ENGINEERS & GEOSCIENTISTS BRITISH COLUMBIA

2020

SCIENCE GAMES

SATURDAY, MARCH 7, 2020

DIVISION 1: TAKE HOME ACTIVITY
FROM GARBAGE TO GREATNESS

Sometimes engineers are asked to solve an exact problem (increase car speed), but often they're asked to look at a whole system and make changes to make it better (reduce the traffic on the bridge, make a product more affordable/sustainable, or use technology in new or original ways to solve problems the public experiences). Many kinds of engineers do this work, but industrial engineers and engineers in planning roles do it the most.

In this activity, teams will go and find out what kind of garbage is left either around their neighborhood or at an outdoor location of their choice. They will then choose one of the pieces of garbage they find and do a deeper investigation about what it's made of, how planet-friendly it is, and how it could have a new life as a building material.

Teams will need to visually represent their idea. This could be done on a poster, by making their own model or through another visual medium. Be creative! Your team will also have to present (or pitch) your new building material at the Science Games.

INSTRUCTIONS

1. **Pick Your Outdoor Location:** Describe the options available—home, school, etc. Remember that this location should be outdoors.

2. **Explore Your Chosen Location:** What type of garbage do you see? Write down what you see on your **Location Survey sheet**, and if possible take pictures to include in your visual presentation. Otherwise, draw the garbage. Describe what you see. Is it worn down? Is it still as strong as it was originally?

Remember: Be sure to read and follow the Safe Exploring Instructions!

3. **Select Your Garbage for Building:** Out of the different items of garbage that you saw, select one item or type of item to use in a new way as a building material.

4. **Think About Your Garbage's Qualities:** If possible, do this by examining a similar (clean) piece of garbage from home or school. Otherwise do your best without touching it. Get creative with tools like sticks for this part if needed! Fill out the **Garbage Qualities sheet** about your chosen item. Your team will need to determine various characteristics about your garbage.

5. **Change Your Garbage into a Building Material:** How can you change this item to make it good for building? Which of its qualities make it a good choice to be used in this way? Good building materials do their job and don't get worn down or broken during bad weather, either because they are resistant to it themselves or because they are protected. Check out our **Home Building Materials Info sheet** for more information about what types of materials are commonly used when building a house.

6. **Get Ready for Your Pitch:** Your team needs to sell this new building material to our Science Games judges. They are looking for new, sustainable materials to build a house. Find a way to show Science Games judges why your new product would make a good building material. Teams will have five minutes to deliver their pitch at the Science Games. This should include some sort of visual representation of the building material, like a poster or a sample, and a verbal presentation that you will deliver at the Science Games. Prepare these items as a team!

DIVISION 1: TAKE HOME ACTIVITY
FROM GARBAGE TO GREATNESS

The pitch will need to answer the following questions:

- What is your new building material? What part of the house is it used on?
- Why did you pick this item to turn into a building material?
- What are some reasons your product would make a good building material?
- What are some reasons your product wouldn't make a perfect building material/what are some disadvantages to your building material (**hint:** check material quality sheet)?

7. **Present Your Pitch and Papers:** Bring your visual representation, notes for your verbal presentation, and all of your worksheets to the Science Games for judging. Everyone must participate in the pitch.

RULES:

- Team's chosen location should be outdoors.
- Team members should follow the **Safe Exploring Instructions** while looking for garbage in their chosen location.
- Teams **do not** need to pick up their chosen garbage element to create their building material. They simply need to observe and take photos of the garbage material in their chosen location. Teams can then source their garbage material from home/school if it is available.
- Visual representations/dioramas/displays **must not** weigh more than 5 lbs.
- Visual representations/dioramas/displays must be easily transportable (e.g., can be moved by a single adult without difficulty).
- Materials must be re-used items from home or school.
- Every team member must participate in the pitch and be ready to answer questions.

