



# **PHILIPPINE PHYSICS SOCIETY**

## **PHYSICS OLYMPICS MANUAL**

**2014 EDITION**

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## INTRODUCTION

Since its first introduction, the Physics Olympics has generated much fun and enthusiasm in the Philippines, especially in the Visayas and Mindanao. Students participate with much *gusto* in the games at both school and provincial level competitions.

The Physics Olympics provides learning with fun. The activities involve the understanding and application of physics principles and the use of creativity. Mere exercise of skills or physical prowess is de-emphasized.

The Physics Olympics was first introduced at the national level during the 6th Philippine Physics Society Annual National Seminar/Workshop Convention held at the University of Negros Occidental - Recoletos, Bacolod City on April 5 - 8, 1984. Dr. Vicenta C. Maxino spoke then on "The Physics Olympics: Dumaguete Experience." During the socials portion of the convention, olympics activities were conducted as parlor games.

The first National Physics Olympics occurred during the 10th Annual National Physics Seminar/Workshop Convention held at the Divine Word University at Tacloban City on April 6 - 9, 1988. By this time, many chapters had initiated the Physics Olympics in their areas. Among these chapters were those of Negros Oriental - Siquijor, Cebu, Butuan and Bukidnon. Since 1988, the Physics Olympics have been conducted annually to provide fun and learning experiences for participants. In many cases, teachers held Physics Olympics when they returned from the annual convention to their respective stations.

The first Physics Olympics in the Philippines was held at Silliman University, Dumaguete City during the School Year 1983 - 1984. While conducting a seminar at Silliman University in January 1983, Dr. Jack John Brennan of the University of Central Florida (Orlando, Florida), who was then Visiting Professor at Xavier University, Cagayan de Oro City, encouraged then SU Physics Chairman Dr. Gerardo C. Maxino and faculty member Dr. Vicenta C. Maxino to initiate the Physics Olympics. He sent materials, among which was a manual of rules for the Physics Olympics. The following school year (1983-1984), then SU Physics Chairman Dr. Vicenta C. Maxino organized the First Provincial Physics Olympics held at Silliman University in December 1983.

The Beach Physics Olympics was introduced in 2006 at Boracay on the occasion of the PPS Annual Convention.

This present manual adapts the Physics Olympics to the Philippine situation. It presents the most liked activities, culled from a greater number played over the years in the Visayas, Mindanao, and Luzon. It is not a definitive manual. It hopes to grow as teachers and students share their experiences from the field.

The Physics Olympics should remain a venue for fun and learning. As always, there should be no monetary rewards. Trophies, pennants, ribbons, certificates, or even plain oral commendation are the ideal prizes in the Physics Olympics. The understanding and application of physics principles should be emphasized. The use of creativity should be encouraged. Towards these ends, in the design and construction of devices for the games, it is a safe policy to allow what is not explicitly prohibited in the rules.

The conduct of the Physics Olympics should continue as fun and learning experience. While competition remains an essential element, the unitive aspect must prevail. After all, the Physics Olympics becomes meaningful only if it nurtures the growth of the physics community.

