FIRST LEGO LEAGUE
CHALLENGE

ENGINEERING NOTEBOOK

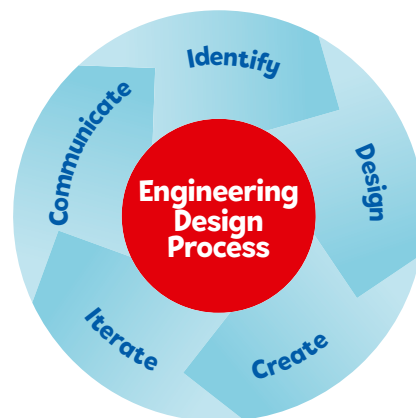## MASTERPIECE℠

FIRST

LEGO education™

WELCOME!

Use the sessions in this *Engineering Notebook* as a guide for your team's journey through the *FIRST®* IN SHOW℠ season presented by Qualcomm and MASTERPIECE℠ challenge.

Use the Core Values and the **engineering design process** throughout your team journey. Have lots of fun as you develop new skills and work together! This notebook is a great resource to share at your judging event, but it isn't required. Check out careers related to the season theme at the end of this notebook.

Engineering Design Process — Identify, Design, Create, Iterate, Communicate

FIRST® Core Values

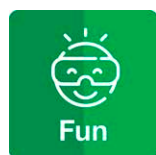**Teamwork** — We are stronger when we work together.

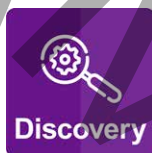**Inclusion** — We respect each other and embrace our differences.

Impact — We apply what we learn to improve our world.
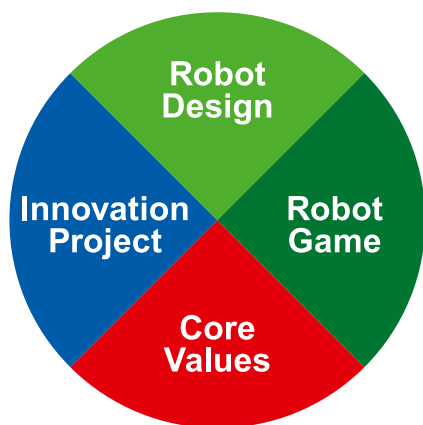

Fun — We enjoy and celebrate what we do!

Discovery — We explore new skills and ideas.

Innovation — We use creativity and persistence to solve problems.

Robot Design, Robot Game, Core Values, Innovation Project

Each of these four equally weighted parts of *FIRST®* LEGO® League Challenge accounts for 25% of your total performance at your event.

Core Values should be demonstrated at the event, where you will showcase your team's amazing work on robot design and the innovation project. These three parts will be evaluated during the judging session. Your robot's performance will be evaluated during the robot game.