BACKGROUND INFORMATION:

Not sure if the garbage you saw is recyclable? Check out the City of Vancouver's Waste Wizard! (not all garbage is recycled the same way in other municipalities) https://vancouver.ca/home-property-development/waste-wizard.aspx

Team Leaders, do you want to see what the most common household garbage is? Check out this 2017 Waste Composition Study of Metro Vancouver: http://www.metrovancouver.org/services/solid-waste/SolidWastePublications/2017MetroVancouverMulti-familyWasteCompositionStudy.pdf

ENGINEERS & GEOSCIENTISTS BRITISH COLUMBIA

2020

SCIENCE GAMES

SATURDAY, MARCH 7, 2020

DIVISION 1: TAKE HOME ACTIVITY
FROM GARBAGE TO GREATNESS

SAFE EXPLORING INSTRUCTIONS:

1. Always follow your team leader's instructions, and stay with your team.
2. Before you go, prepare for the weather. That may include extra layers, sunscreen, or an umbrella.
3. Keep your hands to yourself! Garbage can be sharp and pokey, be slippery, or have dangerous chemicals on it.
4. Watch where you step! Walk a few steps and then look around. Stop to take more observations if you see something to record.
5. If you see something you're not sure about, tell your team leader.

ENGINEERS & GEOSCIENTISTS BRITISH COLUMBIA

2020

SCIENCE GAMES

SATURDAY, MARCH 7, 2020

DIVISION 1: TAKE HOME ACTIVITY

FROM GARBAGE TO GREATNESS

HOME BUILDING MATERIALS INFO SHEET

INSTRUCTIONS

Use this to help brainstorm where your material could be used to build a house! Feel free to choose a material not on this list.

1. **Roof (shingles):** Can be made of a variety of materials including asphalt, metal, slate, concrete, or even solar panels. Needs to protect the house from rain and not wear out after many years in direct sunlight.
2. **Chimney:** Usually metal or brick/concrete. Needs to stand up to lots of heat without losing its shape or catching on fire as it guides hot air safely up and away.
3. **Walls:** Often made of concrete, bricks, or wood. Needs to resist wind and be strong enough to support the upper levels of the home. Can be many layers of different material to accomplish strength, waterproofness, and looks.
4. **Windows:** Usually glass or plastic. Need to be completely clear and stand up to strong wind and severe weather.
5. **Insulation (inside):** Often fiberglass or foam, but can be anything that creates a layer that traps heat. It can be very delicate if it is within walls or somewhere protected from weather conditions.
6. **Foundation:** Generally concrete or bricks. Needs to support the whole weight of the house while staying exactly level (flat) and keep water from getting into the home.

ENGINEERS & GEOSCIENTISTS BRITISH COLUMBIA

2020

SCIENCE GAMES

SATURDAY, MARCH 7, 2020

DIVISION 1: TAKE HOME ACTIVITY

FROM GARBAGE TO GREATNESS

GARBAGE QUALITIES

INSTRUCTIONS

- Choose one of the pieces of garbage from your location survey to look into in more detail. This will eventually be the one you turn into a building material, so choose carefully!
- Answer the questions as well as you can. If possible, get a clean sample from home or school so you can make more observations. Otherwise, use your best scientific judgement.

Describe your chosen piece of garbage.	
Is it waterproof? *Describe the results of your test.*	
Can it be easily ripped? (Shear strength) *Describe the results of your test.*	

ENGINEERS & GEOSCIENTISTS BRITISH COLUMBIA

2020

SCIENCE GAMES

SATURDAY, MARCH 7, 2020

DIVISION 1: TAKE HOME ACTIVITY
FROM GARBAGE TO GREATNESS

Is it strong when pulled? (Tensile strength) *Describe the results of your test.*	
Does it bend easily? Could it be formed into a new shape? *Describe the results of your test.*	
If many of them are bound together to make a bigger product, will it still be strong? Can you do anything to make it stronger when combined?	
Will the material last for a long time, or is there a way to protect it so it can be preserved?	

