

**IMPORTANT: Read through this entire document before starting.**

This year’s New Jersey PLTW Design Challenge is different than previous years. It is being distributed to all NJ PLTW high schools in advance of the actual date of the competitions in the hope that many more students will be eligible to compete.

The project will include a design phase performed at your school and an implementation phase which will be held at XXXXX on XXXXX (likely mid-March, details to follow).

This year, teams from your high school will be asked to design and submit a solution to the Design Challenge before the Implementation phase of the contest.

2012 New Jersey PLTW Design Challenge Rules:

1. The NJ PLTW High School Design Challenge is open only to current IED and/or POE students. (Exception: if students are on a block schedule and have just completed either IED and/or POE, they are permitted to compete.)
2. Your school may have as many internal teams as desired however, only one design may be submitted per school. The design solution to be submitted is at the discretion of your school and PLTW teachers.
3. Your internal high school teams may consist of any number of students however, only one team of up to five students per PLTW high school will be allowed to come to the Design Challenge Implementation Phase finals. Your school and teachers will decide which team of 5 students competes at the Implementation finals.
4. Your team’s work must be your own. Your PLTW teachers may serve as advisers to you and may monitor your progress. If, in the opinion of the Rowan University judges or your PLTW teachers, you have plagiarized a design, your design submission will be disallowed and your team will be disqualified from the Design Challenge.
5. Rowan University judges will select the award for Best Design based on submissions using the Best Design rubric located at the end of this document.
6. Schools that do not submit a design solution by January 13, 2012, the final submittal date, will not be permitted to compete in the Implementation phase of the Design Challenge.
7. Participation in the Implementation phase of the Design Challenge is at the discretion of your school. Schools may submit a solution for Design phase of the Challenge without participating in the Implementation phase.

8. No materials other than those shown on the Bill of Materials in this Design Challenge may be used for your design.
9. You should use and document the techniques in your Design Proposal that you have been taught in IED and/or POE.
10. The team that attends the Implementation finals will be expected to make a presentation documenting the design they are constructing, the methods used to solve the problem, and a demonstration of the constructed robot. If the Implementation team makes improvements to the design, participants are expected to explain what they are and how it improves the design. The Implementation Team will be evaluated using the Best Teamwork, Best Implementation, and Best Presentation rubrics included at the end of this Design Brief.
11. Your presentation may not exceed a specific time limit. This time limit will be announced at the competition and is based on the number of teams competing in the Implementation phase.

# ***The Challenge***

**Robot – a device that performs complicated, often repetitive tasks.**

**Introduction:** A local candy firm, Sweet Things, has a warehouse in your area. One of the highest warehouse costs is picking the various types of candy off the shelf and placing them in boxes to ship. This part of the process is called fulfillment. Sweet Things has asked teams to submit designs for building and demonstrating a “pick and place” pneumatic robot that can pick up the various candies and place them into another location.

## **Design Challenge:**

- 1. Design Phase:** Using only the materials provided in the Bill of Materials in this Design Brief, design a functioning and cost effective pneumatic “pick and place” robot that can grip the candies and move them to a different location. Your Design Team will be required to submit your design for review. The reviewers will select a Best Design from all of the submitted designs using the Best Design rubric. The due date for your school’s design submission is January 13, 2012. Designs shall be submitted as PDF documents, **not to exceed 20 pages in length**, by email to the following email addresses:

[cleary@rowan.edu](mailto:cleary@rowan.edu); [tansky@rowan.edu](mailto:tansky@rowan.edu)

General questions about the Design Challenge may be submitted to [cleary@rowan.edu](mailto:cleary@rowan.edu). All answers will be posted to the PLTW NJ website at <http://www.rowan.edu/open/colleges/engineering/pltw/>

Schools may submit a design only once for the competition. No revised designs may be submitted. The first submitted Design Proposal is final. Your Design Proposal shall include the following, as a minimum:

- Title page to include high school name and location
- Design Team Members
- An email contact person
- Introduction
- List of sources and summary of literature/media search
- List of constraints, criteria, and target values
- Categorization of ideas
- Selection of final design to include decision matrix
- Assembly drawings, tables, etc. sufficient to detail and construct your design
- Conclusion or summary
- Appendix if required

## 2. Implementation Phase: (at the competition site)

Using only the materials and design provided, construct a functioning “pick and place” robot. Your Implementation team may improve upon the supplied design however, you may not use any materials other than those provided.

