HILLSBOROUGH COUNTY
SCIENCE OLYMPICS

2016-2017
Science Olympics Handbook

Hillsborough County
PUBLIC SCHOOLS
Excellence in Education
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Supervisor of Elementary Science Education
Shana Tirado

District Resource Teachers, Elementary Science
Barb Brightman
Michele Wiehagen

District Science Academic Coaches
Area 1 Teresa Bode
Area 2 Stacy Summers
Area 3 Benjamin Donatelli
Area 4 Jane Kemp
Area 5 Brittany Long
Area 6 Melissa Triebwasser
Area 7 Ronald (Ken) Davis
Area 8 Mary Vaughn

Hillsborough Association of Elementary Science Teachers
Mary Vaughn, President
Teresa Bode, President-Elect
Christine Danger, Secretary
Stacy Summers, Treasurer
Michele Bubley-Wiehagen, Past President
Regina Gordon – Past President
Jessica Doherty-Past President
Laura Dunn, Virginia Frissell, Robin Swenson

Science Olympics Co-Chairs
Laura Dunn & Teresa Bode

Olympic Event Chairs
Kindergarten- Diane Davis
1st Grade- Cynthia Lilly
2nd Grade-Jane Kemp
3rd Grade- Melissa Triebwasser
4th Grade- Virginia Frissell
5th Grade- Ken Davis

Olympic Event Head Judges
Kindergarten- Mona Clark
1st Grade- Karen Sampson
2nd Grade-Yvonne LaRosa
3rd Grade- Judy Der
4th Grade- Christine Perez
5th Grade- Ben Donatelli
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PHILOSOPHY

The Science Olympics have been established to:

1. Strengthen student motivation and interest in science and engineering practices.
2. Promote community awareness of STEM.

All events are completed in one day and contestants are required to finish all work on site without assistance from parents or teachers. Prior practice at school sites will increase success on the day of the event.

Why compete?

The Olympics events provide an exciting atmosphere for students, teachers and the community to demonstrate the knowledge and skills students have acquired through the science process and engineering practices. The events are designed to strengthen a student’s investigative and problem solving skills.

Who can enter the Olympics?

Any Hillsborough County public or private K-5 school may enter the Olympics. Each entry will be allowed to bring a team, which consists of the individual or team grade level representatives for each event. Students must compete in a school Olympics before they are eligible to enter the Hillsborough County Olympics. After schools have determined their grade level representatives, the School Registration Form must be returned with your intent to participate and the names of the students representing your school so ample supplies can be ordered.

Competitions

<table>
<thead>
<tr>
<th>GRADE LEVEL</th>
<th>EVENT TITLE</th>
<th>GROUPING</th>
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<tbody>
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</tr>
<tr>
<td>Fifth Grade</td>
<td>Marble Coasters</td>
<td>1 team of 2 students</td>
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QUESTIONS TO ENGAGE THINKING

The Science Olympics activities can all incorporate higher order questions before, during, and after completing the design challenges. Before: use these questions to engage students with the activity or pull out and activate background knowledge. During: use these questions to challenge students further or guide their thinking. After: use these questions to have students show what they have learned as a result of completing their design challenges through notebook reflections or classroom discussions.

**Applying**

- How is ______ an example of . . . . ?
- How could you use . . . . ?
- In your life, how would you apply . . . . ?

**Observing**

- What observations did you make?
- What changes did you make?

**Assessing**

- How could you improve . . . . ?

**Planning**

- What preparations would you . . . . ?

**Connecting/Associating**

- What do you already know about . . . . ?
- What connection can you make between . . . . ?

**Predicting/Hypothesizing**

- What would you predict . . . . ?
- If you were going to guess . . . . ?

**Inferring**

- What would happen if . . . . ?
- What would have happened if . . . . ?

**Problem solving**

- How would you approach the problem?
- What are some possible solutions to . . . . ?

**Evaluating**

- What are the advantages and disadvantages . . . . ?
- What is the most important . . . . ?

**Experimenting**

- How can you test . . . . ?
- What could you do to . . . . ?

**Interpreting**

- Why is ______ important?
- What is the significance of . . . . ?
- What role . . . . ?
Engineer(s): ____________________________

Science Olympics Planning Sheet

Problem/Challenge:

_________________________________________________________________________

Investigate/Brainstorm: *Independently, sketch possible solutions.*

A. _______________________________________________________________________

B. _______________________________________________________________________

*Identify the strengths and weaknesses of this design. How will it help you to complete your proposal?*

_________________________________________________________________________

_________________________________________________________________________

Plan/Design: *Compare your design with your partner’s and choose the one you want to build. Sketch your blueprint. Remember to identify materials and label your design.*

_________________________________________________________________________
Build/Test: Build and then test your solution.

Collect and Analyze Data: Collect data throughout your trials.

<table>
<thead>
<tr>
<th>Data Chart</th>
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<tbody>
<tr>
<td>Trial 1</td>
</tr>
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<td>Trial 2</td>
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<tr>
<td>Trial 3</td>
</tr>
<tr>
<td>Trial 4</td>
</tr>
<tr>
<td>Trial 5</td>
</tr>
</tbody>
</table>

Reflect/Improve:
Was it the best solution? Why or Why not?