ENGINEERS & GEOSCIENTISTS BRITISH COLUMBIA

2020

SCIENCE GAMES

SATURDAY, MARCH 7, 2020

DIVISION 1: TAKE HOME ACTIVITY
FROM GARBAGE TO GREATNESS

LOCATION SURVEY

INSTRUCTIONS

- Make sure you're following the **Safe Exploring Instructions**!
- When you see a piece of garbage, record it on this sheet. If garbage of that type has already been recorded, add a tally mark to that section instead of adding a new line.
- Attach the photos and images of the garbage to your sheet
- Try to find at least 5 different types of garbage.

LOCATION INFORMATION

Description of location	
Approximate size of location	
Explorers involved	

ENGINEERS & GEOSCIENTISTS BRITISH COLUMBIA

2020

SCIENCE GAMES

SATURDAY, MARCH 7, 2020

DIVISION 1: TAKE HOME ACTIVITY

FROM GARBAGE TO GREATNESS

SURVEY INFORMATION

DESCRIPTION	WHAT MATERIAL(S) IS IT MADE OF?	CONDITION (LIKE NEW, SLIGHTLY WORN OUT, TOTALLY DESTROYED)	NUMBERS OF PIECES OF THIS GARBAGE YOU SAW

ENGINEERS & GEOSCIENTISTS BRITISH COLUMBIA

2020

SCIENCE GAMES

SATURDAY, MARCH 7, 2020

DIVISION 1: TAKE HOME ACTIVITY

FROM GARBAGE TO GREATNESS

SURVEY INFORMATION

DESCRIPTION	WHAT MATERIAL(S) IS IT MADE OF?	CONDITION (LIKE NEW, SLIGHTLY WORN OUT, TOTALLY DESTROYED)	NUMBERS OF PIECES OF THIS GARBAGE YOU SAW

ENGINEERS & GEOSCIENTISTS BRITISH COLUMBIA

2020

SCIENCE GAMES

SATURDAY, MARCH 7, 2020

DIVISION 1: TAKE HOME ACTIVITY

FROM GARBAGE TO GREATNESS

SURVEY INFORMATION

DESCRIPTION	WHAT MATERIAL(S) IS IT MADE OF?	CONDITION (LIKE NEW, SLIGHTLY WORN OUT, TOTALLY DESTROYED)	NUMBERS OF PIECES OF THIS GARBAGE YOU SAW

ENGINEERS & GEOSCIENTISTS BRITISH COLUMBIA

2020

SCIENCE GAMES

SATURDAY, MARCH 7, 2020

DIVISION 1: MYSTERY ACTIVITY
FLOAT THE BOAT

Have you ever thought about what shipping means? It means ships! Every day cargo ships transport millions of kilograms of products from one place to another. These ships are specially designed to be able to hold a lot of weight very effectively. This is the key kind of work that marine/mechanical engineers do. Today you've been commissioned to design the next shipping ship for a very important client.

In this activity, teams will be building boats using several different materials. The materials that you are provided with will have different traits, making them good at one thing and not great at another. The challenge is to combine them and use each material's strength to create a boat that's capable of holding as much weight as possible without falling over or sinking. Because you need to present your reasoning to your client, you'll also complete a worksheet highlighting why the materials you chose are the right ones.

INSTRUCTIONS

1. **Test Your Materials:** Teams will look and test materials to determine their strengths and weaknesses. Write down what you find on the Material Testing Observation Sheet. Use the items in your Test Materials bag for this part of the activity.
2. **Design Your Ship:** Answer the questions on the Observation Sheet. What did you learn from testing your materials? How will that impact your ship design? Draw out your ship design on the Observation Sheet and label the key parts of your ship.
3. **Build Your Ship:** Teams will work together to build their ship. Use the materials you think will be most useful to keep your boat floating. Use the materials in your Building Materials bag for this part of the activity.
4. **Testing Time!** As a group head outside with your judge and test your boat. Your team will be paired with another group so you can see how your design compares to theirs.