Implementations will be evaluated using the Best Implementation rubric provided at the rear of this document. A Best Teamwork award will also be awarded based on the Best Teamwork rubric and evaluation during the Implementation phase.

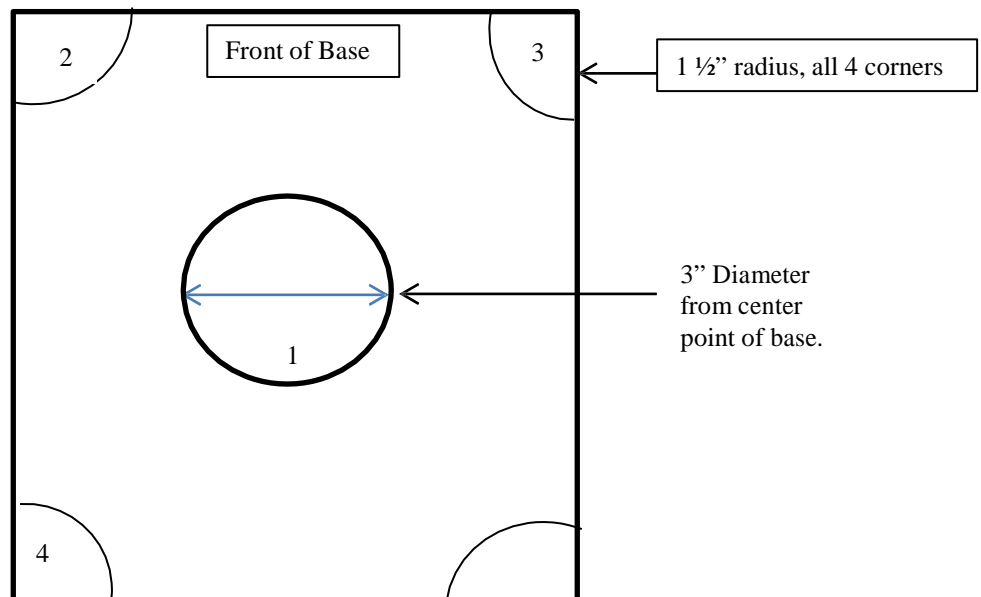
## 3. Presentation and Demonstration Phase:

Your Implementation team shall be prepared to present your robot to an outside panel of judges. Your presentation should include a demonstration of a functioning robot, the Implementation process and, if necessary, improvements you would make to the design if given sufficient time. Your presentation is timed and will be evaluated using the Best Presentation rubric at the rear of this document.

### Design Specification:

1. The motive power for robotic arms and grippers shall be supplied by the syringes and tubing supplied.
2. Your goal is pick up the candy from the four designated locations and move it from the base to the surrounding table. You may not push the candy off the base.
3. The robot must be located on the base.
4. Candy locations must be placed as per Figure 1 and Table 1 below. The robot base may be placed anywhere on the base except in the candy locations.

Figure 1



**Table 1**

Section No.	"Halloween Size" Candy Piece
1	Milk Dud Box, Hershey Kiss, and Smarties
2	Butterfinger
3	Reese's Peanut Butter Cup
4	Hershey Nugget

**Design Restrictions:**

1. During the Implementation phase, you may not cut the base. The base must remain at 12" x 12" dimension.
2. You may use only the materials as provided in the Design Brief Bill of Materials for the Design Phase and Implementation Phase. Sources in the Bill of Materials are provided as a reference only.