2014 Edition



Gerardo C. Maxino, PhD  
National President, PPS

## **GENERAL RULES**

1. In the construction of devices, what is not expressly prohibited in the written rules are allowed.
2. For each event/game/contest, the First Place winner will be given 20 points; the 2<sup>nd</sup> Place winner, 15 points; and the 3<sup>rd</sup> Place winner, 10 points.
3. In case of a tie, each of the concerned teams will get the same points assigned to the particular winning position (1<sup>st</sup>, 2<sup>nd</sup>, or 3<sup>rd</sup>). If two teams tie for the 1<sup>st</sup> Place, each will get 20 points; but the next in rank will be declared as only a 3<sup>rd</sup> Place winner and will be given only 10 points. If, on account of a tie, there are already three or more winners in the 1st Place and 2nd Place, none will be declared a 3<sup>rd</sup> Place winner. If a tie occurs in the 3<sup>rd</sup> Place, each concerned team will be awarded 10 points.
4. Each delegation shall be composed of only one school/institution.
5. There should be at most only one team per delegation per event. No two members of a delegation may join more than one team for a given event; otherwise it forfeits points that would otherwise be earned by any member of the delegation for the event.
6. A team may be composed of members coming from different delegations. If a team wins, the points it earns will be equally divided among the delegations composing it. If a member of the team forfeits the points, the forfeited points shall not be enjoyed by the other member.
7. The over-all winners shall be determined by adding the points earned by the members of each delegation.
8. There shall be three Grand Champions, one for each category: professional, college, high school.
9. In case the Regular and Beach Olympics are both conducted in the same seminar, convention, or gathering, there shall be three Grand Champions for each.
10. The PPS President, or his designate, shall serve as the ultimate judge, whose decision shall be final and cannot be appealed or questioned in any venue. All participants are understood to subscribe to this. Those who do not shall not participate; and if they do, their participation shall be void ab initio.
11. The Regular Physics Olympics shall consist of one or more of the following events (games): egg drop, egg transport, bridge building, super magnet, large barge, paper tower, paper airplane, and master robot.
12. The Beach Physics Olympics shall consist of one or more of the following events (games): tallest sand tower, most popular sand castle, longest single span sand bridge, sand buggy, water transport straw, unsinkable boat, electronically-controlled toy boat, and water rocket.

## **REGULAR PHYSICS OLYMPICS**

The Regular Physics Olympics I consists of one or more of the following events (games): egg drop, egg transport, bridge building, supermagnet, large barge, paper tower, paper airplane, and master robot.

### **EGG DROP**

**OBJECT:** To provide a container that will protect a raw egg when dropped from an altitude to a hard surface like a concrete flooring.

**TEAM:** Maximum of two (2) members. At least one (1) team member must be assigned to drop the container.

**MATERIALS:**

To be prepared by host:

1. Balance/ weighing scale
2. Empty/Open box, 10 cm x 10 cm x 20 cm

3. Empty/Open box, 20 cm x 20 cm x 40 cm
4. Dozens of medium size chicken eggs (one for each team)
5. meter stick

#### **APPARATUS:**

1. The members of the team must construct (at home, etc.) the container prior to the contest.
2. Each container must meet the following specifications:
  - a. Maximum mass - 30 g.
  - b. Body size - the container must fit inside a rectangular box 10 cm x 10 cm x 20 cm.
  - c. Parachute - 20 cm x 20 cm x 40 cm, when spread at flight (fair estimate)
3. A variety of materials may be used: paper, cardboard, foam materials (like styrofoam), rubber bands, feathers, string, glue, etc.
4. Fins and other aerodynamics paraphernalia may be added. They should not exceed the 10 cm x 10 cm x 20 cm limit before the container is dropped. Also, they must not exceed a 20 cm x 20 cm x 40 cm dimension while in flight.
5. At no time during the fall may any part of the container have any material exceed the maximum dimensions as outlined above. This allows for parachutes and other wind dragging elements, provided they remain within 20 cm x 20 cm x 40 cm dimensions throughout the fall.
6. All containers must be checked in during registration. No further work will be permitted after the entry has been checked in.

#### **COMPETITION:**

1. A medium size chicken egg will be supplied for each entry. Eggs will be furnished at the physics olympics site. Contestants must be able to secure their eggs in the containers within 10 minutes immediately prior to the drop.
2. The container will be dropped from successive heights until a breakage occurs. The minimum height a container must survive is one meter.
3. Between drops, repairs may be made provided no additional material is added to the container.
4. The mass of the entry container will be determined before the first drop.
5. The entry that survives the fall from the highest height wins. If two or more entries survive the same height, their winning rank will be based on their masses. The entry with the lighter mass will have the higher rank. An entry that does not survive a height of one meter shall not be declared a winner and shall not earn any point.

