

**FIRST®
LEGO®
LEAGUE
CHALLENGE**

ENGINEERING NOTEBOOK

**MASTER
PIECE™**





FIRST® LEGO® LEAGUE GLOBAL SPONSORS



The LEGO Foundation

CHALLENGE DIVISION SPONSOR

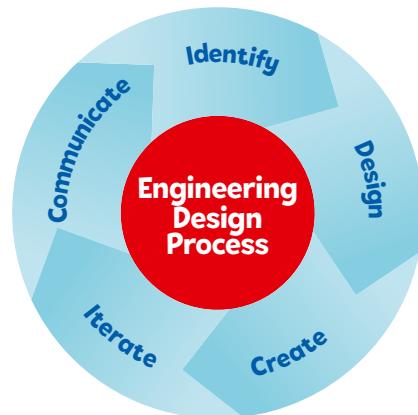


WELCOME!

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.



FIRST® Core Values



We are stronger when we work together.



We respect each other and embrace our differences.



We apply what we learn to improve our world.



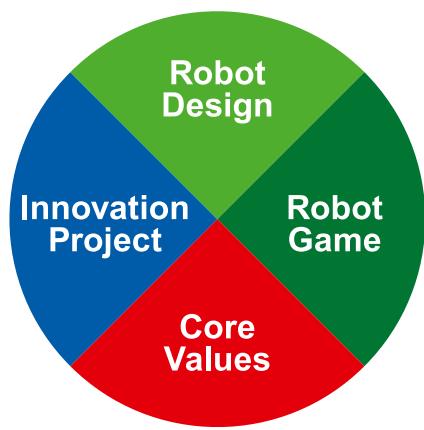
We enjoy and celebrate what we do!



We explore new skills and ideas.



We use creativity and persistence to solve problems.



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.

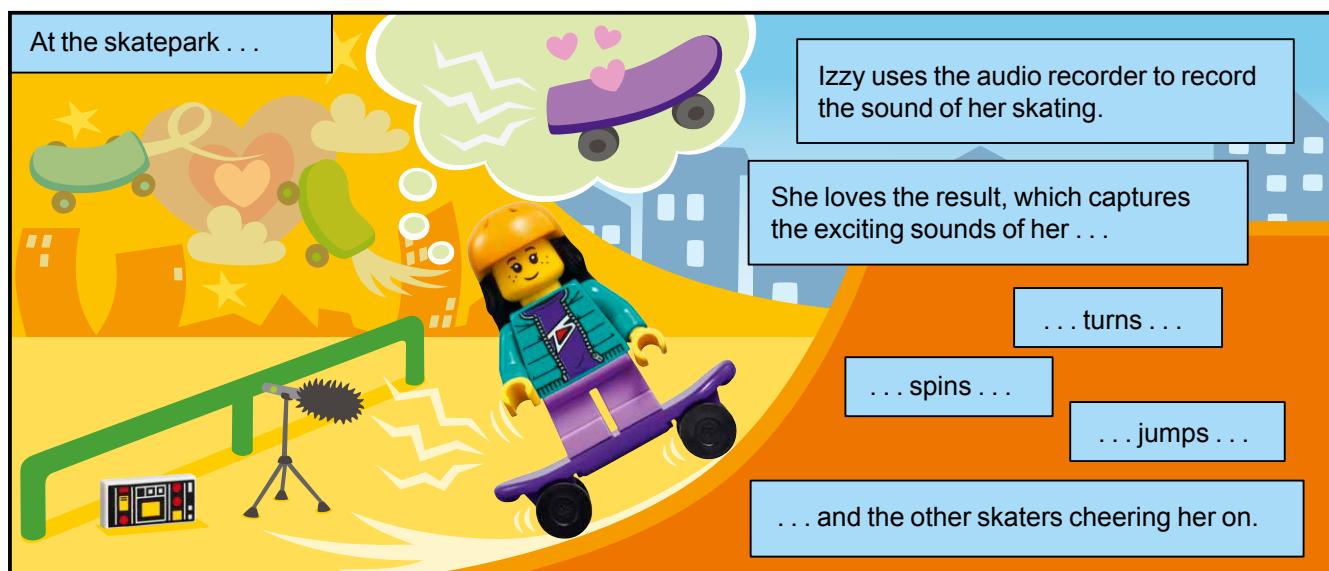
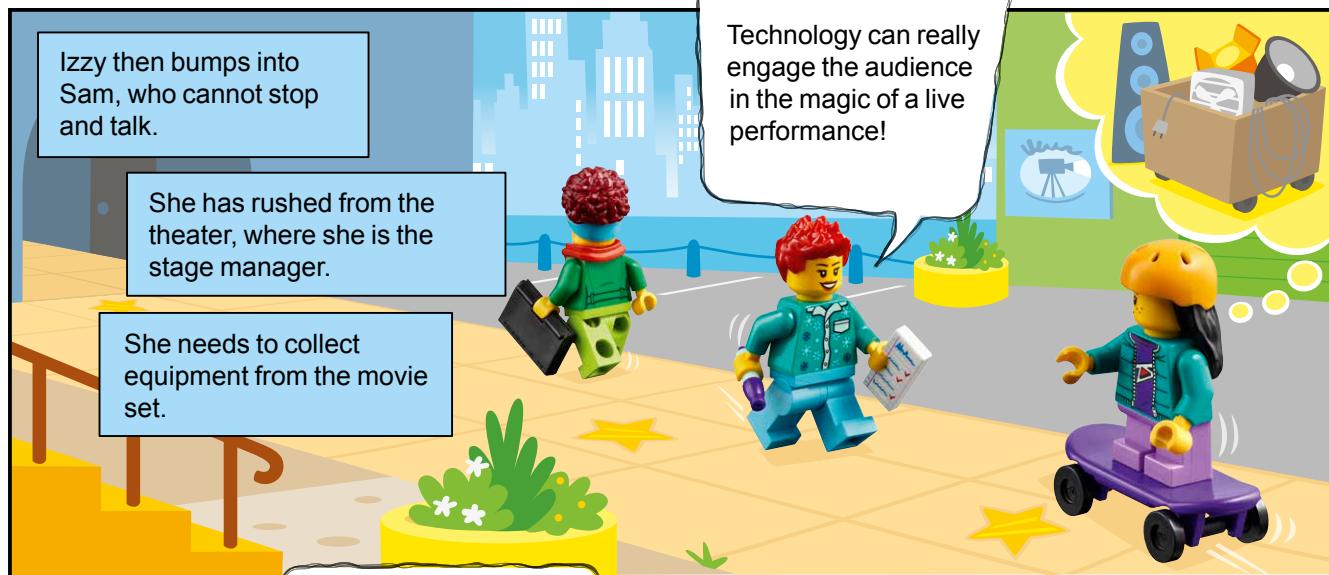
Coopertition® is showing that learning is more important than winning. Teams can help others even as they compete.

