APEGBC 2015 Science Games

Division 1 Take Home Activity: Marble Slide

Saturday, March 7, 2015 | 8:30am - 12:30pm | H.R. MacMillan Space Centre & Museum of Vancouver

Instructions:

Engineers are at work all over the world. They design everything from bridges, to car engines, to water slides. In the 2015 Science Games Take Home Challenge, teams will have to think like engineers! Team mission: build a slide for a marble to move along. The goal for this challenge is to create a slide which takes the marble the longest time to travel along from the start (top) to the end (bottom), without stopping.

Team Leaders were contacted in December and asked to collect toilet paper tubes, paper towel tubes and wrapping tubes for use in this activity. These tubes will make up pathway that your marble travels along.

Teams will have to decide on the building material for the base of their slide. This should be a household item, like an egg carton, cardboard box, packaging from a toy box or something else that will provide a stable base for your slide. The popsicle sticks in your activity box should be used as support to create your slide.

Your team should create a theme for your slide. This theme can be something natural or something manmade. Decorate your slide using household materials to show your theme to our judges.

Building Hints:

Hint #1: It's easier to start building from the bottom up. Teams should start their slide design by choosing where they would like their marble to come out at the bottom and build up.

Hint #2: Do you know what a switchback is? Switchbacks are used to slow down cars when they travel on a steep hill by making the car zig zag back and forth, forcing them to switch directions. Do you think a switchback could be used in your slide? Show us how!

Rules

1. Teams need to release the marble at the top of the slide
2. Teams cannot touch the marble as it travels along the slide
3. The slide should not be larger than 25 inches wide, 25 inches long and 25 inches high
4. Teams should design the slide so that it is strong enough to be transported to the event. Please note: no materials or equipment will be provided to teams to repair their slide should it be damaged in transport.
5. Teams should include their team name somewhere on their slide.
6. The marble can only travel along the recycled tubes. No plastic tubes or other materials should be used for the marble to travel along.
7. No hot glue guns can be used on your slide.
8. Aside from the base, only popsicle sticks, tongue depressors and/or paper rolls can be used to support the slide. No other materials should be used to support the paper rolls. Other household materials can be used to show the theme of the slide.

Contact Information

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Division 1 Mystery Activity: Crash Test Cars

Saturday, March 7, 2015 | 8:30am - 12:30pm | H.R. MacMillan Space Centre & Museum of Vancouver

Instructions:

Safety is a very important part of engineering. Marine engineers have a lot of safety concerns to consider when making a ship. They have to make sure that the ship will still be able to float when it's filled with people and heavy cargo. Safety is also something that electrical engineers need to consider in their job. They make sure that you don't get zapped when you turn on a light.

In this Science Games Mystery Activity, teams will work together to create a car which can safely transport its driver down a ramp and protect the driver during a crash. The driver in this activity is an egg. Each team will be given a sample driver (e.g., a hard boiled egg) to use while building your car. A real egg will be used during the actual testing phase.

Your car will need to keep the driver safe during regular driving conditions and in a crash. It will be tested on the Science Games Safety Course. Teams will launch their Crash Test Car from the top of the course.

At the start of the Science Games Safety Course, your cars will roll down an incline. Then when the car reaches the bottom of the hill, it will crash into a wall. If your driver makes it through the course without injuries, your car will move on to the next level of testing on the Science Games Safety Course. In this level, the hill will be higher. This makes your car move faster and hit the wall with more force. The Science Games Safety Course will have five different levels for your cars to be judged on. But remember: the driver has to make it through the first crash without injury to move onto the second.

Just like with a real car, you need to make sure your Crash Test Car will drive straight while going through the course. Teams can test their car on the ramps prior to judging. Please note: your team may have to wait in line to test your car.

Teams will be awarded points based on the damage to the driver after each incline as well as teamwork and creativity.

Rules:

- Your Crash Test Car must easily allow it's driver to enter and exit the vehicle.
- The driver must be 50% visible and cannot be hidden or enclosed in a compartment (just like a passenger wearing a seatbelt).
- Team members are not allowed to touch the car after it has begun to roll.
- Make sure your car will roll straight down the ramp, otherwise it may fall off the Safety Course, causing you to lose points.
- Only the wheels provided can make contact with the surface of the ramp.
- Teams will use the same driver (non-hardboiled egg) for all inclines.

Activity Timeline

- 10 minutes: Review activity instructions and rules
- 30 minutes: Building / Testing
- 20 minutes: Judging

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Division 1 Mystery Activity: Play Cards

Saturday, March 7, 2015 | 8:30am - 12:30pm | H.R. MacMillan Space Centre & Museum of Vancouver

Instructions:

Engineers are at work all around us. They create and build everything from skyscrapers to the latest roller coaster. While these may be very different things, many of the same shapes are used as the building blocks of these items.

