

# Toy Box Tower

4<sup>th</sup> Grade

Unit 1 – Tales of the Heart

Text Connections: *Tales of a 4<sup>th</sup> Grade Nothing* by Judy Blume

## Design Challenge Summary

### Challenge: What will the students be required to do?

Peter is really tired of Fudge getting into his toys. He needs your help in constructing a tower that will hold his toy box. Peter will need a model of the tower that he can show his dad for building the real thing later. Peter needs the tower to be at least 4 ft high so that Fudge can't reach the top.

(the design will be a scale model: each inch of straw is equivalent to ½ foot/6 in)

### Standards: What standards are addressed?

#### Science:

NS.1.4.1 Communicate observations orally, in writing, and in graphic organizers

NS.1.4.3 Conduct scientific investigations individually and in teams

NS.1.4.5 Communicate the designs, procedures, and results of scientific investigations

NS.1.4.6 Estimate and measure length, mass, temperature, capacity/volume, and elapsed time...

NS.1.4.12 Evaluate the quality and feasibility of an idea or project

NS.1.4.13 Use simple equipment, age appropriate tools, technology, and mathematics in scientific investigations

PS.6.4.2 Investigate the relationship between force and mass

4-ETS-1-1 Define a simple design problem reflecting a need or want that includes specified criteria for success and constraints on materials, time, or cost.

#### Math:

Mathematical Practice Standards

4.MD.2 Use the four operations to solve word problems involving distances, intervals of time, liquid volume, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit.

#### ELA:

W.4.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information.

W.4.3 Write narratives to develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences.

W.4.4 Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience.

W.4.10 Write routinely over extended time frames and shorter time frames for a range of discipline-specific tasks, purposes, and audiences.

SL.4.1 Engage effectively in a range of collaborative discussions with diverse partners on grade 4 topics and texts, building on other's ideas and expressing their own clearly.

SL.4.3 Identify the reasons and evidence a speaker provides to support particular points.

SL.4.4 Report on a topic or text, tell a story, or recount an experience in an organized manner, using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.

# Toy Box Tower

**Result:** What will students know, value, and be able to do as a result of the lesson? What's the big idea?

Know and apply the engineering design loop. (This lesson is designed to introduce/explore the design loop process.)  
Value collaboration and discussion.

**Assessment:** What evidence will be used to determine student learning?

Did they build a tower (meeting requirements) that would hold the toy box?  
Did they follow the design loop process?  
Did groups work collaboratively together?

**Prior Knowledge/Experiences:** What prior content knowledge and skills will the students need?

Experience with the Engineering Design Loop process  
Connections to the Mathematical Practices  
Investigations/Inquiry in Science  
Experiences with relationship of force and mass

**Summary/Connections:** How will this design challenge connect with new/future learning, other content areas, real world experiences, etc.?

This lesson will help students develop problem solving skills and collaboration skills that are essential in succeeding in the 21<sup>st</sup> century. It will allow students the opportunity to transfer and apply skills from various content areas within one task.

Engage students in writing about their challenge.

Pose math word problems similar to the scenario to allow students experiences in working with the idea of scale.

## Extensions:

Increase the height of the tower; add width requirements  
Add an area or perimeter component: tower needs to hold a box with a perimeter of...; area of the base of the tower should be...; etc.  
Change the materials used; change size or weight of box/object tower needs to hold

**Materials/Equipment/Preparation:** What materials and equipment will students need to successfully complete this design challenge?

## Per group:

8 straws  
7" tape  
1 index card  
Scissors

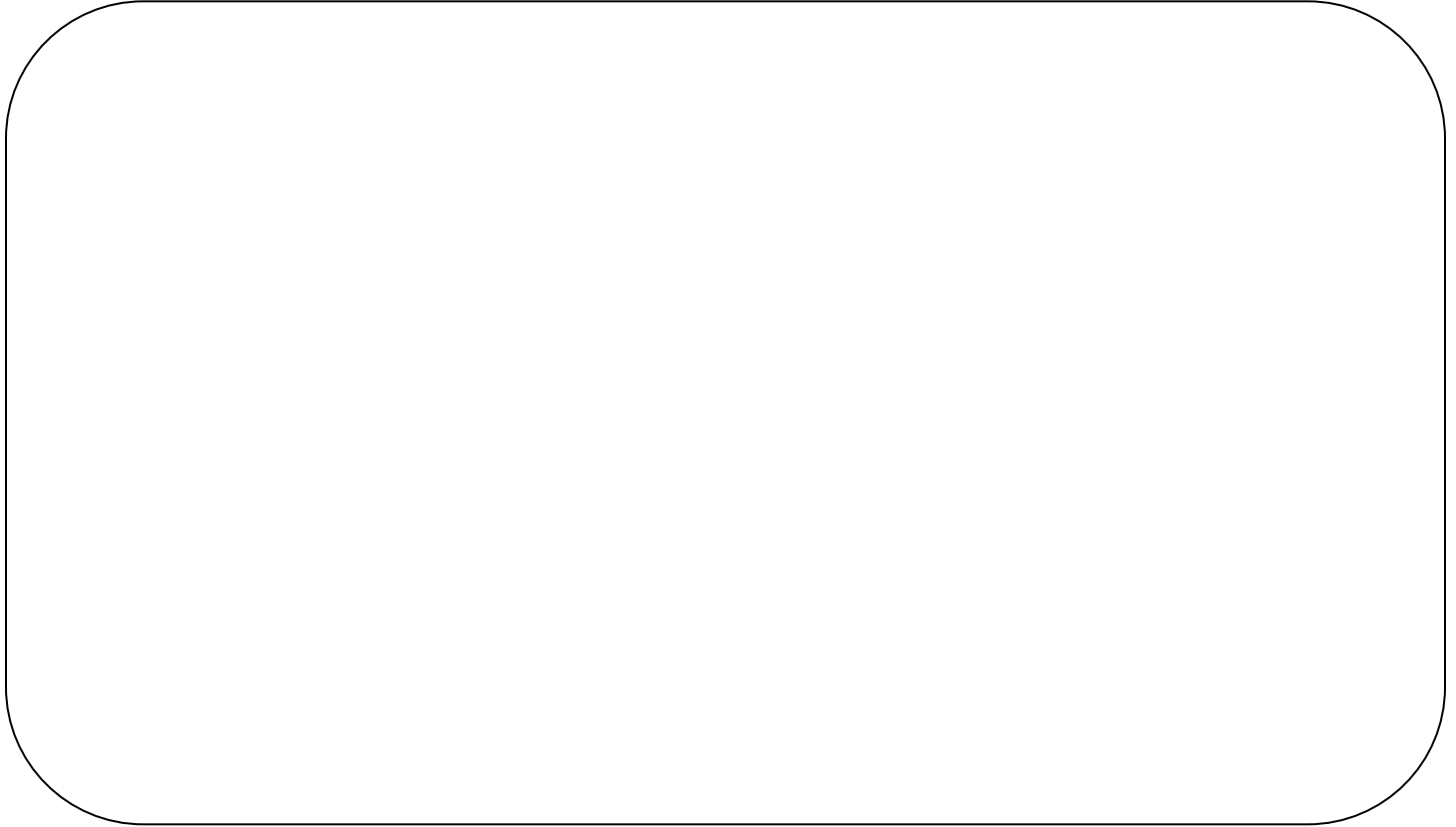
## For design testing:

Box/Object to represent the toy box that is to be placed on top of the tower to test the design.  
Object/box should have some weight to it – so that it is a challenge to hold it. You will want to let students “hold” the object/box before the challenge begins to get a feel for the weight they will need their tower to support.

# *Toy Box Tower*

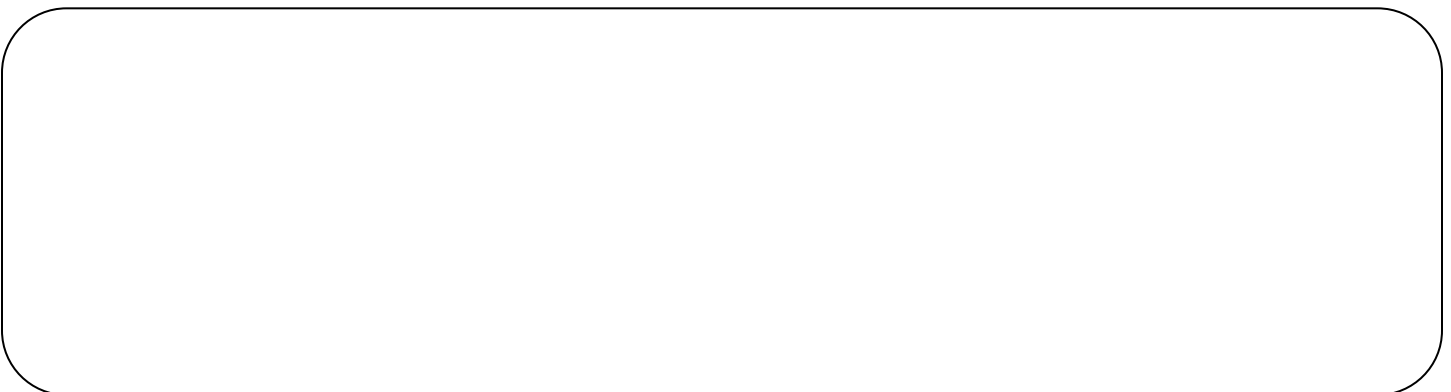
Peter is really tired of Fudge getting into his toys. He needs your help in constructing a tower that will hold his toy box. Peter will need a model of the tower that he can show his dad for building the real thing later. Peter needs the tower to be at least 4 ft high so that Fudge can't reach the top. The design will be a scale model: each inch of straw is equivalent to  $\frac{1}{2}$  foot (6 in).

**Generate Ideas:**



**Select a Solution:**

*As a group, determine what idea or group of ideas you will use in designing your toy box tower. Record that solution:*



# *Toy Box Tower*

Build the Item - test your tower:

*Record observations from the building process and when testing your toy box tower.*

# *Toy Box Tower*

Evaluate:

1. Describe the design of your toy box tower. Why did you choose this design? Did it work?

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2. If you were to do this process again, what would you do differently? Why?

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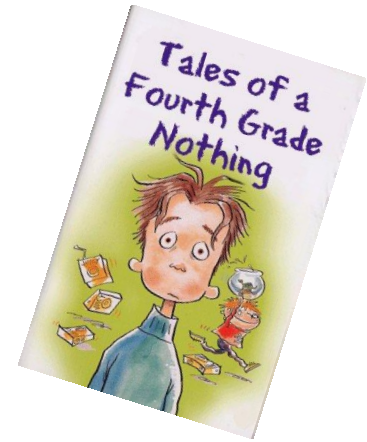
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(the design will be a scale model: each inch of straw is equivalent to  $\frac{1}{2}$  foot or 6 inches)

## **Group Supplies:**

- 8 straws
- 7 inches of tape
- 1 index card
- Scissors

Testing Object representing the Toy Box