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

Challenge Story



Challenge Story



Innovation Project

How we share our own hobbies and interests with others can be an expression of our creative selves. People who work in the arts can teach us a lot about how to communicate, how to engage, and how to entertain an audience of any size. What can you learn from museums, theaters, and films that can help you share what you love to do?

Innovation Project
Resources



START

How can you use technology and the arts to help engage others or increase participation in what you love to do?

→ **Identify a specific problem related to sharing your hobbies or interests.**

Performing. Reading. Collecting. Skateboarding. Your hobbies and interests might be different from your friends'. Can you teach people about your hobby in a way that makes it fun and engaging?

→ **Research your problem and solution ideas.**

Explore the many ways people share their interests with others. Using the arts as a guide, think about creative ways you could teach people about what you love to do. Can you find a fun way to get more people interested in your hobby? How can you use technology to make learning about your interests more immersive? Are there any experts you could interview?

→ **Design and create a solution that helps people learn about your passions!**

Use your research and explorations to either improve an existing way your hobby is shared or design a new innovative way to share! Can you think of any technology that could be used in a new or creative way? Make a drawing, model, or prototype of your solution.

→ **Share your ideas, collect feedback, and iterate on your solution.**

The more you iterate and develop your ideas, the more you will learn. What impact will your solution have on your audience?

→ **Communicate your solution with a live presentation at an event.**

Prepare a creative and effective presentation that clearly explains your innovation project solution and its impact on others. Make sure your whole team is involved in sharing your progress.

Use your critical thinking and innovation to inspire others to learn and be entertained with *FIRST® IN SHOW*SM presented by Qualcomm.

Robot Design and Robot Game

This year's MASTERPIECESM robot game is about the technology that will improve an audience's experience of a creative production. Points are scored by activating different types of technology. The experts involved in designing the shows and the audience members need to be delivered to various venues around the mat.

Robot Resources



START

Design and create a robot that will complete missions in the robot game.

→ Build your mission models and identify your mission strategy.

Each mission and model provides inspiration for possible solutions to your innovation project. You will learn from four experts and discover the technology they use in their jobs. You can complete the missions in any order!

