

Event: Toothpick Bridge

Materials:

Allowed:

- Toothpicks (Provided by school)
- Glue

Not allowed:

- Anything else

Objective:

Your objective for this event is to build a bridge using only toothpicks and glue that can support the most mass compared to its own mass.

Requirements:

- The bridge must be able to span a 30cm opening
- The bridge must have a place for a 1.5cm diameter rod to be put through the bridge near the center of the bridge
- The bridge must also have space for a 4cm x 4cm wood block to be placed above the 1.5cm diameter hole

*If you are confused by why there are needed or how to ensure these requirements are followed, ask a teacher to see the bridge testing setup

****At the end of the competition, your project will be destroyed****

Scoring - Highest Score Wins:

On the day of the competition, the judge will mass your bridge and then you will be responsible for placing your bridge on the testing table and attaching the load platform rod. Once the rod is attached, you will add mass to the rod in the amounts you choose until the bridge breaks. (If your bridge bends below the level of the table without snapping this will be considered breaking)

Your score will be calculated using the following equation:

$$\text{Final Score} = \frac{\text{Mass held (kg)}}{\text{Mass of bridge (g)}}$$

*Ties will go to the bridge with less mass

Related Terms:

(Focus on appropriately using as many of these words as possible in your justification of design)

- Compression
- Load
- Support
- Arch bridge
- Beam or truss bridge
- Suspension bridge
- Cantilever bridge

**Toothpick Bridge Score Sheet
(Judges Keep)**

Name(s): _____

Teacher:
Augustyn Brahm Knapik Skarr Thomas
 Tsoukatos Mankowski

Block: 1 2 3 4

Bridge Length: _____

Mass of bridge (g): _____

Mass held (kg): _____

Final Score: _____

Equation:

$$\text{Final Score} = \frac{\text{Mass held (kg)}}{\text{Mass of bridge (g)}}$$

Toothpick Bridge Score Sheet (Student Copy)
(Judges fill out and return to students)

Name(s): _____

Teacher:
Augustyn Brahm Knapik Skarr Thomas
 Tsoukatos Mankowski

Block: 1 2 3 4

Bridge Length: _____

Mass of bridge (g): _____

Mass held (kg): _____

Final Score: _____

Equation:

$$\text{Final Score} = \frac{\text{Mass held (kg)}}{\text{Mass of bridge (g)}}$$

Judge's Signature: _____

Event: Shake It Up (Earthquake Proof Structure)

Materials:

Allowed:

- 1 cardboard base (25cm x 25cm)
- Paper clips
- Staples
- String
- 30 Straws (Supplied by school)

Not allowed:

- Anything else

Objective:

Your objective for this event is to build a structure out of straws and the allowed materials that can withstand a shaking table designed to model an earthquake. If the structure is able to withstand the shaking, weights will be added.

Requirements for your structure:

- Two stories (each story must be at least 18 cm tall)
- Total height must be at least 36 cm
- A cardboard platform that is 28cm x 28cm
- Only uses approved materials

****At the end of the competition, your project will be destroyed****

Scoring:

On the day of the competition, your table will be placed on the shake table and shaken for 20 seconds. If the structure withstands this, then a sandbag will be attached to the 1st story of the structure and shaken for another 20 seconds. If the structure is still undamaged, then a second sandbag will be attached to the 2nd story, and shaken for another 20 seconds. If the structure is still undamaged, sandbags will continue to be added in this fashion, alternating placement on 1st story and 2nd story, until your structure collapses. Your score will be determined by how many sandbags your structure can hold while on the shake table. In the case of a tie, the taller structure wins.

