

# REPORT REQUIREMENTS

**DUE FRIDAY, NOVEMBER 15, 2013 before 9 p.m.:**

A 10-page maximum report that contains relevant material to support criteria A through D in the rubric. It must be submitted as a **PDF** before 9 p.m.

Please save the PDF with the proper file name: Team#\_Report.pdf (e.g. **Team23\_Report.pdf**).

Email the report to: **kisdcc@kis.ac.th**

Your report must include:

## **Inquiry and Analyzing**

- A **design brief** (up to **3** sentences) that clearly and concisely describes the team 's process.
- **Research** from at least **5** different sources of information, include one non-Internet
- A **bibliography** in MLA format showing all sources researched.

## **Developing Ideas**

- The range of **design ideas** (a minimum of **3**) that the team developed.
- Your team's **final machine design choice** with clear justification.

## **Creating the Solution**

- **Photographic evidence** of your collaboration and creativity.

## **Evaluating**

- A **critical evaluation** of how well your team tested their design specifications to achieve the goal.
- A description of **changes** made throughout the design cycle process.
- A description of **how the machine could have been improved**.

Team 18 - The French Toast  
Keng, Peter, Levi, Momo, Sonia, Marc  
November 15, 2013  
Design Cycle Challenge



## Design Brief

The layout of our machine is heavily inspired by the cycle of life, where the machine begins with a domino, as well as ending with a domino. The design for our Rube Goldberg machine incorporates watermelon-inspired accents. The highlight of our design is the resembles a pendulum mechanics, but instead of having a marble going back and forth, the marble would work like a spiral around a PVC pipe. We will have a marble tied around a PVC pipe, when it got released, it will create a spiral movements hitting another marble into another PVC pipe and onto a different domino.

## Research

Guiding Question	Research	Sources
How to build a rube goldberg machine?	7 Steps: 1. Looking at other machine for inspiration. 2. Choose the task/purpose of the machine. 3. Connects all the actions together using different mechanics. 4. Being creative with the mechanics 5. Assemble the machine 6. Test repeatedly to make sure it would work 7. Decorate.	<a href="http://www.wikihow.com/Build-a-Homemade-Rube-Goldberg-Machine">http://www.wikihow.com/Build-a-Homemade-Rube-Goldberg-Machine</a>
How to use a lifting wheel? Lifting wheel mechanics.	Lifting Wheel: $F = W d / D$ $F = \text{effort force (N)}$ $W = m a = \text{weight of body (N)}$ $d = \text{wheel inner diameter (m)}$ $D = \text{wheel outer diameter (m)}$ $m = \text{mass of lifted body (kg)}$ $a = 9.81 \text{ m/s}^2 - \text{acceleration of gravity}$	<a href="http://www.engineeringtoolbox.com/lifting-wheel-d_1306.html">http://www.engineeringtoolbox.com/lifting-wheel-d_1306.html</a>
Some cool ideas for our machine.	Roped ball tied to a stick.  Mouse traps.	<a href="http://www.youtube.com/watch?v=7UdzAaw-H0o">http://www.youtube.com/watch?v=7UdzAaw-H0o</a>  <a href="http://www.popularmechanics.com/technology/engineering/gonzo/7-unbelievable-rube-goldberg-machines-we-love#slide-1">http://www.popularmechanics.com/technology/engineering/gonzo/7-unbelievable-rube-goldberg-machines-we-love#slide-1</a>

<p>How to make a lifting wheel lifts something up on its own? How to use a lifting wheel?</p>	<p>We can have one side with a marble, and the other side with something heavy. Using a wood or something to prevent the heavy side from lifting the marble up. Then to make it lift the marble up, have a domino or something to knock the wood down, so the heavy side would fall, while lifting it the marble up onto a ramp or something. - summarized</p>	<p>Interview Pete G11</p>
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## Bibliography

"How to Build a Homemade Rube Goldberg Machine." *WikiHow*. N.p., n.d. Web. 15 Nov. 2013.

Jittalarn, Pete. "How to Use a Lifting Wheel." Personal interview. 13 Nov. 2013.

"Lifting Wheels." *Lifting Wheels*. N.p., n.d. Web. 15 Nov. 2013.

"Steve Price (aka "Sprice") Shows Off His Complex Rube Goldberg Machine - America's Got Talent."

*YouTube*. YouTube, 18 June 2013. Web. 15 Nov. 2013.