→ Design and create your autonomous robot and programs.

Create a plan for your robot design. Build a robot and its attachments using LEGO® Education SPIKE™ Prime or any LEGO Education-compatible set. Code your robot to complete a series of missions autonomously in a 2.5-minute robot game to score points.

→ Test and iterate on your robot solution to complete missions.

Iterate on your robot design and programs with continual testing and improvements.

→ Communicate your robot design solution at judging.

Prepare a short presentation that clearly explains the process your team used to create your robot and programs and how they work. Make sure your whole team is involved.

→ Compete in robot game matches.

Your robot starts in a launch area, tries missions in an order of your team's choosing, and returns anywhere into home. You can modify your robot when it is in home before launching it again. Your team will play multiple matches, but only your highest score matters.



Your innovative robot design, clear mission strategy, and functional programs are key in the FIRST® IN SHOWSM season presented by Qualcomm.

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.

Team Captain

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

Creative Designer

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

Researcher

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

Communicator

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

Project Manager

Focuses on time management and preparing for the event.



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.

What are the four parts of FIRST LEGO League Challenge?

Our Notes:

→ 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?



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



Museum Curator

Project Spark

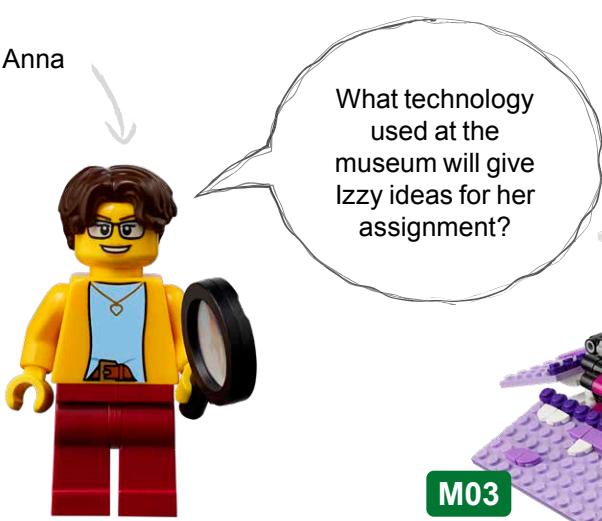
Museums are places where people learn about art, culture, science, history, and more. Technology is often used to make learning more interesting and engaging.

Think about and research:

- Who visits museums and why?
- What kind of technology is used to help people interact with a museum exhibit?
- Who are the people that work behind the scenes at a museum?
- How do museums protect and preserve their exhibits and artifacts?

Our Ideas:

Anna



M03



→ Tasks

(50-60 minutes)

- Read the Project Spark.
- Build the Museum Curator models in Bags 3, 5, and 11.
- Review the missions that relate to the models you built.
- Discuss how the mission models are linked to the Project Spark.
- Capture your ideas.

→ Share

(10-15 minutes)

- Get together at the mat.
- Refer to the field setup section of the *Robot Game Rulebook* for the models pictured below.
- Place each model where it belongs. Show the robot skills you learned.
- Show how the models work and explain how they relate to the Project Spark.
- Discuss the reflection questions.
- Clean up your space.

→ Reflection Questions

- What innovation project ideas do the mission models spark?
- What kind of technology do museums in your community use?



M05

M12

→ Introduction

(10-15 minutes)

- Think about some goals you want to achieve. These can grow and change throughout your journey.
- In this session, use the engineering design process and try out using the team roles listed on page 8.

My Personal Goals:

→ Tasks

(50-60 minutes)

- Open the SPIKE™ Prime app. Find your lesson.



Competition Ready Unit: Training Camp 1: Driving Around

- Determine what coding and building skills you can apply in the robot game.
- Try it out! Which missions look like the most fun?

See if you can use the skills you learned to drive your robot to one of the mission models.

Our Notes:

→ Reflection Questions

- How can you aim your robot toward a model?
- How did you use the engineering design process and team roles in this session?



Use these goal prompts for inspiration!

We will use Core Values to ...

We want to experience ...

We want our robot to ...

We want our innovation project to ...



Visual Effects Director

Project Spark

Visual effects and other video and audio technology can create a powerful impact for viewers of movies and other types of media. Using innovative techniques, visual effects directors can make a movie scene really exciting and immersive!

Think about and research:

- What movies use visual effects?
- How does a visual effects director collaborate with others on a movie set?
- What tools or technology are used to help create exciting visuals?
- How can visual effects make an audience feel like they are part of the action?

