**Forces and Structures: Designing Structures**

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Class: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Internet Activity**

Using the site <http://www.pbs.org/wgbh/buildingbig/lab/shapes.html> please answer the following questions in the space provided.

**1.** Under the “**Shapes**” tab, compare the different shapes as forces (elephants) are applied. To do this, you slide the bar up and down on the right hand side.

**a.** Explain what happens to each of the shapes when 1 elephant, 3 elephants, 6 elephants, and 9 elephants are piled on the various shapes. If, and when, the shape fails, put the ditto “ mark in the box.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Rectangle | Arch | Triangle |
| 1 Elephant |  |  |  |
| 3 Elephants |  |  |  |
| 6 Elephants |  |  |  |
| 9 Elephants |  |  |  |

**b.** Briefly explain how each shape be strengthened (to do this, click on each shape and follow the steps). Include a diagram. \*\*Can you strengthen a triangle by adding things?? Where should you push instead?

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Rectangle** | **Arch** | **Triangle** |
| **How can it be strengthened?****(Add a Diagram)** |  |  |  |

**c.** Which of the shapes shown is the strongest? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Why? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**2.** Under the “**Materials**” tab, starting with the wood, use the slider to see what happens to each material when you stretch it and squeeze it. Complete the following table for each material.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Material** | **Type** | **Ingredients** | **Cost****/9** | **Weight /9** | **Pros****(Strengths)**  | **Cons****(Weaknesses)** | **Applications & Examples** |
| **Wood** |  |  |  |  |  |  |  |
| **Plastic** |  |  |  |  |  |  |  |
| **Aluminum** |  |  |  |  |  |  |  |
| **Brick** |  |  |  |  |  |  |  |
| **Concrete** |  |  |  |  |  |  |  |
| **Reinforced Concrete** |  |  |  |  |  |  |  |
| **Cast Iron** |  |  |  |  |  |  |  |
| **Steel** |  |  |  |  |  |  |  |

**3.** Under the “**Loads**” tab, start by writing down the definition for “load”.

Load = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**a.** For each type of load, use the following chart to define it, explain why the structure failed, and how each structure can be strengthened. Include a diagram for how it can be strengthened.

\*Remember to “Try It” once it has been strengthened.

|  |  |  |  |
| --- | --- | --- | --- |
| Load | Definition – What is it? | How does it make structures fail? | How can structures be strengthened? |
| Weight of Structure(Dead Load) |  |  |  |
| Weight of Objects(Live Load) |  |  |  |
| Soft Soil(Settlement Load) |  |  |  |
| Temperature(Thermal Load) |  |  |  |
| Earthquake(Earthquake Load) |  |  |  |
| Wind(Wind Load) |  |  |  |
| Vibration(Dynamic Load) |  |  |  |

**4.** Under the “**Forces**” tab, use the chart to define each force, draw a diagram to represent each force, and provide a real life example as to where you would see that force acting.

|  |  |  |  |
| --- | --- | --- | --- |
| **Force** | **Definition – How does this force work? What is it?** | **Diagram** | **Real Life Example** |
| **Squeezing****(Compression)** |  |  |  |
| **Stretching****(Tension)** |  |  |  |
| **Bending** |  |  |  |
| **Sliding****(Shear)** |  |  |  |
| **Twisting****(Torsion)** |  |  |  |