RULES

- Can only use the materials provided.
- A boat has capsized! It no longer qualifies **if it touches the bottom or if any weights fall out**.
- Boats must fit within the testing container without leaning on or touching the container's edges. They must float freely in the center. A Judge or team member can push the boat away from the sides of the container if needed.
- Pens/writing tools cannot be used as boat materials.

ENGINEERS & GEOSCIENTISTS BRITISH COLUMBIA

2020

SCIENCE GAMES

SATURDAY, MARCH 7, 2020

DIVISION 1: MYSTERY ACTIVITY

FLOAT THE BOAT

MATERIAL TESTING OBSERVATION SHEET

INSTRUCTIONS

- Test each material in the water.
- Use a (✓) or an (**x**) to show your answer for each material.

	Does it float?	Does it absorb water?	Would you use it in your boat?
Paper			
Plastic			
Popsicle Sticks			
Cork			
Plasticine			
Paperclip			

ENGINEERS & GEOSCIENTISTS BRITISH COLUMBIA

2020

SCIENCE GAMES

SATURDAY, MARCH 7, 2020

DIVISION 1: MYSTERY ACTIVITY

FLOAT THE BOAT

BOAT DESIGN PLAN

Team Name: _____

INSTRUCTIONS

- Sketch your boat design. Label the materials you will use for each part of the boat.

ENGINEERS & GEOSCIENTISTS BRITISH COLUMBIA

2020

SCIENCE GAMES

SATURDAY, MARCH 7, 2020

DIVISION 1: MYSTERY ACTIVITY

OZOSTRIKE!

Computers and technology are all around us! When you use a computer to play games or a cell phone to chat with your family or look something up on the internet, you're using technology that didn't exist 100 years ago.

Electrical engineers and computer engineers are technology wizards! Electrical engineers design and build systems that use electricity and electronics. Computer engineers combine electrical engineering with computer science to create hardware, software, and other important computer devices. Together, they design technology we rely on everyday—from cell phones, to computers, to cars, to robots!

In this activity, Division 1 teams will use their coding skills to turn their Ozobot into a bowling ball and knock down as many virtual bowling pins as possible!

Your bowling team has made it to the 2020 Science World 6-Pin Bowling Championship Finals! To win the final championship game, you need to create a series of codes for your Ozobot ball to follow on the bowling lane template to reach and knock down the 6 virtual bowling pins at the end of your bowling lane.

As a team, you will need to create an Ozobot path that meets the following criteria while knocking down all the pins in each challenge. All three types of codes an Ozobot can follow must be used at least once:

1. A speed code
2. A direction code
3. A cool moves code

Each team member must also be able to answer the following questions:

- What codes did you use to program your Ozobot?
- What algorithm (solution) did your Ozobot follow, and in what sequence of steps did it move?
- Did you need to do any debugging (problem solving)?

Your team will be marked on how well your team is able to incorporate the design criteria above, how many challenge sets your team is able to successfully complete, the answers to the questions above, and overall teamwork and creativity in design.

INSTRUCTIONS

1. **Discuss Your Path:** How will you move your bots through the challenge path? Split your team into two groups to discuss a path for your bots.

- **DIRECTION:** Choose the route you want your bot to go through.
    - What direction codes do you need to give your bot to travel this route?
- **SPEED:** Do you want your bot to go fast or slow?
    - Make sure to add in one speed code to your route.

DIVISION 1: MYSTERY ACTIVITY
OZOSTRIKE!

- **COOL MOVES:** What cool moves code will your bot do along its route?
    - Make sure to add in a cool moves code for maximum points!

2. **Code Your Design:** As a team, decide what path to take. Use the paper template and markers provided to draw out your code in the blank squares along the path your Ozobot bowling ball with travel.

3. **Calibrate your Ozobot:** (See directions below)

4. **Test Your Code:** When you're ready, line up your bowling pins by writing 'X' on all of the points where you place a virtual pin and use the Ozobot to test your design. Trace the Ozobot's path on the separate tracking sheet.