***Bill of Materials***

Quantity.	Material	Unit
6	12 cc hobby syringe, Source: <a href="http://www.amazon.com/Disposable-Syringe-Tapered-Curved-Tip/dp/B0002YFRAW/ref=sr_1_fkmr2_1?ie=UTF8&amp;qid=1320175437&amp;sr=8-1-fkmr2">http://www.amazon.com/Disposable-Syringe-Tapered-Curved-Tip/dp/B0002YFRAW/ref=sr_1_fkmr2_1?ie=UTF8&amp;qid=1320175437&amp;sr=8-1-fkmr2</a>	Each
2	35 cc syringe Source: <a href="http://www.amazon.com/35-Disposable-Syringe-without-Needle/dp/B0002YFRAC/ref=sr_1_fkmr0_1?ie=UTF8&amp;qid=1320175527&amp;sr=8-1-fkmr0">http://www.amazon.com/35-Disposable-Syringe-without-Needle/dp/B0002YFRAC/ref=sr_1_fkmr0_1?ie=UTF8&amp;qid=1320175527&amp;sr=8-1-fkmr0</a>	Each
1	1/8" OD diameter, plastic tubing, 5 feet Source: <a href="http://www.amazon.com/Clear-Tygon-Laboratory-Tubing-Length/dp/B000FMYVSK/ref=sr_1_cc_2?s=petsupplies&amp;ie=UTF8&amp;qid=1320175592&amp;sr=1-2-catcorr">http://www.amazon.com/Clear-Tygon-Laboratory-Tubing-Length/dp/B000FMYVSK/ref=sr_1_cc_2?s=petsupplies&amp;ie=UTF8&amp;qid=1320175592&amp;sr=1-2-catcorr</a>	Ft.
1	Base ,1/4" x 12" x 12", plywood	Each
1	½" Poplar Dowel, 36" long Source: <a href="http://factorydirectcraft.com/catalog/products/1302_2110_1494-7598-12_x_12_unfinished_wood_dowel_rods_5pcs.html">http://factorydirectcraft.com/catalog/products/1302_2110_1494-7598-12_x_12_unfinished_wood_dowel_rods_5pcs.html</a>	Each

1	¼" Poplar, Dowel, 36" long Source: <a href="http://factorydirectcraft.com/catalog/products/1302_2110_1494-7605-14_x_12_unfinished_wood_dowel_rods_10pcs.html">http://factorydirectcraft.com/catalog/products/1302_2110_1494-7605-14_x_12_unfinished_wood_dowel_rods_10pcs.html</a>	Each
1	¾" Poplar, Dowel, 12" long Source: <a href="http://factorydirectcraft.com/catalog/products/1302_2110_1494-7600-34_x_12_unfinished_wood_dowel_rods_4pcs.html">http://factorydirectcraft.com/catalog/products/1302_2110_1494-7600-34_x_12_unfinished_wood_dowel_rods_4pcs.html</a>	Each
1	1" x 1" wood stake, 12" long – Source: <a href="http://www.amazon.com/WOODSTREAM-WW6-1-GARDEN-STAKE-WOOD/dp/B002DZVM8O">http://www.amazon.com/WOODSTREAM-WW6-1-GARDEN-STAKE-WOOD/dp/B002DZVM8O</a>	Each
1	Soft Grip Jar Opener Source: <a href="http://www.dollartree.com/kitchen-tableware/paper-plastic-tableware/serving-pieces-cutlery/Softgrip-Jar-Openers/213c267c272p294650/index.pro">http://www.dollartree.com/kitchen-tableware/paper-plastic-tableware/serving-pieces-cutlery/Softgrip-Jar-Openers/213c267c272p294650/index.pro</a>	Each
10	1" long, brass fasteners Source: <a href="http://www.staples.com/OIC-1-Brass-Fastener-3-8-Head/product_378814">http://www.staples.com/OIC-1-Brass-Fastener-3-8-Head/product_378814</a>	Each
4	Rubber Bands, Thick Source: <a href="http://www.staples.com/Staples-Economy-Rubber-Bands-Size-84/product_831636">http://www.staples.com/Staples-Economy-Rubber-Bands-Size-84/product_831636</a>	Each
4	Rubber Bands, Thin Source: <a href="http://www.staples.com/Staples-Economy-Rubber-Bands-Size-18/product_646090">http://www.staples.com/Staples-Economy-Rubber-Bands-Size-18/product_646090</a>	Each
2	Small wood teardrops Source: <a href="http://store.creative-wholesale.com/Home/tabid/118/CategoryID/98/Category2ID/475/List/1/Level/2/ProductID/358/Default.aspx?SortField=free3+desc%2cproductname">http://store.creative-wholesale.com/Home/tabid/118/CategoryID/98/Category2ID/475/List/1/Level/2/ProductID/358/Default.aspx?SortField=free3+desc%2cproductname</a>	Each
1	Sandpaper Sheet	Each
8	Wooden blocks (IED blocks)	Each
6	Craft sticks small Source: <a href="http://www.amazon.com/Charles-Leonard-Craft-Sticks-Regular/dp/B00342VDG6/ref=sr_1_2?s=office-products&amp;ie=UTF8&amp;qid=1320176955&amp;sr=1-2">http://www.amazon.com/Charles-Leonard-Craft-Sticks-Regular/dp/B00342VDG6/ref=sr_1_2?s=office-products&amp;ie=UTF8&amp;qid=1320176955&amp;sr=1-2</a>	Each
2	Cardstock 8 ½ x 11	Each
6	Craft sticks large Source: <a href="http://www.amazon.com/Charles-Leonard-Craft-">http://www.amazon.com/Charles-Leonard-Craft-</a>	Each