### **PAPER TOWER**

**OBJECT:** To construct a free-standing tower of maximum height using a single sheet of bond paper (long size).

**TEAM:** Maximum of two (2) members in a team. No one other than those actually constructing towers will be permitted in the room (or contest area) during the contest.

#### **MATERIALS:**

To be prepared by host:

1. Two-meter long measuring scale
2. Scotch tape (smallest size of roll, one roll for each team; or one-meter long piece of tape for each team)
3. bond paper, 8.5" x 13"

To be supplied by the contestant:

1. Ruler

2. Pair of scissors, cutter, and/or blade

### **RULES:**

1. Each team will be given one sheet of paper and one small roll of cellophane tape at the start of the contest. Only one entry will be allowed for judging. Each team should have only one entry.
2. The sheet of paper may be cut into pieces and reassembled as desired. Parts may be rolled, folded, or slit.
3. Cellophane tape may be used to fasten the parts of the tower together. It may not be used to attach the tower to the floor or any other object.
4. No other glues or tapes may be used. The paper may not be soaked, painted or chemically treated to add rigidity.
5. A tower shall be declared free-standing if it remains self-supporting until measurements on all entries are finished. This means standing during the time between the end of the construction period and the end of the measurement period. If a tower has been measured but collapses or falls before all other towers are measured, it shall be disqualified from winning.
6. Height is determined by measuring the perpendicular distance from the highest point of the tower to the floor.
7. Each team must complete the construction of each tower within an hour.
8. The three tallest towers will be declared First, Second and Third Place Winners, respectively.

## **BRIDGE BUILDING**

**OBJECTIVE:** To build a bamboo bridge that can support the heaviest load.

**TEAM** : Maximum of two (2) members

### **MATERIALS:**

To be prepared by host:

1. Balance/ weighing scale
2. Vernier caliper or ruler with mm scale
3. Sturdy rope, at least half a meter long
4. Heavy duty weight hanger
5. Weights, a total of 20 kgs with one kg composed of weights of 100 g or smaller
6. Match box type toy car
7. Cube of edge 10 cm
8. Rectangular box, 40 cm wide and 2 cm high

**APPARATUS:** Construction and materials of the bridge are as follows:

1. The bridge shall be constructed by the team before the contest.
2. Bamboo sticks and sewing thread are the only materials to be used.
3. Only cloth sewing thread will be used in tying or fastening the bamboo sticks of the bridge.
4. The total mass of the bridge and sewing thread shall not exceed 100 grams.
5. The bridge shall allow a 10 cm cube to slide underneath perpendicular to the bridge's length without touching the bridge.
6. The bridge shall allow a 40 cm wide by 2 cm high board to slide underneath perpendicular to the bridge's length without touching the bridge.
7. The bridge must be free-standing.

8. The bridge shall provide a smooth and level surface across which a small car of the “Matchbox” variety may roll given a single push of the hand. The road surface (level surface) shall have a minimum length of 20 cm.

9. The bridge shall contain no element wider than 5 mm x 5 mm bamboo stick. Two or more single pieces, each separately qualifying, may be attached by the student without violating this requirement.

10. The bridge design shall allow masses (“weights”) to be hung at the center of the bridge. For this purpose, a rope should be used. It should be placed over the level surface, at the center of the bridge, and should be formed into a closed loop such that a weight hanger can be hung at the lower portion of the loop. Weights can then be placed on the weight hanger.

11. Only one bridge may be entered per team. All entries must be submitted during registration.

12. Any bridge not meeting the above restrictions will be automatically disqualified.

13. Once the bridge is checked in, no further work on it will be allowed.

### **TESTING:**

1. The bridge shall be placed upon the ends of two level table surfaces approximately 35 cm apart.

2. A weight hanger shall be suspended from the lower portion of the loop of a rope placed over the level surface at the center of the bridge. Standard weights should be slowly added until an audible cracking sound, or any sign indicating the failure of some structural member or joint of the bridge, is noted.

