

BRIDGE BUILDING

Description:

In this event, students will build a long, strong, stable and reproducible bridge from paper straws and one meter of masking tape capable of supporting the weight of an object, not to exceed 10 x 10 x 10 cm with a mass of between 30 and 100 grams, for 10 seconds.

Number of Participants: 1-2 **Construction Time:** 20 minutes **Impound:** Yes (after build)

The Competition:

1. The event supervisor will announce the mass and show the object to be used. Object mass will be between thirty and one hundred grams.
2. Students will be given fifty paper straws and 1 meter of masking tape. They are to construct a bridge that spans the greatest possible distance and be able to support the object when placed by the judge in the center of, and at a right angle to, the length of the bridge.
3. The bridge must support the block for ten seconds.
4. No building materials, except the fifty straws and tape, will be allowed in the construction of the bridge.
5. Scissors will not be provided, but will be allowed. Each team will responsible for bringing their own scissors. Only one pair is allowed. The cutting of both the straws and the tape is allowed.
6. The bridge will be suspended between two similar supporting structures, such as two tables starting at 60 centimeters and must hold for 10 seconds. Subsequent tests on the same bridge will be increased by 2 centimeters until the bridge fails.
7. Straws may be crimped and slipped together.
8. No tape may be used for sticking the bridge to the supporting structures. No sticky part of the tape may touch the top or sides of the supporting structure.
9. All parts of the bridge must sit *above* the supporting structure *before* testing (note: the sinking of the bridge *below* the supporting structure *is* allowed during testing due to the weight being added).
10. Any team which uses any tools or materials other than straws, scissors, and tape at the competition site will be disqualified.

Scoring:

1. Each team's bridge will be tested beginning with a span of sixty centimeters, followed by increments chosen by the event supervisor and be the same for all teams, until the bridge is unable to hold the block for ten seconds. The greatest distance spanned before succumbing to the weight of the object will be recorded as a team's final score.
2. Bridges will be ranked based on their final score (the longer the final span, the higher the rank).
3. If a tiebreaker is required, more weight will be added incrementally until the last bridge is still standing.
4. If all bridges fail during the *incremental weight* tiebreaker round, the one that held the weight for the longest will be declared the winner.

CAN RACE

Description:

In this event, teams will construct a vehicle made from a can which will travel as close to 300 cm as possible in the shortest amount of time and in the straightest possible path.

Number of Participants: 1-2 **Test Time (per team):** 5 minutes

Impound: Yes – during designated impound time (and with a “data chart” if the team made one)

The Competition:

1. Each team will make and bring to the competition one can racer to test.
2. Any type of can may be used (irrespective of size or material).
3. Racer surfaces may not be modified by the addition of any substance (e.g. rubber bands at the can edges).
4. The racers will remain in the impound area until the assigned race time.
5. The racers will be run on a course approximately three meters long and one meter wide. The sides of the track will be wooden barriers (such as 2 x 4's).
6. Teams will be given two runs of the raceway. The better of the two runs will then count as the official time/distance measurement.
7. A maximum of five minutes will be allowed to complete the two runs.
8. Adjustments will be allowed between runs.
9. No parent or coach may intervene during the 5-minute race time.
10. Racers will be released on a center line by contestants without any assisting push, and may not be touched by anyone until they stop rolling.
11. Racers stuck against the lane barriers will have their run length measured at that point.
12. The can will be timed for the entire time it runs; even if it passes the three-meter line.
13. The stopping location will be measured from the center-point of the center-line of the can. (i.e., in essence, the point will be at the top of the can, in the center, where it will cut the cylinder in half.)

Scoring:

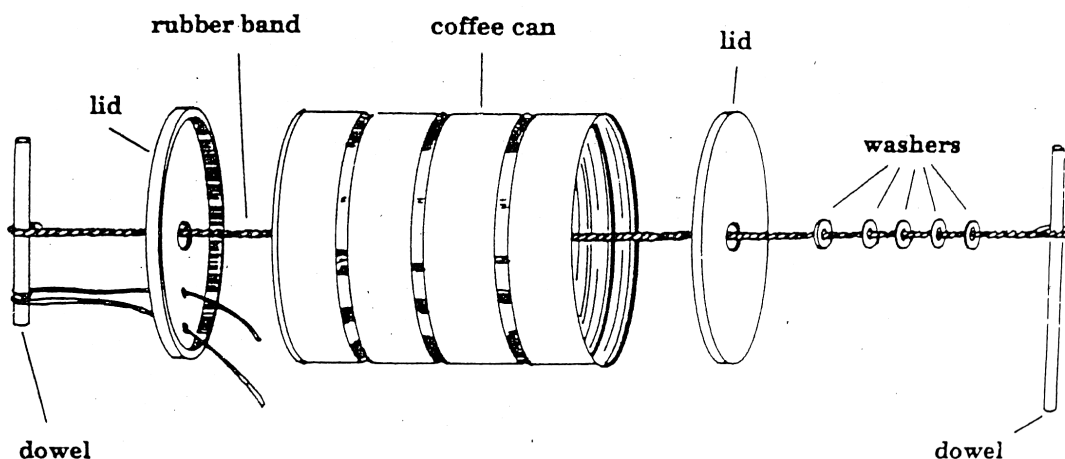
1. Additions:
 - a. One point will be awarded for every centimeter the racer travels up to 300 centimeters.
2. Deductions:
 - a. One point will be deducted for every centimeter the racer travels beyond the 300 centimeter line.
 - b. One point will be deducted for every second the racer travels before it comes to a complete stop.
 - c. One point will be deducted for every centimeter away from the center line the racer is when it comes to a complete stop.

For example, if a can traveled 400 cm. in 15 seconds and strayed from the center line by 10 cm., the score would be 300 (highest allowable distance points) – 100 (centimeters traveled past the 3-meter line) – 15 (seconds traveled) – 10 (centimeters strayed from the center line), for a final score of 175 points.

3. Tie breaker. In the event of a tie, teams that submit any type of “data chart” (compiled from before-event practice runs) will be ranked higher.

One Way To Make a Racer:

1. Drill holes in the precise center of the can bottom and plastic lid(s) - the holes must be large enough so a large rubber band will thread through them easily. Be sure the edge of the hole in the can is smooth so it won't cut the rubber band.
2. Put the lid(s) on the can and thread the large rubber band through the hole so that the loops protrude from both ends of the can.
3. Push the shorter wooden dowel or stick through the loop of rubber band protruding from the can bottom.
4. Punch two small holes in the can bottom on either side of the stick, and tie the stick securely to the can bottom with twine, wire, or a twist tie.
5. Thread the other loop of the rubber band through the holes in several washers. (There must be a sufficient number of washers to keep the longer stick, which is added in step 6, from rubbing against the edge of the can. Later, if appropriate, you can increase or decrease the number of washers).
6. Finally, place the longer wooden dowel or stick through the loop with the washers so that one end sticks out beyond the side of the can.
7. Wind up the rubber band(s) and release the racer.



CATAPULT

Description:

Prior to the competition, students will design, construct, and calibrate their own free standing (not hand held) catapult device that must be capable of “lobbing” a Tennis Ball between 2 and 5 meters at a target. Students must bring and wear safety goggles.

Number of Participants: 2 **Approximate Launch Time:** 10 minutes

Impound: Yes The device, all necessary tools and chart must be impounded. No adjustments or alterations of the device will be allowed at or during impound.

Eye Protection Required: Yes Goggles or safety glasses do not need to be impounded but both students need to bring an individual pair to compete with.

Construction:

1. Each team will bring a homemade wood or plastic catapult to the competition (metal fasteners are allowed). Each device should be designed and built by the students. Adult construction assistance is OK. No kits. The event supervisor for the competition will provide standard regulation Tennis Ball.
2. Each device should be designed to operate safely at all times. Any device that cannot be operated safely will be disqualified. (Event Supervisors’ discretion) No points will be awarded for design.
3. Launch force must be provided by gravity or elastic solids (such as springs, rubber bands, etc.)
4. No point on the entire device may exceed 50 cm at any time – before, during, or after the launch.
5. The team name must be prominently displayed on the catapult. Unmarked catapults will be ranked after marked catapults.
6. To operate, the device will be placed within a 2 meter by 2-meter square called the Launch Area. The device may not be anchored to the ground. Teams must be out of the launch area during the launch. Therefore, the device will be launched with a “pull chord” of some type from outside the box by the school’s catapult team.

