



2019 National TEAMS Design/Build & Engineering Computations Competitions

Overview:

Using materials on the approved list and provided onsite at the competition, students design, build, and test an autonomous vehicle, capable of navigating everyday city obstacles. Students record and document evidence of the effectiveness of their designs.

Background:

Autonomous vehicles: Autonomous vehicles are beginning to make their entry into society. Like our brains, these vehicles use a variety of sensing and communication techniques to guide them through their surroundings. The potential to minimize accidents, increase gas mileage, and increase mobility across society are all notable benefits, while concerns for safety, liability and adoption remain. Ensuring that we are able to utilize the benefits of autonomous vehicles while still mitigating concerns, will require new technological approaches.

Computational Thinking: Computational thinking is a problem-solving technique that focuses on decomposing problems in a logical order and structure in order to solve it by both a computer system and a person.

Traffic Engineering: Traffic engineers consider the physical design of the road and how cars move through these confines, all while making safety a top priority. Your team will use established rules and formulas that model human behavior around traffic systems to make predictions about the consequences of driver behavior in order to effectively navigate city blocks.

Challenge:

Participants work as a team to design, build, and test an autonomous vehicle, capable of navigating everyday city obstacles, such as pedestrians and traffic, all while making safety a top priority. Participants will also answer related math questions.

Prior Knowledge:

This competition is designed to be completed onsite, with no prior preparation. Knowledge of the following topic areas may be helpful:

- Programming a micro:bit microcontroller using Microsoft MakeCode. Including:
 - Variables
 - Logic
 - Loops
 - Functions
- Using the following sensors and their inputs to control a physical system:
 - Ultrasonic Sensors
 - Line Follower Sensors
 - Motion Sensors (Accelerometers and Compass)

Procedure:

1. Designated team captains will report to the captains meeting on Saturday, June 29th to receive updates about the competition and will make sure their computers are functioning properly before the event.
2. On the day of the competition, competitors report to the event area at the time and place stated in the conference program.
3. The challenge is distributed.
4. Teams may use a scientific or graphing calculator. Calculators are not supplied by TSA.
5. Teams will bring the required materials with them to the challenge and will also be supplied with additional materials necessary to complete this challenge. A materials list will be posted on the TEAMS website by May 1st.
6. Instructions will be given by the event coordinator once teams are seated. The timed competition will begin following the verbal instructions.
7. Teams will have 90 minutes to complete the design/build challenge and the related engineering computations questions.

Regulations:

1. Each team will have 4 to 8 members.
2. All team members must stay in the event area while working on the challenge.
3. Only the materials listed on the materials list may be brought to the competition site by participants. All other materials used in this competition are supplied by TSA.
4. Smart phones running calculator emulation software are permitted. During the problem-solving challenge, all communication on the smart phone and computers must be turned off (e.g. wifi, cellphone data, bluetooth). All technology equipment is subject to inspection by the event judges at any time and violations of this rule will result in immediate disqualification.
5. Only competing students will be allowed in the TEAMS Design/Build & Engineering Computations competition room. Parents, teachers and other guests are not allowed in the competition room (depending on location, a guest viewing area may be provided by the competition coordinators).

Competition Attire:

- Shirt or blouse: button-shirt with a turned down collar or a polo/golf shirt. The TEAMS shirt (red) or the official TSA shirt (royal blue) may be worn (unacceptable: t-shirts, halter tops, tank tops)
- Dress skirt or pants: (unacceptable: jeans, baggy pants, exterior pocket pants, shorts)
- Shoes: dress shoes worn with dark socks, hosiery (optional); open-toe shoes or sandals are acceptable (unacceptable: athletic shoes; flip-flops; military boots; or work boots)

Evaluation:

Points will be earned based on performance, test results, and design elements. The engineering computations will be scored based on the number of math problems correct.