3. The maximum load supported by the bridge before cracking divided by the mass of the bridge will determine the winners accordingly.

## **LARGE BARGE**

**OBJECT:** To construct a barge that can support the greatest load without sinking.

**TEAM :** Maximum of two (2) members.

### **MATERIALS:**

To be prepared by host:

1. Washers of practically uniform size to serve as weights, to total 1500 g
2. Three or four basins (palanggana/batya)
3. Pieces of aluminum foil of equal sizes, each not exceeding 30 cm in length, one piece per team

### **RULES :**

1. Each team will be given a piece of aluminum foil not more than 30 cm in length.
2. Each team will construct within 15 minutes a barge out of the given material without using tape, glue, staples or any other material.
3. The barge must be loaded by the team while floating on a basin of water.
4. Only dry loads should be used. If any water leaks into the barge during the loading process, the barge will be considered sinking. Thus damp or wet cargo must be unloaded, the barge dried and reloaded. Only two reloadings will be allowed.
5. Each team will be allowed one repair of its construction after thorough drying.
6. The barge that supports the heaviest dry load will be considered the winner and others judged accordingly.

7. Loads will consist of washers. The dry load just before the barge sinks will be the one recorded. If the load gets wet, the test must be repeated. Only 2 repetitions will be allowed. Consistently wet cargo will be a cause for disqualification.

8. Winners will be determined on the basis of the number of washers as load before the boat sinks. If entries have the same number of washers as load, a tie shall be declared. This means load is quantized.

## **PAPER AIRPLANE**

**OBJECT:** To construct an airplane of largest range and longest time of flight.

**TEAM :** Maximum of two (2) members per team.

### **MATERIALS:**

To be prepared by host:

1. Long tape or rope (20 m long, marked at one-meter intervals), meter stick
2. Three stop watches, timers

### **A. The competition**

1. Two separate rounds will be run, one for distance and one for time of flight. The same plane must be used for each round. Each team will have only one airplane.
2. Regarding the construction of the paper airplane, the following procedure shall be followed:
  - a. Each team will be given a piece of paper out of which the paper airplane is to be constructed.
  - b. Each team should finish construction of the plane within 30 minutes after the start of the contest.
3. The following rules and requirements shall be followed:
  - a. Preferably, competition will take place in an open air field or gymnasium where wind velocity is negligible and insignificant. Launches will be executed by the competitor horizontally from a standing position, and at shoulder level. If a launch violates this rule, the contestant shall be given another chance. A second violation disqualifies the team.
  - b. Stepping beyond the assigned marker will be a fault.
  - c. A second fault will disqualify the contestant.
  - d. Each team will be allowed two launches in each round with the best score for the set being retained for purposes of the competition.
  - e. Each team will compete in each part of the competition.
  - f. No practice flights will be allowed in the vicinity of the launching area during the duration of the contest.

### **B. Scoring**

#### **Distance Round**

1. The plane should be launched horizontally at shoulder level.
2. Horizontal distance from the point in the ground directly below the launch point to the position of first impact with the ground will be measured.
3. Impact with any object prior to hitting the ground will allow a repetition of a launch.
4. The greatest distance achieved will be awarded 20 points with all other scores scaled proportionately to distance achieved to the nearest tenth of a point.

#### **Time-of-Flight Round**

1. In this part of the contest, the airplane may be launched at any angle.

2. Time from the flight of the airplane until first impact with the floor will be measured by two or three timers.
3. Impact with any object prior to hitting the ground will allow a repetition of a launch.
4. The average time of the timers to the nearest tenth of a second will be recorded.
5. Greatest duration will be assigned 20 points with all other scores scaled proportionately to the nearest tenth of a point.

**Total Score** is composed of the two (2) scores thus obtained. The highest scoring team will be awarded 20 points towards the total competition; the second, 15 points; the third, 10 points.

