# FIRST® LEGO® League TUT⚙RIALS

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# ROBOT DESIGN JUDGING

SESHAN BROTHERS

# ROBOT DESIGN JUDGING OVERVIEW

- Robot Design judging focuses on **process**

- Talk to the judges about your engineering design process, and how you came up with your ideas and how you improved them

- Make sure that everyone on the team is involved

- During your 5-minute presentation, you need to cover all the components of the Robot Design rubric

| | BEGINNING 1 | DEVELOPING 2 | ACCOMPLISHED 3 | EXCEEDS 4 | How has the team exceeded? |
|---|---|---|---|---|---|
| **IDENTIFY** – Team had a clearly defined mission strategy and explored building and coding skills they needed. | | | | | |
| | Unclear mission strategy | Partially clear mission strategy | Clear mission strategy | | |
| | Limited evidence of building and coding skills in all team members | Inconsistent evidence of building and coding skills in all team members | Consistent evidence of building and coding skills in all team members | | |
| **DESIGN** – Team produced innovative designs and a clear workplan, seeking guidance as needed. | | | | | |
| | Minimal evidence of an effective plan | Partial evidence of an effective plan | Clear evidence of an effective plan | | |
| | Minimal explanation of robot and code's innovative features | Partial explanation of robot and code's innovative features | Clear explanation of robot and code's innovative features | | |
| **CREATE** – Team developed an effective robot and code solution matching their mission strategy. | | | | | |
| | Limited explanation of their robot and its attachment and sensor functionality | Simple explanation of their robot and its attachment and sensor functionality | Detailed explanation of their robot and its attachment and sensor functionality | | |
| | Unclear explanation of how code makes their robot act | Partially clear explanation of how code makes their robot act | Clear explanation of how code makes their robot act | | |
| **ITERATE** – Team repeatedly tested their robot and code to identify areas for improvement and incorporated the findings into their current solution. | | | | | |
| | Minimal evidence of testing their robot and code | Partial evidence of testing their robot and code | Clear evidence of testing their robot and code | | |
| | Minimal evidence their robot and code was improved | Partial evidence their robot and code was improved | Clear evidence their robot and code was improved | | |
| **COMMUNICATE** – Team's explanation of the robot design process was effective and showed how all team members have been involved. | | | | | |
| | Unclear explanation of robot design process | Partially clear explanation of robot design process | Clear explanation of robot design process | | |
| | Minimal evidence that all team members were involved | Partial evidence that all team members were involved | Clear evidence that all team members were involved | | |

# DESCRIBE YOUR ROBOT

- How did you come up with the design for the base robot? Did you start with an existing design (your last year's robot or something from the Internet/book)?

    - Experienced judges can recognize standard designs. Therefore, always cite your sources.

- Did you test your design(s) before picking it?

- What features does it have and why?

| Robot Testing | | Name: | |
|---|---|---|---|
| **Instructions:** | | | |
| 1. If you design more than one robot, use this chart to compare them. At the top of each column, describe your robot | | | |
| 2. Come up with some basic tests to compare the robot designs. Can this robot move straight accurately? Can it turn consistently? Can it line follow? Can it detect a line? Did the robot move as intended? | | | |
| 3. Discuss which robot performed the best to help you pick the best design for your team. | | | |
| | **Robot 1:** Wheels: Size: Sensors: Motors: | **Robot 2:** Wheels: Size: Sensors: Motors: | **Robot 3:** Wheels: Size: Sensors: Motors: |
| Move Straight 50cm | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| **Overall: Speed Balance** | | | |

Available at
https://flltutorials.com/en/Worksheets.html

# DESCRIBE THE SENSORS & MOTORS

- How many motors and sensors do you use? Which ones? Why?