	<a href="http://www.amazon.com/Sticks-66575/dp/B0039HPS9E/ref=sr_1_4?s=office-products&amp;ie=UTF8&amp;qid=1320176955&amp;sr=1-4">Sticks-66575/dp/B0039HPS9E/ref=sr_1_4?s=office-products&amp;ie=UTF8&amp;qid=1320176955&amp;sr=1-4</a>	
1	Cardboard Sheet (8 ½ x 11)	Each
1	Soda Straw	Each
2	Large clothes pin Source: <a href="http://www.amazon.com/Wood-Spring-Clothespins-CKC365801-Category/dp/B001QACHX6/ref=sr_1_4?s=office-products&amp;ie=UTF8&amp;qid=1320177100&amp;sr=1-4">http://www.amazon.com/Wood-Spring-Clothespins-CKC365801-Category/dp/B001QACHX6/ref=sr_1_4?s=office-products&amp;ie=UTF8&amp;qid=1320177100&amp;sr=1-4</a>	Each
1	Length of Velcro – small, not to exceed 3” long by 1” wide	Each
6	Paper clips, #1 size. Source: <a href="http://www.amazon.com/s/ref=nb_sb_ss_i_0_10?url=search-alias%3Daps&amp;field-keywords=NJper+clips&amp;srefix=NJper+clip">http://www.amazon.com/s/ref=nb_sb_ss_i_0_10?url=search-alias%3Daps&amp;field-keywords=NJper+clips&amp;srefix=NJper+clip</a>	Each
2	Rubber thimbles Source: <a href="http://www.amazon.com/Swingline-Rubber-Finger-Diameter-S7054035/dp/B0017DF9U0/ref=sr_1_1?s=office-products&amp;ie=UTF8&amp;qid=1320177137&amp;sr=1-1">http://www.amazon.com/Swingline-Rubber-Finger-Diameter-S7054035/dp/B0017DF9U0/ref=sr_1_1?s=office-products&amp;ie=UTF8&amp;qid=1320177137&amp;sr=1-1</a>	Each
2	3x5 notecards Source: <a href="http://www.amazon.com/Mead-5-Inch-Index-Cards-63350/dp/B0010XUO52/ref=sr_1_1?ie=UTF8&amp;qid=1320784418&amp;sr=8-1">http://www.amazon.com/Mead-5-Inch-Index-Cards-63350/dp/B0010XUO52/ref=sr_1_1?ie=UTF8&amp;qid=1320784418&amp;sr=8-1</a>	Each
2	Small Clothes Pin - Source: <a href="http://www.amazon.com/Mini-Craft-Clothespins-Case-pack/dp/B004XK7IHQ/ref=sr_1_3?s=home-garden&amp;ie=UTF8&amp;qid=1318983962&amp;sr=1-3">http://www.amazon.com/Mini-Craft-Clothespins-Case-pack/dp/B004XK7IHQ/ref=sr_1_3?s=home-garden&amp;ie=UTF8&amp;qid=1318983962&amp;sr=1-3</a> Can buy at Michaels	Each
2	Wooden Spools, Large Source: <a href="http://www.amazon.com/Laras-Wood-Spool-pack/dp/B001LUHA1K/ref=sr_1_17?s=arts-crafts&amp;ie=UTF8&amp;qid=1318984642&amp;sr=1-17">http://www.amazon.com/Laras-Wood-Spool-pack/dp/B001LUHA1K/ref=sr_1_17?s=arts-crafts&amp;ie=UTF8&amp;qid=1318984642&amp;sr=1-17</a>	Each
2	Wooden Spools, Small Source: <a href="http://www.amazon.com/Wood-Mini-Spools-Maya-Road/dp/B004QZNLHE/ref=sr_1_2?s=arts-crafts&amp;ie=UTF8&amp;qid=1318984642&amp;sr=1-2">http://www.amazon.com/Wood-Mini-Spools-Maya-Road/dp/B004QZNLHE/ref=sr_1_2?s=arts-crafts&amp;ie=UTF8&amp;qid=1318984642&amp;sr=1-2</a>	Each
2	Aquarium tees Source: <a href="http://www.amazon.com/Plastic-Tee-12-Catalog-Category/dp/B005X077RG/ref=sr_1_1?ie=UTF8&amp;qid=1320177392&amp;sr=8-1">http://www.amazon.com/Plastic-Tee-12-Catalog-Category/dp/B005X077RG/ref=sr_1_1?ie=UTF8&amp;qid=1320177392&amp;sr=8-1</a>	Each