What would you have done differently? How would you improve your design?

Evaluate and justify your answer.
Discuss your findings with the other engineers in the classroom. Draw a conclusion using your data to justify your thoughts.

*Use the data and collected observations to design and test a NEW prototype.*
<table>
<thead>
<tr>
<th>DATE</th>
<th>EVENT/ITEM</th>
<th>LOCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>September 6- November 4</td>
<td>School Olympics</td>
<td>Your School Site</td>
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<tr>
<td>October 12, 2016</td>
<td>School Registration Form &amp; Registration Fee Due</td>
<td>School Mail to: Shana Tirado Elementary Science ROSSAC Rt. 7</td>
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<tr>
<td>October 29, 2016 Areas 1, 3, 5, 7</td>
<td>Semi-Finals</td>
<td>Museum of Science and Industry, Tampa</td>
</tr>
<tr>
<td>November 5, 2016 Areas 2, 4, 6, 8</td>
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<td>Science Olympics Finals</td>
<td>Museum of Science and Industry, Tampa</td>
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</table>
2016 Science Olympics Registration Form  
Museum of Science Industry  
Due: October 12, 2016

School: ___________________________  
Route #: ________

Science Olympic Contact(s): ___________________________  
Phone: ___________________________
Science Olympic Contact(s) email: ___________________________

<table>
<thead>
<tr>
<th>GRADE LEVEL</th>
<th>EVENT</th>
<th>GROUPING</th>
<th>NAME OF STUDENT(S) (First &amp; Last Names)</th>
<th>Signed Media Release on file. (Please initial)</th>
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<tbody>
<tr>
<td>Kindergarten</td>
<td>Skyscrapers</td>
<td>1 team of 2 students</td>
<td></td>
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<tr>
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<td>Aqua Foils</td>
<td>1 student</td>
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<tr>
<td>Second Grade</td>
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<td>Fifth Grade</td>
<td>Marble Coasters</td>
<td>1 team of 2 students</td>
<td></td>
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It is suggested to have an alternate student/team chosen in case something happens to the students entered.  
The alternate can replace the registered student(s) on the day of the Olympics.

REGISTRATION FEE

-Schools with 100% HAEST membership by October 12, 2016: Free

-Schools WITHOUT 100% HAEST membership by October 12, 2016: $30  
This fee helps to cover the cost of materials and awards for the events.

Checks made payable to HAEST. NO CASH WILL BE ACCEPTED.

Name on check: ___________________________  
Check #: ___________________________

*Please do not staple CHECK – attach with paperclip  
Due: October 12, 2016 to:

Shana Tirado  
Elementary Science  
ROSSAC  
Rt. 7  

Shana Tirado  
Elementary Science  
901 East Kennedy  
Tampa, FL 33602
Dear ________________,

Congratulations on your outstanding accomplishment to represent your school at the 2016 Science Olympics at the Tampa Museum of Science and Industry (MOSI) on ________________. You should be very proud of your hard work! No supplies will need to be brought by you unless you are a 3rd Grade Balloon Racer student, 4th Grade Marshmallow Flyer Student, or a 5th Grade Marble Coaster student. If you are competing in these events, remember to bring your Balloon Racer, Marshmallow Flyer, or your Marble Coaster blueprint.

You and your family will not be charged an entry fee to participate in the Olympics, but you must receive an entry sticker. MOSI entry stickers will be distributed to you outside the Main Entrance of MOSI. You and your parents need to allow a few extra minutes upon arrival to receive that MOSI entrance sticker before you go to the event location and still allow you time to “find” the event location. You will check-in for your event at the specific location of your event. You will receive more information about this as the Olympics date nears. On the Saturday of the Olympics, the museum will be open to the public. You and your family are invited to stay after your event and explore MOSI.

Should you and your family want to view a movie at the IMAX Dome Theatre be prepared to pay a discounted admission fee of $5.95 per person (discount is good on the day of your event only and excludes special engagements). In addition, the ropes course is available for $5 and the Zipline is $8. The rest of the museum is free for you and your family all day long!

*Please note that MOSI charges $5.00 per vehicle and must be paid at the parking station. The fee can be paid in the form of cash or credit card.

Have a fun and educational day!!!!

Please call the school if you have any questions. Sincerely,

______________________
School Olympic Contact Teacher
Estimado ____________________:

Felicidades por el logro de representar tu escuela en las Olimpiadas de Ciencia del 2016 en MOSI, el _____________________________. ¡Debes estar muy orgulloso(a) de tu arduo trabajo! No necesitarás llevar contigo ningún tipo de materiales a menos que seas un estudiante de quinto grado en Marble Coaster. Recuerda traer el plan de Marble Coaster y Balloon Racer.