Related Terms:

(Focus on appropriately using as many of these words as possible in your justification of design)

- Center of gravity
- Foundation
- Height-base ratio
- Symmetry
- Seismic waves
- Richter scale

**Shake It Up (Earthquake Proof Structure) Score Sheet
(Judges Keep)**

Name(s): _____

Teacher:

Augustyn

Brahm

Knapik

Skarr

Thomas

Tsoukatos

Mankowski

Block: 1 2 3 4

Requirements Check:

Height: _____ cm

Fits in platform?	Y/N
Has 2 stories?	Y/N
Each story is at least 18 cm tall?	Y/N
Only used required materials?	Y/N

Scoring:

Score = _____ sandbags

Shake It Up (Earthquake Proof Structure) Score Sheet (Student Copy)
(Judges fill out and return to students)

Name(s): _____

Teacher:
Augustyn Brahm Knapik Skarr Thomas

 Tsoukatos Mankowski

Block: 1 2 3 4

Requirements Check:

Height: _____ cm

Fits in platform?	Y/N
Has 2 stories?	Y/N
Each story is at least 18 cm tall?	Y/N
Only used required materials?	Y/N

Scoring:

Score = _____ sandbags

Judge's Signature: _____

Event: Seed Pod

Materials:

Allowed:

- Any safe materials
- 5 black beans (Supplied by school)

Not allowed:

- Parachutes (commercially made or hand-made)
- Umbrellas
- Toys
- Printer paper
- Notebook paper
- Intact plastic bags
- Ziploc - style bags

Objective:

Your objective for this event is to create a “seed pod” that will carry 5 black beans through the air once released from a height of approximately 5 meters. Your goal is to have your seed pod to take the most time to fall to the ground while also traveling as far as possible from the drop location.

****At the end of the competition, your project will be destroyed****

Scoring:

Your score will be calculated according to the following equation:

Final Score = time in the air + distance from drop point

Related Terms:

(Focus on appropriately using as many of these words as possible in your justification of design)

- Gravity
- Propagation
- Seed dispersal
- Wind
- Average speed
- Air resistance
- Terminal velocity

Seed Pod Score Sheet
(Judges Keep)

Name(s): _____

Teacher:
Augustyn Brahm Knapik Skarr Thomas

 Tsoukatos Mankowski

Block: 1 2 3 4

Time in the air: _____

Distance from drop point: _____

Final Score: _____

Equation:
 Final Score = time in the air + distance from drop point

Seed Pod Score Sheet (Student Copy)
(Judges fill out and return to students)

Name(s): _____

Teacher:
Augustyn Brahm Knapik Skarr Thomas
 Tsoukatos Mankowski

Block: 1 2 3 4

Time in the air: _____

Distance from drop point: _____

Final Score: _____

Equation:
 Final Score = time in the air + distance from drop point

Judge's Signature: _____

Event: Paper Roller Coaster

Materials:

Allowed:

- Paper Templates (provided by school)
- Glue
- Tape
- Staples
- Foam Board
- Cardboard

Not allowed:

- Anything else

Objective:

Your objective for this event is to build a roller coaster out of cardstock using the provided templates that gets a marble from start to end in as little time as possible without leaving the track. The start and end of your roller coaster must be clearly labeled. In your roller coaster, you are required to have some specific parts included and your roller coaster must be at least the minimum dimensions.

You must have:

- 3 - 40 cm straight track pieces
- 3 - 180^o curves/turns
- 1 - 360^o vertical loop

The minimum dimensions are: 50cm tall x 35cm wide x 50 cm long

****At the end of the competition, your project will be destroyed****

Scoring:

Your score will be the time it takes for the marble to make it from the start point to the end point of your roller coasters. You will have two attempts. If the marble leaves the track, that attempt is disqualified. Ties are broken by the longer total path length of the marble.

