SCIENCE OLYMPIAD

Exploring the World of Science

San Joaquin County Elementary Division 2025-2026

Updated 12.10.26

SAN JOAQUIN COUNTY
OFFICE OF EDUCATION

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Science Olympiad Division A Rulebook

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Welcome to the 2026 Science Olympiad

Division A

Registration information is due October 23, 2025 (or when we reach 50 teams)
Register online at: https://forms.gle/jpH2kCvts4c47k3WA

The Permission Forms and Team Roster are due February 6, 2026

Team Size
Each team will consist of up to 18 students. Each team may have no more than (7) sixth grade students.

Alternates
Teams may have 3 alternate students, but they will not be registered on the "Official Team Member" list. They will be listed on the "Alternates" section. These students may be placed on the official team member list up to the day of the events or by 8:45am on the competition day. If a student needs to be replaced on the team, the head coach should go to the check-in table on the day of the competition to make changes.

Additional Teams
Registration for a second team (lottery) will open after the October deadline. A confirmation will be emailed to the head coach on October 27th, if there are still spots available. Continue to practice with your teams; spots may open up.

Code of Ethics
Student participants are expected to compete in tournament events with an honest effort to follow the rules and the spirit of the competition. Team members are expected to be the builders of all the devices used in the events. The goal of competition is to give one's best effort while displaying honesty, integrity, and sportsmanship. Students, coaches, parents, and guests are expected to display courtesy and respect toward Science Olympiad staff, volunteers, other teams, and guests of the Science Olympiad. Failure to show honesty, and/or courtesy by a participant, coach or guest of the team may result in the disqualification of the team from the event, the entire tournament or future tournaments.

Scheduling
Check the schedule of events carefully. Do not over-commit any one child. Although Event Managers can be flexible in allowing students to switch schedules, this is not guaranteed or required. If two teams compete from the same school, both teams will be put in the same section. The two teams do not work or collaborate.

Open Events

We will have designated areas for families to watch the open events. We kindly ask that spectators do not interact with competing students or event managers. If you have any concerns, please have your head coach reach out to the Science Olympiad Coordinator directly. We will remind parents to stay within the designated areas. Consequences of not listening will result in disqualification of team.

Event Manager

Each participating team is required to run one event. Events will be chosen on a first-come, first-served basis. The Event Manager will be required to:

- Understand the rules and procedures for event:
    - Impound rules
    - Scoring/Tie Breaker in place
    - Turn-in scores as soon as possible
- Create and Provide:
    - Event Test
    - Materials, handouts, etc. *(SJCOE can provide duplication)*
- Communication with coaches and SJCOE staff
- Be present full day of competition

We will be working closely with our event managers to ensure that all rules are aligned with the official manual. Please remember event managers are volunteers. Any concerns with an event manager should be shared with the head coach, and the head coach will bring to the event coordinator. **No exceptions.**

Impound

Impound is the period of time, before the start of competition, when teams must submit their constructed devices to Event Managers to be stored in secure locations.

- This will ensure that teams cannot modify their devices after the competition has begun, thus promoting fair competition.
- Any member of the team may “drop off” their build for impound, However, coaches and parents are NOT allowed.
- Impound for each event will be held in the same location as that event.

Disqualifications We've updated our disqualification policy to better align with Science Olympiad's vision of inspiring a love for science through hands-on learning and teamwork. Our goal is to ensure all students have the opportunity to participate, not to disqualify. Teams will still have the opportunity to participate but in a Tier status. Tier status are rankings after all Tier 1 teams have been ranked.

Astronomy

Description: Students will learn about stars and galaxies.

A Team of Up To: 2 **Approximate Time:** 50 min
Impound: No **Visitors:** No

Teams: Students may bring in one 8.5" x 11" double-sided page for the team with information from any source. Recommended that each participant bring in his/her own #2 pencils.

Event Managers: will provide all equipment, pictures, and diagrams needed.

The Competition: Participants will be presented with one or more tasks requiring their knowledge and understanding of stars and galaxies. Event will be a station to station timed test. Each station will have one or more answer sheets to be collected at each station. Information includes but is not limited to:

a. Types of Stars
b. Life Cycle of Stars
c. Population 1 and Population 2 Stars
d. Absolute vs Apparent Brightness
e. Hipparchus catalogue of Stars
f. Hertzsprung- Russel Diagram
g. Energy Production in Stars
h. Nucleosynthesis
i. Gravity
j. Cosmic Distance Ladder
k. Types of Galaxies
l. Organization of galaxies- Local Group, Supercluster etc.
m. Special Emphasis on the Milky Way Galaxy

Representative tasks:
1. Students will be given pictures of galaxies and identify the type
2. Students will determine the location of a star on the Hertzsprung-Russel diagram
3. Students will be able to put pictures of a star in order of its life cycle

Scoring: High score wins. Points will be awarded for the quality and accuracy of responses. Ties will be broken by the accuracy and quality of answers to pre-selected questions.

Boggle Science

Description: Teams will attempt to locate science words pertaining to a particular category on a board of 16 letters.

A Team of Up To: 2 **Approximate Time:** 50 min
Impound: No **Visitors:** No

Teams: No outside resources will be allowed.

Event Managers: will provide all equipment, pictures, and diagrams needed.

The Competition:

1. Teams will be given a board of 16 letters arranged in a 4x4 square pattern and a category. All teams will receive the same boards and the same categories.
2. The majority of words will be taken from the Astronomy Event topics.
3. 5 minutes will be given for teams to locate words pertaining to the given category on a specific bard of letters. Boards will contain 3-9 words each.
4. To make a word, students will start with a letter and each succeeding letter in the words must touch the previous letter in the same way (share a side OR touch corners). No letter square may be used more than once in a single word. Abbreviations, contractions, hyphenated words and foreign words not found in an English dictions are not acceptable. Singular and plural forms of a word count as the same word (i.e. CAR and CARS count as the same word, but CARS is worth more points due to extra letter.
5. Numbers given next to the letter in each box will be used to identify the first and last letters of the word (see sample next page)

Scoring: Five points will be awarded for each word. An additional point will be awarded for each letter in each word. Ties will be broken by number of words, then by the longest words.

Boggle Science cont.

Sample:

Category: Things with wheels

Team card:

C A R S
1 14
P L A N E
9 8
B I K E
15 8

Team board:

1C	2G	3N	4Y
5L	6A	7H	8E
9P	10R	11U	12K
13W	14S	15B	16I

5 X 3 words = 15 points (cars, plane, bike)
1 X 13 letters = 13 points (C,A,R,S,P,L,A,N,E,B,I,K,E)

Topics

Astronomy

a. Types of Stars
b. Life Cycle of Stars
c. Population 1 and Population 2 Stars
d. Absolute vs Apparent Brightness
e. Hipparchus catalogue of Stars
f. Hertzsprung- Russel Diagram
g. Energy Production in Stars
h. Nucleosynthesis
i. Gravity
j. Cosmic Distance Ladder
k. Types of Galaxies
l. Organization of galaxies- Local Group, Supercluster.etc
m. Special Emphasis on the Milky Way Galaxy

Bridge-a-Roni

Description: The objective of this event is to design and build the lightest bridge, constructed only of pasta and glue, with the greatest structural efficiency, capable of supporting a load no less than 15 kg. Each team may bring and enter only one pasta bridge.

A Team of Up To: 2 **Approximate Time:** 10 min
Impound: No **Visitors:** Yes
Eye Protection: Teams must bring safety goggles

EVENT PARAMETERS:

a. Each team is allowed to enter only one pre-built Pasta Bridge built prior to the competition.
b. Team members must wear proper eye protection during the set-up and testing of the bridge. Teams without eye protection must not test and must be ranked in Tier 2.
c. The Event Manager will provide all assessment devices, testing apparatus (4), two bucket stabilization sticks, and clean, dry sand or similar dry, free-flowing material (hereafter "sand").

CONSTRUCTION PARAMETERS:

a. The Bridge must span a horizontal opening of 35.0 cm.
b. Bridge Dimensions: The bridge shall not exceed 55.0 cm in length, 15.0 cm in width. Minimum height is 10.0 cm (there is no maximum height).
c. No portion of the bridge may extend below the top surface of the Test Base prior to testing.
d. The bridge is to be a single structure constructed of ONLY pasta, multi-purpose glue, and/or hot glue. Multipurpose glue must be labeled safe and non-toxic (e.g. Elmer's). **Other materials are not allowed, including paint, rubber bands, twist ties, other types of glue, etc.**
e. The bridge must support, at the center of its span, the loading block and chain assembly described in {Testing Apparatus (b.)}. The bridge must have an adequately sized opening at its center that allows the bolt and chain to pass through the bridge and hang below the bridge. The loading block assembly must rest freely on the bridge and cannot be rigidly attached to the bridge.
f. If the bridge has multiple levels, the team may decide which level to place the loading block on, as long as it remains at the center of the span.

Bridge-A-Roni Cont.