Our Ideas:

Emily



M09



→ Tasks

(50-60 minutes)

- Explore the Project Spark.
- Build the Visual Effects Director models in Bags 1, 7, and 8.
- Look over the missions that correspond to the models.
- Talk about how the mission models relate to the Project Spark.
- Capture your ideas.

→ Share

(10-15 minutes)

- Get together at the mat.
- Place each model where it belongs. Refer to the Field Setup section in the *Robot Game Rulebook*.
- Share the robot skills you learned.
- Show how the models work and explain their connections to the Project Spark.
- Chat about the reflection questions.
- Clean up your space.

→ Reflection Questions

- What other effects are used in movies that don't require expensive technology?
- Can you think of examples of visual effects in exhibits or live performances?

→ Introduction

(10-15 minutes)

- Use the bricks in Bag 4 to build something that represents your team.
- Create a team object with the bricks and be sure each person gets to contribute.

Our Team Design:

→ Tasks

(50-60 minutes)

- Open the SPIKE™ Prime app. Find your lesson.



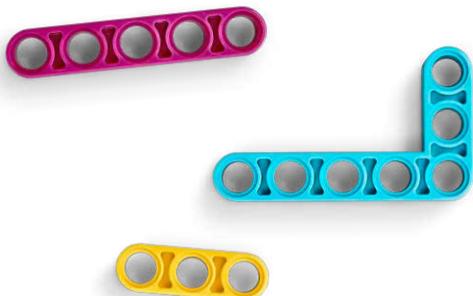
Competition Ready Unit: Training Camp 2: Playing with Objects

- Reflect on the skills you learned that will be beneficial in completing missions.
- Try it out! See if you can code your robot to complete a mission.

Our Notes:

→ Reflection Questions

- How can you drive your robot to deliver your team object to the museum?
- What objects does your robot need to avoid?



Stage Manager

Project Spark

A stage manager is responsible for ensuring all aspects of a live production are ready for showtime. The set, furniture, props, and costumes used on stage create lots of interest and excitement for the audience.

Think about and research:

- How can props and costumes help tell a story during a live performance?
- What skills does a stage manager need to be successful?
- Who does a stage manager work closely with in a theater?
- How could puppets be used on stage to help create excitement for the audience?

Our Ideas:



→ Tasks

(50-60 minutes)

- Look over the Project Spark.
- Build the Stage Manager models in Bags 2, 10, and 12.
- Identify the missions that relate to the models you built.
- Discuss how the Project Spark and models are linked.
- Capture your ideas.

→ Share

(10-15 minutes)

- Get together at the mat.
- Place each model where it belongs.
- Share how the models work and the robot skills you learned.
- Demonstrate the models' functions and how they connect to the Project Spark.
- Talk about the reflection questions.
- Clean up your space.

→ Reflection Questions

- What challenges could a stage manager encounter when getting ready for a show?
- What examples of live theater do you have in your community?

→ Introduction

(10-15 minutes)

- Think about how you have used the Core Value of **discovery** in your team's journey so far.
- Record examples of how your team has learned new skills and ideas.

→ Tasks

(50-60 minutes)

- Open the SPIKE™ Prime app. Find your lesson.



Competition Ready Unit: Training Camp 3: Reacting to Lines

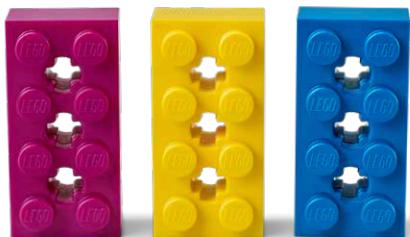
- Determine what building and coding skills will help you in the robot game.
- Try it out! See if you can use the skills you learned to complete another mission.

→ Reflection Questions

- How did testing and debugging your program help make your robot more accurate?
- Can your robot follow the line from the left launch area to the sound mixer model?

Discovery: We explore new skills and ideas.

Our Notes:



Sound Engineer

Project Spark

Sound engineers use mixers and other audio equipment to enhance a listening experience. Whether you're listening to your favorite artist sing a song or feeling the vibrations of a bass drum, sound can have a powerful impact.

Think about and research:

- What kind of projects could a sound engineer work on?
- How is sound used to change a listener's experience?
- What kind of training do you need to be a sound engineer?
- How is sound used in museums or films?

Our Ideas:

→ Tasks

(50-60 minutes)

- Read the Project Spark.
- Build the Sound Engineer models in Bags 6 and 9.
- Identify the missions that relate to the models you built.
- Discuss how the Project Spark and models are linked.
- Capture your ideas.

