**Tall Tower Challenge**

**Overview:** Students and their family members will design and build the tallest tower they possibly can that will support a golf ball or a small bag of pennies. Students can work individually, in pairs with family members, or small groups of family members can compete to complete the design challenge.

**ACTIVITY**

Who are engineers? Engineers are people who use their creativity and knowledge of math and science to design things that solve problems. Today, *you’ll* be an engineer, using the Engineering Design Process to design towers that can support a golf ball or bag of pennies. This weight must be supported near the top of the tower, with the bottom of the ball or the bag no more than 20% below the upper height of the tower.

**Materials**

* 50 straws
* 50 pipe cleaners
* 25 paper clips
* 1 tape measure
* 1 golf ball or bag of pennies

**Note:** You do not have to use all of the materials listed above. Furthermore, if you don’t have the materials listed, improvise with items in your house such as index cards, newspaper, cardboard, and inner tubes of paper towel rolls. If you don’t have paper clips, you can use cellophane (Scotch) tape, but no more than 2 feet of tape. If you don’t have straws you can use paper—roll it around a pencil to form a straw.

Let’s use an ***Engineering Design Process*** to solve this problem.

The ***Engineering Design Process***is:

* ***Ask*** questions about the problem,
* ***Imagine***ways to solve it,
* ***Plan*** a design,
* ***Create*** and **test** it,
and then think about ways to ***improve***it.

**Let’s Begin:**

* It is time to look at the materials and *imagine* different ways to make them work. Can you *imagine* any ways you could use these materials to engineer a tower?
* Now let’s *plan* and *create* your tower. Remember the challenge is to design the tallest possible tower that supports the weight of the golf ball or bag of pennies for at least two minutes. You may want to sketch your ideas before you start building.
* You can work by yourself, or with a sibling or other family members. If you have a few people at home, turn this into a family event and make teams of at least 2 people so you can compare towers at the end.
* You have 20 minutes to build your tower. You can decide to use more than 20 minutes but do not take fewer than 20 minutes to build.

Begin designing. You can ask yourself or your teammates, **why do you think your design will work well?** Thinking about the Engineering Design process, **which step are you using right now? How do you know?**

Once your tower is done, measure the height of the tower. Also consider the following questions:

* How similar was your design to the actual tower you built?
* If you found you needed to make changes during the construction phase, describe why your team decided to make revisions.
* Did you use all the parts provided to you? Were any of the parts used only to increase the height of the tower?
* Whether or not the tower stands, ask: **Which parts would you *improve* if you could design your tower again? Why?**

Congratulations on using an engineering design process to solve a problem! **If you can, take a picture of your tower and share it with your teacher and your class.**

Want to learn more about tall towers? Visit the link below:

[Great Towers of the World](https://www.burjkhalifa.ae/en/the-tower/GreatTowers.aspx)

You may use this to help organize your thinking:

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| Ask questions about the problem* What does gravity have to do with this problem?
* What object/s are you using to test your design?
* Do you have any other materials that might help build the tower?
* How tall can you build a tower that will support weight?
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| Imagine ways to solve it:* After looking at the [Great Towers of the World](https://www.burjkhalifa.ae/en/the-tower/GreatTowers.aspx), what type of tower would you like to design?
* Give the names and cities of two towers you admired
 | Name of Selected Tower: City, Country:  Name of Selected Tower: City, Country:  |
| Plan a design· Sketch out two different designs using the materials you have. · Which do you think will work best? · What about the design makes you think it will work? | Design A        | Design B |
| Create and test it | How many pennies did you use?How long did your tower hold the pennies? How many minutes? How many seconds?\_**\_\_\_\_\_\_\_**Minutes and \_**\_\_\_\_\_\_\_**Seconds  |
| How would you improve your design next time? | Height? Materials? Number of pennies? |