EVENT 6: LASER TARGET SHOOT

OBJECTIVE: To predict the correct placement of a triangular prism so that it refracts a laser beam onto a target.

RULES:

1. Low-power He-Ne tabletop lasers will be used. For safety reasons, teams are not permitted to bring their own lasers/laser pointers to the competition, or use them at any place or time during the competition. This will disqualify the team.
2. Only the judges will operate the lasers. They are table top lasers that shine along the surface, so everyone can clearly see the laser beam.
3. The laser beam must enter the prism on one side, travel through and refract out of the prism on one of the other sides.
4. The laser beam, the prism, and the target are all in the same plane (horizontal).
5. The prisms will be equilateral triangular refraction dishes that are about 45 mm on each side.
6. Teams must bring their own protractors, rulers, pencils and handheld calculators. Laptops, cell phones, tablets, smart watches, lasers/laser pointers, prisms, or any printed materials are NOT permitted. Use of any prohibited items will disqualify the team.
7. Teams will be given a piece of white paper taped to the table showing the refractive index of their prism, the placement of the incident laser beam and the target location. Target location and refractive index will vary for each team. A sheet of scratch paper will also be given.
8. Teams will have up to 15 minutes from the time they are given their paper and prism information to perform calculations and to set up the prism in their desired location.
9. A timer will be started as soon as teams are given their paper and their refractive index. The timer will be stopped, and time recorded by a judge when the team notifies the judge that they have placed the prism in their desired position. No team member or judge can touch the prism after the timer is stopped.
10. A judge will then turn the laser on and measure/record the location of the refracted beam with respect to the target location.

COMPETITION:

11. The timer starts when the team has been given the paper with their prism and target information, plus 1 sheet of scratch paper.
12. When the team has placed the prism, the judge will record the time, then turn on the laser and measure the distance of the refracted beam from the target (cm).
    a. Note– only the refracted beam, based on team calculations, is considered. Any stray beams that result from reflections or scattering will not count.
13. Participating teams that aren't able to place a prism to be tested on the tabletop within 15 minutes will receive a disqualification score from the judges.

14. Participating teams whose beam does not refract in and out of the prism in the required way at two surfaces, or whose beam does not fall on the measuring screen will receive a disqualification score.
15. All papers must be returned to the judges – teams may NOT keep them.

SCORING:

$$\textbf{Team's Final Score} = \frac{(Distance\ (cm)\ of\ winning\ team\ from\ the\ target)+"n"}{(Distance\ (cm)\ \ of\ your\ team\ from\ the\ target)+"n"}\ \textbf{x 100}$$

"n" is a factor decided by the final scoring judges depending on the winning distance. The same value of "n" applies to all teams.

Tiebreaker for top scores: The team with the least amount of time spent, wins the tie.

Disqualification Score**:** If a participating team performs according to the rules but it fails to meet the objective as specified in the rules above, a minimum Disqualifying Score (greater than zero) will be applied by the judges.

Failure to follow Rules: If a team violates the rules, they may be assigned a Disqualification Score of "zero", at the discretion of the judges.

It is the team's responsibility to periodically check in or inquire about changes and clarifications to the rules. Go to www.njaapt.org (top menu, "Events" and "Forum")