In the study subjects provided to you before this event, teams were encouraged to learn more about different kinds of shapes. In particular, which shapes are stronger than others. In this Science Games Mystery Activity, your team challenge is to build the tallest structure possible. Each team will be given 5 decks of playing cards and 3 rolls of scotch tape to build their structure.

There are lots of different shapes that you can use as building blocks for your structure. A few common ones are cubes, triangles and polygons.

Your team will be awarded points based on the height and stability of your structure, creativity and teamwork. Structural Engineers have to think about stability all the time in their job. They always have to be careful that anything they build is stable and won't fall down. So when you build your structure make sure it's stable, like a real building.

Our judges will be visiting your team while you build to record your progress. Each team will have a chance to record a new height after 20 minutes of building and 30 minutes of building as well as a final height.

All teams will also have to manage their use of materials as each team will only have 5 decks of cards and 3 rolls of scotch tape to build their structure. Each team will have one opportunity to trade one deck of cards for a roll of scotch tape or vice versa.

Team Building Tips:

- Build in 3D!
- Need a quick review of shapes? Check out the sample shapes which our judges have created. Which ones do you think are the best to build with?
- Manage your building materials: Each team has a limited amount of cards and tape available so use it carefully.
- Work as a team: you can try to build your structure in sections and then combine them to create your final structure.

Rules:

- Your structure must be able to stand up on its own.
- It can't be attached (ex. taped to the floor or table).
- Teams are only able to trade in materials once.

Activity Timeline:

- 10 minutes: Review activity instructions and rules
- 40 minutes: Building/Testing
  - 20 minutes into building - 1st record of height for each team
  - 30 minutes into building - 2nd record of height for each team
  - 40 minutes into building - final recording
- 10 minutes: Judging

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Division 2 Take Home Activity: Build a Seismometer

Saturday, March 7, 2015 | 12:45m - 4:45pm | H.R. MacMillan Space Centre & Museum of Vancouver

Instructions:

Have you ever felt an earthquake? When the earth's crust breaks, seismic waves move through the earth and cause the ground to shake. We call this movement of the ground an earthquake.

– Geoscientists study earthquakes using seismometers. These tools can measure the intensity (strength) of the ground movement and the duration (how long it lasts).

– The challenge for the 2015 Science Games Division 2 Take Home Activity is to build a seismometer which can be tested at the APEGBC Science Games. Your team's seismometer should be able to record a 5 second "earthquake" on a piece of paper.

– Research is important to this activity. Each team will need to write one Team Journal to show their research. Look online and at your local library for more information about seismometers and earthquakes so that your team can build the best seismometer and write a great Team Journal.

– Your Team Journal will help our judges understand your building and research process.

The Journal should be typed and stapled with:

- Your Team Name on the First Page
- 1-2 Pages about primary waves (P Waves) & secondary waves (S Waves). What's the difference between these two? Be sure to use diagrams and give definitions.
- 1 Page answering the question "Why do we have earthquakes in Vancouver?" Make sure you use a diagram here as well!
- Source List: Please list all your sources.
  - Include the names of any websites you used and their links
  - Include any book titles and the name of their authors
- Log of Improvements: If your team found seismometer instructions online, what changes did you make to the design to make it better? Teams should be prepared to talk about their seismometer designs and any improvements they've made with our judges.

Both the seismometer and your Team Journal will be marked by Science Games judges so make sure to bring both of these items with you to the Science Games. If your team has any design drawings, seismometer prototypes or other documents which demonstrate what research your team has done, please bring those to the Science Games as well.

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Building Tips:

Things for teams to keep in mind while building their seismometer:

- They should also be designed to sit on a flat surface.
- The paper must move along the seismometer to be able to record the "earthquake." How will your paper move to record the movement?
- What will you use to record the movement on the paper? Does your pen touch the paper? What will you do to ensure the pen and paper continue moving/ recording throughout the 'earthquake?'
- What sort of material will you use to create a stable/ durable structure for your seismometer? Remember, you will have to be able to transport it to the Science Games.

Don't forget, the first step in this activity is research!

Rules

1. Journals should be handed in at the Science Games Registration Desk when teams check in. These will be returned to teams during the event.
2. Seismometers should be constructed so that they are no larger than 1.5 x 1.5 ft. (45 cm x 45 cm)
3. No electronics should be used on your seismometer.
4. Teams must include their team name on their seismometer in a visible place.
5. Only household materials should be used to build your seismometer (ex. items that can be purchased at a Dollarstore)
6. Adult Team Leaders involvement should be minimal unless there are safety concerns (ex. using hot glue gun)
7. Seismometers should be durable enough to travel to the Science Games. No materials will be provided on site to repair seismometers if they are damaged.

