



MISSION MISSION POSSIBLE

IMAGINE. DESIGN. CREATE.

MISSION : Reach for the Sky

Your mission is to build the tallest tower... using only paper and tape!

WHAT YOU'LL NEED

- Recycled paper from around your house (newspaper, printer, notebook or construction paper will all work)
- Tape (scotch tape or masking tape)
- Ruler, yardstick or tape measure
- Optional: pencil, pen, crayon or marker, plus paper to draw on



LET'S READ

Find a comfortable spot and read! Here are some ideas to get you started:

- *The Tallest Buildings* by Susan K. Mitchell
- *DK Eyewitness: Buildings* by DK Publishing
- *Extreme Structures* by David Jefferis
- *The Inside Story: Skyscraper* by Dana Meachen Rau

You can download digital copies of these books for free from openlibrary.org. Here is how!

1. Go to openlibrary.org.
2. Click the blue "sign up" button on the top right to create a free account. You will be sent a confirmation email.
3. Sign in.
4. Type the book title and author into the search bar.
5. Find your book and click the blue "borrow" button.
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Sam Noble Home



Activities

For more activities visit samnoblemuseum.ou.edu/samnoblehome

Get Started:

- 1) Pick the area where you are going to work – you'll need somewhere with a sturdy, flat surface to build on (a table, the floor, etc.)
- 2) Gather the paper, tape and ruler from around the house.
- 3) Look at the supplies and the space where you will build your tower:

THINK!

- How can you use the paper and the tape together?
- How can you shape the paper to make it stronger?
- How tall do you think your tower will be?
- How much paper will you need?
- How much tape will you need?
- Optional: Draw what you want your tower to look like!

4) Build it!

5) Once you have built your tower, measure to see how tall it is! (If it is bending over, measure only to the point where it starts to bend.)

WHAT HAPPENED?

- How did you use the paper and tape together?
- Did you to try different designs before you found one that would stay up?
- How tall was your tower?
- Was your tower as tall as you thought it would be?

6) Try again! Think about how you can change your idea to build a tower that is taller than your first attempt. Be creative and try as many times as you want. Ask an adult or partner for ideas if you've tried all of yours. (If you need some hints, check out the next page.)



When you're done, share what you did with someone!

TELL THEM

- How tall was your tallest tower?
- How did you change your tower design to make it taller?
- How many ideas did you try?
- What was hard about the challenge?
- If they wanted to try this challenge, what should they do?

