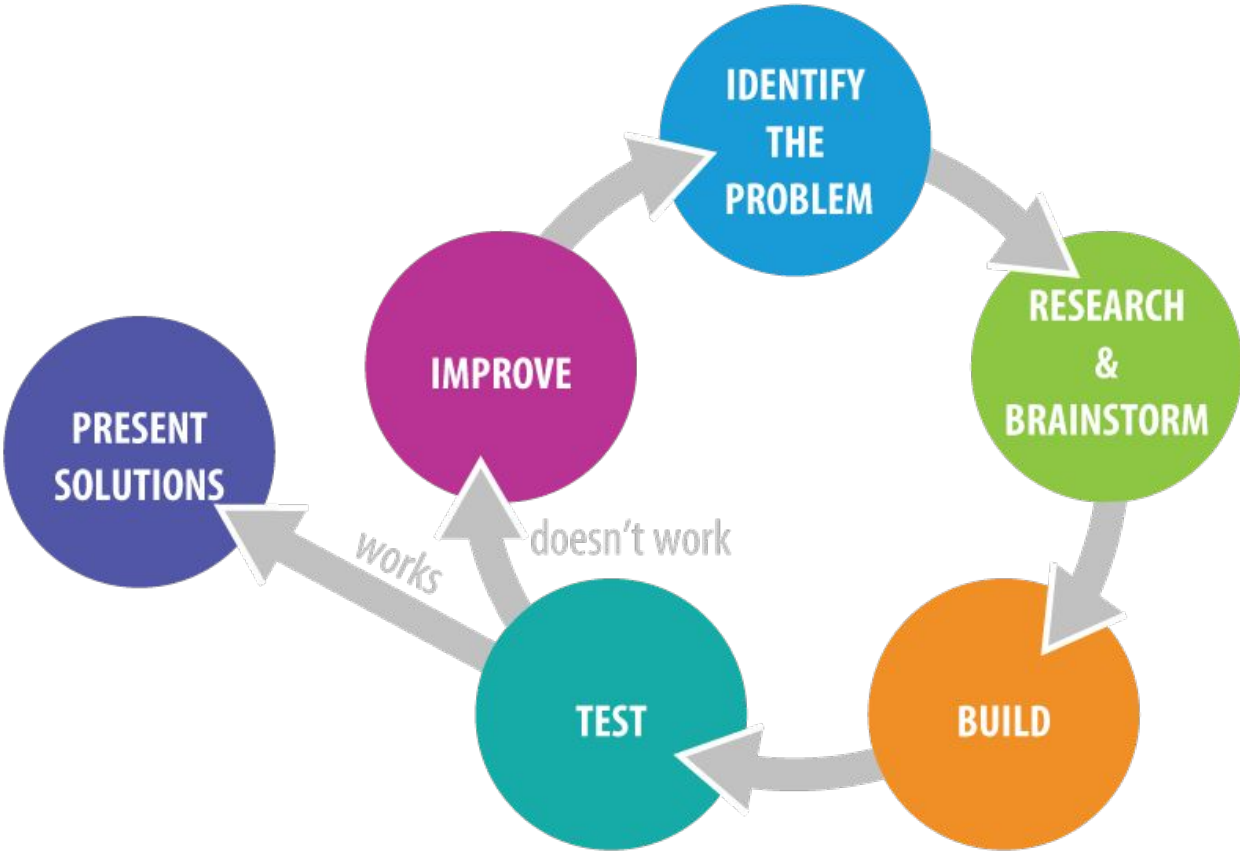
4 floors high  
2 pennies!

# The Marshmallow Challenge!

A tall, thin, spire-like structure made of marshmallows and spaghetti sticks, reaching into a blue sky with white clouds. The structure is positioned vertically in the center of the image, extending from the bottom edge towards the top. The background is a clear blue sky with a layer of white, fluffy clouds near the horizon.

1. What is the tallest structure *you* can build?
2. How much weight can your structure hold?

# ENGINEERING DESIGN PROCESS







**Your goal:** Build the tallest tower with just toothpicks + marshmallows

At the very end, we will also add external weight (pennies!) so be sure your building has a flat roof!