5. **Judging Time:** Let your judge know when you are ready to test your code.

They'll ask you some questions about your route and codes, like

- What codes did you use?
- What algorithm or sequence did you follow?
- Did you do any debugging?

6. **Talk with Your Neighbors About How It Went:** As a group, talk about how your code went. Did it work? What changes would you make to your design? What worked well and what didn't work so well?

- If your both groups in your team were not successful, re-try.
- If one groups is successful, they need to teach the other half before moving on
- If both groups are successful, then move onto the next challenge

7. **Repeat Steps Above**

CALIBRATING YOUR OZOBOT

1. Hold down the power button on Ozobot for 2 seconds until the LED light flashes white.
2. Quickly Place Ozobot in the middle of the black calibration dot.
3. Ozobot will calibrate on a black dot (about the size of the robot's base). When drawing, you can create your own black dot with markers.
4. Ozobot will move forward and blink green, which means it has successfully calibrated. Start over if Ozobot blinks red.

ENGINEERS & GEOSCIENTISTS BRITISH COLUMBIA

2020

SCIENCE GAMES

SATURDAY, MARCH 7, 2020

DIVISION 1: MYSTERY ACTIVITY

OZOSTRIKE!

RULES

- Your path design must include at least one speed code, one direction code, and one cool move code.
- Virtual bowling pins must be placed on the X's marked on the bowling lane template.
- The Ozobot must cross over the 'X' to be considered "knocked down".
- All team members must participate together in the designing, coding, and testing process.
- Teams will not be able to move onto the next challenge until they have completed the earlier challenge sets.
- Teams should leave their activity area tidy.
- Teams need to make sure markers are sealed properly.

ENGINEERS & GEOSCIENTISTS BRITISH COLUMBIA

2020

SCIENCE GAMES

SATURDAY, MARCH 7, 2020

DIVISION 2: TAKE HOME ACTIVITY
BREAD BRIDGE BONANZA

Engineers and geoscientists must think about how to make their designs better through a process called prototyping. Think about bridges that you've seen and of the shapes that together make the bridge. What makes those shapes strong?

Now, think about what makes bread tougher or harder, and what would make bread better at holding up weight. Come with a recipe and bake your first prototype! You can test it at home with just a bucket and a strap. Bake different loaves until you figure out what works the best.

View Instructional Video

In this activity, each team will bake a bread bridge and bring it to the competition. The bread bridge must span a gap of 30 cm, weigh under 1 kg, and use only the materials allowed in the list of typical bread ingredients. Judges will place a strap and bucket over the loaf and fill the bucket with water until it breaks! Teams are judged based on how much weight the bread bridge held, the level of detail included in the recipe worksheet, how well they worked as a team, and how well they answer the follow-up questions, which are related to baking and structures.

INSTRUCTIONS

1. **Research How to Make Bread:** What makes bread harder or softer? What makes a strong shape? How can your team build a loaf of bread that is made to be strong instead of soft for eating?
2. **Develop Your Recipe:** Each should include a list of ingredients, a mixing methodology, baking time, and temperature. If your team took any other steps to make your loaf stronger, list them on your **Recipe Worksheet**.

Make sure to double check the rules to see what ingredients are available for your team to use in your bread recipe.

3. **Bake a Test Loaf:** Now that your team has an idea of what your recipe will be, it's time to bake it and see how strong your bread is.
4. **Test Your Loaf of Bread:** Once baked, teams should test out their bread to see how durable and strong it is. Record any observations from your test at home. Teams are encouraged to create different prototypes and test them. It's important to have a strong shape as well as strong building materials.

Teams are encouraged to try different shapes during the prototyping phase. Look at different bridges and beams for inspiration relating to strong bridge shapes.

