

## Grade 8 – Mechanical Systems

### 'MSS FUN ZONE' - Global Project Challenge

Thrill rides have become extremely popular and the quest for the greatest thrill continues. These rides must be engineered and tested to provide a safe experience for the thrill-seeker. Your task in this Global Project Challenge is to design and construct a thrill ride that will safely carry 2 marbles in each riding compartment of the ride through the course of the ride. The safety test will be part of your evaluation along with the schematic diagrams and additional information, which outlines the scientific principles used in the design and construction of your amusement park thrill ride.

#### **Specifications:**

- The **Amusement Park Thrill Ride** (structure) must be free standing and operated by a hydraulic/pneumatic system
- It should be no larger than 50 cm X 50 cm X 50 cm
- Total mass should be minimized (total mass will be a factor used in the overall comparative evaluation with the other entries) *'the lighter the better'*
- The load must be suspended a minimum of 20 cm above the surface of the table base upon which it will be operated (the marbles – ie. Passengers – must experience a 'thrilling ride' that at least 20 cm above the surface)

#### **Materials:**

- Craft grade popsicle sticks, wood/doweling scraps, common household materials, string, wire and adhesives (of your choosing), syringes and or plastic tubing.
- **No commercial construction or hydraulic/pneumatic kits** are allowed (some kit components may be used – ie. Gear wheels and gear trains, to help the structure operate freely)
- Assortment of decorative materials (of your choosing) to enhance the aesthetic aspects of your ride

#### **Operation Test:**

- The ride must operate three times completely and safely during the test (each operation will be evaluated on the dynamics of the ride and the time it takes to operate)

#### **Safety:**

- It must safely carry 2 marbles (as passengers) in each passenger compartment of the ride
- The marbles (passengers) must be secured in the passenger compartment throughout the ride
- The marbles must not come into contact with the structure (other than their seat) at any time and must not be released (projected) from the structure during operation

#### **Project Report:**

- Step-by-step action description of how the ride operates.
- Construction Details, including types of joining principles and types of adhesives used. Describe in detail the hydraulic/pneumatic operating system developed and used.
- Design Blueprint - A Scientific Drawing of the ride labeling the stresses and forces acting on all parts of the structure, throughout the operation of the ride. (arrows should indicate where these forces are acting on the exterior and interior of ride). The center of gravity and thrust line of your structure should be identified along with a description of the live and dead loads within the structure.
- Troubleshooting Diary – a day-by-day account of the process that occurred to complete this project. Including the problems faced – alternatives explored and the solutions tried.

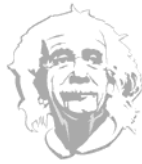
Components of this project, will be evaluated using the **Criteria Scoring Guide** below and the attached

#### **GLOBAL Project Rubric**

Scoring will be as follows:

<b>Evaluation Criteria</b>	<b>Score</b>
Scientific Information (Report)	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Design/Construction/Organization	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Scale Model Final Product	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Operation of thrill ride (safety test)	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Mass of structure and aesthetic appeal by category	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
<b>Grade for MSS FUN ZONE amusement park Thrill Ride</b>	<b>/100</b>

This project Rubric should be used at the local level Grades 7, 8 and 9 - to evaluate each of the Thrill Rides your students complete as a school based project. The best project from each grade within your school can then be entered into the Global Competition – at which time a more detailed Rubric will be provided and used to evaluate all of the projects from each of the schools at each grade level entering the Global Challenge.

	<b>MSS FUN ZONE - PROJECT RUBRIC</b>							
	<b>Scientific Information (Report)</b>	<b>X</b>	<b>Design/ Construction/ Organization</b>	<b>X</b>	<b>Scale Model Final Product</b>	<b>X</b>	<b>Operation/ Safety Test</b>	<b>X</b>
<b>5</b> Meets Standard of Excellence	Scientific information that this project is based on shows <b>mastery</b> of the concepts	4 3 2 1	Clear evidence of planning and organization of materials in such a way that represents the concepts masterfully	4 3 2 1	Final Product is an <b>exemplary example</b> of the concept	4 3 2 1	The project's practical application of the scientific principles is <b>successful operated</b>	4 3 2 1
<b>4</b> Approaches Standard of Excellence	Scientific information that this project is based on <b>approaches mastery</b> of the concepts	4 3 2 1	Effective evidence of planning and organization of materials in such a way that represents the concepts effectively	4 3 2 1	Final Product <b>approaches being an exceptional example</b> of the concept	4 3 2 1	The project's practical application of the scientific principles is <b>effectively operated</b>	4 3 2 1
<b>3</b> Meets Acceptable Standard	Scientific information that this project is based on <b>demonstrates understanding</b> of the concepts	4 3 2 1	Adequate evidence of planning and organization of materials in such a way that represents the concepts adequately	4 3 2 1	Final Product is an <b>acceptable example</b> of the concept	4 3 2 1	The project's practical application of the scientific principles is <b>adequately operated</b>	4 3 2 1
<b>2</b> Does not Meet Acceptable Standard	Scientific information that this project is based on indicates <b>some understanding</b> of the concepts	4 3 2 1	Limited evidence of planning and organization of materials in such a way that represents the concepts with some misunderstanding	4 3 2 1	Final Product may represent an <b>acceptable alternative example</b> of the concept	4 3 2 1	The project's practical application of the scientific principles is operated with <b>some errors</b>	4 3 2 1
<b>1</b> Below Acceptable Standard	Scientific information that this project is based on indicates <b>misunderstanding</b> of the concepts	4 3 2 1	Inadequate evidence of planning and organization of materials in such a way that represents the concepts inappropriately	4 3 2 1	Final Product <b>does not represent a working example</b> of the concept	4 3 2 1	The project's practical application is <b>inadequately operated</b>	4 3 2 1
Rubric Score								
<b>Overall Placing Score /100%</b>			<b>Rubric 80%</b>		<b>Mass 10%</b>		<b>Aesthetics 10%</b>	

20% of this project is based on the total mass of the structure built and its aesthetic appeal

**Mass of Structure**

**Aesthetic Appeal ( Teacher/Judging Committee Based )**

10 9 8 7 6 5 4 3 2 1  
Lightest ----- Heaviest

10 9 8 7 6 5 4 3 2 1  
Eye Appealing----- Eye Sore  
Attractive

(For more students in your class use decimals)

10 9<sup>.75</sup> 9<sup>.5</sup> 9<sup>.25</sup> 9 8<sup>.75</sup> 8<sup>.5</sup> 8<sup>.25</sup> 8 7<sup>.75</sup> 7<sup>.5</sup> 7<sup>.25</sup> 7 6<sup>.75</sup> 6<sup>.5</sup> 6<sup>.25</sup> 6 5<sup>.75</sup> 5<sup>.5</sup>  
5<sup>.25</sup>

5 4<sup>.75</sup> 4<sup>.5</sup> 4<sup>.25</sup> 4 3<sup>.75</sup> 3<sup>.5</sup> 3<sup>.25</sup> 3 2<sup>.75</sup> 2<sup>.5</sup> 2<sup>.25</sup> 2 1<sup>.75</sup> 1<sup>.5</sup> 1<sup>.25</sup> 1 .75 .5  
.25