5	Push Pins Source: <a href="http://www.amazon.com/Officemate-Push-Clear-Count-35711/dp/B002WN32YE/ref=sr_1_2?s=office-products&amp;ie=UTF8&amp;qid=1320784458&amp;sr=1-2">http://www.amazon.com/Officemate-Push-Clear-Count-35711/dp/B002WN32YE/ref=sr_1_2?s=office-products&amp;ie=UTF8&amp;qid=1320784458&amp;sr=1-2</a>	Each
4	Wood Rectangle Cutout, 3" wide x 1 ¼" tall x ¼" thick Source: <a href="http://www.craftparts.com/wood-rectangle-cutout-p-1237.html?cat_id=319">http://www.craftparts.com/wood-rectangle-cutout-p-1237.html?cat_id=319</a>	Each
1	¼" x ¼" x 12" wood rod Source: <a href="http://www.amazon.com/Waddell-9304U-Square-Hardwood-Dowel/dp/B000ZRMP42">http://www.amazon.com/Waddell-9304U-Square-Hardwood-Dowel/dp/B000ZRMP42</a>	Each
1	Candy packet – 6 pieces – see Table 1. All candy pieces are "Halloween size" candies.	

During the Implementation Phase, teams will have approximately 2 hours to complete all the steps necessary. When the facilitator informs teams they must stop, all work on the Implementation and presentations shall stop. Save your presentation to a flash drive.

**Performance Specification:**

The robot shall be able to successfully lift and place the candies from the required locations from the base area to the surrounding table top.

Human intervention is permitted to operate all syringes that are used in your design. The number of syringes needed to accomplish the transfer of goods is at the discretion of the Design and Implementation Teams, not to exceed the quantity specified in the Bill of Materials.

**Presentation Specification:**

Your presentation shall be sufficient to **briefly** describe and demonstrate your design, within the prescribed time period. This time period will be announced at the competition and is based on the number of teams competing.

Your team may want to practice and time your presentation at least once. You must use Microsoft Power Point for your presentation. No other program shall be used for the presentation. It is expected your team should make at least one demonstration attempt. Your team is permitted to make any number of attempts to demonstrate your robot within the presentation period.

**Presentation Order:**

The Project Lead The Way facilitator will determine the presentation order using random number generation prior to the competition. There will be a two (2) minute break between each presentation while the next team comes to the presentation lectern. The Facilitator shall announce who is "on deck" prior to the start of a presentation. Please be

prepared to come to the lectern as the times will be **strictly enforced**. When your team's time has expired, the Facilitator will say STOP and your presentation and demonstration will cease.

### **The Contest Venues:**

At each competition, these common design supplies will be available for each Implementation team:

<b>12-inch ruler</b>	<b>Pencil(s)</b>
<b>Graph paper*</b>	<b>Eraser</b>
<b>Isometric graph paper*</b>	<b>Protractor</b>
<b>Cutting knife</b>	<b>Cutting board</b>

**\*In the rear of this packet**

### **Tool Resource Center:**

The following tools (at minimum) will be in the **Tool Resource Center** and are shared tools. The Facilitator reserves the right to ensure all teams have equal access to the **Tool Resource Center**. Tools may only be used at the **Tool Resource Center** and may not be taken back to your work area.