"7 Unbelievable Rube Goldberg Machines We Love." *Popular Mechanics*. N.p., n.d. Web. 15 Nov. 2013.

## Design Specifications

Specifications	Test	Evaluation
<p>Starts with a domino and ends with a domino.</p>	<p>Photographic evidence. Taking a photo/video, showing that the machine starts with a domino as well as ending with a domino.</p>	<p>We've successfully connect our machine with the other two machines using a domino. (Photo 1)</p>
<p>Must incorporate our visual stimulus. (watermelon)</p>	<p>Photographic evidence Taking a photo/video of the dominos that we've painted.</p>	<p>We've painted most of the dominos with the color green and red which represents a the outer and the inner core of a watermelon. (Photo 1 - During the middle of</p>

		the process, where dominos are seen red and green)
The whole process of our rube goldberg machine must go on for at least 15 seconds.	Video evidence Taking a video of the process in our rube goldberg machine.	It took exactly 15 seconds to finish the process of our rube goldberg machine.
Must be able to connected to the other two machines.	Photographic evidence Taking a photo/video of our rube goldberg machine connected to the other two machines.	As we said in the first specification. Our machine works really well with the other two machines next to us.
Must involves at least 3 different type of actions.	Photographic evidence Taking a photo/video of all the actions we have included in our machines.	Actions included in our machine: - Marbles rolling down a ramp (Photo 2) - Domino falls on a roped ping pong ball, that hit onto another domino. (Photo 3) - Roped Marble tied to a PVC pipe. When released, creates spiral motion to hit another marble down another PVC pipe. (Photo 4)

## Photographic Evidence

Photo #1



Photo #2

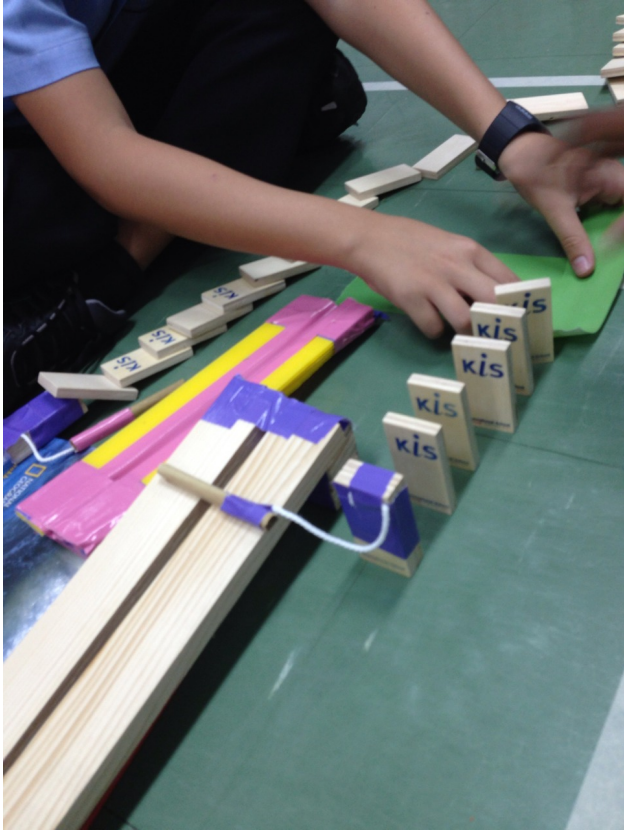
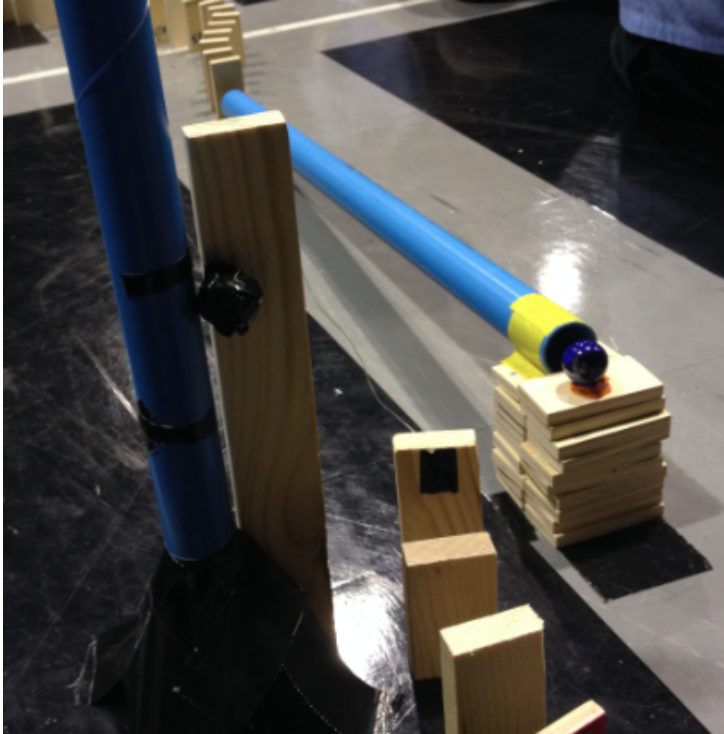


