

JUNK BOX WARS

Super Structures

Build a structure that will hold the most pennies!

Competition Rules:

Each team will be provided with a junk box filled with materials to build a super structure. Each team will receive only one set of materials! Teams may use all or part of the materials provided and are not allowed to share materials with other teams. Scissors will be provided by the teacher.

Teams will be allowed time to build and test their structures. Competitors are allowed to bring diagrams to help them build their structures. After the time is up, all structures will be impounded and no changes will be allowed!

Junk Box Possible Supplies

Straws
Wooden Craft Sticks
Index Cards
Paper
Pencils
String
Rubber Bands
Masking Tape
Paper Clips
CDs

Structure Requirements:

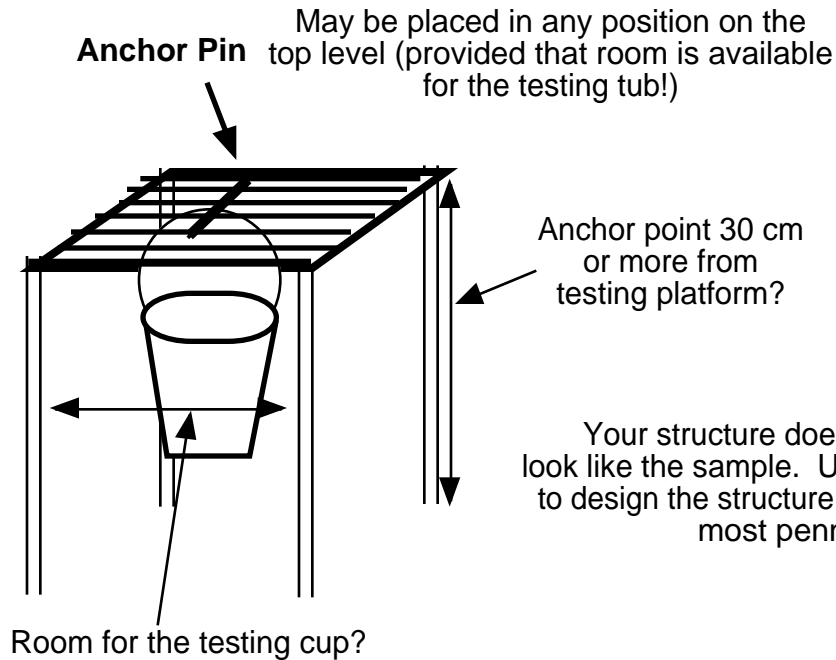
The structure must be able to sit unaided on the table or testing platform and may not be taped or attached to the table in any way. Structures must have an anchor point that is at least 30 cm from the testing platform. An anchor pin (at least 10 cm long) and the testing cup will be provided by the teacher. Structures must be wide enough to allow room for the testing cup so that it does not touch any part of the structure during the testing process!

Testing Procedure:

After the testing cup has been attached to the anchor point, team members will begin adding pennies to the testing cup one at a time. After the first penny has been added, no adjustments are allowed! At the time that the structure appears to have reached its maximum load, teams may be asked to wait 5 seconds before adding additional pennies. Dumping extra pennies into the cup at the last minute is not allowed!

Testing will be done when (1) the testing cup touches the table, (2) the testing cup touches any part of the structure, or (3) a penny falls out of the cup. The structure that holds the highest overall mass will be declared the winner! In case of a tie, the lightest structure will be the winner.

Sample Structure



Your structure does not have to look like the sample. Use your creativity to design the structure that will hold the most pennies!

Visit the **Building Big** website to explore the world of structures!
<http://www.pbs.org/wgbh/buildingbig/>

Event Score Sheet



Super Structures

Team Name: _____

Team Members: _____

Structure Requirements:

Height of anchor point at least 30 cm from testing platform? Yes No

Room allowed for testing cup? Yes No

Structure Mass = _____ g

Total Mass Held = _____ g

Event Score Sheets



Super Structures

Team Name: _____

Team Members :

Structure Requirements:

Height of anchor point at least 30 cm from testing platform? Yes No

Room allowed for testing cup? Yes No

Structure Mass = _____ g

Total Mass Held = _____ g



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Super Structures Teacher Notes

Recommended Supply List:

50 Straws	50 Wooden Craft Sticks (popsicle sticks)
20 Index Cards (3 x 5)	5 Pieces of Paper (8 1/2 x 11)
10 Pencils	200 cm of String/Fishing line
20 Rubber Bands (assorted sizes)	500 cm of Masking Tape
20 Paper Clips (Under 5 cm)	10 CDs (if available)

Testing Tub/Masses

Testing Cup - 16 oz plastic cup and fishing line

Overall height (cup + fishing line) must be less than 20 cm.

Anchor Pin - Metal bolt that is between 10 cm - 12 cm long

Masses - Pennies (Need enough to fill the testing cup - approx. 600 for a 16 oz cup)

Notes:

(1) Students may use all or part of the materials in the junk box. I allow the students to use any material inside the box. For example, if any of the materials come in wrappers or boxes, teams may use those for the device. The materials may be modified with the understanding that if a goof is made they will not receive new materials.

(2) Structures can be built using many designs - bridges, arches, platforms, or towers - provided they meet the basic requirements. Structures must have an anchor point that is at least 30 cm from the testing platform (table) and allow room for the testing cup. The testing cup must not touch any portion of the structure during testing.

(3) Before testing, complete the score sheet sections for dimensions and mass and impound the structures. No changes are allowed after impoundment.

(4) Team members must attach the testing cup to the anchor pin. Once the first penny is added, no adjustments are allowed! During testing, team members must add pennies one at a time. When the structure appears to be reaching maximum load, you may ask members to wait a few seconds before adding more pennies. Dumping a handful of pennies into the testing cup at the last moment is not allowed!

Safety Note: I require students to wear goggles to protect their eyes from flying debris!

(5) After testing is completed (cup touches the table, cup touches any part of the structure, or a penny falls out of the cup), use a scale to calculate the total mass (cup, anchor pin, and pennies) rather than counting the number of pennies. Team members must be careful adding pennies to the testing cup so that it doesn't touch the structure at any time during the testing process!

NOTE: Structures may collapse during the testing process and drop below the 30 cm height requirement. Teams may continue adding pennies only if the testing cup did not touch the table or any part of the structure and all the pennies stayed in the cup.

For a great lab with pennies, visit <http://www.middleschoolscience.com/cents.htm>.