<b>Hot glue guns</b>	<b>Hand saw</b>
<b>Miter box</b>	<b>Cordless drill</b>
<b>Drill bits</b>	<b>Duct Tape</b>
<b>Masking Tape</b>	<b>Scroll Saw</b>

If you do not know how to use a tool, you may ask any PLTW teacher to demonstrate the correct usage. **Safety First please!** PLTW Teachers may not provide any other advice regarding the contest.

**STUDENTS MUST USE SAFETY GLASSES AT THE TOOL RESOURCE CENTER. FAILURE TO USE SAFETY GLASSES CAN RESULT IN DISQUALIFICATION FROM THE CONTEST**

**IF YOU INJURE YOURSELF, NO MATTER HOW MINOR, YOU MUST REPORT IT TO YOUR PROJECT LEAD THE WAY TEACHER IMMEDIATELY!**

## **AWARDS:**

There are four awards. They are:

Best Design (previously awarded)  
Best Implementation  
Best Presentation  
Best Teamwork

A school may only win one award.

Judges will use rubrics to determine winners for each category. The rubrics start on page 11.

## **GENERAL NOTES:**

This is a difficult Design Challenge. There are many designs that you may believe might accomplish this task. If the criteria in the Design Brief are met, you can feel a definite sense of accomplishment. Remember that no matter how good your solution is, you can make some suggestions as to how your design can be made better.

If your team feels it needs more of a challenge, factors such as **how quickly your Robot can move the required items, the estimated cost of your robot, the use of a minimum amount of materials, extra mass transported, and the originality and aesthetics of your design** should be considered as an additional "challenge" to set your solution apart from others.

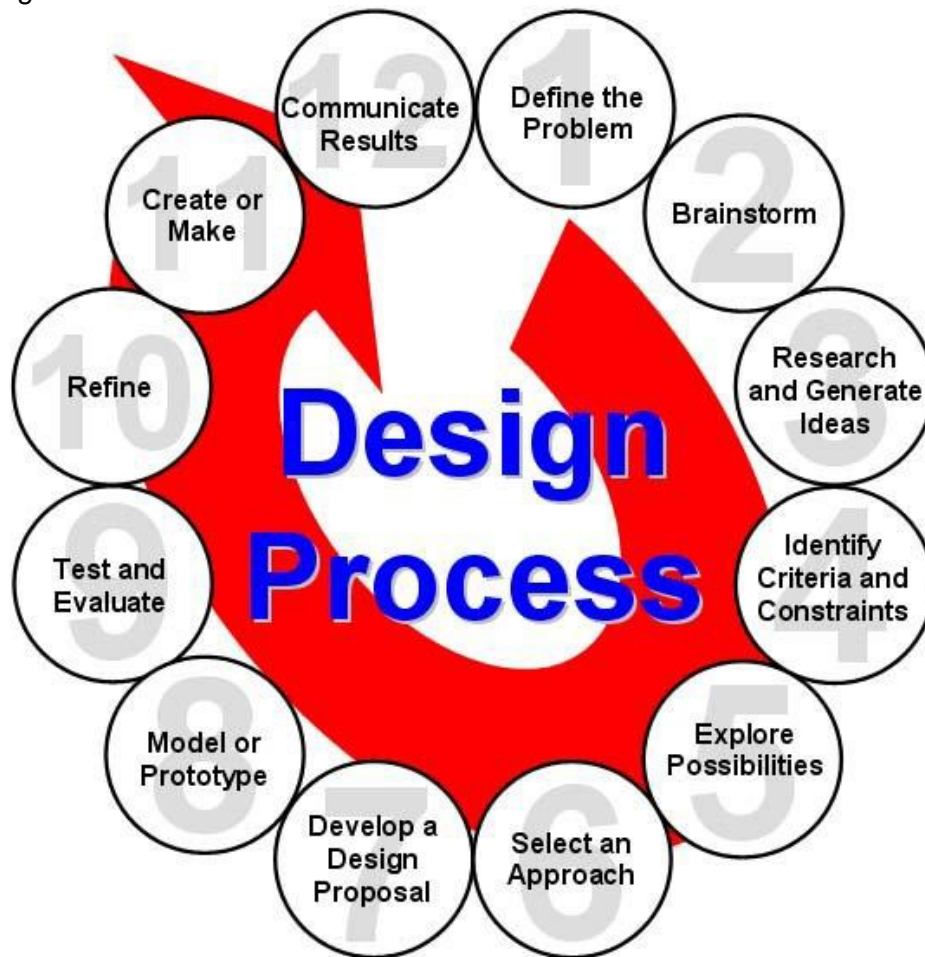
There is also the chance that your team may not be successful in completing the task. If this occurs, please be prepared to explain what issues your team encountered and, given more time, what your team might have done to complete the robot. Be specific as to what problems you encountered and the next steps you would take.