5. **Bake Your Competition Loaf:** After your team is finished prototyping, bake your final competition loaf.
6. **Time for Judging:** Bring your competition loaf and Recipe Worksheet to the Science Games for judging. At Science Games, judges will ask your team questions about your bread bridge, recipe, and meothodology. Make sure all of your team members can answer questions about your bread bridge and bridge-making process. Prepare these items as a team!

ENGINEERS & GEOSCIENTISTS BRITISH COLUMBIA

2020

SCIENCE GAMES

SATURDAY, MARCH 7, 2020

DIVISION 2: TAKE HOME ACTIVITY
BREAD BRIDGE BONANZA

RULES

- The loaf must be capable of spanning a gap that is 30 cm in length.
- The loaf may not weigh more than 1 kg (2.2 lb) at the time of testing. If it weighs more, then the bread will be scored less based on how much over the limit the loaf is.
- The loaf may only be made of typical, edible bread ingredients that could be found in a bakery or grocery store, limited to the following:
    - Flour
    - Water
    - Yeast, baking soda, or baking powder
    - Liquid or granular sugar, which has not been processed into caramel or candy
    - Any oil or fat that is liquid at 45 degrees Celsius (includes margarine, butter, and coconut oil)
    - Salt
    - Food colouring
- Other ingredients not included in the list above are prohibited. Ingredients such as pasta, eggs, nuts, etc. are prohibited.
- The bread must be at room temperature at time of testing.
- The finished loaf must be edible and recognizable as bread, but the contestants are not required to eat the bread (i.e., burned bread is not considered edible).
- The team must submit their recipe with their loaf using the Recipe Worksheet provided. Recipe includes the ingredients list, mixing methodology, baking time, oven temperature, and a diagram of the shape of the loaf.

ENGINEERS & GEOSCIENTISTS BRITISH COLUMBIA

2020

SCIENCE GAMES

SATURDAY, MARCH 7, 2020

DIVISION 2: TAKE HOME ACTIVITY

BREAD BRIDGE BONANZA

RECIPE WORKSHEET

Recipe Name: _____

Think of a "punny" name for a bridge made of bread.

Version number: _____ Date Baked: _____

LIST OF INGREDIENTS	DRAW THE SHAPE OF A SLICE FROM THE MIDDLE OF YOUR LOAF
_____ _____	
_____ _____	
_____ _____	
_____ _____	
_____ _____	
_____ _____	
_____ _____	

MIXING AND BAKING INSTURCTIONS

LIST ANY FURTHER STEPS TAKEN TO ENHANCE THE STRENGTH OF YOUR BREAD

ENGINEERS & GEOSCIENTISTS BRITISH COLUMBIA

2020

SCIENCE GAMES

SATURDAY, MARCH 7, 2020

DIVISION 2: TAKE HOME ACTIVITY

BREAD BRIDGE BONANZA

RECIPE WORKSHEET

Recipe Name: _____

Think of a "punny" name for a bridge made of bread.

Version number: _____ Date Baked: _____

LIST OF INGREDIENTS	DRAW THE SHAPE OF A SLICE FROM THE MIDDLE OF YOUR LOAF
_____ _____	
_____ _____	
_____ _____	
_____ _____	
_____ _____	
_____ _____	
_____ _____	

MIXING AND BAKING INSTURCTIONS

LIST ANY FURTHER STEPS TAKEN TO ENHANCE THE STRENGTH OF YOUR BREAD

ENGINEERS & GEOSCIENTISTS BRITISH COLUMBIA

2020

SCIENCE GAMES

SATURDAY, MARCH 7, 2020

DIVISION 2: MYSTERY ACTIVITY

SLOPE N' SLIDE

Have you ever wondered why a road can get washed out during a rainfall event? Or why there are weight limits on certain roads? Engineers and geoscientists work together to build roads and try to avoid environmental disasters!

This activity will help teams understand slope stability and moisture content and why they are vital in road construction, by having teams construct their very own roads with different slopes! Slope stability is important because we want to understand how we can construct a road on a preexisting slope, the safest way, so that there won't be a landslide.