Tu y tu familia no tendrán que pagar la entrada para participar en las Olimpiadas, pero recibirás un sello adhesivo de entrada. El sello adhesivo de entrada a MOSI se entregará en la entrada principal. Tú y tus padres deberán llegar unos minutos antes para recibir este sello adhesivo de entrada antes de ir al lugar del evento y también necesitarán tiempo adicional para encontrar el lugar del evento. La registración para tu evento se hará en el mismo lugar del evento. Ver el itinerario. MOSI es un lugar muy grande. El museo estará abierto al público ese sábado, durante las Olimpiadas. Tú y tu familia están invitados a quedarse después del evento y explorar MOSI.

Si ustedes desean ver una película en el teatro IMAX, deberán pagar una entrada a precio reducido de $5.95 (este precio es bueno solamente durante el día de el evento) También podrán usar el curso de queridas por $5 y el Zipline por $8. El resto del museo es gratis para ti todo el día.

* Tenga en cuenta que MOSI cobra $5.00 por vehículo y debe pagarse en el estacionamiento de la estación. La cuota puede prestarse en forma de efectivo o tarjeta de crédito.

¡Que tengas un día educativo y divertido!!!!

Por favor, llama a la escuela si tienes alguna pregunta. Atentamente,

______________________________
Maestra Contacto, Olimpiada Escolar
## MATERIALS

<table>
<thead>
<tr>
<th>GRADE</th>
<th>EVENT</th>
<th>SUPPLIES</th>
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</table>
| Kindergarten | Skyscrapers    | • 20 paper cups, (8 oz-12 oz) per team* (Size can vary based upon availability)  
• 10 plastic cups, 473 mL (16 oz) per team  
• 5 letter-size manila file folders per team  
• Timer or Stopwatch for judging purposes*  
• Meter sticks or measuring tapes for judging purposes* |
| First        | Aqua Foils     | • Heavy-duty aluminum foil (One 30cm X 20 cm piece per team)  
• Marbles (small student size)*  
• Water*  
• Timer or Stopwatch for judging*  
• Strawberry baskets (to hold marbles for weigh-in)  
• Plastic Bins approx. 40 cm x 14 cm x 27 cm (for water to float foil boats)  
• Scales (to weigh marbles for judging) |
| Second       | Paper Airplanes| • 1 sheet of 8 ½” x 11” white copy paper per student  
• Timer or Stopwatch for judging*  
• Meter sticks or measuring tapes for judging* |
| Third Grade  | Balloon Racers | • Two nine inch oval balloons  
• One letter-sized manila file folder*  
• Four pipe cleaners 12"long, 6mm wide  
• Eight bendable drinking straws  
• One pair of scissors  
• 30 centimeters of masking tape*  
• Meter sticks or measuring tapes for judging* |
| Fourth Grade | Marshmallow Flyers | • 1 paper cup, (8 oz-12 oz) per team* (Size can vary based upon availability)  
• 25 ETA brand SnapCubes per team  
• 1 paint stir stick per team  
• 2 large marshmallows (one for each trial) per team  
• A foam mat (ex. a yoga mat) on which to place the flyer to launch  
• Goggles for launching  
• 4 Size-19 rubber band per team  
• Marker (to mark team’s name on marshmallow) per team  
• 30 cm masking tape (1") per team*  
• Timer or Stopwatch for judging*  
• Meter sticks or measuring tapes for judging* |
| Fifth Grade  | Marble Coaster | • 3 pieces of 1” pipe insulation (slit in half length-wise and approximately 1.8 meters long each) per team  
• 1 marble (small student size glass) per team*  
• 4 paper cups, (8 oz-12 oz) per team* (Size can vary based upon availability)  
• 300 cm masking tape (1") per team*  
• 1 chair  
• Timer or Stopwatch*  
• Meter sticks or measuring tapes for judging* |

*Cup size will be consistent during all heats of the Science Olympics District Competition.*  
*Items in BOLD type are available in the Office Depot Catalog.*  
*Items to be used in multiple events*  

NOTE: Not all items need to be purchased by the school. Ask local businesses for donations. Parents are also a good source for donations either from their place of work or from home.
Skyscrapers
Kindergarten

Grouping:
Team of two (2) students

Purpose:
The purpose is for a team of two engineers to build a tower from all the materials provided. Using the beginning principles of architectural engineering, the engineers will create a foundation that will support their tower.

Materials:
- 20 paper cups, 237 mL (8 oz-12 oz) per team (Size can vary based upon availability)
- 10 plastic cups, 473 mL (16 oz) per team
- 5 letter-size manila file folders per team
- Timer or Stopwatch for judging purposes
- Meter sticks or measuring tapes for judging purposes

Time Limit:
The team will have 10 minutes to create a tower.

Procedure:
A team of two engineers will create a Skyscraper. It is not required to use all materials. Materials may be manipulated. The engineers will NOT be allowed to stand on chairs or any other items.

Scoring & Judging Notes:
The winning group will erect the tallest standing structure. The Skyscraper must stand until measured. If any materials fall, after time is called or during judging, the engineer may not replace the fallen materials. Due to size availability of the paper cups, the competition will remain fair as long as all students are given the same size.

Safety:
Engineers will not be allowed to stand on chairs, etc. They must devise ways to add height.

