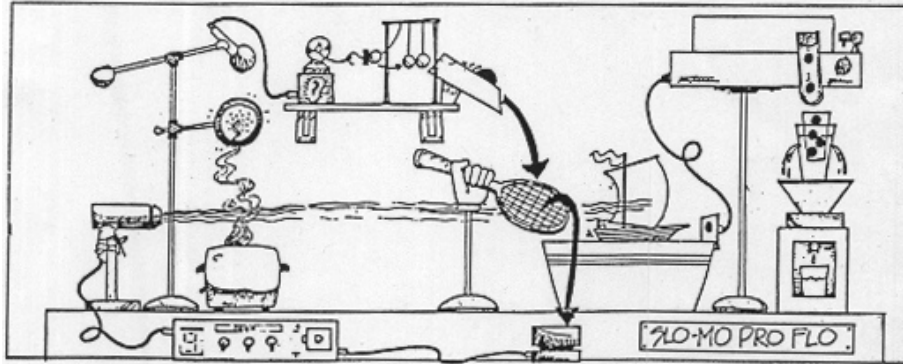


Group 3 Toy R Us's Rube Goldberg Machine



Physics Behind the Rube Goldberg Machine

Kinetic energy is an energy that is in motion. Great examples of kinetic energy are water, wind, and electricity; even though you are not able to see the energy doesn't mean there's no energy on that object. Kinetic energy applied in the rube goldberg machine in many ways. In order for the machine to work there must be kinetic energy, without kinetic energy nothing will happen and so the result is failure. Kinetic energy is a great way to explain how the rube goldber machine works.

Force, mass, acceleration, and gravity are applied in the rube goldberg machine. Each part of the rube goldberg machine use these concepts to make the machine works. Example of the concept of force working on the machine is when the plank of wood falls on the box and moved the marble on the track, that force cause the marble to have motion. Example of mass in the rube goldberg machine is when the small marble hit the large marble and the large marble cause the dominoes to fall down faster than the small marble. Example of acceleration in the machine is when the marble rolls down the spiral tower, the marble accelerates when the slope is steep and slows down when the slope is leveled. Example of gravity in the machine is when the marble falls off the track and landed on the spiral tower.

Newton Laws of Motion

1st Law - *an object at the rest stays at rest and an object at motion stays in motion with the same speed commonly known as Law of Inertia*

2nd Law- *If there's more mass that means we must add more force in order for it to accelerate (this force is called net force, it is measured in newton 'n').*

3rd Law- *for every action there is an opposite force acting on it*

Friction- *resistance to motion in solid object*

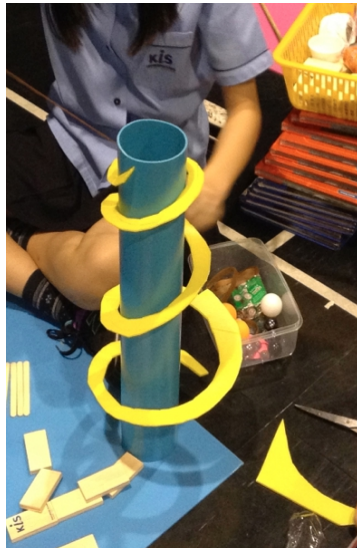
This Rube Goldberg Machine applied to all newton laws (1st law, 2nd law, 3rd law, and friction). It is applied to 1st law; when the marble stays at rest it stays at rest and when there's motion acting on it, it stays in motion with its same speed. It is applied to 2nd law; the larger marble tends to act faster than the small marble which means there's more net force on the larger marble than it does on the small marble. It is applied in the 3rd law; when the marble moves on the track there's a force push the marble downwards to make it stick to the track and another force pushing it upwards to make the marble to not sink through the track. Finally friction, friction is applied to this machine because on the track there's friction, that friction effects the

speed of the marble and how much will the marble accelerates. All these laws are very important in the making of the Rube Goldberg machine.