Related Terms:

(Focus on appropriately using as many of these words as possible in your justification of design)

- Acceleration
- Centripetal force
- Gravity
- Kinetic energy
- Potential energy
- Speed
- Velocity

**Paper Roller Coaster Score Sheet
(Judges Keep)**

Name(s): _____

Teacher:

Augustyn

Brahm

Knapik

Skarr

Thomas

Tsoukatos

Mankowski

Block: 1 2 3 4

Requirements Check:

Dimensions: _____ cm x _____ cm x _____ cm

One 360° vertical loop

1 - 360° vertical loop	Y/N
3 - 180° curves / turns	Y/N
3 - 40 cm straight track pieces	Y/N

Scoring:

Length of track: _____ cm

	Trial 1	Trial 2
Ball left track?	Y/N	Y/N
Time(s)		

If marble gets stuck on track enter 5000 as time

Event: Hot Stuff (The Solar Oven)

Materials:

Allowed:

- Any safe materials
- Clear plastic cup (approx. 9 cm tall) (Provided by the school on the day of the competition)

Not allowed:

- Glass
- Sheet metal
- Anything that is dangerous to you or anyone else

Objective:

Your objective for this event is to build a solar oven that is able to heat up a cup of water while sitting in direct sunlight. The oven must be built so that it can hold a clear plastic cup which will contain 150 mL of water.

****At the end of the competition, your project will be destroyed****

Scoring:

On the day of the competition, you will be given a clear plastic cup filled with water and given time to place it in your oven. The initial temperature of the water will be recorded. After 15 minutes, the cup will be removed and the final temperature will be measured.

At the same time that your oven is being tested, a store bought oven will also be in the sun and have a cup of water with the initial and final temperature recorded in the same way.

Your score will be determined using the following equation:

$$\text{Final Score} = \frac{\text{Temperature change of your oven (}^{\circ}\text{C)}}{\text{Temperature change of store bought oven (}^{\circ}\text{C)}}$$

Highest score wins

Related Terms:

(Focus on appropriately using as many of these words as possible in your justification of design)

- Conduction
- Conservation of energy
- Convection
- Heat transfer
- Insulation
- Radiation
- Solar energy
- Solar powered

**Hot Stuff (Solar Oven) Score Sheet
(Judges Keep)**

Name(s): _____

Teacher:
Augustyn Brahm Knapik Skarr Thomas
 Tsoukatos Mankowski

Block: 1 2 3 4

Dimensions of oven: _____ cm x _____ cm x _____ cm

	Store bought oven	Student oven
Initial Temperature (°C)		
Final Temperature (°C)		
Temperature Change (°C)		

Final Score: _____

Equation:

$$\text{Final Score} = \frac{\text{Temperature change of your oven (°C)}}{\text{Temperature change of store bought oven (°C)}}$$

Build a Battery Score Sheet (Student Copy)
(Judges fill out and return to students)

Name(s): _____

Teacher:
Augustyn BrahmKnapik Skarr Thomas
 Tsoukatos Mankowski

Block: 1 2 3 4

Dimensions of oven: _____ cm x _____ cm x _____ cm

	Store bought oven	Student oven
Initial Temperature (°C)		
Final Temperature (°C)		
Temperature Change (°C)		

Final Score: _____

Equation:

$$\text{Final Score} = \frac{\text{Temperature change of your oven (°C)}}{\text{Temperature change of store bought oven (°C)}}$$

Judge's Signature: _____

Event: Egg Drop

Materials:

Allowed:

- 8.5" x 11" plain white printer paper
- 1 inch wide masking tape

Not allowed:

- Parachute devices
- Any other kind of tape
- Any other materials not listed in the allowed materials list

Objective:

Your objective for this event is to design and build a device using only the allowed materials that will be able to protect a raw egg from breaking when dropped from a height of about 5 meters onto pavement. **This device can only have a maximum mass of 80 grams.** Your device should be constructed so the egg can be easily inserted before the drop and removed after the drop to check for breakage. (The egg will be provided on the day of the competition)

****At the end of the competition, your project will be destroyed****

Scoring:

Before you test your device, judges will mass it. The main objective for this event is to protect the egg. If the egg breaks, the score will be 0 for the event. (Any crack in the shell is considered a broken egg) If the egg is unbroken, the distance between the center of the target and the closest edge of your device will be measured. Your score will then be determined using the following equation:

$$\text{Final Score} = \frac{2017}{\text{Mass} + \text{Distance}}$$

****To improve your score you want your device to be as light as possible and land as close to the target as possible**

Related Terms:

(Focus on appropriately using as many of these words as possible in your justification of design)

- Action / Reaction Forces
- Air resistance
- Distributing force
- Force of impact
- Time of impact
- Energy transfer
- Potential energy
- Kinetic energy
- Acceleration due to gravity

**Egg Drop Score Sheet
(Judges Keep)**

Name(s): _____

Teacher:
Augustyn Brahm Knapik Skarr Thomas
 Tsoukatos Mankowski

Block: 1 2 3 4

Mass: _____

Did the egg break? _____ (yes or no)(If the egg broke, your score is zero)

Distance: _____ cm

Final Score: _____

$$\text{Final Score} = \frac{\text{2017}}{\text{Mass} + \text{Distance}}$$

Egg Drop Score Sheet (Student Copy)
(Judges fill out and return to students)

Name(s): _____

Teacher:
Augustyn Brahm Knapik Skarr Thomas
 Tsoukatos Mankowski

Block: 1 2 3 4

Mass: _____

Did the egg break? _____ (yes or no)(If the egg broke, your score is zero)

Distance: _____ cm

Final Score: _____

$$\text{Final Score} = \frac{2017}{\text{Mass} + \text{Distance}}$$

Judge's Signature: _____

Event: Catapult

Materials:

Allowed:

- 3 Pill Cups (Supplied by school)
- 6 Tongue Depressors (Supplied by school)
- 1 Plastic Spoon (Supplied by student)
- 10 Rubber Bands (Supplied by student)
- 3 Thumb Tacks (Supplied by student)
- Glue (Supplied by student)
- String (Supplied by student)

Not allowed:

- Anything else

Objective:

Your objective for this event is to build a catapult using the materials listed above. The catapult will be used to launch a large bouncy ball as far as possible and in as straight of a path as possible. (If you wish to see the size of the ball, ask a teacher **before** the day of the test) You do not need to use all of the materials listed above, but you may not use more than the materials listed.

****At the end of the competition, your project will be destroyed****

Scoring:

At the science competition, one student will operate the catapult while wearing safety goggles. The student will secure the catapult to the table using up to 2 trigger clamps and then have 2 chances to launch the ball.

The goal is to shoot the ball as far as possible in as straight of a path as possible. A ball shot completely straight out from the table will receive a score of 180 for accuracy. The accuracy score will decrease as the ball's path differs from a straight path.

The equation used to determine final score for each trial is: $\text{Score} = \text{Accuracy} \times \text{Distance}$
Highest score wins.

Related Terms:

(Focus on appropriately using as many of these words as possible in your justification of design)

- Catapult
- Energy
- Potential Energy
- Kinetic Energy
- Force
- Accuracy
- Mass
- Trajectory

**Catapult
(Judges Keep)**

Name(s): _____

Teacher:
Augustyn Brahm Knapik Skarr Thomas
 Tsoukatos Mankowski

Block: 1 2 3 4

	Trial 1	Trial 2
Distance (cm)		
Accuracy		
Final Score (Distance x Accuracy)		

Highest Score = _____

Catapult (Student Copy)
(Judges fill out and return to students)

Name(s): _____

Teacher:
 Augustyn Brahm Knapik Skarr Thomas
 Tsoukatos Mankowski

Block: 1 2 3 4

	Trial 1	Trial 2
Distance (cm)		
Accuracy		
Final Score (Distance x Accuracy)		

Highest Score = _____

Judge's Signature: _____

Event: Build the Brain of an Imaginary Animal

Materials:

Allowed:

- Clay
- Any safe materials

Objective:

Your objective for this event is to design the brain of an imaginary animal that you have created. The characteristics, behaviors, senses, environment, and survival adaptations of the animal should be clearly explained and tied into the structure of the brain itself. The relative size, function, and structure of all parts of the brain listed on the rubric should be addressed. You will be building a model of the inner and outer structures of your imaginary brain and presenting this model to the judges the day of the competition. The presentation must clearly explain the model and the rationale for the design. (You should research the brains of humans and various animals to help with this design)

****At the end of the competition, your project will be destroyed****

Scoring:

Judges will listen to your presentation and score you using the Judge's Score Sheet (which is attached). Judges will be assigning points based on if all necessary parts of the brain are addressed and the quality of explanations and reasoning behind the design of the brain. The scores from the judges will then be averaged. Highest score wins.