Graph or Data Chart:

1. Prior to the competition, teams should prepare a graph or data chart, clearly labeled with the school and students’ names, graph title, labeled x- and y- axes and graduated using appropriate units for usage of their device. Students should be prepared to answer questions about their device and graph. A bonus of +3 points will be awarded.
2. One graph should be submitted during impound. The graph may be used during the competition.

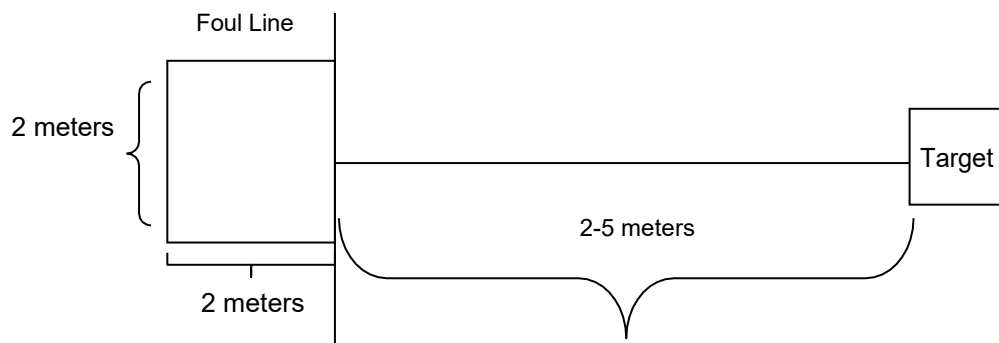
Competition:

1. Each team must bring their catapult – along with all graphs, tools and other materials needed for the competition – to the impound area during impound time. They will be accepted there as ready to go. Devices will be measured in impound to determine whether they meet or do not meet construction requirements. No adjustments will be allowed before a team’s test time. Safety goggles (or glasses) are required during launch time. Following an initial warning, a penalty of +3 points will be assessed for failure to don safety goggles before a launch by either team member.

2. Once teams enter the event area to compete, they may not leave the area or receive outside assistance, materials or communications until they are finished competing. Following an initial warning, a three- point penalty (+3) will be assessed per violation.
3. Teams will be lobbing Tennis Ball (provided by the event supervisor) at a specified target, which will be a three-dimensional object, at least 10cm high, wide and long.
4. The target distance (anywhere between two and five meters) will be announced by the supervisor before each event. To ensure fairness, each team will receive a randomly selected target distance before they compete. The target distance will be measured from the center of the foul line to the center of the target. Students may place their catapult at any point behind the foul line, within the 2-meter square launch area. The device will sit on the ground and fire at the target that will be at ground level.
5. Teams may place their catapult at any point behind the foul line, within the two-meter square launching area. The device must sit on the ground (or be level on the ground) and fire at the target area that will also be at ground level. The device may not be anchored to the ground.
6. Each team will have a one-shot practice round, after which they will have three shots at the target. Firing time, to include the practice shot, is a total of 10 minutes.
7. Teams must give ample warning to the judge prior to launch. Warning may be “3,2,1 launching...” etc. Following an initial warning, a penalty of +3 points will be assessed for failure to warn judges before launch. Teams must be out of the launch area when fired.
8. Only successful launches will be measured. Launches are successful when a Tennis Ball goes beyond the foul line. Only 3 shots fired are allowed beyond the practice shot regardless if they are successful or not.
9. The distance from the center point of the target and the Tennis Ball’s initial point of impact will be determined by the supervisor. This distance will be measured after each shot, including the practice shot, and announced to the team to allow them to make adjustments based on one data chart and/or graph.
10. The device may be moved by the participants within the 2-meter square launch area after each attempted launch. Teams may make adjustments to their device, between shots, while in the launch area using only materials that were impounded with the device. They may not change the device in any way that would violate impound rules.
11. Participants may not enter the target area at any time.

Scoring:

1. The first two shots (not including the practice shot) will count toward the score. Tennis Balls hitting the target on initial impact will receive a perfect score of zero. The cumulative distance after the first two shots, plus any penalties and/or bonus points, will count towards the total score. The lower the score the higher the ranking.
2. The third shot will be used only in case of a tie. It will be recorded by the supervisor, but will only be used as a tiebreaker if needed.
3. Devices and materials will be released from impound when the team has finished competing. Appeals by teams will not be processed after they remove their device from impound.
4. The official event course may not be used for practice before or during the catapult event except during the specified practice round or actual competition.