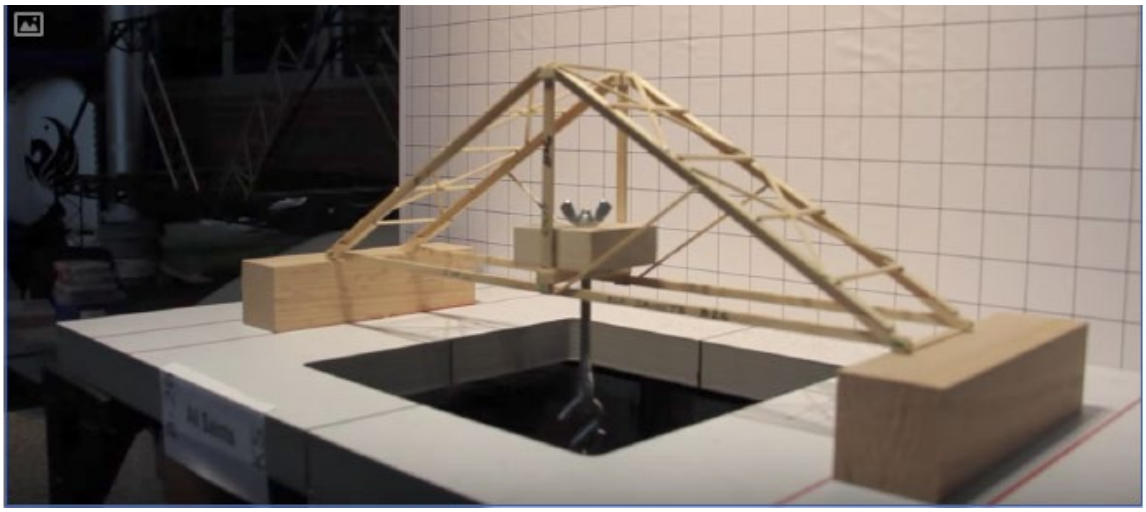
TESTING APPARATUS: Supplied by the Event Manager

a. The Test Base must be a solid and level surface as follows:

i. Must be at least 55.0 cm long x 32.0 cm wide.
ii. Must have a smooth, hard surface (e.g., hardwood, metal, or high-pressure plastic laminate) and be stiff enough so it does not bend noticeably when loaded.
iii. Must have an opening approximately at its center approximately 20.0 cm x 20.0 cm.

b. The Loading Block Assembly must consist of:

i. Loading Block: a square block measuring 5.0 cm x 5.0 cm x approximately 2.0 cm high with a hole no larger than 8 mm diameter drilled perpendicular to and centered on the 5.0 cm x 5.0 cm faces for a ¼" threaded eyebolt.
ii. A ¼" threaded eyebolt (1" nominal eye outside diameter), no longer than 3" and a ¼" wing nut.



c. A chain and S-hooks that are suspended from the Loading Block Assembly.
d. An approximately five-gallon plastic bucket with a handle to be suspended from the chain and hook.
e. The Event Manager must verify the combined mass of the Loading Block Assembly, chain, hooks, bucket, and sand is at least 15.100 kg but no more than 15.300 kg prior to testing.
f. YouTube resource: Please note that your students' bridge will be constructed using pasta.

Bridge-A-Roni Cont.

THE COMPETITION:

a. Check-in
   i. Team members must place their bridge on the scale for the Event Manager to determine its mass in grams to the nearest 0.01 grams.
   ii. No alterations, substitutions, storage, or repairs may be made to the bridge after check-in. Once teams enter the event area to compete, they must not leave, receive outside assistance, materials, or communication.

b. Testing
   i. Teams must have a maximum of 6 mins. to set up and test their Bridge to the max. load or to failure.
   ii. Team members must set the bridge on the 2.0 cm x 5.0 cm faces so that it spans the open space.
   iii. The Event Manager will check the height of the bridge at the Clear Span Line of the Bearing Zone where the bridge directly touches the Test Base to assure it does not exceed 2.0 cm.
   iv. Team members will place the Loading Block approximately at the center of the test base opening.
   v. Team members must assemble the Loading Block Assembly, eyebolt, chain and S-hooks, and hang the bucket to load the Bridge. Team members may disassemble the Loading Block Assembly to set up the test. The bucket must be mounted to allow enough clearance above the floor to allow for bridge deflection.
   vi. Team members must be allowed to adjust the Bridge until they start loading sand. No adjustment may be made after sand loading has begun.
   vii. Team members must load the sand into the bucket and be allowed to safely and effectively stabilize the bucket from movement caused by sand loading. Direct contact with the bucket by team members is not allowed. Teams choosing to stabilize the bucket must use the bucket stabilization sticks provided by the Event Supervisor. Only the tip of the stabilization stick may touch the bucket.
   viii. Bridges that fail before supporting 15.000 kg must be scored according to the actual load supported at time of failure, measured to the nearest gram or best precision available. Failure is defined as the inability of the bridge to carry any additional load, any part of the bridge touching the test base outside of the Bearing Zone, any contact of the bridge with the Bearing Zone at the end supported by the Test Support, or any part of the load supported by anything other than the Bridge. Incidental contact between the chain/eyebolt and the device is not failure. Incidental pieces falling off the bridge is not failure.
   ix. Loading must stop immediately when a failure occurs or when time expires. The Event Manager must remove any parts of the Bridge that fell into the bucket and sand added after time has expired or failure

Bridge-A-Roni Cont.

SCORING

MUST KNOW

a. The best structural efficiency (highest number) wins, determined by the following equation:
   i. Score = Load Supported (g)/Mass of Bridge (g)
   (Load Supported: The maximum weight (in grams) the bridge can hold before it fails.)
   (Mass of Bridge: This is the weight (in grams) of the bridge itself)

   ii. Ties are broken by this sequence: 1. Lowest Bridge Mass; 2. Widest Bridge, measured at the widest point of the Bridge prior to loading.

SCORING EXAMPLE:

a. Load Supported = 500 g, Bridge Mass = 14.27 g, Score = 35.03

Color Wheel

Description: Each student will use tempera paint to make secondary and tertiary colors on the color wheel.

A Team of Up To: 2 **Approximate Time:** 45 min
Impound: No **Visitors:** No

Competition:

1. Students will be given a blank color wheel for their template as well as a color wheel for their reference.
2. Paint, paintbrush, water cup and paper towels will be provided.
3. ONLY Red, Yellow and Blue paint will be made available for participants to create their color wheel.
4. Students will mix their primary colors to accurately replicate the color wheel sample given.

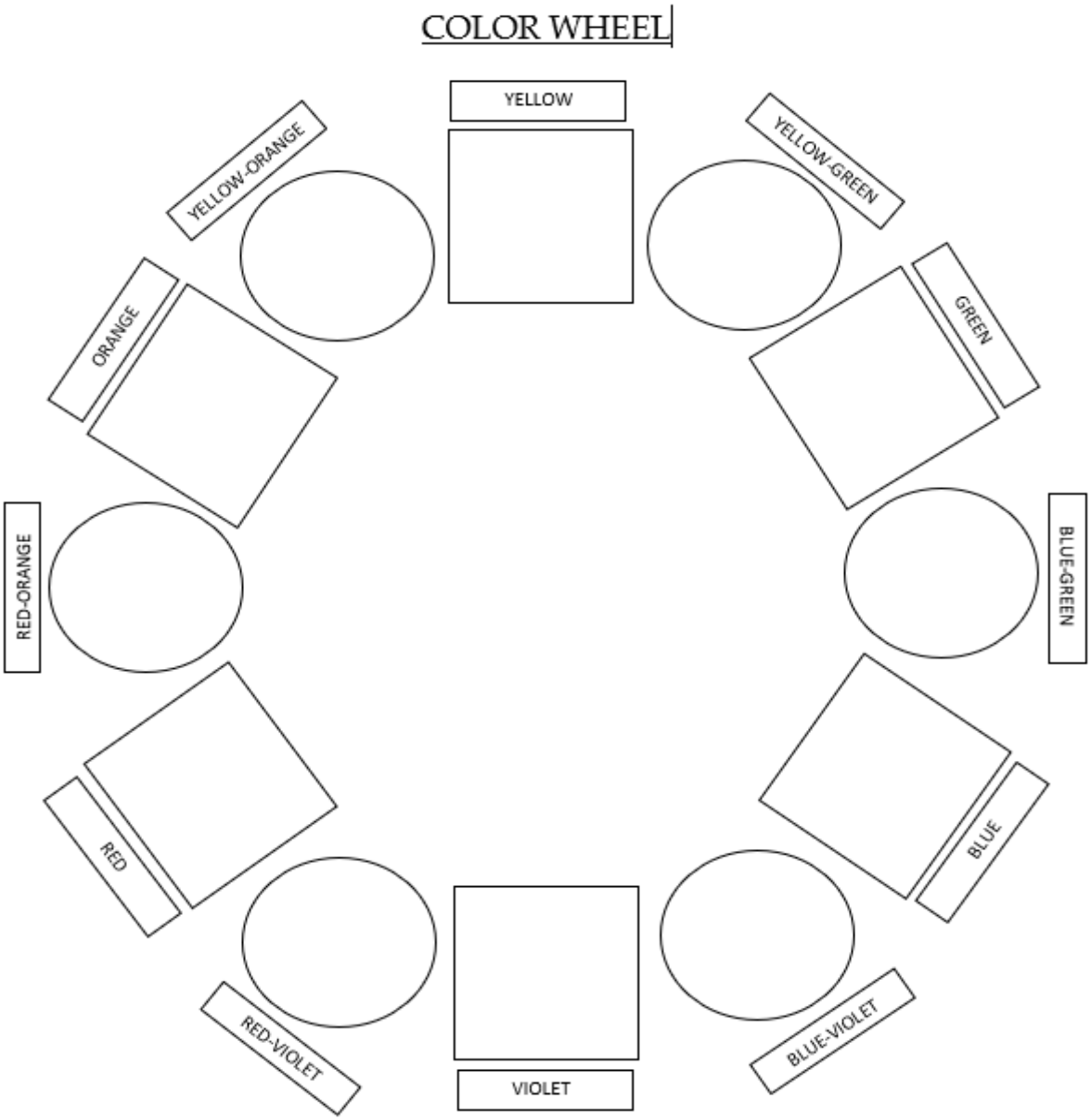
Scoring:

The scoring of the event will be based on the accuracy of their paint matching to the color wheel sample.