Photo #3



Photo #4



## Evaluation

On the first day, one of our member was absent, due to his sickness. With that, we need to collaborate more as a group in order to come up with a great design. None of our teammates brought any cool items to use, leaving us with only the provided materials. Many of our inventions works well with the other inventions, but some just aren't working. So we've worked out many solutions together as a team.

On the second day, it was a really big step forward for our group, since everybody came, and some brought an items to use for design. There are many improvements included in our designs.

On the third day, we had a test of persistency, and our machine worked three out of five times on its own. We had to test our design many times, especially the swinging marble. The swinging marble had to be very accurate and precise, for it to hit another small marble. We had to first let the marble swing, then estimate the location of the impact point. Then we would put the stand and another marble there. The keep using the process of "guess and check" until we finally found a spot and position, that the marble would swing and made an impact on another marble to roll into the PVC pipe. We then would mark the spot of the exact height where the swinging marble should be on the marble's stand, so we could remember where to put it if it moved. We also knocked our S shaped dominoes over a lot of times, so we decided to put the ping pong wrecking ball away while we set the dominoes, so that if it falls, only half of the S shape would fall.

On the last day, we didn't make any real changes to our design, but we came up with new ideas of making the whole machine work on its own every time. Including how we place the dominos and other mechanics of our machine.

## Challenges

There were a lot of challenges we had to face as a team, one of them were communicating with each others. A lot of our mechanics entails considerable risks of not being able to keep the machine going, so in order for us to solve the problem, we were trying to as collaborative as possible and work together as a team. There weren't many ideas in the beginning to begin with to start our rube goldberg, and because we lack of communication and teamwork many ideas mostly comes from one person or two. One of the hardest challenge we had to go through are thinking of an ideas for our action with the most creative way as possible.

## Improvements

Many of our changes weren't successful and some were, we had a lot of problem in the process of making our rube goldberg and that's why we made a lot of changes and those were improvement. Some of the major changes that we made were the action, we don't have enough action in our machine starting from 1 action to 4. There were a lot of changes base on things we think didn't went well.

Here we state some of the problem we had:

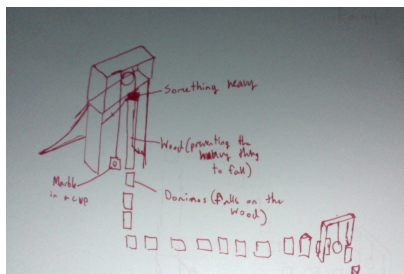
The thing that we need to most improve on is the very special domino that we customized ourselves. When it gets knocked down, it would move a stick which is holding back the marble at the beginning (the slope). Sometimes, the domino would get knocked over, but the stick would not go off of the slope and the marble would not roll. The sticks are the reason why we only got a 3/5 for the persistency test. We could have also added more complex mechanics to our machine, but we couldn't figure out how to make them, and it could cause a lot of trouble in the future as we are setting it up.

## Some Design Developments



### Day 1 Idea

This is the design that we uses everyday. As well as developing it until it is flawless design that would work on its own everything. A domino is attached to a stick by a rope. The stick is on a ramp, preventing the marble to roll down a rape. When domino falls, the sticks goes with it, letting the marble roll down the ramp freely.



### Day 2 Idea

It's the lifting wheel idea we came with up by interviewing Pete from G11. It's a really good idea but would required some time to build. In the end, we decided not to use it and used the swinging marbles instead.

## Being Collaborative

## Photographic Evidence

Credits: Momo