Sunshine State Standards:
- Big Idea 1: The Practice of Science
  - SC.K.N.1.1: Collaborate with a partner to collect information.
- Big Idea 5: Earth in Space and Time
  - SC.K.E.5.1: Explore the law of gravity by investigating how objects are pulled toward the ground unless something holds them up.
The Mayor of Tampa has asked YOU to design and build a new building in downtown Tampa! He wants a building that will be taller than all the other buildings in downtown Tampa.

What will your building look like? How tall can you build it?

Good luck! The Mayor is counting on you!
OBJECTIVE:
In a team of two engineers, build the highest possible tower from the materials you are given.

MATERIALS PROVIDED:
- 20 Paper Cups, (8 oz.-12 oz.)
- 10 plastic cups, 473 mL (16 oz)
- 5 letter-sized manila file folders

RULES:
- You may use only the materials provided to you on the day of the event.
- Teams may NOT stand on chairs or any other items.

Time Limit
Teams will have 10 minutes to build a tower.

PROCEDURE:

☐ Your team may choose to practice prior to the day of the event by collecting your own materials and building towers to find the best method.

☐ On the day of the event, your team will use the materials given to you to create a skyscraper in a 10 minute time period.

☐ Towers will be measured after the 10-minute building period. Any tower that falls after time is called, or during judging, may not be fixed.
Aqua Foils
First Grade

Grouping:
Individual engineer

Purpose:
To see how many marbles an aluminum foil boat can hold

Materials:
- Heavy-duty aluminum foil (One 30cm X 20 cm piece per team)
- Marbles (small student size)
- Water
- Timer or Stopwatch for judging
- Strawberry baskets (to hold marbles for weigh-in)
- Plastic Bins approx. 40 cm x 14 cm x 27 cm (for water to float foil boats)
- Scales (to weigh marbles for judging)

Time Limit:
The engineer is allowed 3 minutes to create the aqua foil boat.

Procedure:
The engineer will be given foil and will have 3 minutes to create a boat; after time is called engineers may not manipulate their boat. Each engineer will individually bring his or her boat to the water container (see above). The engineer will place his or her marbles in the boat one at a time until the boat begins to take on water and sink. Once marbles are placed inside of the boat they may not be picked up or moved. The judge will count or find the mass of the marbles. If you have no available scales, just count the marbles, but keep the marbles consistent in size and material they are made of.

Scoring & Judging Notes:
The boat holding the greatest mass before sinking will be the winner. The marble that sinks the boat will not be counted in the mass.

Sunshine State Standards:
- Big Idea 1: The Practice of Science
- SC.1.N.1.1 - Raise questions about the natural world, investigate them in teams through free exploration, and generate appropriate explanations based on those explorations.
- Big Idea 8: Properties of Matter
- SC.1.P.8.1 - Sort objects by observable properties, such as size, shape, color, temperature (hot or cold), weight (heavy or light), texture, and whether objects sink or float.
You and several of your friends are stranded on an island with no way to get home. Luckily, you have just found a large piece of metal! You think that the piece of metal is large enough to make into a boat to take YOU off the island, but you want all of your friends to come with you, too.

What is the best way to shape the metal to form a boat that will get you and your friends safely off the island? Your friends are counting on you!!!
OBJECTIVE:
You will create a boat out of provided materials that will hold the most marbles.

MATERIALS PROVIDED:
- 1 piece of heavy-duty aluminum foil (30cm x 20cm)
- Marbles (small student size)
- Plastic Bin in which to float boat
- Water

RULES:
- You must build your boat in the three (3) minute time period only.
- You may only use the piece of foil provided.
- You may tear your foil, but you may not use scissors or tape

TIME LIMIT:
You will be given three (3) minutes to build your Aqua Foil boat.

PROCEDURE:
- You may choose to practice prior to the day of the event by gathering your own materials, making practice boats, and testing them.
- On the day of the event, you will:
  - Build your boat in three (3) minutes. After the three minute building time period, you will not be allowed to work on your boat.
  - You will then place your boat in a bin of water and place marbles one at a time in the boat until it begins to take on water and sink. Once marbles are placed inside, they may not be picked up or moved.
  - When your boat sinks, the judges will find the mass of your marbles for you.

SCORING:
- The mass of the marbles your boat held will be your score.
- The boat holding the greatest mass before sinking will be the winner.
- The marble that sinks the boat will not be counted in the mass.
Paper Airplanes
Second Grade

Grouping:
Individual engineer

Purpose:
To create a paper airplane that will fly the farthest

Materials:
- 1 sheet of 8 ½” x 11” white copy paper per engineer
- Timer or Stopwatch for judging
- Meter sticks or measuring tapes for judging

Time Limit:
Engineers will be given 3 minutes to construct an airplane. Note: Paper balls are not considered airplanes!

Procedure:
The engineer will construct an airplane. Standing with toes behind the start line will toss the airplane. Engineers may be outside, so wind speed and direction may have to be considered.