→ Share

(10-15 minutes)

- Get together at the mat.
- Put each model where it belongs.
- Show how the models operate and their connection to the Project Spark.
- Show the robot skills you have learned.
- Discuss the reflection questions.
- Clean up your space.

→ Reflection Questions

- How does a sound engineer record music and modify it to make instruments or vocals stand out?
- Where do concerts happen in your community?



Session 5

→ Introduction

(10-15 minutes)

- Think about **teamwork** and your team.
- Record examples of how your team has learned to work together.

→ Tasks

(50-60 minutes)

- Open the SPIKE™ Prime app. Find your lesson.



Competition Ready Unit: Guided Mission

- Read over the guided mission.
- Have fun practicing this guided mission until it works perfectly!

Teamwork: We are stronger when we work together.

→ Reflection Questions

- What does the guided mission show you about *Coopertition*®?
- Can you change the program so that the mission works when you start the robot from the opposite launch area?

Guided Mission: Mission 2 Theater Scene Change

To help you learn about navigating and interacting with a model, complete this guided mission.

In the app, download the program that solves this mission.

Start your robot in the correct position in the left launch area. Run your robot and watch it complete the mission and score the points.

Like all the mission models, Mission 2 Theater Scene Change might inspire you to think of a solution for your innovation project.

Think about how to incorporate the Theater Scene Change mission into your mission strategy. Apply your new line-following skill to a different mission model.

Investigate Ideas

Research Findings:

→ Tasks

(50-60 minutes)

- Revisit Sessions 1-4 to review the Project Sparks.
- Think about the great solutions you came up with in the previous sessions.
- Research the innovation project and different problems you have identified.
- Use this page to capture your research.
- Identify the problem your team will solve and record your problem statement.

→ Share

(10-15 minutes)

- Get together at the mat.
- Show how your robot scores points on the guided mission.
- Discuss the problem your team has identified and think about next steps.
- Discuss the reflection questions.
- Clean up your space.

→ Reflection Questions

- What problem did you decide to solve?
- Is there an expert you can talk to about the problem?

Problem Statement:

→ Introduction

(10-15 minutes)

- Locate Bag 13 and assemble the expert minifigures.
- Work as a team to assemble the minifigures and discuss their jobs. Think about how these experts could help with your innovation project ideas.

→ Tasks

(50-60 minutes)

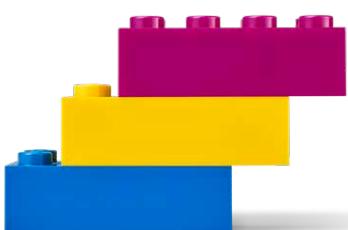
- Watch the “Robot Game Missions” video.
- Start to think about your mission strategy.
- Design an effective plan.
- Discuss which missions your team will attempt first.
- Complete Pseudocode on page 22.
- Think about how the program will make your robot act.
- Revisit the earlier lessons or do the optional lesson listed here.



Competition Ready Unit: Assembling an Advanced Driving Base

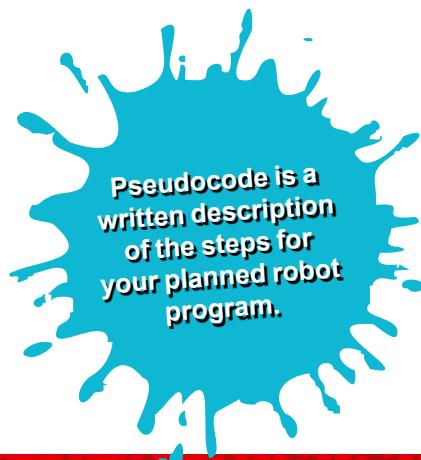
→ Reflection Questions

- How could you use line following to help you navigate the mat?
- How did you use the engineering design process to create your mission strategy?



Innovation Project Model Design:

Strategy:



Identify Solutions

PROBLEM AND SOLUTION ANALYSIS

Record important information here.

→ Tasks

(50-60 minutes)

- Research the problem you chose and any existing solutions.
- Generate solution ideas. Make a plan for how you will develop your solution. Use page 23, Innovation Project Planning, as a tool.
- Be sure to use a variety of sources and keep track of them on the Innovation Project Planning page.
- Select your project's final solution as a team.

→ Share

(10-15 minutes)

- Get together at the mat.
- Review your Pseudocode page. Make changes to the page if necessary.
- Explain what you discovered in your research. Discuss any solution ideas.
- Discuss the reflection questions.
- Clean up your space.