Overall there are six concepts of physics presented in the rube goldberg machine, those are kinetic energy, force, mass, acceleration, gravity, and Newton laws of motion.

Inspiration

The inspiration of our group is the music video of an artist name Ok go and song name This Too Shall Pass (Rube Goldberg Machine version). This music video inspired us because of the machines simplicity, success, and awesomeness. We wanted to make our group's rube goldberg machine to be as good as the Ok go band. In their machine it displays the toy theme, our machine is also the toy theme which this is one of the main reason why they inspired us so much. Each thing that happened in the machine in their music video represents each event that may have likely happen to them (the band). In their machine there's a part where the TV and the Piano got smash, this may mean that there's once a failure or a difficulty in their band somehow. We're also trying to transfer a deep meaning to our machine in the part where we have the spiral; the spiral represents our confusion and complications. We have our confusions and complications when we were trying to build the machine, thinking about whats going to go first, why things work and doesn't work, who's going to be in charge of what and what, etc. So this machine is not just a machine, its a machine where it represents our adventure and the fun we had as a team in the design cycle week. Here is the link of the music video of the Ok go band: <http://www.youtube.com/watch?v=qybUFnY7Y8w>



Design Brief

Our rube goldberg machine

Design Specifications

- 1) The machine must work from point A to point B.
- 2) The start and the end of the machine must have dominoes the school provide us.
- 3) The machine must have tracks for the marbles to roll on.
- 4) The machine must have large and small size marble the school provide us.
- 5) The machine must have something related to the theme (toy).
- 6) The machine must have three actions and 2 mechanics that causes potential energy

- 7) The machines should be simple and cool
- 8) The machines must cooperate and work together smoothly.
- 9) The machine must have at least two different elevations.
- 10) The machine must have at least one domino tricks

Tests

- 1) We will know that machine will work when the dominoes from the beginning and the end falls down.
- 2) We will know that the machines have dominoes in the beginning and the end of the machine by taking a picture of it.
- 3) We will know that the machine will have tracks for the marble to roll on by taking a picture of it.
- 4) We will know that the machine will have large and small size marble the school provide us by taking a picture of it.
- 5) We will know that the machine is related to the theme (toy) by taking a picture of the whole machine and look for toys within the machine. If there's no toys in the machine that means the machine does not relate to the toy theme. If the machine have toys, that means the machine is related to the toy theme.

Design Ideas (explain in details what the design is about, purpose,.. etc.)

List:

- Spinning ramp
- Brightly painted Dominos

Design 1

There are various parts to our first design. The design consists of 4 actions (dominos, spinning ball, ramp, and marble ramp) 2 potential energy source (marble drop and spinning around the ramp, Spinning ball creates energy which is transferred when stopped by a book and makes the domino fall and hit the other ones) The purpose of this design

Design 2

In the second design, we changed the first design and took of the spinning ball because it proves not to be consistent so we changed it by using ramps and marbles to be dropped down instead, which means that we still followed our design specification by keeping the potential energy source to a minimum of two and made it more efficient and more consistent. We also added another marble ramp on a table which will trigger a chain reaction of dominos instead of using the small spinning ball.

Justification for final design

We choose to use the final design of the machine because once we tried making it and launched it, it worked successfully where as the previous designs didn't work totally. We try to plan as many design as we possibly can so we know which machine will work successfully and which machine will fail. As we were making the machine on the first day on our first design it didn't work, so we decided to make the second design which works better but still didn't work, and the third we made little changes to the machine which successfully worked. The justification is why use a machine that doesn't work when we got a machine that works.

Evaluation (does it fit with design specs, changes u made, how it can b improved)

After testing our machine multiple times the result of this tests is sometimes the machine works and sometimes it doesn't. Aftr we know the result we dicided that we must improve our machine. So we drew

is that sometimes the machine work and doesn't work. We decided that we need to improve the machine

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