## **EGG TRANSPORT**

**OBJECT:** To build a vehicle powered by a rubber band(s) or rubber strip(s), which can carry an egg to the greatest horizontal distance.

**TEAM :** Maximum of two (2) members per team.

**MATERIALS:**

To be prepared by host:

1. Balance/ weighing scale
2. Meter stick

**RULES :**

1. The contestants are to design and construct their own “cart” or vehicle prior to the contest. The cart or vehicle can be made of any inanimate material (commercial or scratch-built) like an empty spool. This is to be checked in. No further work will be allowed after checking in the device during registration.

2. The rubber band(s) or strip(s) as a source of energy must be a part of the vehicle. Catapults or other launching devices external to the vehicle (or initially connected or attached to an object/point external to the vehicle) are not allowed.

3. Up to 6 rubber bands or strips may be used. A strip formed into a loop will be counted as two strips. The width of the band/strip should not exceed 5 mm.

4. The maximum mass of the vehicle or device should not exceed 100 grams.

5. The egg may be rolled or carried by the vehicle.

6. The egg should remain unbroken or undamaged during the roll or transport.

7. A starting line will be marked on the floor.

8. The vehicle must move on a lane 50 cm wide. If the vehicle strikes the boundary side or line in the course of the roll/transport, that point will be marked as the end of the roll.

9. If the egg separates from the vehicle, the point at which the egg separates will be marked as the end of the roll/transport.

10. Winners will be determined on the basis of horizontal distance moved (perpendicular to the starting line) during the roll/transport.

11. Each team will be allowed two trials, with the greater distance retained for purposes of the competition.

## **SUPER MAGNET**

**OBJECT:** To construct an electromagnet that can support the largest load possible.

**TEAM :** Maximum of two (2) members

**MATERIALS:**

- Half-inch nails (*suelas*)
- Balance (weighing scale)
- DC power supply, about 3.5V

**RULES :**

1. The electromagnet should be constructed before the contest and submitted for weighing before the contest begins.
2. The maximum mass of the electromagnet should not exceed 200 grams.
3. The electromagnet should be constructed in such a way as to leave two ends free (about 10 cm) for connection to a voltage source, preferably a DC power supply of 3-5 Volts. The same power supply should be used for all entries. If dry cells (two 1.5V dry cells connected in series) are used as the voltage source, the dry cells should be changed often so that the same voltage and current, as much as possible, will be used for all entries.
4. The magnet will be dipped into a box of nails (half-inch long, *suelas*). The nails it lifts will be weighed.
5. The average of three trials will be taken.
6. The winners will be determined from the average mass of the nails lifted.

**MASTER ROBOT**

**OBJECT:** To build a robot that can perform pre-specified tasks.

**TEAM:** Maximum of two (2) members.

**MATERIALS:**

To be prepared by host:

1. Wooden box (10 cm long, 10 cm wide, and 15 cm deep)
2. Wooden box (20 cm long, 20 cm wide, and 15 cm deep)
3. Half-inch nails (*suelas*), a total of 2.0 kg
4. Ball bearings of 5 mm diameter, colored red, yellow, and blue (10 for each color)
5. Two vertical wooden panels, each measuring 20 cm by 20 cm and mounted on a 2.5 cm x 2.5 cm base)

**RULES:**

1. The robot must be self-designed and constructed. It should be built prior to the contest.
2. Ready-made parts may be used.
3. The robot should be self-actuating after it is switched-on/initiated.
4. Any physical means (i.e., electrical, electronic, mechanical, thermal, optical, acoustical, etc.) may be used in the operations/ functions/ etc. of the robot.
5. Each team should use only one robot throughout the contest, although the tasks are varied.
6. The robot may perform the complete task or portion of a task. Points will be awarded on the basis of what is accomplished by the robot.
7. A team may choose not to participate in certain tasks. (The robot should perform at least one task completely or partially.)
8. For tasks performed, corresponding points will be given. For each participant, the total points should then be taken and used in determining the winners.