→ Reflection Questions

- What types of improvements do existing solutions need?
- What are your brand-new ideas to solve the problem?

Guiding Questions:

- What questions are you trying to answer?
- What information are you looking for?
- Can you use different types of sources such as credible Internet websites, books, and experts?
- Does your source have information relevant to your project?
- Is this a good and accurate source of information?
- How do your innovation project plans connect with the innovation project rubric?



Izzy

Pseudocode

Mission Name:

Mission Number:

CODING STEPS

Write out the moves the robot should make to complete the mission.

Move 1

Move 6

Move 2

Move 7

Move 3

Move 8

Move 4

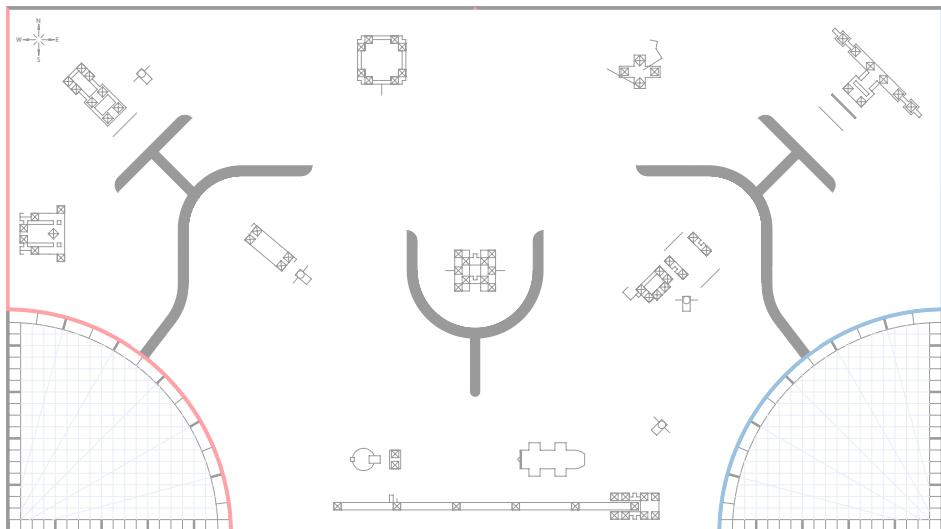
Move 9

Move 5

Move 10

ROBOT PATH DIAGRAM

Draw the route your robot will take to complete the mission.



Go to the app and start a new project. Explore which coding blocks will move your robot the same way as your planned coding steps would move it.

Complete this page in Session 6.

Innovation Project Planning

PROCESS

Describe the process you followed to develop your innovative solution.

SOURCES

Write down where you got your information. Include details such as the title, author, and website.

1.

2.

3.

Complete this page in Session 6.

→ Introduction

(10-15 minutes)

- Think about **Gracious Professionalism®**.
- Write ways your team will demonstrate this in everything you do.
- Look over page 6 in the *Robot Game Rulebook* to see how *Gracious Professionalism* is evaluated during the tournament.

Gracious Professionalism: We show high-quality work, highlight the value of others, and respect individuals and the community.

Robot Design:

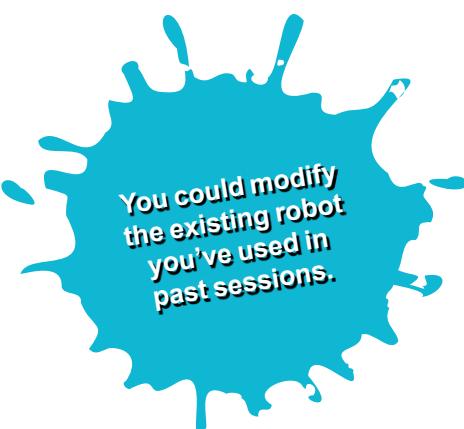
→ Tasks

(50-60 minutes)

- Continue to develop your robot and its attachments to complete missions in the robot game.
- You can improve the existing robot used in the previous sessions or create a new design.
- Create a program for each new mission you attempt. You could combine mission solutions into one program.
- Test and improve your robot and its programs.
- Revisit previous lessons to develop your coding skills or work on solving the missions.

→ Reflection Questions

- Can you follow how the program on your device is making your robot move?
- How can you iterate and improve on the existing robot design used in previous sessions?



Create Solutions

PROJECT DRAWING

→ Tasks

(50-60 minutes)

- Develop and create your innovation project solution.
- Sketch your solution. Label the parts and how it will work.
- Describe your solution and explain how it solves the problem.
- Create a prototype, model, or drawing of your solution.
- Document the process you use to develop your solution on page 23, Innovation Project Planning.