- Which missions do you use them on?
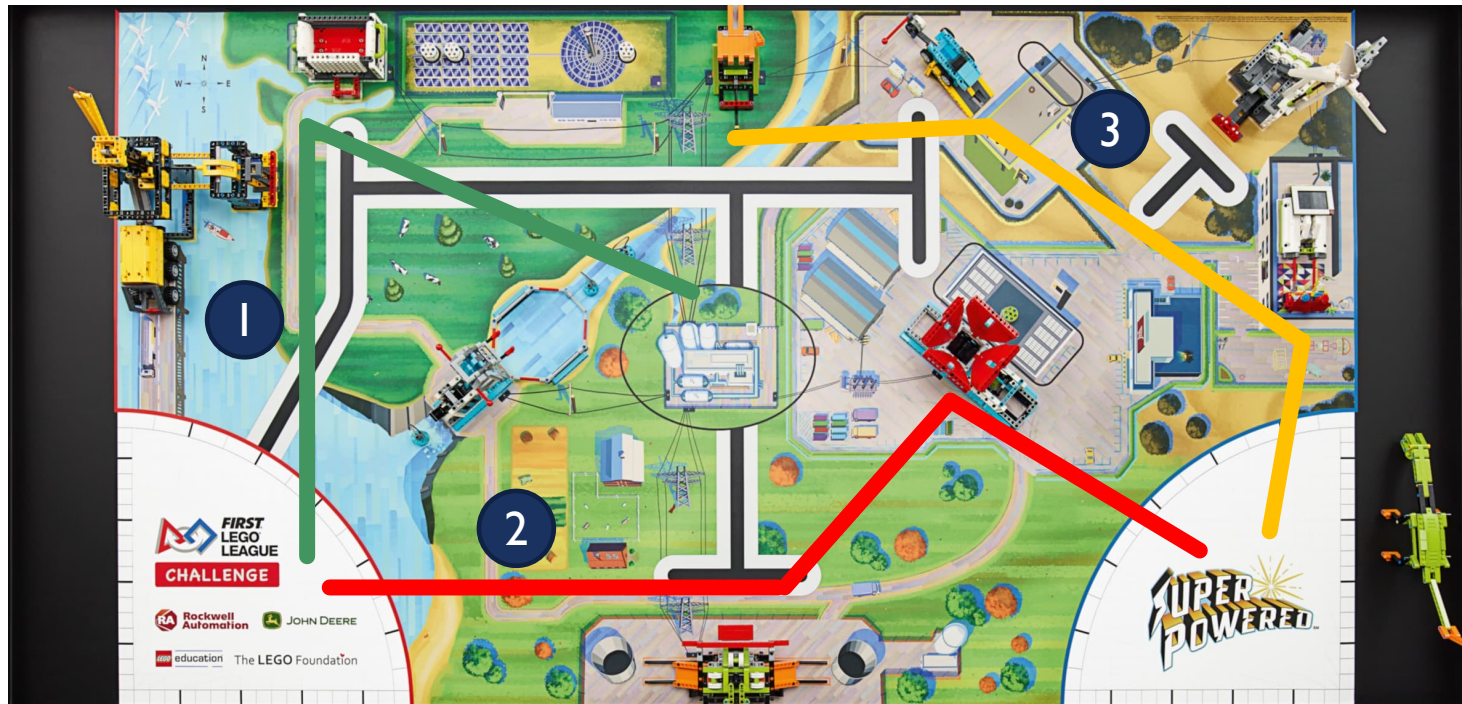
- How do you use sensors and do you use them in any novel way?
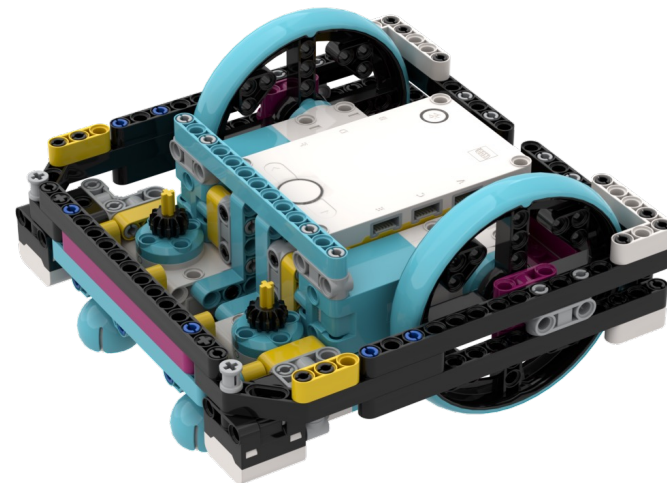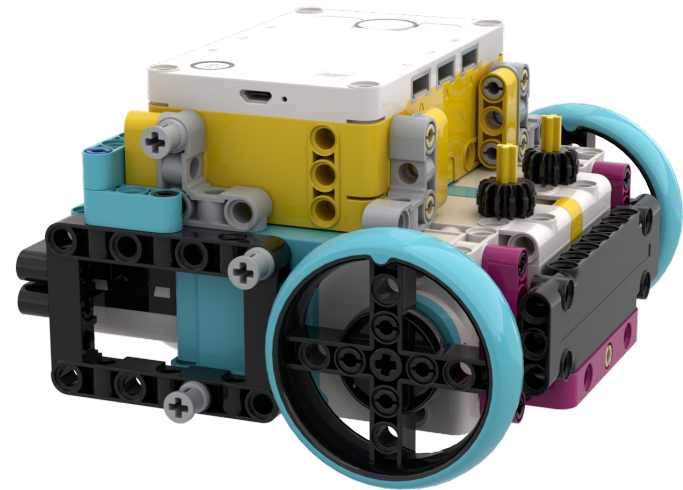
# EXPLAIN YOUR TEAM'S STRATEGY

- How did you come up with your strategy?

- How did you decide on which missions to accomplish and which path to take?

Bring a picture like the one on right to explain your robot runs and strategy.

# EXPLAIN YOUR ATTACHMENT DEVELOPMENT

How do you solve the missions?