- 2 points for exact match
- 1 point for close match/attempt
- 0 points for non attempt or wrong color

TIEBREAKER: Based on fastest time completed with closest color accuracy.

Color Wheel Cont.



D is for Dentistry

Description: This event will test students on their knowledge of both anatomy and function of the human adult and baby mouth.

A Team of Up To: 2 **Approximate Time:** 50 min
Impound: No **Visitors:** No

Teams: No outside resources will be allowed.

Event Managers: Will provide all necessary items, objects, materials, questions and response sheets for participants to complete stations.

The Competition: The test may include various formats such as slides, stations, puzzles, hands-on models, pictures, written answers, scantrons, multiple choice, etc. Students should be familiar with the **anatomy of the human mouth, identification of both adult and baby teeth, causes of decay, dental tools, diseases, and dental specialties.**

Scoring: Each team will be given one answer sheet. High score wins.
Tie Breaker: timed activity will be identified on competition day

Possible Question/Station:

-Identify which tooth (from a picture)

-A patient needs to have their wisdom teeth surgically removed. Which type of dental specialist would perform this procedure, and what is the name of their field?

Dynamic Planet

Description: Oceanography is the study of all aspects of the ocean. This topic of oceanography will cover a wide range of topics from properties of water, currents and waves, the movement of sediments, and seafloor geology. This event concentrates on physical oceanography and does not include specific marine organisms except corals and biogenous sediment.

A Team of Up To: 2 **Approximate Time:** 50 min
Impound: No **Visitors:** No

Teams: Teams may bring in one 2-sided 8 ½ x 11" reference sheet that may contain pictures, diagrams, and information from any source. Students should bring #2 pencils.

Event Manager: will provide all other materials needed

Information includes but is not limited to:

1. Water structure and properties including surface tension, specific heat capacity, physical composition, cohesion, adhesion, mediator of Earth's climate, origin of the oceans
2. Sea water – composition, chlorinity, density, sources of salts, water masses, thermocline, pycnocline
3. Waves – properties of waves, types of waves, origin of waves, shoaling, notable tsunamis
4. Tides
5. Currents – surface currents, gyres, thermohaline circulation, effects on climate
6. Upwelling and downwelling
7. Geography – location of oceans and seas, parts of the ocean floor
8. Coastal features
9. Types of ocean sediments
10. Hydrothermal vents
11. Palte tectonics in the ocean – volcanoes, ridges (spreading centers), subduction zones, hot spots, types of island formation, age of ocean floor
12. Instruments that research the ocean.

Representative tasks:

1. Given a map of the sea floor, identify its features
2. Given pictures of waves, be able to identify types of ocean waves
3. Be able to explain the importance of upwelling and/or downwelling for marine organisms
4. Draw a diagram showing either spring and/or neap tides

Scoring: Scoring: High score wins. Points will be awarded for the quality and accuracy of responses. Ties will be broken by the accuracy and quality of answers to pre-selected questions.

Gummi Bear Long Jump

Description: In this event teams will build their own free-standing (not handheld) catapult that must be capable of "lobbing" a Gummi Bear at a target placed between 2 and 4 meters.

A Team of Up To: 2 **Approximate Time:** 8 min
Impound: Yes **Visitors:** Yes

Teams: Each team will bring their catapult and possibly a protractor.

Impound: Teams will impound their device on competition day before 8:45am at the specified room location. Place catapult in box with the following listed on 8 ½" x 11" paper: assigned team section number, school name, team member names and team color.

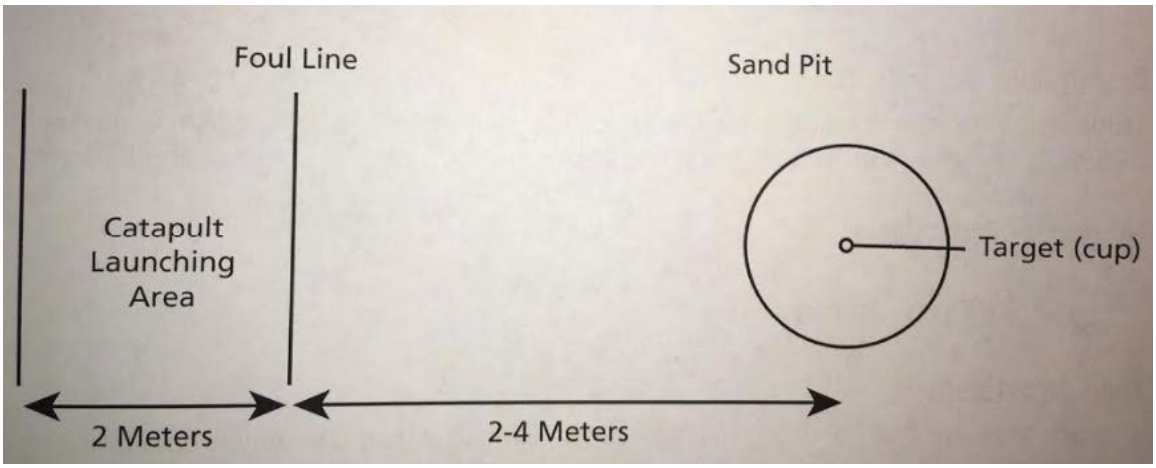
Event Managers: Will provide gummi bears. Gummi bears will be placed on a wax piece paper right before launch.
Please remind students not to grab or hold onto gummi bears prior to launch. – *Makes gummi bears sticky*

The Competition: At arrival, teams will be told the official distance of the target. Using your pre-collected data, teams will set up their device. Each device should be designed and built by the students (adult construction **assistance** is okay). If an event manager deems the catapult unsafe, the device will not be allowed to compete. The device will sit on a level area of ground and fire at a target area that will also be at ground level. The target area, at minimum, will be a printed target on an 8.5 x 11 sheet of paper with a marker designating the center of the target. When instructed by the event manager, teams will place their devices in the launch area, ensuring that the device is behind the foul line. Teams will have 8 minutes to compete one practice shot, and two additional shots that will be used for scoring.

Scoring: Each team will have a one-shot practice round after which they will each shoot at the target two times. The distance from the initial impact to the center target will be measured and recorded after each shot. After each launch, the distance will be announced to the team to allow them to make adjustments based upon their data chart. No Gummi Bear should be shot before or during the catapult event except during the specified practice round or actual competition. A violation of this rule can result in placement in a tier 2 or 3. The team whose Gummi Bear lands closet to the target wins. In the event of a tie, the distance of both launches will be added. The team with the lower cumulative score will receive the better ranking.

See additional page

Gummi Bear Long Jump cont.



Herpetology

Description: This event will test students on their knowledge of **reptiles and amphibians**.

A Team Of Up To: 2 **Approximate Time:** 50 min
Impound: No **Visitors:** No

Teams: Each team may bring in only **one** 8.5" X 11" two-sided page of information, in any form, from any source.

Event Managers: Event Managers will provide writing instruments and tests. The test may include various formats such as slides, stations, written answers, scantrons, multiple choice, etc.

The Competition:

1. Each team will be given an answer sheet on which they will record answers.
2. The event may include living and preserved specimens, skeletal materials and/or slides or pictures of specimens.
3. Both **Class Reptilia** and **Class Amphibia** specimens on the **Herpetology List** will be used. Only specific sections of the **Class Reptilia** list will be used. Please consult the list on the following page.
4. Only **common names** will be used.
5. Teams will be asked to do basic identification and demonstrate knowledge of anatomy and physiology, reproduction, habitat characteristics, ecology, diet, behavior, conservation, sounds and biogeography.
6. The focus will be on reptiles and amphibians of North America.

Scoring: High score wins. Selected questions may be used as tiebreakers.

Possible Question/Station:

-Compare and contrast a crocodile with an alligator.
-Identify the order and family of the provided sample.
-Based on the dental structure of this organism, predict the type of food this organism eats.
-Is this organism native to North America or is it an introduced species? Where is it originally from?
-What makes this organism unique?