PROJECT DESCRIPTION

→ Share

(10-15 minutes)

- Get together at the mat.
- Show any missions you are working on or have completed.
- Discuss your research and your innovation project solution.
- Discuss the reflection questions.
- Clean up your space.

→ Reflection Questions

- Can you describe your innovative solution in under five minutes?
- How does your solution address your identified problem?



→ Introduction

(10-15 minutes)

- Reflect on **Coopertition®**.
- Note ways your team will demonstrate this at an event.

→ Tasks

(50-60 minutes)

- Decide which mission to attempt next.
- Think about your mission strategy and plan.
- Build any attachments you need to complete missions.
- Iterate and refine your program so your robot completes the mission reliably.
- Be sure to document your design process and testing for each mission!

Coopertition: We show that learning is more important than winning. We help others even as we compete.

Design Process:

→ Reflection Questions

- How has your team used Core Values to develop your robot solution?
- In what order will you run the missions in the robot game?



Guiding Questions:

- Describe the attachments you built.
- Explain your different programs and what the robot will do.
- How did you test your programs and attachments?
- What changes did you make to your robot and programs?
- How does your robot plan connect with the robot design rubric?



Continue Creating

Plan to Share:

→ Tasks

(50-60 minutes)

- Make a plan to share about your solution with others!
- Evaluate your present solution.
- Iterate and improve to make it better based on feedback.
- Determine if you can do any testing of your solution.

Our Improvements:

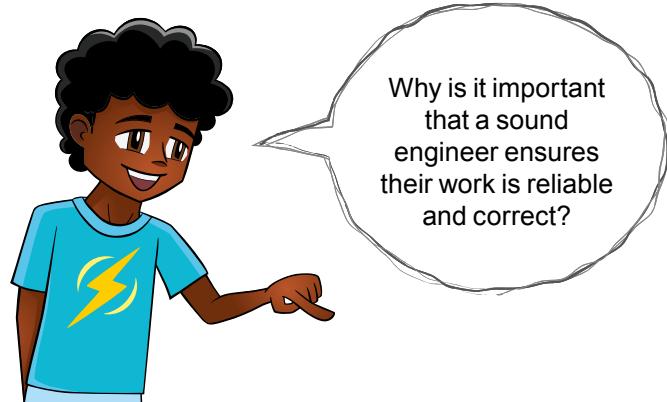
→ Share

(10-15 minutes)

- Get together at the mat.
- Show any missions you are working on or have completed.
- Discuss how you will share your solution and project plan with others.
- Discuss the reflection questions.
- Clean up your space.

→ Reflection Questions

- How can you realistically implement your innovation project solution?
- Could your innovation project solution be manufactured? What would it cost?



Session 9

Solution Planning

→ Introduction

(10-15 minutes)

- Think about **innovation** and your team.
- Record examples of how your team has been creative and solved problems.
- Use the bricks in Bag 4 to build your team's LEGO® art piece.

→ Tasks

(100-120 minutes)

- Code your robot to complete Mission 04 using the art piece you created.
- Think about your mission strategy on the mat and the missions you will solve.
- Continue to create a solution for each mission as time allows.
- Test, iterate, and improve your robot and innovation project solutions. Be sure to document all this.

→ Share

(10-15 minutes)

- Get together at the mat.
- Show the work completed on the innovation project and robot game.
- Look over the Core Values rubric. Talk about how you will demonstrate Core Values at the event and judging session.
- Clean up your space.

→ Reflection Questions

- What features on your robot show good mechanics?
- What changes have you made to your innovation project solution based on feedback from others?
- What progress have you made on the goals set in Session 2?

Innovation: We use creativity and persistence to solve problems.

Iterations and Improvements:



Session 10

Iterate Solutions

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

Presentation Script:

→ Introduction

(10-15 minutes)

Think about **impact** and your team.

Record examples of how your team has had a positive influence on you and others.

→ Tasks

(100-120 minutes)

Plan out your project presentation. Refer to the innovation project rubric for what to cover.

Write out your innovation project presentation script.

Make any props or displays that you need. Be engaging and creative!

Continue to create, test, and iterate on your robot solution.

Practice a 2.5-minute robot game with all your completed missions.

→ Share

(10-15 minutes)

Get together at the mat.

Share the project presentation work completed.

Share what missions you have completed.

Discuss how everyone will be involved in the presentation.