How did you come up with that particular solution?

How did that solution change over time?

Do you solve a particular mission in an unusual way?

**Attachment Evolution**    Name:

Date:
Mission Name:

| Describe Attachment Features | Image |
|---|---|

**Attachment Testing**    Name:

Date:
Mission Name:

| Attachment Tested |
|---|

What

|  | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| What worked well? | | | |
| What did not work? | | | |
| Next steps: What will you change or modify? | | | |

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https://flltutorials.com/en/Worksheets.html

# EXPLAIN YOUR PROGRAMMING

- You must explain your programming in judging.

- You will not have time to talk about all your code. Pick one program, one run, or your best code.

- No matter what programming language you used, you should be able to communicate your programming techniques to the judges

  - Make sure you have pseudocode and comments

- You can share your code on a laptop or using a printout
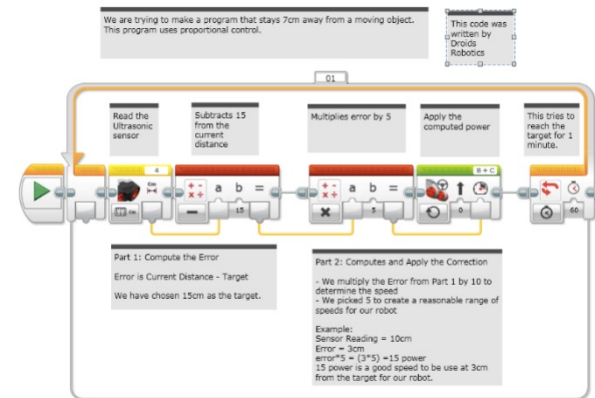




```
Import time
motor_pair = MotorPair('A', 'E')
motor_pair.set_stop_action('brake')
motor_pair.start_tank(50, 50)
time.sleep(3)
motor_pair.stop()
```

# TIPS FOR EXPLAINING YOUR PROGRAMMING

- Explain how your code is organized

    - How do you know what a block is doing? Are there comments?

    - Do you use My Blocks (or equivalent Functions in another language)?

    - How do you keep track of changes to the code?

- Explain any interesting algorithms your team came up with

- Explain how your code helps your robot be more reliable. What coding techniques/sensors do you use?

- Again, experienced judges will recognize code from others

    - If you used code from some source, always remember to cite it, explain how it works, and how your team modified or used it
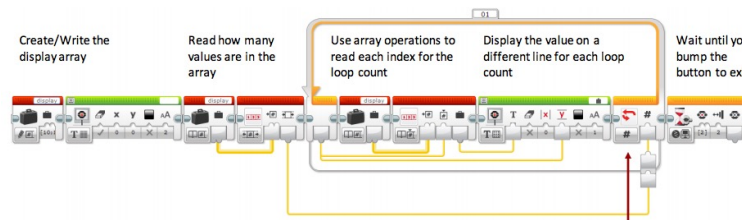
# DOCUMENTATION

- Consider having a team Engineering Journal to document your engineering design process

- Share any testing your team may have done

- Print out your code as well as pictures of your development process and current robot

- If permitted, consider leaving a one-page summary of your presentation with your judges to help them remember your team (include a picture of your team, your robot and the key information you want to communicate)

Available at https://flltutorials.com/en/Worksheets.html

# FINAL THOUGHTS

- Even though the Judging Flowchart refers to Robot Design as an "explanation" and not a presentation, you are strongly encouraged to prepare and practice a formal presentation

- This way you ensure that everything you want to share about your robot design process is covered

- Think of this session as a show-and-tell. You will show your robot, attachments and code and explain the process behind them

- Again, cover everything in the rubric!



**Judging Session Flowchart**

Teams should demonstrate Core Values in everything they do. The judges are excited to see how they show **teamwork**, **discovery**, **inclusion**, **innovation**, **impact**, and **fun** as they present their Innovation Project and Robot Design work.

This is the team's time to shine, so try to settle their nerves and encourage them. Please make sure they don't leave anything in the judging room, including any documentation, when they leave.

**TEAM ENTERS**

**Team Welcome** — Introductory conversation takes place as the team sets up any materials they have brought. — 2 minutes

**Innovation Project** — Live Presentation — 5 minutes

**Innovation Project** — Question and Answer — 5 minutes

**Robot Design** — Explanation — 5 minutes

**Robot Design** — Question and Answer — 5 minutes

**Core Values** — Reflection — 3 minutes

**Feedback** — Judges provide verbal feedback to the team. — 5 minutes

**TEAM LEAVES**

Judges discuss the team and complete the rubrics together.

10 minutes

Judges submit the rubrics once they are complete, before next team enters.

# CREDITS

- This tutorial was created by Sanjay Seshan and Arvind Seshan

- More lessons at www.ev3lessons.com, www.primelessons.org, and www.flltutorials.com