Resources/Notes from EM: These books are a good starting point but be sure to use all available resources.
National Audubon Society Field Guide to Reptiles and Amphibians North Americ – ISBN: 978-0-394-50824-5
Peterson Field Guide to Western Reptiles & Amphibians – Fourth Edition – ISBN: 978-1-328-71550-0
Peterson Field Guide to Reptiles and Amphibians of Eastern and Central North America–Fourth Edition – ISBN:978-0-544-12997-9

See provided handout with more information.

Herpetology List

Class
Order
- Family
  - *Genus (species-none listed)* – common name

Class Reptilia
Crocodylia – crocodiles and alligators
- Crocodylidae – crocodiles
- Alligatoridae – alligators and caiman

Squamata – lizards and snakes
SUBORDER LACERTILA OR SAURIA – LIZARDS
- Gekkonidae – gecko lizards
- Polychridae – anoles
  - *Anolis* – anoles
- Iguanidae – iguanids
  - *Iguana* – green iguana
  - *Dipsosaurus* – desert iguana
  - *Sauromalus* – chuckwalla
- Crotaphytidae – collared lizards
- Phrynosomatidae – earless, spiny, tree, side-blotched and horned lizards
  - *Sceloporus* – spiny lizards
  - *Cophosaurus & Holbrookia* – earless lizards
  - *Uma* – fringe toed lizards
  - *Urosaurus & Uta* – tree and side blotched lizards
  - *Phrynosoma* – horned lizards
- Scincidae – skinks
  - *Eumeces* – skinks
- Anguidae – glass lizards and alligator lizards
  - *Ophisaurus* – glass lizards
  - *Gerrhonotus* – alligator lizard
- Helodermatidae – gila monster

SUBORDER SERPENTES (Ophidia) – SNAKES
- Leptotyphlopidae – blind snakes
- Boidae
  - *Charina* – rubber boa and rosy boa
- Colubridae – typically harmless snakes
  - *Nerodia* – water snakes and salt marsh snakes
  - *Storeria* – brown snakes and redbelly snakes

  - ***Thamnophis*** – garter, ribbon and lined snakes
  - ***Heterodon*** – hog-nosed snakes
  - ***Coluber*** – racers
  - ***Opheodrys*** – green snakes
  - ***Elaphe*** – rat snakes
  - ***Pituophis*** – pine, bull and gopher snakes
  - ***Lampropeltis*** – king and milk snakes
  - ***Tantilla*** – crowned and blackhead snakes
- Elapidae – coral snakes
- Hydrophiidae - sea snakes
- Viperidae – (subfamily viperinae) pit vipers
  - ***Agkistrodon*** – copperhead and cottonmouths
  - ***Crotalus*** – rattlesnakes

Class Amphibia

Caudata (Urodela) – salamanders

- Cryptobranchidae – hellbenders
- Dicamptodontidae – giant slamanders
- Proteidae – mudpuppies and water dogs
- Rhyacotritonidae – torrent and seep salamanders
- Amphiumidae – amphimus
- Sirenidae – sirens
- Ambystomatidae – mole salamanders
- Salamandridae – newts
- Plethodontidae – lungless salamanders
  - ***Desmognathus*** – dusky salamanders & kin
  - ***Plethodon*** – woodland salamanders & kin
  - ***Ensatina*** – ensatina
  - ***Batrachoseps*** – slender slamanders
  - ***Hydromantes*** – web-toed salamanders
  - ***Hemidactylium*** – four-toed salamanders
  - ***Gyrinophilus*** – spring salamanders
  - ***Eurycea*** – brook salamanders
  - ***Typhlomolge*** – Texas and Blanco blind salamanders

Anura (Salientia) – frogs and toads

- Scaphiopodidae – spadefoot toads
  - ***Scaphiopus*** – spadefoot toads
- Bufonidae – true toads
  - ***Anaxyrus*** – American toad and Oak toad
- Hylidae – treefrogs
  - ***Hyla*** – gray treefrog & green treefrog
  - ***Pseudacris*** – western chorus frog, ornate chorus frog & spring peeper

  - ***Acris*** **– cricket frogs**
- **Ranidae – true frogs**
  - ***Lithobates*** **– bullfrog, green frog, northern leopard frog & wood frog**
- **Microhylidae – narrow-mouthed toads**
  - ***Gastrophryne*** **– narrow-mouthed toads**

Note: The taxonomic scheme is based upon a combination of traditional and current categories (designed to utilize familiar terms widely used in published resources available to students.)

Hot Air Balloons

Description: This event requires a team of three students to build and to fly the paper hot air balloon. The balloon must be pre-built and brought to the competition.

A Team Of: Must be 3 **Approximate Time:** 6 min
Impound: Yes **Visitors:** Yes

Teams: All team members are required to use protective gloves. It is recommended teams bring their own gloves to make sure they fit (no mittens.) *Each student is also required to impound their own journal, documenting trials, errors, photos, lessons learned in the process of building device.*

Impound: Teams will impound their device on competition day before 8:45am at the specified room location. Place balloon along with journal in a box with the following listed on 8 ½ "x 11" paper: assigned team section number, school name, team member names, and team color.

Event Managers: Will provide extra protective gloves if needed and launch device.

The Construction:

1. Each team is required to build a balloon using **tissue paper and glue** (avoid tissue paper with foil.)
2. Teams are also required to use a rigid wire in the air intake part of the balloon to keep the opening from collapsing. The use of aluminum foil to line the air intake is optional but not recommended. No other types of materials (including Mylar, foil tissue paper, string) are allowed.
3. Balloons should be designed to allow hot air **(approx. 400 degrees Fahrenheit)** to inflate the balloon without scorching. This is most easily accomplished by allowing an unrestricted path for hot air. The event manager will closely monitor the balloon during inflation and may cancel a launch for safety reason.
4. The heating device has a 6 inch diameter metal tube to deliver hot air to the balloon from a propane tank. (see photo) .The opening of the balloon (mouth) needs to fit over the tube.
5. The heating device temperature may vary, but will be approx. 400 degrees.
6. Don't forget journal.

The Competition:

1. Each team will be given up to three minutes to inflate their balloon and get it airborne.
2. Students are requested to tell the event managers if they wish to release before the end of their 3 minute fill time.

3. No additional launch assist devices may be used such as poles, hooks, chairs, parents, etc. Balloons must fly using only their own buoyancy-no pushing. **Care should be used when placing balloon on stove. (See 2nd picture)**
4. No device may be used to close the mouth of the balloon (example: aluminum foil) before or during launch. Such an attempt will disqualify the balloon.
5. Each balloon will be heated by the team from a source provided by the event manager. The heating device is designed for safety, but caution is required.
6. Should balloon get caught in ceiling or wall equipment, 20 seconds will be given before the balloon flight is deemed over.
7. Because of the fumes from the propane tanks, the outside doors to the gym will be open.
8. No repair kits will be allowed or impounded and no time given for repairs.
9. No horseplay will be tolerated in the launch area.
10. If the balloon is deemed a safety hazard either to spectators once launched or to the students filling it, the balloon will not be launched and will be ranked below all other balloons.

Scoring: Balloons will be ranked by the longest time in flight. Each balloon will be timed by a stopwatch to the nearest hundredth of a second and the time recorded. Three timers will be used with the middle time being recorded. The longest flight time wins. No tiebreaker.

Resources/Notes from EM:

*Encourage teams to make sure the mouth of balloon is big enough to fit over mouth of device so air will go into balloon.
*If worried about tissue catching on fire, EM will allow foil around the wire opening however this adds weight to balloon.
*For practice, you can use 1-2 blow dryers to practice filling balloon.

How Big Can It Grow?

Description: : In this event, the participants will grow two celery plants from an existing celery bunch central core. The participant will bring them unpicked to the tournament to have them measured, along with data collected during the planting and growing process.

A Team of Up To: 2 **Approximate Time:** 15 min
Impound: No **Visitors:** Yes

Teams: No outside resources will be allowed.

Event Managers: The Event Manager will provide a device to measure the height and circumference of the new celery growth from the original base. *See growing details on the attached page for reference.*

Teams will: Working together, the participants will:

- Follow the regrow celery procedures on the attachment provided. Make sure there is sufficient lead time to allow the celery to regrow.
- Propagate and grow their celery, collecting and recording data about the amount of water provided, soil temperature, hours of sunlight, amount of fertilizer or any other observations that helped to inform the growing process.
- Report at their assigned time to submit their unpicked celery and data log to the event manager, at the tournament.
- Present their celery plant to the Event Supervisor as they measure the length and circumference at the widest point of the celery stocks in a bunch.
- Participants will need to decide upon what kind of celery bunch they are going to grow from the store. (organic, inorganic etc)
- Participants need to learn about the following topics:
  - Indoor growing techniques, (i.e., horticulture)
  - Regrowing propagation techniques
  - Growing behaviors of celery

Competition: The room should be set-up with 2 to 3 stations. Each station will have the needed materials for the participants to have their celery measured by the event supervisor.

Scoring: Participants will be awarded points based on the average height and circumference measurement of their two celery plants.