Scoring & Judging Notes:
The plane will be measured in meters from starting point to landing point or the stopping point (stopping point after slide). If the plane hits an object other than the ground, the engineer will have the option to toss the airplane again. Engineers will only be allowed to re-throw a maximum of two times. We will use the BETTER of two throws to count as the final score.

Safety:
Throw planes away from other children.

Sunshine State Standards:
- Big Idea 1: The Practice of Science
  - SC.2.N.1.6: Explain how scientists alone or in groups are always investigating new ways to solve problems.
- Big Idea 13: Forces and Changes in Motion
  - SC.2.P.13.3: Recognize that objects are pulled toward the ground unless something holds them up.
There is a crisis, and airplane design engineers are requesting YOUR help!

With the rising price of fuel, a plane is needed that will use less fuel. In fact, the engineers want you to build a plane that will glide through the air without using any fuel. They have requested that you use one piece of 8 ½” x 11” paper to build your plane.

Good luck! The airplane design engineers are counting on you!
OBJECTIVE:
You will create a paper airplane that will fly the farthest.

MATERIALS PROVIDED:
1 piece of 8.5” x 11” white, copy paper (standard weight)

TIME LIMIT:
You will be given three (3) minutes to construct your airplane.

RULES:
• You must build your plane in the three (3) minute time period only.
• You may only use the piece of paper provided.
• You may tear your paper, but no scissors will be provided. Paper balls are not considered an airplane.
• You may be outside, so wind speed and direction may need to be considered. Also, keep in mind that you will not know the wind conditions of the event day ahead of time.

PROCEDURE:
• You may choose to practice prior to the day of the event by gathering your own materials and making practice planes.
• On the day of the event, you will:
  □ Build your plane in three (3) minutes. After the three minute construction time period, you will no longer be able to adjust or work on your plane.
  □ Standing with your toes behind the start line, you will toss your airplane straight ahead.

SCORING:
• The linear distance will be measured in meters from the starting point to the landing/stopping point of the plane.
• If the plane slides, the point at which it comes to rest will be the point to which it is measured.
• You will be allowed two (2) trial throws. The better score of the two trials will count as your final score.
• If the airplane hits an object other than the ground, the engineer will have the option to toss the airplane again. You will only be allowed to re-throw a maximum of two times.
Grouping:

Team of two (2) engineers

Purpose:

The purpose is for a team of two engineers to design and build a balloon-powered vehicle, **ACCORDING TO PLANNED BLUEPRINT SPECIFICATIONS**, using the materials provided that will travel the greatest distance.

Materials:

- Two 9 inch oval balloons
- One letter-sized manila file folder
- Four chenille pipe cleaners (12" long, 6mm wide Office Depot # 270801), twelve inch length
- Eight bendable drinking straws
- One pair of scissors
- 30 centimeters of masking tape
- Meter sticks or measuring tapes for judging*

Time Limit:

Engineers will have ten minutes to build their design based on their blueprints.

Procedure:

The team of engineers will design and build a balloon racer. The racer must be powered by one balloon. **It is required to use a component of all materials** in the design of the racer. Materials may be manipulated. This racer will start on the floor at a designated starting location. Engineers will have ten minutes to build their design. A **blueprint with specifications of the Racer must be made on an 8 1/2” x 11” copy paper (or graph paper) and brought to the competition. Teams without a blueprint will not be allowed to compete. THERE WILL NOT BE TIME TO MAKE ONE at the Olympics.** Engineers will release their racer. Once the racer stops moving, it will be measured in a straight line from the closest point of the racer to the starting line. They will have one try.

Scoring & Judging Notes:

Prior to the competition, engineers should test their balloon to make sure there is not a hole in it. The winning team will create a racer that travels the furthest measured via straight line from the starting line to the closest point of the device. Racers that finish behind the start line will not be measured. After time is called engineers may not add or alter their design. **Engineers are not allowed to cross the starting line.**

Safety:

- Be careful blowing up the balloon.
- Items or pieces of items may not be placed inside the balloon.
- Be aware of engineers with latex allergies.
- Use correct safety measures with the scissors.

Sunshine State Standards:

- **Big Idea 1: The Practice of Science**
  - SC.3.N.1.1 - Raise questions about the natural world, investigate them individually and in teams through free exploration and systematic investigations, and generate appropriate explanations based on those explorations.
- **Big Idea 5: Earth in Space and Time**
  - SC.3.E.5.4 - Explore the Law of Gravity by demonstrating that gravity is a force that can be overcome.
- **Big Idea 10: Forms of Energy**
  - SC.3.P.10.1 - Identify some basic forms of energy such as light, heat, sound, electrical, and mechanical.
  - SC.3.P.10.2 - Recognize that energy has the ability to cause motion or create change.
The HAEST transportation committee is requesting your help in designing a mode of transportation which is more environmentally friendly. The transportation committee wants their designers to know that resources are limited, and the focus is on creating the most efficient transportation device possible. Due to this, the materials will be restricted and all devices must be powered by a balloon.