INSTRUCTIONS

1. **Assess Materials Available:** Each team will have a container used to simulate an environment, access to rolled oats, water, weights and the tools available to construct your road.
2. **Construction Begins:** Construct a road with a **30 degree** slope angle.
3. **Test Your Road:** Use the weight provided to test the road you constructed and how it reacts when a car (weight) is placed on it.
4. **Record Your Observations:**
   - What happened when your car moved along the road?
   - Did your slope change?
   - How far did your road materials slide into the Environmental Zone? (measure the distance)
5. **Continue Construction:** Construct a road with a **60 degree** slope angle.
6. **Test Your Road:** Use the weight provided to test the road you constructed and how it reacts when a car (weight) is placed on it.
7. **Record Your Observations:**
   - What happened when your car moved along the road?
   - Did your slope change?
   - How far did your road materials slide into the Environmental Zone? (measure the distance)
8. **Continue Construction:** Construct a road with a **30 degree** slope angle. During this build you will can add water to your road. You will have a limited amount of water available to add.
9. **Test Your Road:** Use the weight provided to test the road you constructed and how it reacts when a car (weight) is placed on it.

DIVISION 2: MYSTERY ACTIVITY
SLOPE N' SLIDE

10. **Record Your Observations:**
    - What happened when your car moved along the road?
    - Did your slope change?
    - How far did your road materials slide into the Environmental Zone? (measure the distance)
    - Did the water have an impact?
11. **Continue Construction:** Construct a road with a 60 degree slope angle. During this build you will can add water to your road. You will have a limited amount of water available to add
12. **Test Your Road:** Use the weight provided to test the road you constructed and how it reacts when a car (weight) is placed on it.
13. **Record Your Observations:**
    - What happened when your car moved along the road?
    - Did your slope change?
    - How far did your road materials slide into the Environmental Zone? (measure the distance)
    - Did the water have an impact?
14. **Judging:** Answer Judges questions about your road.

RULES

- Team members should work as a team to take turns using the protractor and and recording results.
- Teams cannot touch the rolled oats with their hands (it's like cement and it may dry on you!)
- Teams can only use road construction tools (e.g. plastic spoons and forks) to build their road
- Teams need to cover the Building Zone and have it at the correct angle for the test.
- Teams should be as tidy as possible with the rolled oats. Your team may be docked points.

ENGINEERS & GEOSCIENTISTS BRITISH COLUMBIA

2020

SCIENCE GAMES

SATURDAY, MARCH 7, 2020

DIVISION 2: MYSTERY ACTIVITY

SLOPE N' SLIDE

ACTIVITY WORKSHEET

Team Name: _____

EXPERIMENT 1: DRY SAND (30 DEGREES)

Sketch Observation:	**Measured Angle (degrees)**	
	Mass Applied (g)	
	Enviro Score	

ENGINEERS & GEOSCIENTISTS BRITISH COLUMBIA

2020

SCIENCE GAMES

SATURDAY, MARCH 7, 2020

DIVISION 2: MYSTERY ACTIVITY

SLOPE N' SLIDE

ACTIVITY WORKSHEET

Team Name: _____

EXPERIMENT 2: DRY SAND (60 DEGREES)

Sketch Observation:	**Measured Angle (degrees)**	
	Mass Applied (g)	
	Enviro Score	

ENGINEERS & GEOSCIENTISTS BRITISH COLUMBIA

2020

SCIENCE GAMES

SATURDAY, MARCH 7, 2020

DIVISION 2: MYSTERY ACTIVITY

SLOPE N' SLIDE

ACTIVITY WORKSHEET

Team Name: _____

EXPERIMENT 3: WET SAND (30 DEGREES)

Sketch Observation:	**Measured Angle (degrees)**	
	Mass Applied (g)	
	Enviro Score	

