



Physics Fun Day
Inertia Collage Competition

(Boardwalk Ballroom Lobby)

1. Collage can be on any poster size cardboard. If each student creates their own on 8-1/2 x 11 piece of paper, all these can be mounted onto one large cardboard.
2. Collage must be about inertia, according to what you're learning in school.
3. Student Name, Name of your school, Teacher's name & grade level must be on the Front of the collage.
4. Collage must be picked up at 2:00pm from the Lobby of the Boardwalk Ballroom on Thursday. Any collages left will become the property of Knott's Berry Farm.



Physics Day

Paper Tower Building Contest

Objective:

Construct a freestanding tower of maximum height using a single sheet of paper and 30 cm of transparent tape.

Participants: A team will consist of two to three students. The number of teams will be limited to the first 30 arriving at the contest site and remaining in line. No one other than those actually constructing the towers will be permitted in the construction area during the contest. No team or team member will be admitted after the event is started. No team member may leave his or her assigned area during the competition and no one may enter the area during the competition. An observation area will be available.

Apparatus: Each team will be supplied with one sheet of copy paper (21.5 x 28.0 cm) and tape on arrival at the contest site. Construction aids such as scissors and 30 cm rulers will be available to use by the participants. No other construction aids or material other than those supplied may be used or brought into the construction area.

Rules: (Limited to 30 teams of no more than 3 students)

1. The towers will be built from floor level, not on tables.
2. Each team must complete the construction of its tower within 30 minutes. Time will start upon receipt of the materials.
3. The sheet of paper may be cut into pieces and reassembled as desired. Parts may be rolled, folded or slit. The paper may not be soaked, painted or otherwise treated to add rigidity.
4. Tape is to be used to fasten parts of the tower together. It may not be used to attach the tower to the floor or any other object. Excess tape may not be used to extend the height
5. A tower shall be declared freestanding if it remains self-supporting for more than 10 seconds. (This is not a point of arbitration but will be solely determined by the judge or his/her appointed aide.)
6. The team must inform the judge several minutes prior to the completion of their tower to allow proper time for measurement.
7. Height is determined by measuring the perpendicular distance from the highest point of the tower to the floor. (Towers must be still standing when measured.)
8. Measured towers are not to be destroyed beyond recognition or removed prior to the completion of the competition.
9. The highest tower will be declared to winner with the rest of the competitors ranked accordingly.
10. If a team decides to build its tower higher after being officially measured, only one additional height will be measured.



Physics Day Fermi Questions

Objective

A "Fermi question" is a question in physics that seeks a fast, rough estimate of quantity that is either difficult or impossible to measure directly.

For example: Assume a question is: How many dollar bills in a stack of dollars 10 miles high? We assume: dollars are as thick as copy paper and 500 sheets of copy paper are about 2 inches high. Then the math: $(10 \text{ miles})(5000 \text{ ft/mi})(10 \text{ in/ft})(500 \text{ sheets/2 in}) = 12.5 \times 10^7$ or 1.25×10^8 . (Note: If one used more precise conversions and a calculator, you would get 3.16×10^8 , still magnitude 10^8 .)

Grading

Teams will select the best order of magnitude value for each question from a list of 15 possible answers.

Possible answers for the above question might include the following:

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

The team should neatly draw an "X" on their answer sheet through "8" because 1.25×10^8 is best approximated by 10^8 , (We are marking only the exponent of 10.) All questions should be marked according to this general scheme.

Participants

Teams of two members are permitted with a maximum of two teams per school. There will be a maximum of 30 teams.

Materials

One envelope of Fermi Questions; pencils, paper, and answer sheet. Participants may use no calculators or any other electronic devices.

Rules

1. The first 30 teams lined up will participate. Your school team will be seated on the floor.
2. A single answer sheet will be provided and time allotted to fill in required information.
3. All teams will receive an envelope containing two blank sheets of paper, two pencils, and the same 10 Fermi questions on two separate sheets of paper, one for each team member. The sequencing of questions may vary from team to team.
4. Only when directed to do so, will teams open the envelope and begin answering the questions. Teams will be given 20 minutes to answer as many questions as possible, marking appropriate answers on the provided answer sheet.
5. Judges will advise periodically of time remaining. When judges indicate time is up, all marking of answers must cease or the team will be disqualified.
6. Answer sheets will be collected and scored as follows:
 - 5 points for the correct exponent
 - 3 points for the correct exponent ± 1
 - 1 point for the correct exponent ± 2
7. Announcement of the top three scoring teams will be made as soon as possible. Additional Fermi questions will be used to break ties.
8. Teams will be disqualified for "sharing" any information with other teams.

There are purposely more questions than can be easily answered within this time limit. However you will answer more of them if you concentrate on estimating quantities, rather than trying to calculate them exactly.