Good Luck! HAEST is counting on you to get things moving!
OBJECTIVE:
To design and build a balloon-powered vehicle that will travel the greatest distance

MATERIALS PROVIDED:
- Two nine inch balloons (latex or non-latex)
- One letter-sized manila file folder
- Four chenille pipe cleaners (12” long 6mm wide office depot #270801)
- Eight bendable drinking straws
- One pair of scissors
- 30 centimeters of masking tape
- Meter sticks or measuring tapes for judging*

SAFETY: Items or pieces of items may not be placed inside the balloon.

RULES:
- Your device must be powered by a single balloon (two balloons are provided in the event one pops)
- You are required to use a component of all materials in the design of the racer.
- A blueprint of your design must be brought to the challenge
- You have 10 minutes to build your design
- Your device must start on the floor at a predetermined start line. You may not cross the starting line.
- Your device must follow the design on your blueprint.

PROCEDURE:
☐ You may choose to practice prior to the day of the event by gathering your own materials and designing your device and testing it.

☐ On the day of the event:
  o You will be given ten minutes to build your device based on the blueprint or drawing you bring with you. After the 10 minute build time, you will no longer be able to adjust or work on your device.
  o You will be given a set of materials, you are required to use a component of the materials in the design of your racer, but your device must be powered by the balloon.
  o Your device must start on the floor at the designated starting location.

SCORING:
- With a meter stick, the judges will measure the distance the balloon racer traveled from the starting point to the closest point of the device, in a straight line. You may not cross the starting line.
- You will be allowed one try.
- The team with the furthest distance will be the winner.
- The device will only be measured if it has travelled in a forward motion. It cannot end behind the starting line.
Marshmallow Flyers

Fourth Grade

Grouping:
Team of two (2) engineers

Purpose:
To construct a flyer using the given materials, **ACCORDING TO PLANNED BLUEPRINT SPECIFICATIONS**, that will launch a large-size marshmallow the greatest distance.

Materials:
- 1 paper cup, (8 oz-12 oz) per team *(Size can vary based upon availability)*
- 25 ETA SnapCubes per team
- 1 paint stick per team
- 2 large marshmallows (one for each trial given 1 at a time for each launch)
- 4 size-19 rubber bands
- 30 cm masking tape (1”) per team
- Timer or Stopwatch for judging
- Meter sticks or measuring tapes for judging
- Goggles to wear for launching
- 1 foam mat if launching from a hard surface (ex. yoga or placemat)

Time Limit:
Engineers will have ten minutes to build their design based on their blueprints.

Procedure:
The flyer will be built using all the supplies listed. **A blueprint with specifications of the flyer must be made on an 8 1/2” x 11” copy paper (or graph paper) and brought to the competition. Teams without a blueprint will not be allowed to compete. THERE WILL NOT BE TIME TO MAKE ONE at the Olympics.** The marshmallow will be placed in the carrier that the engineers design using the material(s). The base will be made of SnapCubes and the snap cubes must touch the paint stick. The base of the flyer may be held during the launch, but not attached to the floor, wall or person. Engineers will have ten (10) seconds to launch their marshmallow after the judge gives them the marshmallow. The force must come in front of the marshmallow. If the marshmallow hits anything other than the ground, the engineers will have the option to launch again up to a maximum of two re-launches. After the first launch, engineers will be given one (1) minute to repair the flyer to the original design. If it breaks during launch, replacement materials will not be provided. All materials must be used!

Definition
**Carrier** – the carrier is the part of the flyer in which the marshmallow can rest unassisted until launch.

Scoring & Judging Notes:
1 marshmallow will be given to the engineering team at each launch. The marshmallow will be measured in meters from starting point to the final stopping point. The BEST distance of two launches will be used as the team’s score.

Sunshine State Standards:
- Big Idea 1: The Practice of Science
  - SC.4.N.1.1: Raise questions about the natural world, use appropriate reference materials that support understanding to obtain information (identifying the source), conduct both individual and team investigations through free exploration and systematic investigations, and generate appropriate explanations based on those explorations.
- Big Idea 10: Forms of Energy
  - SC.4.P.10.2: Investigate and describe that energy has the ability to cause motion or create change.
- Big Idea 12: Motion of Objects
  - SC.4.P.12.1: Recognize that an object in motion always changes its position and may change its direction.
The American Marshmallow Company is searching for new ways to distribute their marshmallow products. They have asked you to design a way to send a marshmallow over a great distance.

Your task is to create a flyer that will launch a marshmallow the greatest possible distance. The American Marshmallow Company has asked that you use all of the materials listed below, as these are products they have on hand at their factory. It is important that you use ALL of the materials so that there is no waste.

MATERIALS:
- 1 paper cup, (8 oz-12 oz)
- 25 SnapCubes
- 1 paint stir stick
- 1 Foam mat (ex. yoga mat, placemat)
- 4 size 19 rubber bands
- 30 cm masking tape, 2.3 cm (1” wide)
- 2 large marshmallows – given one at a time at each launch
- Goggles to wear for launching
OBJECTIVE:

A team of two engineers will construct a flyer that will launch a marshmallow the greatest distance.