**TASKS:**

1. Lifting nails (*suelas*) from a wooden box (10 cm wide, 10 cm long, and 15 cm deep) to a height of at least 10 cm. One point will be awarded for every 2.0 g (or major fraction thereof) of nails lifted..

2. Transferring nails (*suelas*), while the robot remains in one place, from a wooden box (10 cm wide, 10 cm long, and 15 cm deep) to another wooden box (20 cm wide, 20 cm long, and 15 cm deep) placed at a distance of 30 cm from the first. The 30 cm distance is measured between the neighboring sides of the boxes. Three (3) points will be awarded for every 2.0 g (or major fraction thereof) of nails transferred.
3. Transferring nails (*suelas*), while the robot travels from one place to another, from a wooden box (10 cm wide, 10 cm long, and 15 cm deep) to another wooden box (20 cm wide, 20 cm long, and 15 cm deep) placed at a distance of 100 cm from the first. The 100 cm distance is measured between the neighboring sides of the boxes. Six (6) points will be awarded for every 2.0 g (or major fraction thereof) of nails transferred. On return trips, 12 points will be awarded for every 2.0 g or major fraction thereof.
4. Transferring colored (painted) ball bearings (having diameters of 5 mm approximately), while the robot remains in one place, from a wooden box (10 cm wide, 10 cm long, and 15 cm deep) to another wooden box (20 cm wide, 20 cm long, and 15 cm deep) placed at a distance of 30 cm from the first. The 30 cm distance is measured between the neighboring sides of the boxes. The ball bearings will be colored red, yellow, and blue. The robot will transfer the yellow-colored ball bearings. For every yellow-colored ball bearing transferred, 10 points will be awarded. For every ball bearing of any other color that is transferred, 10 points will be deducted.
5. Transferring colored (painted) ball bearings (having diameters of 5 mm approximately), while the robot travels from one place to another, from a wooden box (10 cm wide, 10 cm long, and 15 cm deep) to another wooden box (20 cm wide, 20 cm long, and 15 cm deep) placed at a distance of 100 cm from the first. The 100 cm distance is measured between the neighboring sides of the boxes. The ball bearings will be colored red, yellow, and blue. The robot will transfer the yellow-colored ball bearings. For every yellow-colored ball bearing transferred, 20 points will be awarded. For every ball bearing of any other color that is transferred, 20 points will be deducted. For return trips, 40 points are awarded (deducted) for each correct (wrong) ball bearing transferred.
6. Same as Task # 5 but two obstacles (each consisting of a vertical wooden panel measuring 20 cm by 20 cm, each mounted on a 2.5 cm x 2.5 cm base) are placed between the boxes (1/3 and 2/3 of the way, respectively). For each correct (wrong) ball bearing transferred, 50 points are awarded (deducted). Each time the robot hits an obstacle, 100 points are deducted. On return trips, 100 points are awarded (deducted) per correct (wrong) ball bearing transferred.

### **BEACH PHYSICS OLYMPICS**

The Beach Physics Olympics consists of one or more of the following events (games): tallest sand tower, most popular sand castle, longest single span sand bridge, sand buggy, water transport, unsinkable boat, and electronically-controlled toy boat..

#### **TALLEST SAND TOWER**

**OBJECTIVE:** To construct a free-standing sand tower of maximum height using only dry or wet sand within a given base area.

**TEAM:** Maximum of two (2) in a team.

**MATERIALS:**

9. Sand
10. Construction tools: pail (bucket), shaping mechanism, trowel, shovel, etc. [To be provided by contestants]

**RULES:**

1. For each team only one entry will be allowed for judging.
2. The tower must not contain any material other than sand and water. Bonding materials, like cement and others, must not be used at any stage of the construction. The sand should not be chemically or physically treated to add rigidity.
3. The tower must be constructed within a square of side 1.0 m.
4. The tower should remain free-standing until the last tower has been measured.
5. Each team must complete the construction of each tower within an hour.
6. Height is determined by measuring the perpendicular distance from the highest point of the tower to the ground/beach level.
7. The three tallest towers will be declared First, Second and Third Place Winners, respectively.