Judging Rubrics:

Best Design: Your Design Team will be judged for the Best Design portion of the contest with the following rubric. You should remember, and follow, the Design Process as you have been taught by your teachers. For your review, the Design Process is repeated on the next page.

<b>Category</b>	<b>4 points</b>	<b>3 points</b>	<b>2 points</b>	<b>1 point</b>
Information Gathering	Thoroughly Recognizes the problem and researches approaches	Adequately Recognizes the problem and researches approaches	Sometimes Recognizes the problem and researches approaches	Seldom Recognizes the problem and researches approaches
Problem Definition	Thoroughly quantifies criteria & constraints	Adequately quantifies criteria & constraints	Sometimes quantifies criteria & constraints	Seldom identifies quantifies & constraints
Idea Generation	Thoroughly explores alternative concepts	Adequately explores alternative concepts	Sometimes explores alternative concepts	Seldom explores alternative concepts
Concept Evaluation	Thoroughly explains how the selected design meets the criteria constraints.	Adequately explains how the design concept meets the criteria constraints.	Sometimes explains how the selected design meets the criteria constraints.	Seldom explains how the selected design meets the criteria constraints.
Design Process	Thoroughly shows evidence of following the Design Process.	Adequately shows evidence of following the Design Process.	Sometimes shows evidence of following the Design Process.	Seldom shows evidence of following the Design Process.
Design Documentation	Design documents are well organized and provide clearly written text and appropriate graphics.	Design documents are organized with minor errors in text and graphics.	Design documents contain all necessary information but are poorly organized or poorly written.	Design documents are missing critical text or graphics.

The Design Process:



- defining a problem
- brainstorming
- researching and generating ideas
- identifying criteria and specifying constraints
- exploring possibilities
- selecting an approach
- developing a design proposal
- making a model or prototype
- testing and evaluating the design using specifications
- refining the design
- creating or making it
- communicating processes and results

Source: International Technology Education Association (ITEA). (2002). *Standards for technological literacy*. pp. 97.

Best Implementation: you will be judged for the Best Implementation of the contest, by the Attending Judges using this rubric.

<b>Category</b>	<b>4 points</b>	<b>3 points</b>	<b>2 points</b>	<b>1 point</b>
Implementation	The solution thoroughly shows neat and effective Implementation techniques.	The solution adequately shows neat and effective Implementation techniques.	The solution sometimes shows neat and effective Implementation techniques.	The solution seldom, or does not, show neat and effective Implementation techniques.
Functional Testing & Performance	Thoroughly demonstrates the effectiveness of the design	Adequately demonstrates the effectiveness of the design	Sometimes demonstrates the effectiveness of the design	Seldom demonstrates the effectiveness of the design
Improvements	The Implementation thoroughly shows creativity, innovation, or uniqueness in improving the performance.	The Implementation adequately shows creativity, innovation, or uniqueness in improving the performance.	The Implementation sometimes shows creativity, innovation, or uniqueness in improving the performance.	The Implementation seldom shows creativity, innovation, or uniqueness in improving the performance..
Use of Materials	The team thoroughly shows optimal use of materials supplied.	The team adequately shows optimal use of materials supplied.	The team sometimes shows optimal use of materials supplied.	The team seldom, or does not, show optimal use of materials supplied.
Further Modifications	Thoroughly describes how the design could be improved upon given sufficient time.	Adequately describes how the design could be improved upon given sufficient time.	Sometimes describes how the design could be improved upon given sufficient time.	Seldom describes how the design could be improved upon given sufficient time.

