**Cardboard Bicycle**

**TECHNOLOGICAL DESIGN**

Mrs. Blouin/ Iroquois Ridge High School

Yes, it IS possible. You are to challenge yourselves in design teams to first design, then build a cardboard bicycle that can successfully hold a person propelled down the hall for 30 feet, and successfully navigate an obstacle course.

**Description**

Bicycles are a perfect representation of the strength of the triangular reinforcement. Cardboard, when used properly, has incredible compression strength. We will remove the complication of a gear system and brakes, and simply make a steerable cardboard bike that can glide down the hall 30 feet; ***unless you would like to challenge yourself and take your design to the next level.***

**Materials**

You are to be given;

* three 4' x 8' sheet of grade 1 cardboard
* 1 extra sheet if you decide to make wheels out of cardboard

You will provide on your own;

* You will also be able to use 1 pencil to aid your gears. This pencil can be split into two pieces for the front and back tire.
* You may use ANY type of wheel you want, be it bicycle wheels, wheels for large toys, wheels for yard machines etc... You are to supply the wheel. Note: you can easily put the wheel you use BACK on the object you take it from as they should remain undamaged if you design your bike properly. You may also use any type of adhesive you want in this competition, remembering of course safety rules for inhalation of noxious substances.

**Testing**

**Distance test:**  
Your teammate will push/propel you from the 'propulsion box' (a taped-off 4' radius around the cyclist). **​**You are to see how far down the tech hall you can be propelled from an initial stop. Once past 30 feet, the clock (or tape measure) starts ticking and the winning design team in this portion of the competition is the one that has the furthest distance past 40'.  
  
**Obstacle course**:  
Your teammate will push/propel you from the 'propulsion box' (a taped-off 4' radius around the cyclist). Rather than speed, your goal is to navigate a simple obstacle course that will involve one vertical challenge (you'll need to go up and down a structure) and several turn-based challenges. Navigation of the whole length of the course will easily be achieved by one simple push for propulsion. The team that completes the course in the fastest time will win the challenge. **NOTE: Bicycles that are able to peddle on their own will demonstrate a high level 4 of engineering design.**

**Technological Report**

### 1. Title Page

The title page is used to grab the attention of the reader. As such, it should contain some form of illustration that appeals to the reader. **It should also contain the name of the report, the person or people involved in the group**. The course code and the date of production (the due date is best).

### 2. Situation (The Problem)

The situation sets the stage and informs the reader about what is being solved and why you are doing the report/project. It may state the identified needs and problems of the project at hand. Describe the problem with all relevant information available as guidelines and/or rules.

### 3. Research & Design description

The research is a **gathering of all the information** found on the product about to be built. The research should include as much information as possible on the history of the product, the use of the product the physics involved in order to make this product work and the pricing of the real product. You are allowed to use images as visual aid in your research, but copy pasting any article found on the Internet or any other means of resource will not be evaluated for marks.  
  
The design description is an **in-depth account of the process** used in the design and fabrication of the product. The sentences in each paragraph should be kept short and to the point. It describes the route used to determine the solution to the design challenge. Include references to your research. Make sure your description is clear and precise, so that if need be someone else could build your article. Don’t just give a sequence of how you assembled the artifact.

### 4. Materials

List all the materials, sizes and costs (if applicable) used in the fabrication of the final product. As much detail as possible should be given.

### 5. Drawings or Illustrations

Include all drawings or illustrations that were used in the development and fabrication of the project. This includes thumbnail sketches, rough sketches, technical drawings, illustrations, and/or photographs of models or products. Ensure all drawings are properly labeled and descriptive.

### 6. Conclusion

Describe what you learned in this design challenge. Include the results of testing solutions. Include a description on how each of the design criteria was met (or not). Why did it succeed? Why did it fail? Describe possible improvements or modifications for future work. Include what you would not do next time? Suggest other users or situations that may benefit from your research and/or testing.

**Evaluation:**

* Before construction begins - paper sketches, and a 3D Google SketchUp or Inventor model must be submitted for assessment. After completion, sketches, a final 3D model will be submitted with the design report.
* From the 3D model, you are to create front and side views as well as top view of your bicycle. You will use these in guiding your construction.
* Bicycle construction - overall design of the finished product will be evaluated including: dimensions, style and adherence to the working drawings.
* Distance results
* Obstacle course timed results. Bikes ability to peddle on it’s own.
* Evaluation/ write-up.

General value of various components of the project:

|  |  |
| --- | --- |
| Component |  |
| 1 - Sketches |  |
| 2 – Google SketchUp or Inventor files |  |
| 3 - Bicycle construction |  |
| 4 - Bicycle distance result |  |
| 5- Bicycle obstacle result |  |
| 6 – Technical Report |  |

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| --- | --- | --- | --- | --- |
| **CATEGORY** | **LEVEL 1**  **12 13** | **LEVEL 2**  **14 15** | **LEVEL 3**  **16 17** | **LEVEL 4**  **18 19 20** |
| **sketches  (Application)** | Many design elements are missing from the drawing, but overall the design can be understood. | Generally the drawing conveys design plans. There are several design elements missing. | Drawing is good, Mostly all details are addressed. | Drawing is flawless. |
| **Google SketchUp or** **Inventor File (Application)** | Many design elements are missing from the 3D design, but overall the design can be understood.  There are large errors in the object views - such that construction will be difficult based on the schematics. | Generally the 3D model conveys design plans. There are several design elements missing.  Generally the drawings can lead towards a final product, but there are flaws in which construction details may be obscured | 3D model are good, Mostly all details are addressed.  All views are present, though there may be confusion in the drawings | 3D model are flawless  Relevant views of the there are clear |
| **Bicycle construction** **(double value) (Application)** | The construction is weak. Joints and or cuts are mismatched which results in a stylistically inferior product.  Bicycle on propel test went past 10’.  Bike started to bend or break while in movement.  Bicycle was not able to go through the majority of the obstacle course. | Generally the construction is solid. Cuts and joints as well as style all leave something to be desired.  Bicycle on propel test went past 20’.  Bike started to bend or break while in movement.  Bicycle was able to go through most areas of the obstacle course. | Construction is sound. Cuts and joints may not all be perfect. Product is generally pleasant to look at.  Bicycle on propel test went past 35’.  Bike somewhat stayed in tack while in movement.  Bicycle was able to go through all areas of the obstacle course. | Construction of the product is superior. All joints and cuts are careful and deliberate. Product is stylistically superior.  Bicycle on propel test went past 40’.  Bike stayed in tack while in movement.  Bicycle was able to go through all areas of the obstacle course with ease.  Bicycle was able to peddle during the obstacle course. (4+) |
| **Technical Report****(Comm)** | There are many flaws in the report | There are aspects missing and work is required | All aspects of the report are present, though may require some work | All aspects of the report are present and exemplary |