



2020 NJ TSA HIGH SCHOOL DESIGN PROBLEMS

Coding

As you can probably imagine, moving to a new community can be both exciting and challenging for students and their families. In addition to the desire of making new friends, newcomers have to learn about their new surroundings.

APP DESIGN CHALLENGE: Design an app that provides some of the most important information that will help new residents feel comfortable in your community. Please follow these guidelines:

- **PLATFORM:** The app can be on any platform (web app, desktop/PC app, a web browser extension, robot, Ruby on Rails, mobile, etc).
- **PROGRAMMING LANGUAGE:** Use any programming language: c/C++, Objective C, C#, Java, JavaScript, Python, Ruby, Swift, “block code”, etc.
- **FUNCTIONALITY:** The app must have some degree of functionality.
- **CONTENT SUITABILITY:** All content must be in good taste and observe all school rules.
- **ORIGINALITY:** The app must be original in design and content.
- **VIDEO:** Create a 1-3 minute video that contains the following information:
 - First name of each team member
 - The name of the app
 - Clearly explain the purpose of the app
 - The tools and coding language used to create the app
 - Show how the app works
- **SUBMIT THE VIDEO** through YouTube
- **IN ADDITION** submit a document that includes the following information:
 - Your ID number(s)
 - Title of the app
 - Explain the app in ONE sentence.
 - What is your app trying to accomplish? (200 characters max.)
 - What technical /coding difficulty did you face in programming your app, and how did you address this technical challenge? (500 characters max.)
 - With what you’ve learned, what improvements would you make to version 2.0 of your app? (500 characters max.)

EVALUATION

- **VIDEO** (50 points)
 - The purpose of the app is explained (10 points)
 - Tools and coding language are explained (10 points)
 - At least 3 features of the app are demonstrated and explained (30 points)
- **DOCUMENTATION** (50 points)
 - Written description of the app’s purpose (10 points)
 - Technical difficulty and solution are explained (20 points)
 - Improvements that should be included in version 2.0 are explained (20 points)

SUBMISSION INSTRUCTIONS

- The URL for the video (posted on YouTube) should be emailed to tsachall@tcnj.edu by 6:00 PM April 8, 2020. Required documentation must be submitted as a PDF attachment to the email.
- Include ID number(s) and “High School Coding” in subject line of email

Computer-Aided Design (CAD), 2D Architecture

Design Problem:

An experienced builder has identified a unique opportunity. Throughout urban areas of New Jersey, there are many narrow vacant lots that can be purchased at bargain prices. To take advantage of the opportunity, the builder needs help designing townhomes for these lots.

Design Brief:

Every townhome will need to have three (3) floors, and should have exactly 700 square feet on each level. Roof access will be important. The roof should include a deck, and 50% of the roof should be devoted to one or more environmentally conscious features, such as solar panels or a living roof.

Specifications/Drawing Requirements:

- Working drawings that include a floor plan, as well as front, side, and rear elevations;
- Include notes that identify at least five (5) features that make the home especially suited for a narrow urban lot;
- Proper scale, dimensions, and notes; and
- The maximum paper size is 24" x 36", or smaller sheets mounted on a 24" x 36" sheet with no overlapping papers.

Computer-Aided Design (CAD) 3D, Engineering

Design Problem:

The Hudson News Corporation owns more than 1,000 airport shops. To help increase their bottom line, the company is anxious to increase the variety of "under \$20.00 travel accessories" that are sold in their shops.

Design Brief:

Since many travelers wash their own clothing during long trips, Hudson wants to be able to sell a portable retractable clothes line that can be used in a hotel bathtub, or shower, and then packed up so that it is ready for future use.

Specifications/Drawing Requirements:

- Include a parts list that identifies all the mechanical and support components of the device;
- Show interior and exterior parts and mechanisms;
- Design a case for travel and storage;
- Include any views or renderings that will enhance the presentation; and
- The maximum paper size is 24" x 36", or smaller sheets mounted on a 24" x 36" sheet with no overlapping papers.

Optical Engineering

Design and build a prototype table lamp for use in an upscale restaurant. Imagine a restaurant with many tables, each having one of your lamps. The light source should be a battery-powered LED tea light, and you should use lenses and/or prisms to produce a unique pattern of light, directed at the tabletop.

In addition to the physical prototype/display, teams must prepare documentation and a presentation as outlined in the NJ TSA High School Supplement (beginning on page 59).

System Control Technology

You have probably noticed that many identical consumer products are sold in a variety of different packages. Large companies employ packaging engineers to design the systems needed to accomplish this.

MARS, a New Jersey company, is interested in selling a pocket size version of their best-selling product, M&M's. Two billion M&M's are manufactured during each shift at their New Jersey plant, and the company is always looking for new ways to increase sales of this famous product.

Your challenge is to build a model packaging system that fills five (5) 35mm film containers with M&M's, and then moves the filled containers along a conveyor system. Note- you do not have to apply caps to the film containers, since another team has been assigned that responsibility.