Gracious Professionalism® is a way of doing things that encourages high-quality work, emphasizes the value of others, and respects individuals and the community.
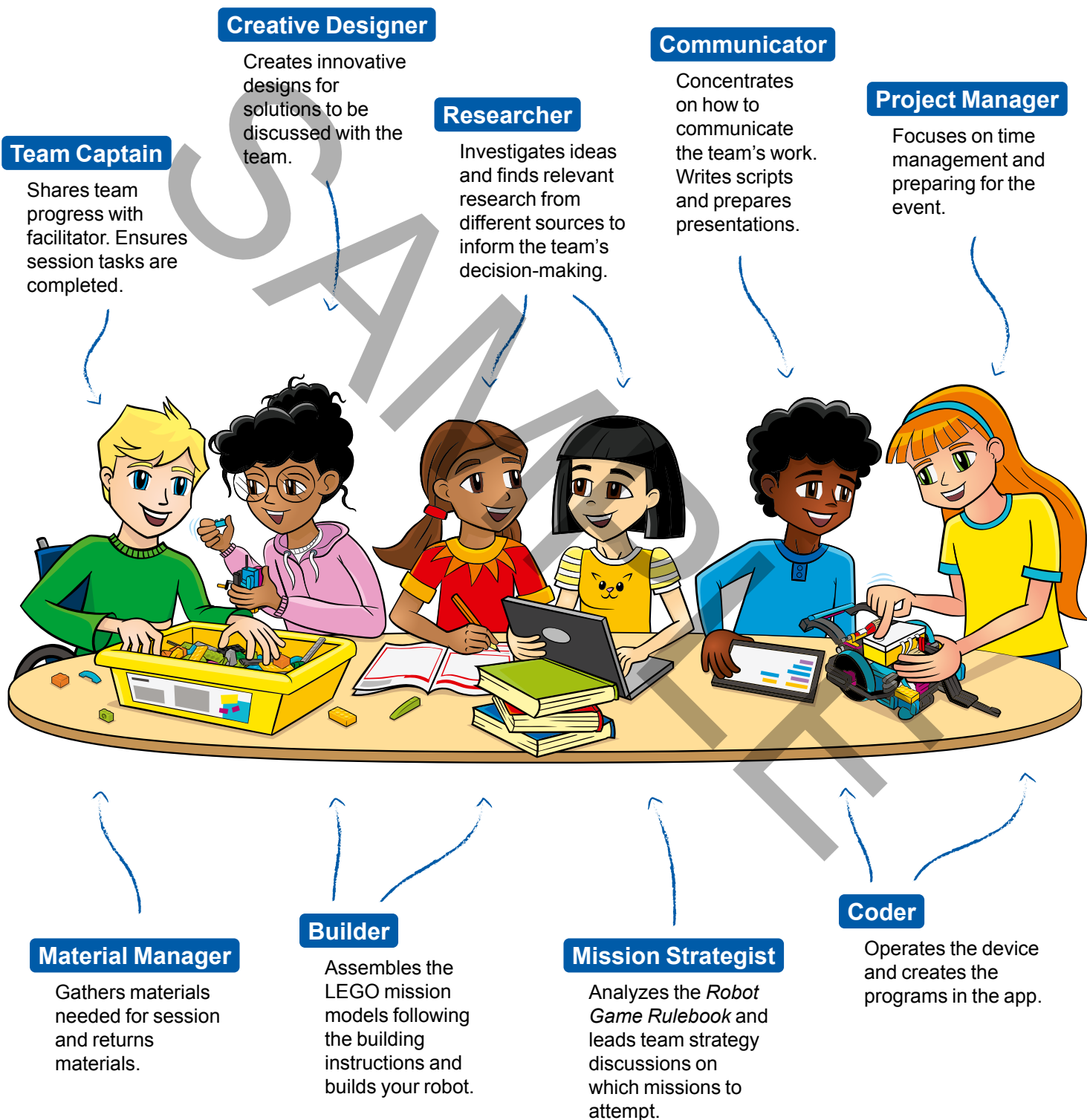
Coopertition® is showing that learning is more important than winning. Teams can help others even as they compete.

We express our Core Values through *Gracious Professionalism*, and this will be evaluated during robot game matches.

Team Roles

Here are sample roles your team can use during the sessions. Everyone on the team should experience each role throughout their *FIRST*® LEGO® League Challenge experience. The goal is to build your team to be confident and capable in all aspects of *FIRST* LEGO League Challenge.

Creative Designer
Creates innovative designs for solutions to be discussed with the team.

Communicator
Concentrates on how to communicate the team's work. Writes scripts and prepares presentations.

Researcher
Investigates ideas and finds relevant research from different sources to inform the team's decision-making.

Project Manager
Focuses on time management and preparing for the event.

Team Captain
Shares team progress with facilitator. Ensures session tasks are completed.

Material Manager
Gathers materials needed for session and returns materials.

Builder
Assembles the LEGO mission models following the building instructions and builds your robot.

Mission Strategist
Analyzes the *Robot Game Rulebook* and leads team strategy discussions on which missions to attempt.

Coder
Operates the device and creates the programs in the app.

FIRST® LEGO® League Challenge Overview

CORE VALUES

Demonstrate *FIRST®* **Core Values** in everything you do. Your team will be evaluated during the robot game and the judging session.

Your team will:

- Apply **teamwork** and **discovery** to explore the challenge.
- **Innovate** with new ideas about your robot and project.
- Show how your team and your solutions will have an **impact** and be **inclusive!**
- Celebrate by having **fun** in everything you do!

ROBOT DESIGN

Your team will prepare a short explanation on your robot design, programs, and strategy.