CRIME BUSTERS

Description:

In this event, participants will use various tests to identify 7 unknown powders. The only powders used will come from the following list:

- | | |
|---------------------|----------------------------------|
| 1. Salt, | 5. Cornstarch |
| 2. Granulated Sugar | 6. Baking soda |
| 3. Plaster of Paris | 7. Limestone (calcium carbonate) |
| 4. Flour | 8. Sand |

They will also be asked to match fingerprints and use paper chromatography to identify a note found at a crime scene.

Number of Participants: 1-2 **Approximate Time:** 40 minutes

Eye Protection Required: Yes

The Competition:

1. Students must bring and wear their own chemical splash-proof goggles or safety glasses and a lab apron or coat.
2. Due to safety reasons, touching or tasting of the substances will not be allowed.
3. Each team will be given seven vials (five vials containing one substance and two vials containing a mixture of two substances. The two vials with the mixture of substances will be labeled. Students will be supplied with a list of possible powders.
4. Teams will be supplied with the following materials to aid in the identification of the powders: water, 1M hydrochloric acid (or vinegar), iodine solution (KI_3), a magnifying glass and several plastic cups. (These materials will be provided by the event supervisor).
5. Students will be given a set of fingerprints from several suspects. They will be asked to match them to fingerprints found at the scene.
6. Students will be asked to make a chromatogram from a pen and use this to help identify the criminals. Chromatograms will be turned in with the test sheet. Chromatograms will be made of chromatography paper or coffee filter paper.
7. After all the evidence is collected, the students will be asked to identify who committed the crime and to explain in writing why they believe this is the criminal, making specific references to the evidence they uncovered during their labs.

Scoring:

1. The score will be based on the following formula:
 - Identification of the powders = 50%
 - Chromatography = 15%
 - Fingerprints = 10%
 - Identification of the criminal, including written component = 25%
2. Ties will be broken by taking into account the clarity and completeness of the written explanation (see number 7 in the "Competition" section above).

DISEASE DETECTIVES

Description:

Epidemiology uses science to study disease, injury, health, and disability in communities. This study involves: reasoning skills, such as those used by “disease detectives”; comparison of risks (the chances of becoming sick or injured); and surveys to help describe different groups of people (for example, kids in school classes and people in neighborhoods). The goal of the Disease Detectives event is to have students understand connections between things they may encounter in daily life and various health problems that affect communities, risks for disease/injury, and opportunities for prevention. The event will also help students to understand general categories of causes of diseases and injuries.

Number of Participants: 1-2 **Approximate Time:** 40 minutes

The Competition:

1. The contestant or team (if 2) will move to different stations. Each station has an object, which may present a risk or prevention opportunity for disease or injury.
2. At each station, participants will perform various activities, such as:
 - a. identifying and writing the disease or injury problem related to the object of the station.
 - b. describing how the object may be used or modified to prevent the disease or injury problem in populations.
 - c. identifying and describing routes of transmission of disease.
 - d. using simple calculations (e.g.; addition and subtraction) to make comparisons or risk for different groups of people.
 - e. interpreting a table or graph presenting data related to diseases or injuries.
3. Participants may develop and bring to the competition a collection of notes to aid them in answering these questions. All the contents of the binder must be student-generated, handwritten notes that fit into one 2” 3-ring binder.

Sample Problems:

Stations might include examples of an improper cooking techniques as a risk factor for food-borne infectious disease, a bicycle helmet as a preventive measure for injury, fatty foods as a risk for heart disease, a tobacco product as a risk for lung cancer, or a bar of hand soap representing effective prevention of person-to-person spread of infectious disease. The last station might include data for students who visit the zoo on a field trip: of 25 students who visited, 12 petted the lizard; of these, 8 became ill. Of the 13 students who did not pet the lizard, only one became ill. How would you represent the risk of illness from petting the lizard? Students might compute risks (e.g. $\frac{8}{12}$ vs. $\frac{1}{13}$) or draw graphs to illustrate the comparison of risk.

Scoring:

Responses for each station with a commonly found item could include identification of the possible risk of use or exposure to the item and a possible means for prevention. Each identification station is worth 2 points (1 point for identification of the health problem, 1 point for description prevention). The final data station is worth 2 points (1 point for appropriate risk comparison, 1 point for an appropriate written explanation).