Best Presentation: you will be judged for Best Presentation from the following rubric. Remember that you will have a limited amount of time to make your presentation and demonstrate your solution. You should plan accordingly and practice your presentation and demonstration at least once.

<b>Category</b>	<b>4 points</b>	<b>3 points</b>	<b>2 points</b>	<b>1 point</b>
Content	Thoroughly states the main points focused on the Design Challenge	Adequately states the main points focused on the Design Challenge	States most of the main points focused on the Design Challenge. May include unnecessary information	States few main points on the Design Challenge or, does not relate to the topic
Organization	Clearly organized into a logical sequence. Excellent use of an outline. Excellent introduction and conclusion.	Adequate evidence of a logical sequence of information. Good use of an outline. Satisfactory introduction and conclusion.	Fair evidence of a logical sequence of information. Some use of an outline. Weak introduction and conclusion.	Minimal or no outline followed. No logical organization; some digressions. Unclear, confusing. No introduction or conclusion.
Delivery	Effectively and creatively delivers the information while staying on the topic and considering the audience. Uses voice variation; interesting and vivid to hear.	Adequately delivers the information while staying on the topic and considering the audience. Speaks clearly and confidently.	Delivers the information but does not stay on the topic. Little consideration of audience. Uses incomplete sentences.	Little or no attempt is made to stay on the topic. Does not consider audience. Difficult to understand.
PreNtation	Clearly and completely describes the design and the design process, including all necessary information in the most appropriate order. Excellent use of content vocabulary.	Adequately describes the design process, including most of the necessary information in a correct order. Good use of content vocabulary.	The design and design process are not clearly described; includes most necessary information but the order is not correct. Fair use of content vocabulary.	The design and design process is not described, includes very few pieces of necessary information. Is weak or has no use of content area vocabulary.
Time Management	Demonstrates highly effective use of time management skills in developing and presenting.	Demonstrates adequate use of time management skills in developing and making the presentation.	Some time management skills are evident but are not effectively used in the creation or presentation.	Few or no time management skills are evident in the development or presenting of the presentation.

Best Teamwork: You will be judged for the Best Teamwork portion of the contest based on the following rubric.

<b>Category</b>	<b>4 points</b>	<b>3 points</b>	<b>2 points</b>	<b>1 point</b>
Helping	Students were offering assistance to each other <b>all</b> of the time.	Students were offering assistance to each other <b>most</b> of the time.	Students were offering assistance to each other <b>some</b> of the time.	Students were offering assistance to each other <b>seldom or none</b> of the time.
Participating	All students on a team were observed working on the Design Challenge <b>all</b> of the time.	All students on a team were observed working on the Design Challenge <b>most</b> of the time.	All students on a team were observed working on the Design Challenge <b>some</b> of the time.	All students on a team were observed working on the Design Challenge <b>seldom or none</b> of the time.
Persuading	Students were observed exchanging, defending, and rethinking ideas <b>all</b> of the time.	Students were observed exchanging, defending, and rethinking ideas <b>most</b> of the time.	Students were observed exchanging, defending, and rethinking ideas <b>some</b> of the time.	Students were observed exchanging, defending, and rethinking ideas <b>seldom or none</b> of the time.
Questioning	Students were observed interacting, discussing, and posing questions to members of the team <b>all</b> of the time.	Students were observed interacting, discussing, and posing questions to members of the team <b>most</b> of the time.	Students were observed interacting, discussing, and posing questions to members of the team <b>some</b> of the time.	Students were observed interacting, discussing, and posing questions to members of the team <b>seldom or none</b> of the time.
Respecting	Students were observed encouraging and supporting the ideas and efforts of all members of the team <b>all</b> of the time.	Students were observed encouraging and supporting the ideas and efforts of all members of the team <b>most</b> of the time.	Students were observed encouraging and supporting the ideas and efforts of all members of the team <b>some</b> of the time.	Students were observed encouraging and supporting the ideas and efforts of all members of the team <b>seldom or none</b> of the time.