- Average Celery Height x 100 points
- Average Celery Circumference at the Widest point of the new celery stocks bunch x 100 points
- Log Score= 1 point for every data entry recorded each day
  - Maximum of 3 points can be awarded per day
  - The Total Log Score Maximum that can be earned is 270 Points

- The highest number of total points wins
- The following will be used as Tiebreakers:
  - Longest individual celery stock:
  - Largest bunch circumference:
- Teams found to have repeatedly left stations messy or have damaged items provided at the discretion of the Event Supervisor, may have up to 20% of their total score deducted.
- Teams also found not regrowing celery in attempts to cheat will also be subject to disqualification from the contest.

Growing Celery from Scraps

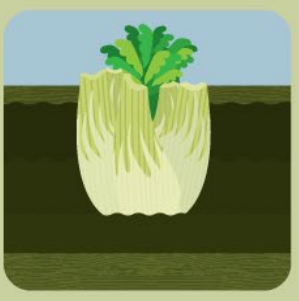
Salvage these **scraps** and **start growing** your own **food!**

STEP 1:
Cut the celery bunch **2”** above the bottom.

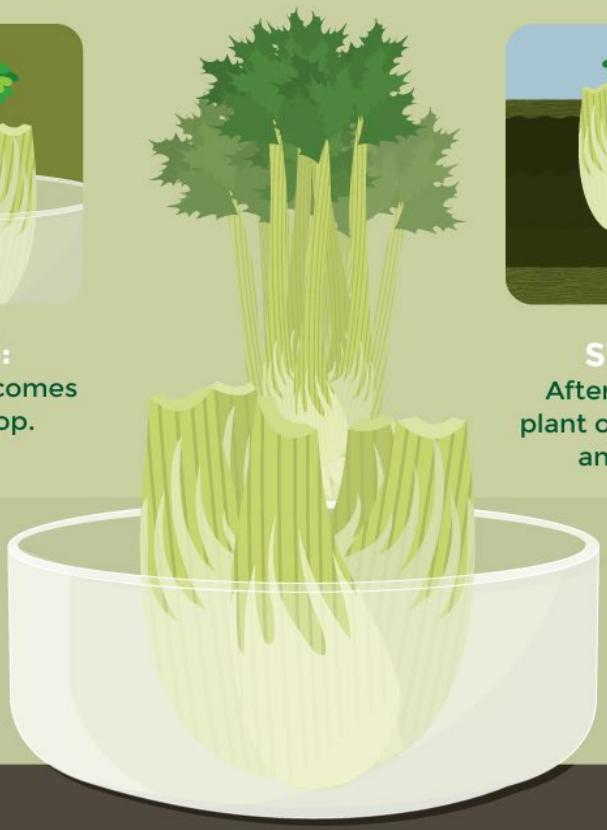
STEP 2:
Place the celery base/bottom in a shallow bowl.

STEP 3:
Add about **1”** of water – always keep water at this level.

STEP 4:
New growth comes from the top.



STEP 5:
After **7-10** days, plant outside in soil and water.



Source: www.gardeningknowhow.com

Mystery Architecture

Description: Students will be given a bag of materials to build a freestanding tower as high as they can. The tower should be constructed to support a ping pong ball at its top.

A Team of Up To: 2 **Approximate Time:** 50 min
Impound: No **Visitors:** No

Teams: May bring in scissors and a ruler to use as tools while building the tower. No other resources are allowed.

Event Managers: Will supply a bag for each team. Each team will receive the same materials. Materials are unknown until the competition.

The Competition:

1. Students will have 20 minutes to construct a tower to support a ping pong ball at its highest point. The top of the ping pong ball must be higher than any part of the structure.
2. Only those materials supplied in the bag, and the bag itself, may be used to construct the tower. No other materials or adhesives may be part of the finished tower.
3. Examples of materials that may be provided include, but are not limited to: straight pins, paper cups, drinking straws, paper clips, tape, string, paper, etc.
4. Each team may bring their own ping pong ball to use while building their tower, however, all towers will be measured using the same ping pong ball provided by event manager.
5. The students are to inform the judges when they finish their tower. The event manager will place the ping pong ball on the top of the tower. The tower must remain standing long enough for the height and base to be measured.
6. The tower must be free standing. It cannot be attached to the tabletop, floor, wall or ceiling.

Scoring:

1. The height of the tower and width of its base will be measured as precisely as possible by the judges. Since no building materials are to extend above the ping pong ball, the ping pong ball will be considered the highest point of the tower. The width of the tower will be measured at its base. The largest diameter of the base will be recorded.
2. All towers that support the ping pong ball will be ranked above those that do not.
3. The towers in each group will be ranked according to their height. Tallest tower first, the shortest tower last.
4. In the event of a tie, the winner will be the tower with the smallest base measurement.

Optics

Description: In this event, the participants will answer questions and complete small tasks about the light and its properties.

A Team of Up To: 2 **Approximate Time:** 30 min
Impound: No **Visitors:** No

Teams: Teams are allowed to bring in a pencil.

Event Managers: Will provide the models, slides, pictures, information, and questions found at each station as well as an answer sheet for participants to record their answers.

Competition: The room should be set-up with 10 to 15 stations where each station features between 6 and 8 questions about light or one small activity associated with light (i.e., creating a color, splitting light with a prism, reflecting light around a barrier) for the team to complete or analyze. Working quietly with their partners, the participants will start at the station assigned by the Event Manager and answer the questions located there. Have between 2 and 3 minutes, depending upon the number of stations, to analyze the information provided and answer the questions asked or complete the task. Rotate to a new station designated by the Event Manager, upon a signal from the Event Manager, and answer the questions found there. Leave the station as they found it when they rotate to a new station. Students will not be allowed to return to any stations after they have rotated to another station.

a. For this event, participants need to learn about the following concepts associated with light:
   i. Electromagnetic Spectrum
   ii. Wave Properties (i.e., Wavelength, Frequency, Speed, the Speed of Light, Energy)
   iii. Visible Light (i.e., Transparent, Translucent, Opaque, Light Sources, Candles/Lumens Measurements)
   iv. Reflection and Refraction (i.e., Laws, Mirrors, Lenses)
   v. Color (i.e., the Spectrum, Primary and Complementary Colors, Colored Materials)

b. For this event, Participants may be expected to complete simple activities such as:
   i. Bend a ray of light around an obstacle using mirrors
   ii. Create complementary colors from primary colors
   iii. Create a reflection using a concave or convex mirror
   iv. Make a spectrum
   v. Use filters to change the color of a light source

Optics Cont.

Scoring:

a. Participants will be awarded points for each correct answer they provide or activity they complete

b. The highest number of points wins

c. The following will be used as Tiebreakers:

   i. Correct spelling of the answers

   ii. Select questions identified at the start of the event

a. Teams found to have repeatedly left stations messy or have damaged items provided at the discretion of the Event Supervisor, may have up to 20% of their score deducted as a penalty.

Paddle Boat

Description: In this event, teams will design, build, and bring to the competition a paddle boat whose main propulsion is produced by up to two #64 rubber bands (3.5" x .25")

A Team of Up To: 2 **Approximate Time:** 10 min
Impound: Yes **Visitors:** Yes

Test time (per team): 5 minutes (timing starts at the winding of rubber band)

Impound: Teams will impound their device on competition day, before 8:45am at the specified room location. Place device in box with the following listed on 8 ½" x 11" paper: assigned section number, school name, team member names, and team color.

Construction:

1. Each team will bring a homemade paddle boat to the competition. Each device should be designed and built by the students. Adult construction assistance is OK when using power equipment or sharp tools. No kits.
2. The final construction paddle boat must fit inside a 20cm by 10cm by 5cm box. (an assembled paddle can be dismantled from the assembled boat to fit within the box. Paddle cannot be disassembled).
3. The dimensions of the water trough are 20cm(width) x 3.66m(length)x 12.5cm (depth)
4. The only materials permitted in the design of the paddle boat are:
    a. Any wood
    b. Any glue
    c. Nails
    d. Two #64 rubber bands (supplied by the event supervisor)
    e. Paint

The Competition:

1. Devices will be measured in impound to determine whether they meet construction requirements. They will remain in the impound area until the assigned race time.
2. Teams will be given two runs in the water trough. The better of the two runs will count as the official distance measurement. A maximum of five minutes will be given to complete the two runs. Adjustments will be allowed between the runs.
3. The rubber bands, which will be supplied at the time of the competition, must be installed at that time.
4. Each rubber band can be twisted no more that twenty times (One twist is defined as a 360 degree rotation of the rubber band. The paddle will have an X marked on one side to keep track of the rotations).

Paddle Boat Cont.

5. The competition will take place as follows:
    a. The boat must stay in contact with the water at all times.
    b. The boat will be released by the contestant from the designated starting position in the water.
    c. The distance traveled shall be recorded in centimeters.
    d. Contestants will not be able to touch the paddleboat once it is released in the water.

Scoring: The team that goes the farthest will be the winner. In the event of a tie, it will be the paddle boat that goes the farthest and has the fastest time.

Clarifications:

Paint must be listed as "water sealant"

Pasta Mobile

Description: Each team will construct a vehicle entirely out of glue and pasta that, when released from the top of a ramp, will travel the greatest distance within a 1.5 m wide "lane" before stopping.