PADDLE BOAT CONSTRUCTION

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")

Number of Participants: 1-2 **Impound:** Yes – during designated impound time.

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

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 constructed paddle boat must fit inside a 20 cm by 10 cm by 5 cm 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 20 cm (width) x 3.66 m (length) x 12.5 cm (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 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 than twenty times (One twist is defined as a 360° rotation of the rubber band. The paddle will have an X marked on one side to keep track of the rotations).
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.

ROCK HOUND

Description:

In this event, students will prepare charts, identify various rocks and minerals, and describe their characteristics and possible origins.

Number of Participants: 1-2 **Approximate Time:** 40 minutes

The Competition:

1. Teams will be handed an answer sheet on which they will record their answers.
2. Teams will be allowed 40 minutes to work through a series of timed stations (approx. 1-2 minutes per station) identifying as many rocks and minerals as possible from a selected group. Samples may include such rocks as, but not necessarily limited to, the following:

ROCKS:	basalt	bituminous coal	conglomerate
	gneiss	granite	limestone
	marble	obsidian	pumice
	quartzite	sandstone	schist (with garnet)
	scoria	shale	slate
MINERALS:	calcite	copper (azurite/malachite)	feldspar
	fluorite	galena	graphite
	gypsum	halite	hematite
	mica-biotite	pyrite	kaolinite
	quartz	quartz (crystal)	talc

3. Teams will also be asked questions about the rocks and minerals, such as their color, relative hardness, shape, texture, etc.
4. Teams may bring in one handwritten charts/notes to the competition limited to one 8 ½ x 11 inch sheet of paper. Both sides of the single page may be utilized. No sheet protectors, layers, tape or glue allowed. These charts/notes may be used in the identification process and to aid in answering any questions.

Scoring:

1. One point will be awarded for each rock or mineral identified and each question answered correctly.
2. Teams will be ranked by total number of points awarded.
3. Tie-breaker questions will be predetermined by the event supervisor.

Suggested Preparation Resources:

- Boxed rock and mineral sets available through Science Olympiad, as well as varied other vendors.
- Rocks and Minerals guides, such as those published by DK

SIMPLE MACHINES

Description:

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

Number of Participants: 2 **Approximate Time:** 40 minutes

The 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 involved 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). An answer sheet will be provided.

Scoring:

The scoring of the event will be based on the number of correct responses.

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 is 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.

STARRY, STARRY NIGHT

Description:

Students will become the school's astronomy experts! They will become familiar with the constellations, planets, the Earth's moon, types of stars, tides and phases of the moon, etc.

Number of Participants: 1-2 **Approximate Time:** 40 minutes

The Competition:

1. Contestants should prepare for the test by looking through astronomy resources, such as textbooks, and sites on the Internet. They should be looking for pictures of the moon, planets, star clusters, nebula and galaxies.
2. Participants may develop and bring to the competition a collection of notes, charts, keys to aid them in answering these questions. All the contents of the binder must be student-generated, handwritten notes that fit into one 2" 3-ring binder.
3. Each team will be given one test booklet and one answer sheet. Team members may consult with each other by writing, but they may not speak to one another. Only one answer for each question will be accepted.
4. At the end of the testing period the test booklet and answer sheets will be collected from those teams who have not at that point turned in their responses.
5. The contestants will be shown either star charts, overhead slides, or photographs of star fields and be asked to identify indicated stars and constellations.

Scoring:

1. Teams will be ranked by total score.
2. Tiebreaker questions will be predetermined by the event supervisor.

Suggested Study Resources:

Fourth, Fifth and Sixth Grade California standards-based science textbook and basic astronomy resources.

STRAW EGG DROP

Description:

In this event, teams will construct a device meant to hold and protect a large, raw egg that will be dropped from a fixed height onto a target.

Number of Participants: 1-2 **Construction Time:** 20 minutes **Impound:** Yes (after build)
Drop time: 3 minutes

The Competition:

1. Each pair of students will be provided with:
 - a. 20 paper straws
 - b. One meter of one-inch masking tape
 - c. One pair of scissors
 - d. One large, raw egg
2. Students will have twenty minutes to construct a device to cushion the egg and prevent it from cracking or breaking. Note that the egg is considered part of the device.
3. The masking tape is intended to help fortify the paper straw structure. No tape may be attached to the surface of the egg.
4. They will have three minutes to drop the device onto a target from a height of 2 – 3 meters
5. There will be one drop per team only.
6. Plumb lines will not be allowed during the competition.
7. Note: during construction time, if an egg is broken, a team will be assessed a distance penalty of 15 centimeters. If broken a second time, another 15 centimeters penalty is added.