Physics Day

Conversion Conundrum

Objective

One definition of a “conundrum” is that it is an intricate and difficult problem. In this game, you will be given a list of values and asked to change or convert those values to their equalities. At least four choices will be given for you to select from. The conversions will include both metric and English conversions. The examples below have the correct answers underlined.

Example #1. 125 meters equals....

- a. 12,500 cm b. 12.5 km c. 1,250 mm d. 1.25 dm

Example #2, 1.0 cubic meter equals....

- a. 1 liter b. 10 liters c. 100 liters d. 1,000 liters

Example #3, 1 gallon (US liquid measure) equals

- a. 378 Liters b. 37.8 Liters c. 3.78 Liters d. 0.378 Liters

Example #4, 1 pound equals

- a. 4.54 kg b. 0.454 kg c. 0.0454 kg d. 0.00454 kg

Grading

Teams will select the best answer from the choices given and neatly draw an “X” on their answer sheet through letter of their choice for each question.

Participants

Teams of two members are permitted with a maximum of two teams per school. There will be a maximum of 30 teams.

Materials

Groups will be given one envelope of Conversion Conundrum Questions, pencils, paper, and answer sheet. Participants may use no calculators or any other electronic devices.

Rules

1. The first 30 teams lined up will participate. Your school team will be seated on the floor.
2. A single answer sheet will be provided and time allotted to fill in required information.
3. All teams will receive an envelope containing two blank sheets of paper, two pencils, and the same 10 Conversion Conundrum Questions on two separate sheets of paper, one for each team member. The sequencing of questions may vary from team to team.
4. Only when directed to do so, will teams open the envelope and begin answering the questions. Teams will be given 20 minutes to answer as many questions as possible, marking appropriate answers on the provided answer sheet.
5. Judges will advise periodically of time remaining. When judges indicate time is up, all marking of answers must cease or the team will be disqualified.
6. Answer sheets will be collected and scored. Announcement of the top three scoring teams will be made as soon as possible. Additional Conversion Conundrum Questions will be used to break ties.
7. Teams will be disqualified for “sharing” any information with other teams.

There are purposely more questions than can be easily answered within this time limit. However you will answer more of them if you concentrate on estimating quantities, rather than trying to calculate them exactly.



Physics Day

Paper Airplane for Accuracy Contest

Objective:

To construct and fly a paper airplane through a hoop and have it land as close as possible to the center of a target.

Rules: (Limited to the first 75 contestants in line)

1. Contestants must sign up before the event starts and receive a flight number
2. Contestants will be supplied with one and only one 21.5 cm by 28.0 cm Sheet of standard copy paper. No other materials may be used in the construction of the airplane. The paper may be torn by hand to make it smaller.
3. All airplanes must be constructed at the contest site. Contestants will be allowed ten (10) minutes for construction. No changes in design will be allowed after this period
4. Contestants must construct a flyable airplane; no paper wads or darts will be allowed.
5. The minimum wingspan, measured when holding the airplane ready to launch, shall be 8cm
6. Contestants will launch their planes by hand from a standing position behind a restraining line. Only one launch per contestant will be allowed (no practice flights). Your first launch is your last launch. No mechanical launching devices will be allowed.
7. Spectators will not be allowed in the construction or launching areas.

Details:

1. The hoop will be a standard "Hula Hoop" with a diameter of approximately 84 cm.
2. The hoop will be mounted vertically on a stand so that the bottom of the hoop is about 1.2 meters off the floor.
3. The stand will be placed about 4 meters from the launch site.
4. The target will be drawn on a piece of paper and taped to the floor 3 meters beyond the hoop along a straight line from the launch site through the middle of the hoop
5. The winner will be the contestant whose airplane's nose stops closest to the center of the target after having passed through the hoop.
6. In case of ties, a fly-off will occur.
7. The decision of the judges will be final.



Physics Day

Buoyancy Challenge

Objective:

Make a "boat" out of heavy duty aluminum foil that will float the most pennies without sinking.

Rules:

1. Each team will be furnished with one piece of heavy duty aluminum foil, approximately 10cm x 10cm, pennies, a rectangular tub with water, and paper towels. No other materials may be used for the contest
2. If your boat SINKS, this will disqualify your entry
3. Teams of 2 students can enter the contest to represent their school.
4. Each team may only compete one time.
5. No items, including adhesive, tape, glue, rubber bands, foam, etc may be added to the foil boats.
6. During the judging, the boat must float with the pennies for 5 seconds in order to qualify. The largest number of pennies floating at least 5 seconds will count as the team score. Boats that sink will be disqualified.
7. Attempts to circumvent the rules above will result in disqualification of the team.
8. Each team will be allowed a maximum of 2 minutes to make their boat and to place their pennies into the boat.
9. Rulings of the judges are final.