**MOST POPULAR SAND TOWER**

**OBJECTIVE:** To construct an artistic sand tower that wins popular acclaim

**TEAM:** Maximum of two (2) in a team.

**MATERIALS:**

4. Sand
5. Any material which the contestants have with them at the start of the contest
11. Construction tools: pail (bucket), trowel, shovel, shaping mechanism, etc. [To be provided by contestants]

**RULES:**

For each team only one entry will be allowed for judging.

4. The tower may contain any material except those which cause permanent (lasting for more than a day) bonding of the sand, like cement, glue, etc., or irreversible damage to the beach. Any material used, however, must be in the possession of the contestants at the start of the contest.
2. The tower must be constructed within a square of side 1.0 m.
6. The tower should remain standing until the last tower has been judged.
7. Each team must complete the construction of the tower within an hour.
8. The winning towers will be chosen by popular vote. The voters will be chosen by the judges/monitors. The voting population should be as large as practical. Each voter shall vote only once and shall vote for only one entry. The judges/monitors shall not vote, except to break a tie.
9. The entry with the highest number of votes shall be declared First Place Winner; the entry with the second highest number of votes, Second Place Winner; and the entry with the third highest number of votes, Third Place Winner.

## LONGEST SINGLE SPAN SAND BRIDGE

**OBJECTIVE:** To build a sand bridge with the longest span possible

**TEAM:** Maximum of two (2) members in a team.

### **MATERIALS:**

1. Sand
2. Not more than 10 bamboo sticks and drinking straws counted together, if the contestants have them at the start of the contest. The bamboo sticks should not have a width or thickness exceeding 2.0 cm at any portion.
3. Construction tools: pail (bucket), trowel, shovel, shaping mechanism, etc. [To be provided by contestants]

### **RULES:**

1. The bridge shall be constructed by the team within one hour.
2. Bamboo sticks, drinking straws and sand are the only materials to be used. Not more than ten bamboo sticks and drinking straws, counted together, should be used. Each bamboo stick should not be wider than 5 mm by 5 mm.
3. No part of the bridge should have a width smaller than 10 cm. The flat surface of the bridge should not be narrower than 6.0 cm at any place along the bridge. This flat surface should allow match-box type vehicles to pass.
7. The bridge must be free-standing, supported only at the ends.
8. The length of the span must be measured by the minimum distance between the supports, the inside portions facing each other.
9. The bridge should remain standing until the last bridge has been measured.
10. The length of the bridge span determines the winners.

## SAND BUGGY

**OBJECTIVE:** To build a vehicle powered by rubber band or rubber strip, which can carry or transport an egg or some other specified load to the greatest horizontal distance.

**TEAM:** Maximum of two (2) members per team.

### **RULES:**

1. The contestants are to design and construct their own “cart” or vehicle prior to the contest. The cart or vehicle can be made of any inanimate material (commercial or scratch-built). This is to be checked in. No further work will be allowed after checking in the device during registration.
2. The rubber band or strip as a source of energy must be a part of the vehicle. Catapults or other launching devices external to the vehicle (or initially connected or attached to an object/point external to the vehicle) are not allowed.
3. Up to 6 rubber bands or strips may be used. A strip formed into a loop will be counted as two strips. The width of the band/strip should not exceed 5 mm.
4. The maximum mass of the vehicle or device should not exceed 300 grams.
5. The egg/load may be rolled or carried by the vehicle.
6. The egg/load should remain unbroken or undamaged during the roll or transport.
7. A starting line will be marked on the beach.
8. The vehicle must move on a lane 50 cm wide. If the vehicle strikes the boundary side or line in the course of the roll/transport, that point will be marked as the end of the roll.
9. If the egg/load separates from the vehicle, the point at which the egg/load separates will be marked as the end of the roll/transport.