Your team will:

- **Identify** your mission strategy.
- **Design** your robot and programs and create an effective plan.
- **Create** your robot and coding solution.
- **Iterate**, test, and improve your robot and program.
- **Communicate** your robot design process and everyone's contributions.

ROBOT GAME

Your team will have three 2.5-minute matches to complete as many missions as possible.

Your team will:

- Build the mission models and follow the field setup to put the models on the mat.
- Review the missions and rules.
- Design and build a robot.
- Explore building and coding skills while practicing with your robot on the mat.
- Compete at an event!

INNOVATION PROJECT

Your team will prepare a live, engaging presentation to explain the work you have done on your innovation project.

Your team will:

- **Identify** and research a problem to solve.
- **Design** a new solution or improve an existing one based on your selected idea, brainstorming, and plan.
- **Create** a model, drawing, or prototype.
- **Iterate** on your solution by sharing it with others and collecting feedback.
- **Communicate** your solution's impact.

→ Introduction
(10-15 minutes)

☐ Watch the season videos and read pages 3-9 on how *FIRST®* LEGO® League Challenge works and the MASTERPIECE℠ challenge.

→ Tasks
(50-60 minutes)

☐ Open the SPIKE™ Prime app. Click the Start button.

Tutorial Activities: 1-6

☐ Check out the *Robot Game Rulebook* for mission details.

→ Reflection Questions
• How could stopping a motor help you solve a mission with your robot?
• What do you know about your teammates' interests and hobbies?
• What are resources that can help you learn more?

What are the four parts of *FIRST* LEGO League Challenge?

Our Notes:

The *Robot Game Rulebook* is a great resource to use throughout the sessions.

Prepare for Your Event

Make a list of what you need to bring to your event. Read over the event day schedule.

Reflect on the Core Values your team has used.
Can you provide examples of your team using Core Values and demonstrating *Gracious Professionalism*®?

Think about all the work you've done on the innovation project.
How will you present the problem you researched? How will you explain the process used to create and iterate on your innovation project solutions?

Talk about the programs you've created for your robot.
How do your programs match your mission strategy? How do your programs make your robot act?
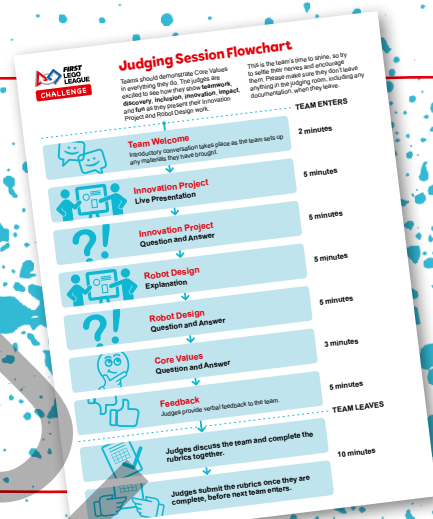
Think about your robot design.
How will you explain the design process and plan used to create and test your robot?

Think about your team.
How will each person on the team participate in the live presentation and show their knowledge?

What to Expect at Your Event

- Your team should have fun and show team spirit and enthusiasm at the event. Be sure to display Core Values in everything you do.

