

## **Gravity Vehicle (Coach Scheduled Event – 45 Minutes)**

**Description:** Teams will build a device out of given materials to travel a distance while holding a golf ball and stopping as close to a designated finish point as possible. All building of devices will take place during the competition. This event will have a short-written test about the basics of gravity.



**Participants per team:** 2

### **Spirit of the Competition:**

- It is a rules violation if coaches, parents, mentors, or spectators enter the competition area, or talk with team members at any time during the competition. Violation of this rule will place the team below all other teams.

### **Team Needs to Bring:**

Something to write with and may bring only 1 picture no larger than 8.5" x 11" of their device concept. This must be 1 picture, not a collage. No other resources are allowed.

### **Safety Requirements:**

Safety glasses labeled ANSI Z87.1+ (impact rated)

- Glasses must be worn during all practice and test runs.
- If a team does not have the required eye protection, they will be given the opportunity to obtain it, time allowing, but will not receive extra time.
- If a team is unable to obtain eye protection, the team will not compete and will receive a no-show score.



### **Materials Provided at Event:**

- Building materials may include (but not limited to) K'nex pieces, Lego bricks, wooden blocks, popsicle sticks, pipe cleaners, wheels, wooden dowels etc. Materials provided will be easily available household 'craft' items.
- Gravity Car Ramp with a starting height of less than 1 meter.
- Golf Ball
- Masking tape or any sticky substance needed to create the device may be given for this event.

### **The Competition:**

#### **Part 1 – Written Test**

- The team members will take a test on the principles of gravity.
- As a part of the written test the team will estimate how close their vehicle will stop from the center of the target in millimeters.
- The estimated time to finish the written test is 15 minutes and 45 minutes for the entire event.

#### **Part 2 – Construction and Competition General Information**

Teams will build a 3 or 4 wheeled device out of the given materials to travel down a ramp and up to a distant target point.

- The event supervisor will state the exact distance on the day of competition.
- The device will be powered solely by the gravitational energy of rolling down a ramp.
- The device must have a fixed piece of material extending above its front edge and close to the track surface. The point directly below this material will be used to measure the scoring distance.
- The device must transport a golf ball, that must remain in the device, until the Event Supervisor completes

the competition measurements.

### **The Ramp:**

- Will have multiple start lines at 20 cm intervals for the students to choose from.
- It will be at least 50 centimeters tall with the exact measurement given on competition day.

### **The Track:**

- The track will be a relatively smooth, hard surface. Most likely a classroom, hallway, or gym floor.
- A target point will be marked and announced at either 4.0, 4.5, 5.0, 5.5, or 6.0 meters.
- A center line will extend from the center front of the ramp in a straight line to the finish point.
- Teams will have a maximum of 30 minutes to construct and test their device.
- Teams that complete and test their device early may complete their official runs early.
- Teams may have up to 3 test runs with their device during the build time.
- Teams may not modify their device after the construction period has ended.

### **Official runs:**

- When the team is ready for official testing, they will notify the Event Supervisor.
- Teams will have 2-minutes to make 2 official runs.
- The team may position the device on the ramp at any of the start lines and in any way.
- No part of the device except the fixed point may touch (or hover above) the start line.
- Teams may adjust the angle of the ramp left or right of the center line, but may not move it forward, backward or side to side.
- When teams have permission from the Event Supervisor, they will release their device to start official runs.
- They cannot push the device.
- Teams may not chase their device down the track, they must wait until they are called by the Event Supervisor to retrieve their device.
- Event Supervisors will measure from the center of the finish point to the fixed point on the front of the device. If there is no fixed point, judges will measure to the furthest point on the device from the finish point.
- If the golf ball or any other part of the device comes off, the Event Supervisor will use its placement as the point of measurement.

### **Scoring:**

Teams will receive two weighted rankings. These rankings will be added to find the final placements. The team with the lowest sum will place first.

- 75% - Teams will be ranked based on the averaged straight-line distance for their two runs from the fixed point on the device to the center of the finish point, measured to the nearest millimeter (or from the part or golf ball should they fall off).
- 25% - Teams will be ranked based on their written test score.
- Teams will be placed in tiers based on adherence to the challenge instructions. Within each tier, teams will be ranked based on the scoring criteria for the challenge.
- Tier 1: Teams with no violations.
- Tier 2: Teams whose device loses a part or has golf fall out.

### **Tiebreakers:**

1. Teams will be ranked based on the difference between their estimated distance and their averaged actual distance.
2. Further ties will be broken by finding the best team measurement closest to the finish point for one run.

**Scoring Example:**

Equation: (written test ranking x 0.25) + (building ranking x 0.75) = final ranking

- Team A ranks 3rd on the written test. This scores 0.75 ranking points. The team also scores 5th on their distance. This scores 3.75 ranking points. The team's final ranking score is 4.5.
- Team B ranks 2nd on the written test. This scores 0.5 ranking points. The team also scores 7th on their distance. This scores 5.25 ranking points. The team's final ranking score is 5.75.
- Team A places first in the rankings.

**Possible Resources:**

Division A will not release previous tests, or the exact resources used by the Event Supervisor or test writer for any events. The listed resources are meant as a starting point. It is up to the competitor to research further.

- [Gravity Vehicle - Wiki - Scioly.org](#) – This resource is from Division B and C and may not have enough information to help with the Division A event.