MATERIALS PROVIDED:
- 1 paper cup, (8 oz-12 oz. Size can vary based upon availability)
- 25 SnapCubes (PopCubes)
- 1 paint stir stick
- 2 large Marshmallows –given one at a time at each launch
- 4 size 19 rubber bands
- 30 cm masking tape 2.3cm (1”) wide
- Goggles to wear for launching

TIME LIMITS:
- Engineers will have 10 minutes to construct and test flyer.
- Engineers will have 10 seconds to launch their marshmallow after the judge gives them the marshmallow.

RULES:
- All materials must be used
- Flyer may not be attached to floor, wall or person.
- The flyer may be fixed after the first trial if it breaks. (1 minute repair time).
- The base is to be constructed of SnapCubes.
- The SnapCubes must touch the paint stick.
- A blueprint of your design must be brought to the challenge
- Your flyer must follow the design on your blueprint.
- The marshmallow must launch from the carrier.
- The force must come in front of the marshmallow.
- The marshmallow must remain unchanged after it is received.

PROCEDURE:
☐ You may choose to practice prior to the day of the event by gathering your own materials and designing your flyer and testing it.

☐ On the day of the event:
  - You will be given ten minutes to build your flyer based on the blueprint or drawing you bring with you. After the 10 minute build time, you will no longer be able to adjust or work on your flyer.

SCORING:
- The engineer will place the marshmallow into the carrier.
- The score will be the distance measured from the starting point to the stopping point in centimeters.
- If the marshmallow hits anything other than the ground, the engineers will have the option to launch again up to a maximum of two re-launches.
- The marshmallow that travels the greatest distance will be the winner.
  - Each team will have two (2) trials, with the score being the BETTER of the trials.
Marble Coaster
Fifth Grade

Grouping:
Team of two (2) engineers

Purpose:
To construct a marble roller coaster, **ACCORDING TO PLANNED BLUEPRINT SPECIFICATIONS**, that will allow a marble to roll down the roller coaster, hit a paper cup at the end of the coaster and move an unaltered cup. The cup that travels the farthest will be the winner.

Materials:
- Three half-pieces of 1” pipe insulation per team (see note below)
- 1 marble (small student size glass) per team
- 4 paper cups, (8 oz-12 oz) per team (Size can vary based upon availability, 3 must be used in the design of the coaster and 1 must remain unaltered for the end of the track)
- 300 cm of 1” masking tape per team
- 1 intermediate student-sized chair
- Timer or Stopwatch for judging
- Meter sticks or measuring tapes for judging cup distance
- 1 chair (style can NOT be guaranteed and engineers may not stand or sit on the chair)

*Note: Each team will receive three (3) sections (approximately 1.8 meters long x 1” diameter) of foam pipe **insulation** that has been cut lengthwise down the middle. (This will be cut prior to engineers receiving the pipe insulation). Engineers will be given THREE (3) of the half sections to create the Marble Coaster. Pipe insulation can be found in the plumbing section of Home Depot, Lowes, or home improvement-type stores. It is used to insulate the pipes around the hot water heater.

![Pipe Insulation Diagram](image)

Cut lengthwise, (straight)

Time Limit:
Engineers will have 20 minutes to construct and test their roller coaster based on their blueprint. No cutting or tearing of insulation will be allowed during the competition. Engineers will not be allowed to be part of the roller coaster structure. (They cannot hold it up or attach it to themselves.)

Procedure:
The roller coaster will be constructed from the three (3) half sections of 1” diameter pipe insulation that were previously cut lengthwise down the middle. **ALL MATERIALS MUST BE USED!** The coaster must contain at least: one loop, one hill, and two tunnels (see definitions). The coaster may only be attached to a chair and or the floor. **A blueprint with specifications of the roller coaster must be made on an 8 1/2” x 11” copy paper (or graph paper) and brought to the competition.** (You may want to make multiple copies.) **Teams without a blueprint will not be allowed to compete. THERE WILL NOT BE TIME TO MAKE ONE AT THE OLYMPICS.** All building materials will be provided. After the marble travels down the roller coaster through a loop, two tunnels
and a hill it will hit an unaltered cup, which is to be positioned within a five (5) cm radius of the coaster’s end. Engineers may NOT stand on chairs during construction or testing (any time). The marble will be placed on the foam within two (2) centimeters of the starting edge. It will be held in place by one finger of one teammate, and then released when the finger is moved. No extra force may be added to the release.

**Scoring & Judging Notes:**
After the marble travels down the roller coaster through a loop, two tunnels and a hill it will hit an unaltered cup, which may be positioned within a 5 cm radius of the coaster’s end. The distance will be measured from the center of the end of the coaster directly to the closest point on the cup at its resting location. The cup that travels the greatest distance will be the winner. If the roller coaster does not meet the regulations *(one loop, one hill, and two tunnels)* and follow the blueprint, no score will be recorded. Each team will have 2 tries with the score being the **BETTER** of the 2 trials. If repairs are necessary, a 30 second repair time may be granted at the judges’ discretion. If the unaltered cup hits an object, the engineer team will have the option to re-do the trial.