A Team Of Up To: 2 **Approximate Time:** 5 min
Impound: Yes **Visitors:** Yes

Teams: While impounding the pasta mobile, each student is also required to impound their own journal, documenting trials, errors, photos, lessons learned in the process of building and testing their vehicle.

Impound: Teams will impound their device on competition day before 8:45am at the specified room location. Place pasta mobile in a box with the following listed on an 8 ½" x 11" paper: assigned section number, school name, team member names, and team color.

Event Managers: Will provide ramp and all equipment for timing and measuring.

The Construction:

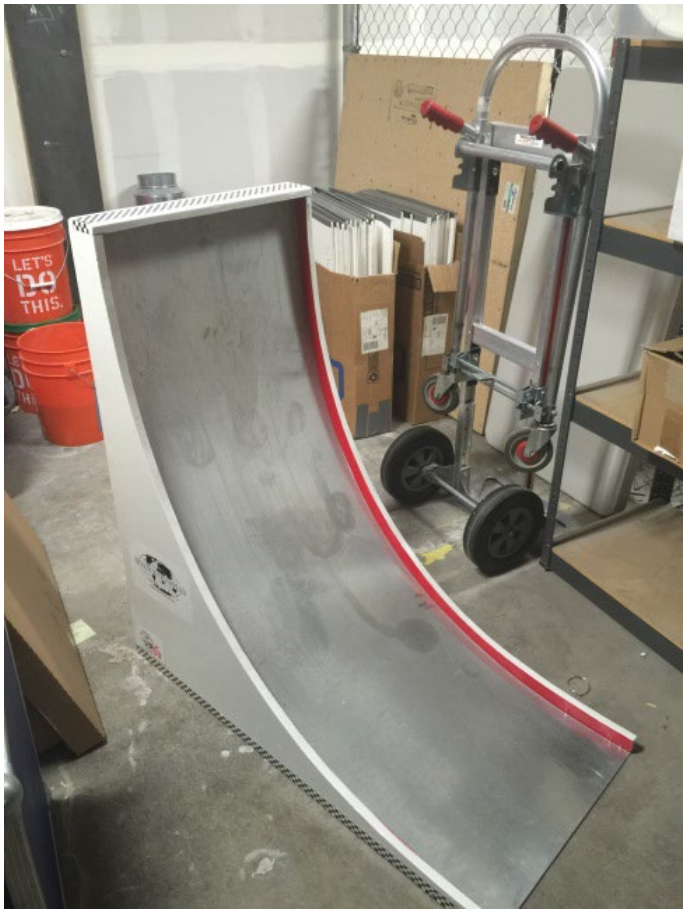
1. Teams may use any supermarket variety of **dry pasta**.
2. The pasta must be uncooked and unaltered from the original form.
3. Pasta may be shaped by filing, sanding or other dry machining techniques.
4. Any commercially available glue may be used. Glue may not be used for sculpting, and/or joint or gap filling.
5. The vehicle must be able to fit into a closed box 30cm X 15cm X 15cm. There are no mass restrictions.
6. The vehicle must make and maintain contact with the surface on which it rests on at least 3 points.
7. Simple spheres, cylinders, etc. will not do.
8. Power tools shouldn't be used.

The Competition:

1. The vehicles will be placed on the ramp so that the rearmost part of the racer is in contact with a horizontal barrier at the top of the ramp. It is then released by a student on team, no helpful nudges allowed.
2. The ramp is 1 meter high, 1 meter long and .5 meter wide. There is a 1" guard rail along both sides to keep the vehicles from falling off the launch area. (see photo)
3. The distance the pasta mobile travels will be measured from the base of the ramp to the rearmost part of the racer where it stops within the 1.5 meter lane.
4. If the vehicle leaves the 1.5 meter lane, the measurement will be taken at the first point where the vehicle crossed the boundary line.

5. Should the pasta mobile lose its structural integrity (fall apart) during its run, it will be placed in the second tier ranking and the distance factor will be determined by the largest surviving structural component.
6. This event may be held outdoors.

Scoring:
The highest scores will be awarded to pasta mobiles that remain intact and travel the greatest distance. Vehicles that do not meet the construction requirements will be ranked after those that do. Ties will be determined by the vehicle that stops closest to the middle line.



Plant Science

Description: Teams will compete in a hands-on, station-based event that tests their knowledge of plant and flower anatomy, as well as their ability to identify plants and flowers from a provided list.

A Team of Up To: 2 **Approximate Time:** 50 - 55 min.
Impound: No **Visitors:** No

Teams: Each team is allowed to bring in one ½" 3 ring binder. The binder may contain notes, charts, keys, filed guides and/ or reference books as long as they fit in the ½" 3 ring binder.

Event Managers: will provide a hands-on event with all necessary items, objects, materials, questions and response sheet for participants to complete stations.

Competition: This event will be run in station format. Teams will rotate through stations that assess teams' knowledge of plant and flower anatomy, classification of plant and flower identification found on the "Plant and Flower Identification and Anatomy" list attached. Common names will be used.

Event Scoring: High score wins. Ties will be broken by the accuracy of the quality of answers of pre-selected questions chosen by the event leaders.

Possible Question/ Station:

- Common use of the plant is:
- Is the plant a pollinator or need a pollinator?
- Does the plant produce fruit, vegetables, or nuts?
- Where is the plant usually found in California?
- What is the function of the plant's anatomy and its identification as male or female?
- A station may include a photo or the real life plant or seed and ask them to identify the plant and or the anatomy of that plant.

Resources/ Notes from EM:

- See attached List

Plant and Flower Identification and Anatomy
Crop Identification List

	Crop Name	Form		Crop Name	Form
1	alfalfa	plant or seed	30	popcorn	seed only
2	barley	plant or seed	31	potato	plant only
3	bermudagrass	plant or seed	32	red bean	seed only
4	black bean	seed only	33	red clover	plant or seed
5	broccoli	plant only	34	red wheat	seed only
6	cabbage	plant only	35	safflower	plant or seed
7	canola	plant or seed	36	sorghum	plant or seed
8	cantaloupe	plant or seed	37	soybean	plant or seed
9	carrot	root provided	38	spinach	plant or seed
10	cauliflower	plant only	39	squash	plant or seed
11	chickpea	seed only	40	strawberry	plant only
12	chili pepper	plant or seed	41	Sudangrass	seed only
13	corn	plant only	42	sunflower	plant or seed
14	cotton	plant or seed	43	sweet corn	seed only
15	cranberry	plant only	44	sweet potato	plant only
16	cucumber	plant or seed	45	sweetclover	plant or seed
17	dent corn	seed only	46	tall fescue	plant or seed
18	durum wheat	seed only	47	timothy	plant or seed
19	flax	plant or seed	48	tobacco	plant or seed
20	hops	plant only	49	tomato	plant or seed
21	Kentucky bluegrass	plant or seed	50	watermelon	plant or seed
22	lentil	plant or seed	51	wheat	plant only
23	lettuce	plant or seed	52	white bean	seed only
24	lima bean	seed only	53	white clover	plant or seed
25	oat	plant or seed	54	white wheat	seed only
26	onion	plant or seed			
27	orchardgrass	plant or seed			
28	peanut	plant or seed			
29	pinto bean	seed only			

	Flower Type		Flower Type
1	Air Plant	21	Gardenia
2	Aloe Plant	22	Gerbera Daisy
3	Alstoemeria	23	Hibiscus
4	Amaryllis	24	Lily
5	Aster plant	25	Marigold
6	Azalea	26	Pansy
7	Baby's Breath	27	Peony
8	Bell Flower	28	Peruvian Lily
9	Big-Leaf Hydrangea	29	Poinsettia
10	Birds of Pardice	30	Rose
11	Cactus	31	Silver Dollar Eucalyptus
12	Calla Lily	32	Snapdragon
13	Carnation	33	Spider Plant
14	Dahlia	34	Sunflower
15	Dahlia	35	Tuberous Begonia
16	Daylily	36	Tulip
17	Fiddle Leaf Fig	37	Verbena
18	Floss Flower	38	Zinnia
19	Fox Tail Fern		
20	Freesia		

Anatomy Part
Sepals
Ovary
Stigma
Style
Calyx
Petals
Pistal
Androecium
Peduncle
Anther
Receptacle
Stamen
Carpel
Anther
Perianth
Filament

RoboLab Rock and Roll 2026

Description: This event will test students' skills in computer science and engineering.

A Team of Up To: 3 **Approximate Time:** 50 min
Impound: No **Visitors:** No

Teams: Students can prepare an engineering notebook beforehand. It may only be one page typed, (2 sided) no smaller than 10-point font, explaining your progress and decisions in building your robot.

Event Managers: Will provide all necessary items.

The Competition: This event will have tables at which teams may build their robot. They must bring it to the testing zone to attempt the challenge.

Challenge: Students will have 45 seconds for a robot to run autonomously from a starting point outside of the platform to move icosahedrons onto the three platforms.

Scoring: Scores are determined at the end of the round. No points are awarded if the icosahedron rolls off.

