



## The Straw That Broke the Camel's Back

### **Annotation:**

This is an inquiry lesson in which students are given toothpicks and straws and asked to construct a platform that will hold as much weight as they can. After the lab is finished students are asked to perform weight, mass, force, and velocity questions about their platform.

### **Primary Learning Outcome:**

After the lab is finished students should better understand construction and teamwork concepts. They should also have a better understanding of the relationship between force, mass, weight, and velocity.

### **Assessed QCC:**

Motion

Laws of Motion and Force

### **Non-Assessed QCC:**

Teamwork

### **Total Duration:**

1 hour 15 minutes (The bulk of the time is spent judging what the students created.)

### **Materials and Equipment:**

1. 6 straws
2. 25 toothpicks
3. Scissors
4. Clay

### **Assessment:**

Guidelines for grading are clearly marked on the student worksheet.

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

## The Straw That Broke the Camel's Back



### Objective

Make a structure of toothpicks and straws that holds a 400ml beaker and as many nails as you can fit into the beaker.

### Materials

6 straws  
25 toothpicks  
Scissors  
Clay

### Rules

You only have 20 minutes.  
The structure must be at least 25cm tall.  
It must hold at least 25 nails.

### Scoring

If the structure fails and cannot hold any nails – 0 points  
If the structure holds 25 nails – 25 points  
For every 5 nails more – 1 point  
For every 1 cm taller – 1 point

### Helpful Equations

Weight = Force

Weight = Mass \* Gravity

$v_t = at + v_0$

### Problems

Find the average mass of one nail (5 points).

Find the average weight of one nail (5 points).

Find the force that you platform can hold (5 points).

Calculate the final velocity of one nail when it falls from your platform and hits the ground (10 points).

Using your numbers for the force that the platform holds, and your knowledge that *for every action there is an equal but opposite reaction*: what is the force that the platform was exerting in supporting the beaker the instant before the nails fell? (5 points)