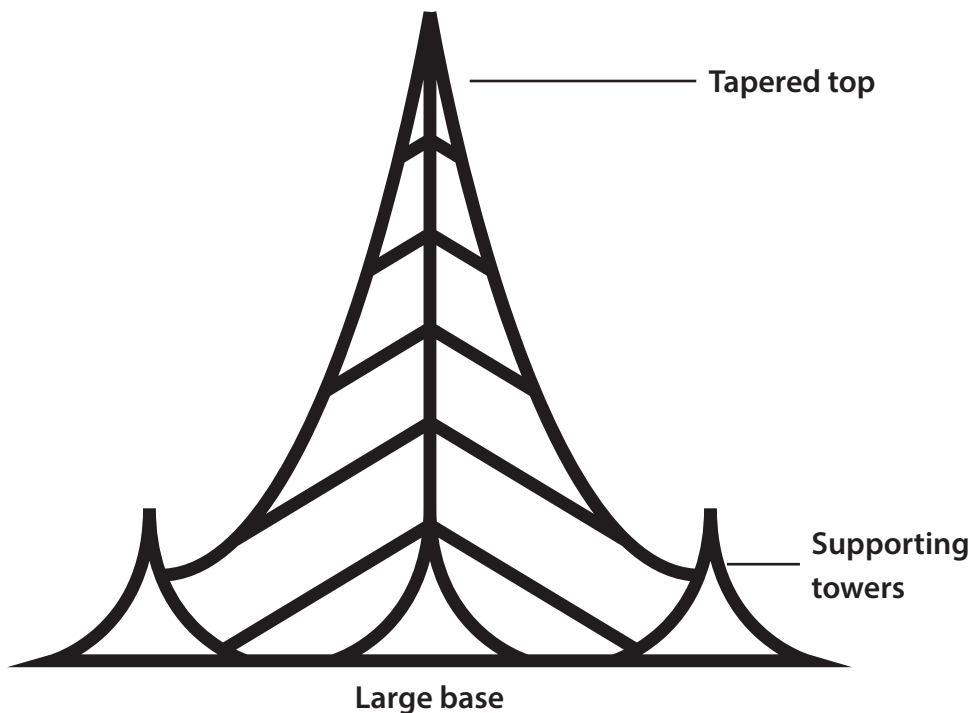
BONUS CHALLENGE

Now that you've built a tower, see if you can:

- Build a tower that is as tall as you are!
- Build a tower that won't fall over with strong wind (aim a fan on it, set it outside, etc.)
- Instead of paper, build your tower out of something else, like spaghetti
- Challenge a partner to build a tower using the same materials and see which tower is taller.

Whether it's a clock tower, watch tower or monument, towers are built to see and be seen! Building something so tall comes with challenges and engineers are always trying to find ways to build towers that are taller and stronger. The big challenge engineers like you face is the weight, or load, of a tower. Since towers are much taller than they are wide, all of the tower's load is concentrated on its small base – like if you tried to stand on your tiptoes without holding on to anything! Towers are also pushed around by wind and are sensitive to the vibrations, or shaking, of the ground they're built on. If they don't have any supports to help hold their load in place, a tower can easily fall over.

Luckily there are many ways to support a tower – most of them can even be used at the same time! Engineers can connect smaller towers or buildings to the base of a tall tower, which helps spread out the load and holds the tower in place. The load of a tower can also be made lighter by using a hollow, tube-like frame or by tapering (getting smaller) towards the top. It's also important that a tower can move with the wind during storms or during vibrations from earthquakes, instead of being totally stiff. This helps spread the load of the tower when it moves, making it less likely to fall or break. How many of these ideas did you use when you built your tower?



TIPS

- You will be able to build a taller tower if you put something around the base to support it.
- Don't make your tower too stiff and rigid – the ability to sway or move a little bit will help it absorb vibrations better.
- Towers buckle when there's more weight on the top than on the bottom.
- Making your tower hollow, like a tube, will help it be strong without being heavy.
- Your tower can come in many different shapes and sizes – there is no right or wrong design. You could:
 - o Make the tower one giant tube out of rolled-up paper.
 - o Add smaller towers at the bottom as supports.
 - o Make the base as wide as the tower is tall.
 - o Roll up pieces of paper like wooden logs to build a frame.

HELPFUL WORDS

Base: the bottom of a structure

Buckle: to bend under pressure

Frame: connected materials that give a structure shape and support

Load: the weight being supported by a structure

Support: something that holds up all of part of the weight of a structure

Sway: move side to side

Taper: become thinner toward one end

Tower: a freestanding tall structure

Tube: a long, hollow cylinder

Vibration: shaking

Talk like a tower engineer!

1. If my tower tapers at the top, it won't buckle under its load.
2. My tower will be more secure with supports around the frame and a sturdy base.
3. If my tower can sway a little bit, it will better absorb vibrations.

Want to learn more about building towers? Check out the links below:



Famous Towers of the World

<https://www.touropia.com/famous-towers-in-the-world/>



Building Big

<https://www.pbs.org/wgbh/buildingbig/skyscraper/index.html>



Constructing a Skyscraper (video)

<https://www.youtube.com/watch?v=K4oj95E8J9M>



The Tallest Tower in the World

<https://guinnessworldrecords.com/records/hall-of-fame/burj-khalifa-tallest-building-in-the-world/>



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