Robot Performance Points:

- 10 Points will be award for each icosahedron on the wide platform
- 15 points will be awarded for each icosahedron on the medium platform
- 20 points will be awarded for each icosahedron on the narrow platform.
- -10 points (lost) if LEGOs not put back in order after competition

Engineering Notebook Points:

- 5 Points, a sketch of your idea
- 5 Points, two photos of other attempts
- 3 Points, clear explanation of how you improved
- 2 Points, listing of team responsibilities
- 5 Points, timeline of team progress

Link to resources: https://sjcoefablab.org/robolab/

Rock Hound

Description: Students will prepare charts, identify rocks and minerals and describe their characteristics.

A Team Of Up To: 2 **Approximate Time:** 45 min
Impound: No **Visitors:** No

Teams: Should bring in their pencils and their completed charts in students own handwriting to be used in the identification process and to aid in answering questions. Charts can be any size, in any form. No books allowed. (See sample chart below)

Chart can be used to answer questions about each rock or mineral. 99% of the answers will come from the recommended book. Only one rock or mineral is not in the book. Those answers can come from another reliable source, book, or internet. Charts are to be completed by the students as a learning tool.

Event Managers: Will supply all materials needed

The Competition: The test will have 20 stations with 1 ¼ minutes allotted at each station. There will be a short introduction and an ending brief.

1. . Teams will be asked to identify (but not necessarily limited to) the following rocks and minerals:

Rocks

basalt	bituminous coal	conglomerate	gneiss
granite	limestone (fossil)	marble	obsidian
pumice	quartzite	sandstone	schist (garnet)
scoria	shale	slate	

Minerals

calcite	copper	feldspar (pink)	fluorite
galena	graphite	gypsum-satin-spar	halite
hematite	mica-biotite	pyrite	kaolinite
quartz (chert)	quartz (crystal)	talc	

- Charts can be turned in with your answer sheet. Charts are judged by content, not presentation. A handwritten chart will be acceptable as long as it is readable.

2. Students will also be asked questions about the rocks or minerals, such as their color, streak, hardness, specific gravity, class (igneous, metamorphic, sedimentary), shape, texture, uses, etc.
3. Students should bring their completed charts with them to the tournament. The charts may be used in the identification process and to aid in answering any questions. Charts and answer sheets will be collected at the end of the twenty-minute period.
4.

Scoring: High score wins. In case of ties, contestants with the most complete and accurate charts will be the winners.

Sample Questions/Station:

-This rock/mineral is called_____.
-It is (metamorphic, igneous, or sedimentary) _____ and has a specific gravity of ____ .
-It is used for _____.

Resources/Notes from EM:

Students may type chart instead of hand write, however EM encourages own handwriting to help memorize. Some rock kits are available from EM.

Four important things to remember:

1. Read the rules
2. Study the books
3. Make a complete chart
4. Practice identifying with rock kit

First Field Guide Rocks and Minerals from National Audubon Society - **used** on internet (out of print) EM has some copies available $10. Scholastic **ISBN O-590-05484-8** paperback, ISBN -0-590-05463-5 hard back.

Also useful:

Eyewitness Series: Rocks and Minerals
Guide to the Elements by Albert Stwertka, Oxford University Press ISBN-13: 978-0-19-515027-8

My Rock Chart - Sample

Rock	Color	Streak	Specific Gravity	Hardness	Igneous, metamorphic, sedimentary	Uses	Other
A							
B							
C							
D							

Relative Hardness (Moh's Scale)

Material	**What it will do**	**Rating**
Talc	Most everything scratches it	1
Gypsum	A fingernail will scratch it	2
Calcite	A copper penny will scratch it	3
Fluorite	A steel knife will scratch it	4
Apatite	A knife scratches it if you press hard	5
Feldspar	Will scratch a knife blade	6
Quartz	Will scratch glass (and all previous)	7
Topaz	Will scratch quartz (and all previous)	8
Corundum	Will scratch all except a diamond	9
Diamond	Will scratch everything	10

Scrambled Eggs

Description: Teams will build on site a device constructed out of specified materials to protect a raw egg from breaking when tossed over a bar or barrier and allowed to fall to the floor or pavement. The goal is to keep the egg from cracking or breaking during its impact with the floor or pavement.

A Team Of Up To: 2 **Approximate Time:** 50 min
Impound: Yes **Visitors:** Yes

Teams: Each team must impound their "toolbox" of supplies. See below for what is allowed in toolbox.

Impound: Teams will impound their device on competition day before 8:45am at the specified room location. Place device in a box with the following listed on an 8 ½" x 11" paper: assigned section number, school name, team member names, and team color.

Event Managers: Event Managers will provide score sheets, scales, raw Grade A Large egg, plastic bag for the egg and all materials needed for event.

The Competition: Teams must impound their toolbox of supplies. The box must be clearly labeled with the assigned team section number, school name and team color. Box must have a lid and fit all the way on the box and close completely. The volume of the box with lid in place can be no greater that ~~525 cm cubed.~~ **2,268in cubed** (Example: A common 10 ream copy paper box with the lid on meets this requirement.

1. Tool box may include:
   a. Cups, plates or bowls made from paper or Styrofoam
   b. Rubber bands, any kind or size. No bungie cords allowed.
   c. Copy paper (recycling used paper is encouraged!)
   d. Paper or plastic straws with or without wrappers
   e. Cotton balls
   f. Packing peanuts
   g. Plastic bags
   h. Standard cardboard tubes from toilet paper or paper towels
   i. Tape of any kind
   j. Scissors

k. Ruler
l. Stopwatch

2. Event leaders will inspect the boxes and their contents while in impound.
3. Teams may organize their toolbox supplies in clear plastic bags or other clear containers. The containers must not be used as building materials.
4. Once teams enter the event area to compete, they may not leave the area or receive outside assistance, materials or communication until they are finished competing. Teams violating this rule will be disqualified.
5. Teams will have 30 minutes to build their devices, load the egg (contained in a plastic bag) into the device and seal the device. Teams should bring their own tape to seal the device.
6. Teams must use eggs and plastic bags provided by the event manager. Teams will select their own egg from carton of available eggs. Once the team chooses an egg, it is their responsibility to handle it carefully and keep it from breaking.
7. The EM will inspect and record the mass of the device to the nearest .1 g after it has the egg in the sealed bag loaded.
8. Teams must stand behind the starting line, and one member will toss the egg-containing device over an elevated bar or barrier that is at/between 2-4 meters high. The device must go over the bar without touching it and land on the hard surface below (floor or ground.) The event manager will indicate when teams may toss device. If a team does not clear the bar, the team may try tossing again without repairing device.
9. Team must remove the egg from the device immediately upon a signal from EM to show if egg survived. Breakage is defined as being cracked or broken enough to leave a wet mark on a paper towel. If the egg is cracked or broken it will be placed in Tier 2.
10. If the egg survives the toss it is placed in Tier 1.

Scoring:

Devices will first be ranked in tiers according to whether the egg breaks or not.

Tier 1 = Device with eggs that survive the toss
Tier 2 = Devices with eggs that are broken
Tier 3 = Devices, regardless of egg breakage, that violate one of the competition rules.

Within each tier, devices will be ranked with the least mass winning.

B/C connection: Trajectory

Simple Machines

Description: Participants will be asked to identify, use and answer questions about simple machines.

A Team of Up To: 2 **Approximate Time:** 50 min.
Impound: No **Visitors:** Yes

Competition: Each participant will move from one station to another for up to 15 stations. Each station will contain a picture or example of a simple machine. The student will be asked to identify the machine and answer a question about it, or use equipment to measure some variable such as length, force or weight.

The Simple Machines used are:

1. Lever
2. Inclined Plane
3. Pulley
4. Screw
5. Wheel and Axle
6. Wedge

Students MUST move at the indicated time to ensure that all teams have equal opportunity to use the equipment at each station (2 minutes per station). Answer sheets will be provided for participants.

Scoring: The scoring of the event will be based on the number of correct answers.

Sample Questions:

There is a drawing or a sample of a lever at a station. The student will be asked:

1. What simple machine is being used?
2. The point of support on this simple machine called_____?
3. What is the length of the effort arm in centimeters?_____

There is a setup of an inclined plane with a mass on it and a meter stick available.

1. What simple machine is being used?
2. Calculate a problem knowing that work equals force times distance.

Water Rockets

Description: Prior to the competition, teams will construct (up to) two rockets designed to stay aloft for the greatest amount of time.

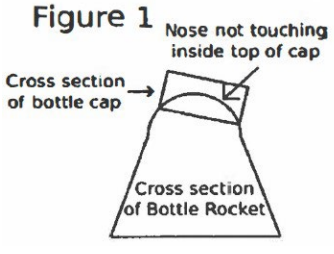
A Team of Up To: 3 **Approximate Time:** 10 min.
Impound: No **Visitors:** Yes

Teams: Must bring own eye protection. Students may bring repair kits containing tools, spare parts and extra parachutes. Teams from the same school may share a repair kit, but they may not share the same rocket or parachutes. Students should keep rockets labeled and stored with them in a safe container. Students will bring their rockets, repair kits and journals at assigned time. Each student is also required to turn in their own journal, documenting trials, errors, photos, lessons learned in the process of building device.