**Definitions:**
- **Hill**: a section of foam including first an incline then a decline
- **Loop**: a section of foam that allows the marble to travel 360°
- **Tunnel**: an enclosed section through which the marble travels

**Sunshine State Standards:**
- **Big Idea 1: The Practice of Science**
  - SC.5.N.1.1: Define a problem, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types such as: systematic observations, experiments requiring the identification of variables, selecting and organizing data, interpreting data and charts, tables, and graphics, analyze information, make predictions, and defend conclusions.
- **Big Idea 10: Forms of Energy**
  - SC.5.P.10.2: Investigate and explain that energy has the ability to cause motion or create change.
- **Big Idea 13: Forces and Changes in Motion**
  - SC.5.P.13.2: Investigate and describe that the greater the force applied to it, the greater the change in motion of a given object.

**Sample Blueprint:**

![Sample Blueprint Image]
You are a ride engineer for the most popular theme park in the world! Attendance at the park has decreased, and your boss has assigned you the task of creating a roller coaster that will attract visitors. However, she has some very specific directions that must be followed during the building of the roller coaster:

- The coaster must include at least **one hill**
- The coaster must include at least **one loop**
- The coaster must include at least **two tunnels**
- The engineers must create a blueprint of their prototype on an 8 ½” x 11” piece of paper.
- All materials must be used.

Your boss has suggested that you test your roller coaster design using the following materials:

- 3 pieces of pipe insulation,
- 300 cm tape
- 4 paper cups, (8 oz.-12 oz.) each

You are on a budget, so your boss does not want to you rip or tear the insulation, just in case it may be reused in the future. When you are done, you will need to place one of the cups at the end of your roller coaster model. Your boss feels that in order for the ride to be considered a successful attraction, your model must move the unaltered cup a great distance.

Are you up for the challenge? Your boss is counting on you!!!
OBJECTIVE:
In a team of two engineers, construct a marble roller coaster, according to planned blueprint specifications, that will allow a marble to roll down the roller coaster, hit a paper cup at the end of the coaster and move the cup. The unaltered cup that travels the farthest will be the winner.

MATERIALS PROVIDED:
- 3 (1.8m) sections of foam half-pipe insulation
- 300 cm masking tape
- 4 (8 oz.-12 oz.) paper cups (3 to be used in the design of the coaster and 1 for the end of the track)
- 1 marble
- 1 Chair
- 1 meter stick (to measure cup distance)
- tape measure (to measure cup distance).

COASTER MUST INCLUDE:
At least.....
- 1 Loop
- 1 Hill
- 2 Tunnels

TIME LIMITS:
- Engineers will have 20 minutes to construct and test their roller coaster based on their blueprint.
- Blueprints must be made prior to the event and brought the day of the event.

RULES:
- Blueprints must be made on 8.5” x 11” white paper
- Coaster must follow blueprints exactly
- The coaster may be attached to 1 chair provided (Safety: engineers may not stand or sit on the chair)
- The coaster may be attached to the floor
- The coaster may NOT be attached to anything/anyone else (walls, team members, etc.)
- All materials MUST be used
- 3 cups may be torn. The final cup must remain unchanged and placed at the end of the coaster.
- Insulation may NOT be cut or torn!

SCORING:
- One unaltered cup must be placed within a 5 cm radius of the end of the coaster.
- The marble will be released by one team member at the start of the coaster.
- After the marble travels down the coaster it will hit an unaltered cup, which may be positioned within a 5 cm radius of the coaster’s end.
- The score will be the distance measured from the center of the end of the coaster directly to the closest point on the unaltered cup at its stopping location in centimeters.
- The cup that travels the greatest distance will be the winner.
- Each team will have two trials, with the score being the BETTER of the trials.
- Any coaster that does not meet regulations (one loop, one hill, and two tunnels) AND follow the blueprint will be disqualified.
- If the cup hits an object, the engineer team will have the option to re-do the trial.
PROCEDURE:

BEFORE THE DAY OF THE EVENT:

☐ Plan your design with your team. You may wish to purchase your own materials and practice prior to the event. You can find pipe insulation at Lowes or Home Depot (about $1 to $2 per piece of tubing, which can be cut to make two half-pipe pieces). You will need to purchase 2 pieces of tubing to get the 3 half pieces.

☐ Draw a blueprint (including labels and measurements) of your coaster on a sheet of white printer paper (8.5”x 11”). You may want to make multiple copies of your blueprint.

☐ Bring your blueprint with you to the event. Teams without a blueprint will NOT be allowed to compete, and you will not have time to make one at the event.

DAY OF EVENT:

☐ Use your blueprint to construct your coaster. You will have 20 minutes to build your coaster based on your blueprint. You must follow your blueprint exactly.

☐ Make sure that your coaster includes one hill, one loop and two tunnels, and it can stand alone (you will not be able to hold it up). Any coaster that does not meet regulations AND follow blueprints will be disqualified.

☐ Test your coaster during your building time to make sure that it works the way you want it to work.

☐ All coasters will be tested after the 20-minute building time period.

Have fun!
Good Luck!