- Your whole team will meet with the judges in a single judging session to share your team's journey throughout the season. Think about what you have achieved and what challenges you have faced and overcome.
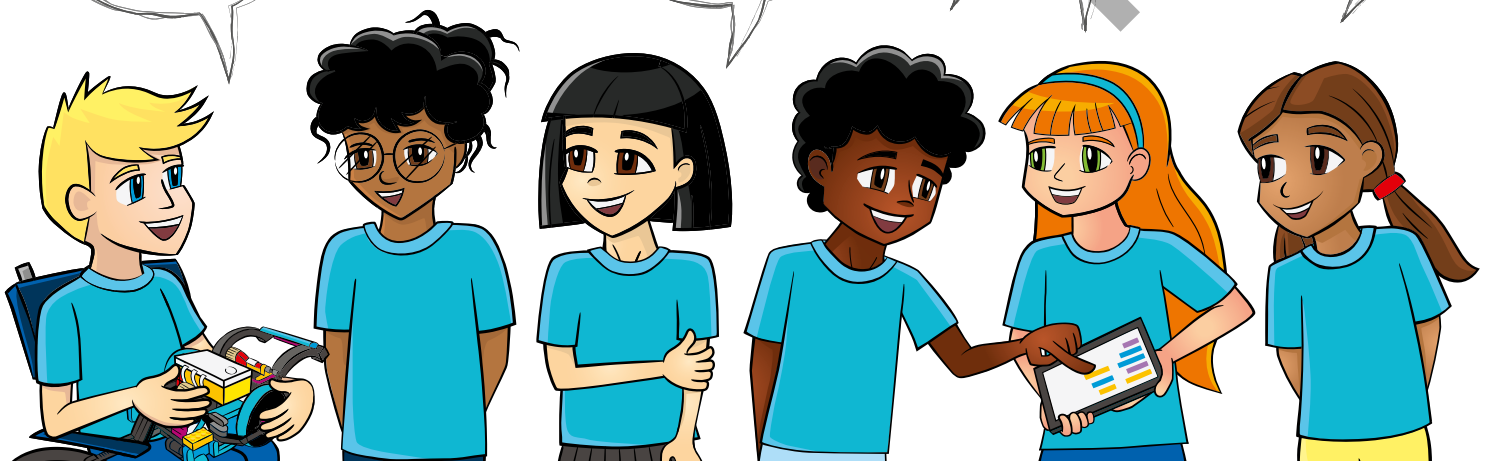

We will describe our robot design and all its different parts.

We will present our innovation project!

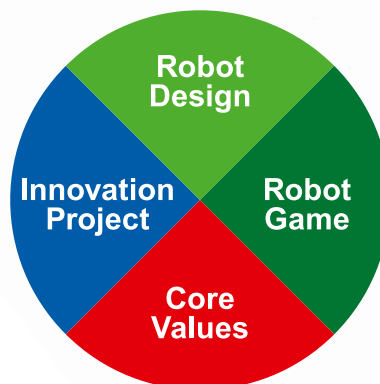We will reflect on how our team showed Core Values.

We will explain our different programs and how they make our robot act.

We will share about our team's journey.

FIRST® LEGO® League is evaluated equally in four areas: Core Values, Innovation Project, Robot Design, and Robot Game. The judges and referees use the rubrics and robot game scoresheets to make this evaluation.

Make sure you are familiar with the rubrics. It is your team's job to explain everything to the judges during the session.
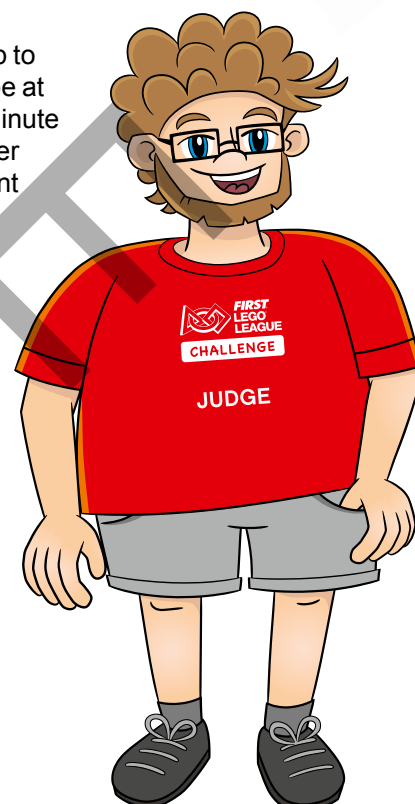

Team Rubrics

Class Pack Rubric

FIRST LEGO League teams express their Core Values through *Gracious Professionalism*®. This will be evaluated by referees for each team at every robot game match.

During the robot game, up to four team members can be at the table during the 2.5-minute match. You can tag in other team members for different missions.

Rubrics

Team Journey

MASTER PIECE℠

Design Your Innovation Project

Design Your Robot

Use **Engineering Design Process**

Engineering Design Process

Identify

Design

Create

Iterate

Communicate

Engineering Design Process

Create Your Innovation Project Solution

Use **Core Values**

Create Your Robot Solution

Iterate on Your Solutions

Communicate Your Solutions at Event
Receive Feedback to **Improve**

Compete in Robot Game
Have Fun and Celebrate!