Event Managers: Will provide water rocket launcher, water and timers.

Construction:

1. Rockets must be made from a standard 2 liter soda bottle which is used to hold water and air pressure that propels the rocket when released. The structural integrity of the pressure vessel must not be altered in any way. This includes but is not limited to: physical, thermal, or chemical damage (holes, scratches, increasing the volume, restricting the bottle's opening, cutting, sanding, aluminum tape, using hot or super glues.) No glues of any type are allowed on the pressure vessel, but glue may be used on other parts of the rocket.
2. Only tape may be used to attach fins or other items to the pressure vessel. If the pressure vessel is covered in tape, paper or other material you may use glue to attach items to the covering as long as it doesn't distort or weaken the pressure vessel.
3. Commercially made rocket components, sharp/pointed objects, parts made from glass and metal are not allowed. (Note: a small metal swivel may be used for the parachute attachment.)
4. The nose of the rocket must be rounded at the tip and designed such that when a standard 2-liter bottle cap is placed on top of the nose, no portion of the nose touches the inside top of the bottle cap (see Figure 1). **Tip must be made of a softer material that is easily compressible by hand.**
   *** CANNOT USE CAP END OF A BOTTLE AS A NOSE.**
5. Event managers will assess the integrity of the pressure vessel by looking for discoloration, bubbles, thinning or cuts in the walls of bottle. Alteration to the structural integrity of the pressure vessel is a safety violation of the



rocket and it must not be launched as this is a safety issue.

6. Fins, parachutes and other items may be added to the outside of the bottle to increase the time aloft.

Water Rockets Cont.

7. No solid weights like batteries, fishing weights or hard rigid items can be used.
8. Energy to propel the rocket must come only from the water and air pressure in the bottle. Other sources of potential or kinetic energy are not allowed. Only plain tap water may be used in the rocket. No other materials of any type may be put in the bottle or added to the water. A water level line may be marked on the bottle to aid in adding water.
9. Parts of the rocket may separate during flight, but they must remain attached by string or lanyard.
10. The rocket must be identified with the school and team name.

The competition:

1. Any parts found to be dangerous (glass or metal), illegal (commercially made rocket parts) or that prevent a rocket fitting on the launch pad must be removed before the rocket can be launched. Rockets that are changed to meet the construction requirements will not be penalized. Rockets that cannot be made to fit on the launcher or those that in the event manager's judgment are unsafe will not be launched.
2. A Pitsco launcher will be used.
3. Two launches will be allowed. Different rockets may be used for each launch. Students must use the water, launch pad and source of pressure provided by the event manager. The students will add the desired amount of water to the rocket before each flight and may make alterations or repairs to rockets between launches. **Outside assistance/coaching from the sidelines is not permitted and will be grounds for disqualification.**
4. The judges will pressurize the rocket to 75 psi. Anyone within 10 meters of a pressurized rocket must wear eye protection. Contestants may not hold their rocket during pressurization. Please do not exceed this pressure when practicing. Only coaches should pressurize the rocket.
5. Once a rocket has been pressurized it must be launched. **In case of high wind, rocket needs to be launched as quickly as possible.** It will be the supervisor's decision whether the flight should be considered as unofficial due to the weather conditions.

1. Have parachutes packed and rocket ready before placing on the launcher.
2. Students must not catch rocket on its descent. Catching the rocket will be means for disqualification.

Scoring:

1. Judges will measure and record the time aloft for each flight. Time starts when the rocket is launched and stops when any part of the rocket touches the ground, or any object in contact with the ground (tree or building.) Teams will be scored using only the flight that will produce the better score/rank.
2. Flights of rockets whose parts do not remain attached together during the entire flight or that cannot be

changed to meet the construction requirements will be ranked by their time aloft, behind all flights of rockets without construction violations and whose parts remain attached.

Water Rockets Cont.

3. Teams whose rockets cannot be launched for any reason will receive participation points only.
4. The longest time aloft wins. Ties will be broken using the team's lesser flights times. Teams with two flights will win ties over teams with only one flight.

Please note: Do not use parts of rockets from previous years. Judges may ask students how rocket was built. The students must have built the rocket.

Resources/Notes from EM: We suggest removing plastic ring near the opening so rockets fit on launch easier.
B/C connection: Bottle Rockets

Wind Turbine

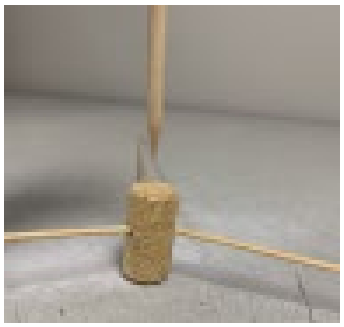
Description: Students will engineer (design/plan, create, test, improve) a wind turbine, specifically the blades of the turbine.

A Team of Up To: 2 **Approximate Time:** 8 min.
Impound: No **Visitors:** No

Teams: **Will bring in prebuilt device.**

Construction:

a. Students will attach 3 wooden skewers (12") to a cork
b. This will then be attached to a sharpened wooden dowel (1/4" diameter)



c. A wooden spool will be attached to the wooden dowel, about 4 cm behind the cork.
d. The free end of the wooden dowel will be inserted into a straw that has been taped to a table.
e. String: one end of a piece of string will be taped to the wooden dowel. The other end will reach the floor where it will be attached to a small container.
f. A fan, such as a box fan, will be placed in front of the device.
g. Students will create 3 blades that attaches to the skewers (1 blade per skewer). You may use any type of adhesive to attach the blades.
h. Goal: to design blades that cause the turbine to spin when the fan is turned on. The turbine must lift the container.
   i. The container will be filled with pennies.
   ii. The more pennies lifted to the top, the better your score.

Wind Turbine Cont.

The Competition:

a. **On the day of the competition, bring only your pre-built device (cork, skewers, blades, *spool, cup, string, wooden dowel) Your turbine should be attached to the wooden dowel, spool with string, and cup. (UPDATED)**

~~**You do not need the wooden dowel or spool.**~~

b. You will be given 8 minutes to complete up to 2 Trials.
   i. To begin, you must insert your device into the provided straw taped to a student desk and arrange the pedestal fan. Link to straw: https://tinyurl.com/38w4msjf
   ii. You may adjust the height, angle, and distance of the fan.
   iii. The pedestal fan must be at least 50 cm from the student desk.
   iv. The event manager will provide the straws and pennies.
   v. The device needs to be prebuilt.

c. You will add your predetermined number of pennies to the container. As you add one penny at a time, you will count out loud so the event supervisor can monitor.

d. You will then turn the fan to its highest setting.

e. Trial 1 is complete.

f. You may attempt a second trial if time permits.

g. Cups to be used: https://www.amazon.com/dp/B0CYXQ378Q?ref=fed_asin_title

Scoring:

a. The number of pennies lifted to the spool equals your score.
   i. The best trial will be used

b. Tiebreaker: the weight of your device (cork, skewers, blades)
   i. The lighter wind turbine will break the tie.

Resource: (Youtube video): https://www.youtube.com/shorts/WHa1qorbp88

a. Sample Score Sheet

Trial	Was the container lifted to the top?		Number of Pennies Lifted to the Top
	Yes	No	
1			
2			

Mass of the device (cork, skewers, blades) _____ gram

Write It/Do It

Description: Technical writing skills are an important part of an engineer or scientist's abilities to communicate precisely and clearly. This event will test a team's ability to effectively communicate by having one team member write a description of how to build a device and having his or her partner re-construct the device from raw materials.

A Team of Up To: 2 **Approximate Time:** 50 min.
Impound: No **Visitors:** No

Teams: Teams must bring a writing instrument. No other resources are allowed.

Event Manger: Will provide paper and all necessary materials.

The Competition:

1. This event will occur in two rooms so that the builders are held while the describers are writing.
2. One team member (the writer) is shown an object (which may be abstract) built from, but not limited to science materials, inexpensive materials (straws, push pins, Styrofoam balls, paper cups, popsicle sticks, etc.) or commercial sets (K'nex, Tinker Toys, Lego, Lincoln Logs, etc.)
3. The "object" will be the same for all teams.
4. A maximum of 20 pieces will be used.
5. No extra pieces will be added to the "do" portion.
6. The writer has 25 minutes to write a description of the object and how to build it. There will be no advantage to finishing early.
7. Only words and numbers may be used. Pictures, symbols, drawings and diagrams are not allowed, with the exception of common punctuation and editing symbols. Punctuation marks and/or editing symbols that can be produced on a keyboard by pressing a single key or a single key along with the shift key may be used as long as it is used in their normal context and not as symbols to form a key or code.
8. All abbreviations must be defined either at the beginning or when the abbreviation is first used.
9. The event leader will pass the description to the other team member (the doer) who will use the description to re-create the original object in twenty (20) minutes.

Scoring:

1. The team that builds the object most like the original object and has properly written instructions wins.
2. Points will be given for each piece of material placed in the proper connection and location compared to the model.
3. Time for the construction phase will be used as a tiebreaker.