Please note: if teams use instructions from an online source to complete this activity, you must show how you have improved upon their original design.

Contact Information

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Division 2 Mystery Activity: Ping Pong Ball Zipline

Saturday, March 7, 2015 | 12:45pm - 4:45pm | H.R. MacMillan Space Centre & Museum of Vancouver

Instructions:

Mechanical engineers can do a lot of different types of jobs. They can build and design robots, engines, appliances and much more! Mechanical engineers who work in the transportation industry have a very specific job. They design buses and cars to move people and things from point A to point B in a fast and efficient way.

In this activity teams will have to think like mechanical engineers and work together to create one or more devices which can transport a ping pong ball along a Zip Line. The goal of this activity is to transport the most ping pong balls back and forth across your team's zip line track.

Teams will be able to test their devices using a sample of the zip line string in their building area.

Each team will be given two 1 minute recording periods to try and transport as many ping pong balls as possible along the zip lines from one side to the other. 10 ping pong balls will be set up on each side of the zip lines. The first recording period will occur after 20 minutes of building and the second will occur at a time decided by each individual team. Volunteers will give a 5 minute warning before the activity ends so teams can make sure they get their second recording period in before time runs out.

Points will be given to teams based on the number of ping pong balls which travel all the way through the zip line, based on creativity and teamwork.

Rules:

- Each device you create to transport your ping pong ball along the zip line must be reusable.
- Each device can only hold one ping pong ball at a time.
- Each device must be able to attach and detach from the zipline easily.
- Tape cannot touch the ping pong ball.
- Your team can only use the materials provided.
- If a ping pong ball drops into the testing area, a judge must be called over to remove it.
- If a device falls off of the zipline, teams must retrieve it before they can continue.
- Teams can only have one device on each zip line at a time.

Activity Timeline

- 10 minutes: Review activity instructions and rules
- 25 minutes: Building/Testing Time
- 5 minutes: 1st Recording Period
- 10 minutes: Building/Testing – This is where you improve upon your original designs
- 5 minutes: Judging

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Division 2 Mystery Activity: Mineral Exploration

Saturday, March 7, 2015 | 12:45pm - 4:45pm | H.R. MacMillan Space Centre & Museum of Vancouver

Instructions:

Geoscientists study the earth. They use their knowledge of the Earth to determine where valuable resources, such as gold, diamonds or copper, may be located underneath the Earth's surface. In Mineral Exploration, teams will work together like geoscientists to determine where mineral deposits can be found in their Exploration Area. Each team will have their own Exploration Area with 1 ore deposit to mine.

Your challenge as a team is to find and recover this deposit. Teams will be marked on two main areas: how you record/find the deposit and how you remove the deposit.

In real life, geoscientists have to be very careful about how they explore beneath the Earth's surface for mineral deposits. They look for clues on the surface to determine if a mineral deposit may be below. Based off of these observations, they decide to dig or take a core sample to see what may be hidden below.

Each team will be given a set of 8 coring samples from their exploration box. You will need to carefully catalogue these samples in your record log. You will need to complete a record log for each of your 8 core samples to find your mineral deposit.

Each record log should include the following:

- The grid number which your core sample comes from
- A diagram of the core sample
- A record of what you find in the core sample and the depth of those items

Once your team has recorded all of the core samples, teams will remove the contents of the sample for a further study of its contents. Use the paper plates in your activity kit to carefully remove the sand from your core samples.

The next step is to review the data from your core samples to map out on the grid sheet the location of your ore deposit. Use the flag marker in your activity kit to show where your ore deposit is located.

Now it's time to dig! Make sure to remove the grid from your Exploration box before you start to dig (since you have placed the flag marker to show where your ore deposit is you will still know where to dig). Each team will be given tools which they can use to mine for ore in their exploration box. The goal is to mine for your ore body only and make as little damage to the land as possible. Geoscientists try to disturb as little land as possible when exploring beneath the earth's surface. Some tools will cause more damage to the land than others, so teams will have to choose the best tool for this job. Teams can continue to mine until they no longer find any gems.

Some team members can dig for the ore deposit while the others examine and document what they pull from the Exploration Box.

There are several different types of minerals which you could find. Use the Mineral Identification sheet to figure out which type of minerals you've found. Make sure to record the type of minerals which you find on your question sheet.

If teams find and successfully remove any minerals they should clean them using the wipes provided.

Tips for Teams:

- Take your Time: Points will be award based on the accuracy of your records.
- Work Together: Team members will need to communicate to record the data correctly.

Rules:

- Teams have 15 minutes to record the 8 core samples
- Any exploration tool can be used to locate gems. Keep in mind that the goal of this activity is to disturb as little ground as possible while discovering the gems.
- All results must be recorded on the log sheet.
- Do not throw or spill your mineral exploration boxes or core samples on the floor.