Related Terms:

(Focus on appropriately using as many of these words as possible in your justification of design)

- Brain Size
- Cortical Complexity
- Cerebrum (Incorporate all four lobes)
- Cerebellum
- Limbic System (Thalamus, Hypothalamus, Hippocampus, Amygdala)
- Brain Stem (Medulla Oblongata, Midbrain, Pons)
- Motor Cortex
- Somatosensory Cortex

Build the Brain of an Imaginary Animal Judge's Score Sheet
(Judges Keep)

Name(s): _____

Teacher:

Augustyn

Brahm

Knapik

Skarr

Thomas

Tsoukatos

Mankowski

Block: 1

2

3

4

Overall Assessment		Excellent	Good	OK	Very Poor	Incorrect
	Ideas Presented Clearly	5	4	3	2	1
	Animal Characteristics Clearly Stated	5	4	3	2	1
	Rationale is logical	5	4	3	2	1
	Aesthetically pleasing	5	4	3	2	1
////////////////////	////////////////////	//////////	//////////	//////////	//////////	//////////
Brain Divisions Assessment		Present & Accurately Explained		Present & Some Explanation		Present with no explanation
	Cortical Complexity	5		3		1
Cerebrum	Frontal (Motor cortex included)	5		3		1
	Parietal (Somatosensory cortex included)	5		3		1
	Temporal	5		3		1
	Occipital	5		3		1
	Cerebellum	5		3		1
Limbic System	Thalamus	5		3		1
	Hypothalamus	5		3		1
	Hippocampus	5		3		1
	Amygdala	5		3		1
Brain Stem	Midbrain	5		3		1
	Pons	5		3		1
	Medulla Oblongata	5		3		1

Build the Brain of an Imaginary Animal Score Sheet (Student Copy)
(Judges fill out and return to students)

Name(s): _____

Teacher:
Augustyn Brahm Knapik Skarr Thomas
 Tsoukatos Mankowski

Block: 1 2 3 4

Judge 1's Score: _____

Judge 2's Score: _____

Judge 3's Score: _____

Judge 4's Score: _____

Judge's Signature: _____

Event: Build a Battery

Materials:

Allowed:

- Safe household materials
- Safe household liquids

Not allowed:

- Food of any kind (e.g. potatoes or lemons)
- Bleach
- Any hazardous materials (if you are unsure ask a teacher)

Objective:

Your objective for this event is to build a battery with the highest voltage using only household materials. The voltage of your battery will be tested using a voltmeter with your choice of test leads or banana clips. You must know where to connect the test leads/banana clips to your battery. (We recommend you try your battery at home before the competition, but use fresh materials after each test)

****At the end of the competition, your project will be destroyed****

Scoring:

Your score will be the Voltage of your battery measured with a voltmeter in Volts. Highest score wins.

Related Terms:

(Focus on appropriately using as many of these words as possible in your justification of design)

- Electric Conductor
- Electric Current
- Electrode
- Electrolyte
- Circuit
- Voltage
- Battery
- Cell

**Build a Battery Score Sheet
(Judges Keep)**

Name(s): _____

Teacher:
Augustyn Brahm Knapik Skarr Thomas
 Tsoukatos Mankowski

Block: 1 2 3 4

Voltage (Score): _____

Build a Battery Score Sheet (Student Copy)
(Judges fill out and return to students)

Name(s): _____

Teacher:
Augustyn Brahm Knapik Skarr Thomas
 Tsoukatos Mankowski

Block: 1 2 3 4

Voltage (Score): _____

Judge's Signature: _____