ENGINEERS & GEOSCIENTISTS BRITISH COLUMBIA

2020

SCIENCE GAMES

SATURDAY, MARCH 7, 2020

DIVISION 2: MYSTERY ACTIVITY

SLOPE N' SLIDE

ACTIVITY WORKSHEET

Team Name: _____

EXPERIMENT 4: WET SAND (60 DEGREES)

Sketch Observation:	**Measured Angle (degrees)**	
	Mass Applied (g)	
	Enviro Score	

ENGINEERS & GEOSCIENTISTS BRITISH COLUMBIA

2020

SCIENCE GAMES

SATURDAY, MARCH 7, 2020

DIVISION 2: MYSTERY ACTIVITY

WILD WATER SLIDES

Civil engineers design things you find in civilization: buildings, roads, and things we find under our feet, like water pipes and sewer systems. Mechanical engineers design the things that put civilization in motion: cars, airplanes, robots, and all the elements that make things go. In a nutshell, mechanical engineers design things that move and civil engineers design things that don't.

If you think about it, water slides do both: while the slide itself doesn't move, the water—and the person sliding down the slide—move very quickly! Civil and mechanical engineers work together to design and build water slides that are fun, work properly, and are safe for everyone to use.

In this activity, Division 2 teams will use their knowledge of simple machines, gravity, and the laws of motion to design a fun, safe, and water-tight water slide.

There's a new Splish Splash Water Park coming to your neighborhood and they need your help! They're calling upon your team of civil and mechanical engineers to use your expertise with water slide design and construction to put together something extra special for the new park!

Once you have a design, you will be given a variety of materials (some water proof and some not!) to build a prototype of your design. We will be testing each prototype by pouring water into the top of your slide and letting a Lego figurine slide down.

You will be marked on how well you are able to incorporate all of the design criteria below, how well your slide holds water, if our Lego figurine can slide all the way from top to bottom, and on your creativity in design.

INSTRUCTIONS

1. **Brainstorm Your Design:** As a group, talk about what you want your water slide to look like. Think about some of the topics you may have researched. What simple machine may you want to use for your slide? How will you keep the water from spilling out of the slide? Who is using your slide and what should you do to make sure that anyone using the slide is safe?

While setting up your waterslide, think about the following:

- A turn or bump in a waterslide must change the direction of travel (vertically or horizontally) by at least 45 degrees.
- Think about this! How will your Lego person get to the top of the slide?

2. **Design Your Water Slide:** Use the paper and pencils provided to sketch a few designs for your water slide. Don't forget the design requirements and think about the supplies available to build with. As a group, decide on a final design.

3. **Build Your Prototype:** Use the materials provided to build your design. You can use as many of the supplies that your group is given as you wish – you do not need to use them all if you don't want to.

4. **Test Your Slide:** When you're ready, have a judge come by to test your design. The judge will test your prototype by pouring water down your slide and having a Lego figurine slide down it.

5. **Talk About How It Went:** With your group and activity judge, talk about what changes would you make to your design if you were to do this activity again. What worked well and what didn't work so well?

ENGINEERS & GEOSCIENTISTS BRITISH COLUMBIA

2020

SCIENCE GAMES

SATURDAY, MARCH 7, 2020

DIVISION 2: MYSTERY ACTIVITY

WILD WATER SLIDES

RULES

- Teams can only build their structure with the materials provided; however, they may utilize any of the space around them.
- You will not be required to move your slide after it's built (we will do all the testing in-place).
- All team members must participate together in the designing and building process.
- Team should leave their activity area tidy.

You will need to design a water slide that meets the following design criteria:

- It must look like a slide and have a pool (bowl) at the bottom to catch all the water coming down the slide.
- It must stand up by itself and be sturdy enough to handle the testing.
- It must be able to carry water from top to bottom without leaking or spilling.
- It must contain at least one turn or one bump.
- It must offer a way for someone to climb from the bottom of the slide (or ground level) to the top, such as a ladder.
- It must carry a Lego person from top to bottom.