10. Winners will be determined on the basis of horizontal distance moved (perpendicular to the starting line) during the roll/transport.

11. Each team will be allowed two trials, with the greater distance retained for purposes of the competition.

### **WATER TRANSPORT**

**OBJECTIVE:** To transport to a container the biggest volume of sea water possible in a given time with the use of straws

**TEAM:** Maximum of two (2) members per team.

**MATERIALS:**

1. Twenty (20) pieces of drinking straws per team. (To be provided by team)
2. Teams may provide themselves with scissors, pocket knives, binding tapes, and water container(s). No other materials and ready-made devices should be in the position of contestants.

**RULES:**

1. The contest proper is divided into two phases: (a) preparation phase and (b) transport phase.
2. In the preparation phase, which lasts for 40 minutes, the contestants prepare/construct, etc. whatever device(s) they think they will need.
3. In the transport phase, which lasts for 10 minutes, the contestants transport water from the sea to the final container.
4. Intermediate container(s) may be used from the point where sea water is taken up to the final container where the sea water is deposited.
5. The minimum distance between the point where sea water is taken up from the sea to the final container is 2.0 m.
6. When taking up water from the sea, all sea water must pass through straw(s).
7. When depositing sea water to the final container, all sea water must pass through straw(s).
8. During the transport stage, each of the members may move from the point where the sea water is taken up to the final container where it is deposited only once.
9. Winners will be chosen on the basis of the volume of sea water transported.
10. Any violation of the rules, including the specification on materials, will disqualify a team.

### **UNSINKABLE TOY SAILBOAT**

**OBJECTIVE:** To construct a toy sailboat that can carry a load and remain afloat the longest time

**TEAM:** Maximum of two (2) members.

**RULES:**

1. The contestants are to design and construct their own sailboat prior to the contest. The sailboat can be made of any inanimate material (commercial, recycled or scratch-built). This is to be checked in. No further work will be allowed after checking in the device during registration.
2. The sailboat must have a sail.
3. No part of the sailboat must protrude outside of a 0.50 m x 0.50 m x 0.50m box.
4. During the contest, the sailboat must remain within a specified area, although it may move about in the given area. If the whole sailboat moves outside the specified area, the entry is disqualified.
5. The sailboat may drop anchor at the beginning of the contest. Dropping of anchor, or adjusting it, is not allowed at any other time.
6. The sailboat must be loaded with sand. The amount of load depends on the contestants.

7. The winners will be chosen on the basis of the length of time the sailboat remains afloat. If after 1.0 hour two or more sailboats remain afloat, the amount (mass or volume, as the judge or monitor decides) of load will determine the winners.

### **ELECTRONICALLY CONTROLLED TOY BOAT**

**OBJECT:** To build an electronically controlled toy boat that can negotiate a given course in the shortest time possible

**TEAM:** Maximum of two (2) members.

**RULES:**

1. The electronically controlled toy boat must be self-designed and constructed. It should be built prior to the contest.
2. Ready-made parts may be used.
3. Any physical means (i.e., electrical, electronic, mechanical, thermal, optical, acoustical, etc.) may be used in the operations/ functions/ etc. of the toy boat.
4. The electronically controlled toy boat must negotiate a given course, with the starting and destination points specified.
5. Only electronic control of the boat is allowed during navigation.
6. If the boat goes off course, the contestant(s) may electronically bring the boat to any of the points traveled by the boat before it went off course.
7. The time of navigation shall be measured from the moment the judge/monitor tells the contestant to start navigating the boat to the moment the boat arrives at the destination.
8. The boats will navigate one at a time.
9. The course should have a width of one meter at certain points to be determined by the judge/monitor.
10. The winners will be chosen on the basis of the time of navigation.