Scoring:

1. All devices will first be placed into one of three categories:
 - a. Unbroken – highest rank
 - b. Cracked but with no liquid escaping (membrane not broken) – middle rank
 - c. Broken/oozing (all others) – lowest rank
2. Within their categories, each device will then be ranked by their nearness to the target (specifically, this is the distance from the center of the target to the farthest edge of the egg, egg part, device, or any part of the device that has broken off.) Eggs with the “broken penalty” will have 15 centimeters added.
3. Please note that the event supervisor will have sole determination of the condition of the eggs after being dropped.
4. Scoring examples:
 - a. An unbroken egg landing 24 cm. from the target would be ranked before any cracked or broken egg, no matter their distance from the target.
 - b. In the event that there are no unbroken or cracked eggs (a case where all eggs are broken and oozing), those landing closer to the target will be ranked higher.
5. In the event of a tie, where both the condition of the eggs and their respective distances from the target, are the same, the smallest device, in terms of diameter, will be declared the winner.

TREASURE HUNT

Description:

Participants will bring and use a compass to locate a hidden treasure.

Number of Participants: 1-2 Maximum Course Time: 5 minutes

The Competition:

1. Participants will be given a “Treasure Marker” and a “Treasure Map” which will contain direction and distance data will be given in compass heading degrees ($0^{\circ} - 360^{\circ}$) and the distance data will be given in meters.

For example: Go 36 meters at 112°
 Go 115 meters at 270°
 Go 89 meters at 90°
 Go 136 meters at 320°

2. When students complete the final “leg” of the “Treasure Map” they will place their “Treasure Marker” where they come to rest. Students should place their school name on the “Treasure Marker” which could be a small flag, golf tee, Popsicle stick, or other marker.
1. Students should know how to use a compass and how to measure their pace or step. They should learn how to sight on a distant object in the path of the compass heading. Young students may find it easier to count their steps rather than pace (2 steps). They should practice their step or pace so it is a consistent measure.

Scoring:

Treasure Markers that are closest to the hidden treasure will determine winners. Ties will be broken by the shortest time to complete the course.

WEATHER OR NOT

Description:

This competition will test the students' knowledge of meteorological terms, techniques, and events.

Number of Participants: 2 **Approximate Time:** 40 minutes

The Competition:

1. Participants will be given a test on basic weather terms and techniques. Material may include cloud charts, simple scientific weather instruments (such as thermometers, barometers, etc.), weather patterns severe weather photos, major weather events/disasters of the past years and other weather charts, graphs, tables, photographs, drawings, or diagrams.
2. Questions may also include state of water, water cycle, weather terminology, atmosphere, weather instruments and their function, seasonal changes in weather, weather safety and types of severe weather and watches/warnings.
3. Students may be asked to make readings on a variety of simple scientific weather instruments such as thermometers, barometers, and anemometers.
4. Each team may bring one, 2-3 inch, 3-ring binder containing pages of information in any form from any source.

Scoring:

The winner will be the team achieving the highest score. Ties will be broken by a pre-selected set of questions.

WRITE IT / DO IT

Description:

This event tests competitor's ability to clearly communicate in writing and follow written directions.

Number of Participants: 2 **Approximate Time:** 40 minutes

The Competition:

1. One student will be shown a contraption built from blocks, science equipment, Legos, K'NEX, PVC pipe fittings, pipe cleaners or other inexpensive materials (cups, plates, straws, pieces of candy, etc.) The student will have 25 minutes to write a description of the object and give directions on how to reproduce it.
2. His/her partner (in another room) takes the description and attempts to recreate (build) the original object in 15 minutes.
3. No diagrams will be allowed and no verbal or other form of communication will be allowed in passing.

Scoring:

The team which builds the object nearest to the original is declared the winner. A point will be given for each piece of material placed in the proper location. No penalty will be assessed for parts that were not assembled. The decision of the judges is final. Time may be used as a tiebreaker.