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UNIT: STructures – Activity 1

The Problem:

Use the Design Process to explore and test different shapes as building structures. Apply what you discover to build a tower that will support the most weight possible, using only index cards.

# CONSTRAINTS AND CRITERIA:

1. Complete the first two challenge rounds as directed to gather information.
2. Include a sketch and summary of your ideas, attempts, and results from each round.
3. Use what you learn to design a tower for the final competition round.
4. The final tower must have at least 3 levels/layers.
5. The final tower must be at least 9 inches tall.
6. The final tower must be made of 20 or less cards.
7. Cards may not be ripped or cut.

**MATERIALS:** (per 2 person team)

* 3 x 5-inch index cards (approximately 30-40 per team)
* Multiple items of the same heavy weight (bricks, canned goods,

wood boards, etc.)

# TOOLS:

* None

# DIRECTIONS:

* **Step#1** – Define the Problem

Read along and listen to your teacher explain the **problem** listed above.

* **Step#2** – Define the Criteria

Read along and listen as your teacher reads through and explains the **constraints** and **criteria**.

* **Step#3** – Develop Ideas

Complete Round 1 of the challenge according to the directions below.

# 

# Engineering Challenge - Round 1:

# A timer will be set for 5 minutes.

# In that time, collaborate as a team to use 20 index cards or less to build a tower that will support 3 items of weight.

# When the time is up, test your tower.

# Record your results below.

# Sketch the structure of your tower in the first box. Write a short summary of your results.

# Sketch: Summary:

# C:\Users\HEATHER.KIEFER\AppData\Local\Microsoft\Windows\INetCache\Content.MSO\22741B8E.tmp

* **Steps #4 & #5**– Develop Solutions, Test & Evaluate

Complete Round 2 of the challenge according to the directions below.

# Research Tests - Round 2:

# Complete each of the 3 Shape Research Tests in this round using 10 or less cards total.

# Cards may be folded, but may NOT be ripped or cut. You may trade for fresh cards between shape tests if your teacher allows.

# Include a sketch of each of the ideas you test. Include labels as needed.

# Write a short summary of your test results.

# Complete the conclusion questions on page 5.

# SHAPE TEST #1 – SQUARES & RECTANGLES

# Use 10 or less cards to create square and rectangle shape structures. Test with one item of weight.

# Sketch each of the structures you test in the box. Write a short summary of your results.

# Sketch: Summary:

# C:\Users\HEATHER.KIEFER\AppData\Local\Microsoft\Windows\INetCache\Content.MSO\22741B8E.tmp

# SHAPE TEST #2 – TRIANGLES

# Use 10 or less cards to create triangle shape structures. Test with one item of weight.

# Sketch each of the structures you test in the box. Write a short summary of your results.

# Sketch: Summary:

# C:\Users\HEATHER.KIEFER\AppData\Local\Microsoft\Windows\INetCache\Content.MSO\22741B8E.tmp

# SHAPE TEST #3 – CIRCLES

# Use 10 or less cards to create circle shape structures. Test with one item of weight.

# Sketch each of the structures you test in the box. Write a short summary of your results.

# Sketch: Summary:

# C:\Users\HEATHER.KIEFER\AppData\Local\Microsoft\Windows\INetCache\Content.MSO\22741B8E.tmp

# CONCLUSION: Which shape structure or structures did you find most effective in holding the weight? Which do you plan to include in your final competition tower?

* **Step #6** – Present and Produce

**Design** your final competition tower using shapes you tested or another shape you feel will perform well. Sketch your plan below**. Include labels** to clearly identify the different shape structures.



# Final Competition - Round 3:

# Build your tower according to your plan – no testing allowed.

# Present to your class by sharing what shape structures your used.

# When it’s your turn, carefully and strategically stack the weights one by one on your tower. Carefully observe the structures and performances of the other towers in the competition.

# Record your results below and answer the reflection questions.

|  |  |
| --- | --- |
| **# of weights held by your tower** |  |
| **Greatest # of weights held by your classmates** |  |

**Reflection Questions:**

1. Describe the performance of your final competition tower. What were it’s strengths? What were its weaknesses?

2. Describe the performance of the tower that held the most weight in the class. What structure shapes were used?

3. Describe a tower or structure in the competition that you found to be unique or surprising? How did it perform?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Indicator  not demonstrated | Indicator  partially demonstrated | Indicator adequately demonstrated | Indicator  effectively  demonstrated |
| **Design Brief & Refection Questions**  Points /4 | **Incomplete**  Less  than 50%  complete  1 | **Inadequate**  Mostly complete; Criterion not met  2 | **Adequate**  Criterion met;  more attention  to neatness or  detail needed  3 | **Exceptional**  Meets or exceeds expectations; high effort, attention to detail  4 |
| **Sketches & Summaries**  Points /4 | **Incomplete**  Incomplete or  missing more than  one constraint requirement  1 | **Inadequate**  Mostly  complete;  Criterion not  fully met  2 | **Adequate**  Sketches and summaries are complete and meet constraint  requirements  3 | **Exceptional**  Excellent details in sketches, labels, and summaries  4 |
| **Model Build**    Points \_\_ /4 | **Incomplete**  Incomplete;  No shape structures used or tower  unable  to compete  1 | **Inadequate**  Shape structures used are unclear or  differ greatly from sketches  2 | **Adequate**  Tests & build  mostly match sketches; shape structures clearly used  3 | **Exceptional**  Creative or innovative use of shape structures in tests & build  4 |
| **Model**  **Presentation**  Points \_\_ /4 | **Incomplete**  Team did not  present  1 | **Inadequate**  Not all required information was presented or not presented seriously  2 | **Adequate**  All required  information  presented; more detail needed  3 | **Exceptional**  Exceeds  expectations; engaging  delivery &  much detail  4 |
| **Effort & Teamwork** | **Incomplete**  Team member refused to participate | **Inadequate**  Frequent  reminders needed from teacher and teammates to stay on task | **Adequate**  Very minimal prompting needed from teacher or teammates to stay on task | **Exceptional**  Team completed all tasks using  effective  teamwork strategies |
| Points /4 | 1 | 2 | 3 | 4 |