Discuss the reflection questions and clean up your space.

→ Reflection Questions

- How did you decide which missions to attempt?
- How can your innovation project solution help your community?
- What skills have you developed throughout your MASTERPIECESM experience?



Session 11

Presentation Planning

→ Introduction (10-15 minutes)

- Think about **inclusion** and your team.
- Record examples of how your team makes sure everyone is respected and their voices are heard.

→ Tasks (100-120 minutes)

- Continue working on your innovation project presentation.
- Plan and write out your robot design presentation. Refer to the robot design rubric for what to cover.
- Make sure everyone can communicate about your design process and programs.
- Determine what each person on the team will say.
- Practice your full presentation.

→ Share (10-15 minutes)

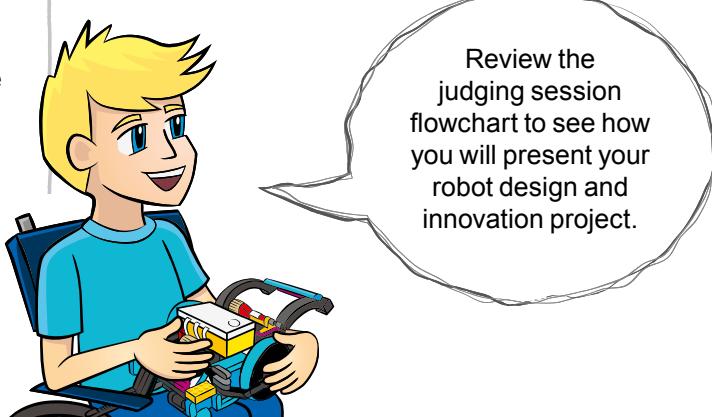
- Get together at the mat.
- Discuss the presentation and each person's role.
- Run a practice 2.5-minute match and explain what missions were done.
- Discuss the reflection questions.
- Decide what else needs to be done and clean up your space.

→ Reflection Questions

- What will you do if one mission does not work?
- How is everyone involved in the presentation?
- How has *FIRST® LEGO®* League impacted you?

Inclusion: We respect each other and embrace our differences.

Presentation Script:



Session 12

Communicate Solutions

Fun: We enjoy and celebrate what we do!

Presentation Feedback:

→ Introduction

(10 minutes)

- Reflect on how your team has had fun.
- Record examples of how your team has had fun throughout this experience.
- Think about your team's goals. Did you meet them?

→ Tasks

(100 minutes)

- Rehearse your full presentation communicating your robot and innovation project solutions.
- Demonstrate Core Values when you present!
- Practice multiple 2.5-minute robot game matches.
- Review pages 32-33, Prepare for Your Event.

→ Share

(10 minutes)

- Review the Core Values, innovation project, and robot game rubrics.
- Provide helpful feedback after the presentation to each other based on the rubrics.
- Discuss the reflection questions.
- Clean up your space.

→ Reflection Questions

- What is your plan for having any LEGO® attachments built ready for the robot game?
- Is everyone ready to speak clearly, smile, and have fun?
- What has your team accomplished?



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.

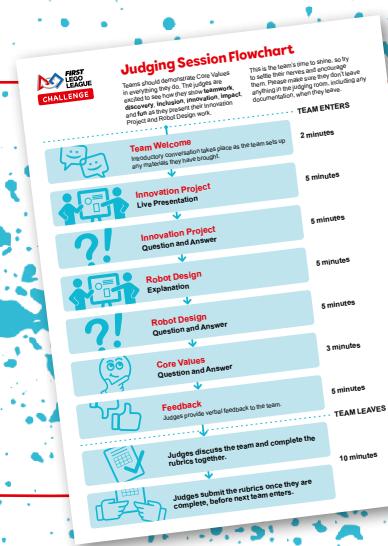
How will you explain the design process and plan used to create and test your robot?

Think about your team.

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

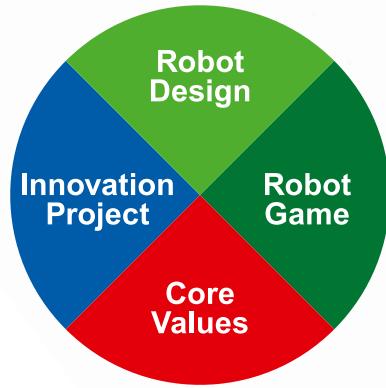
What to Expect at Your Event

- 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.



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.



Robot Design			
Beginning	Developing	Accomplished	Exceeds
How has the team exceeded?			
IDENTIFY: Team had a clearly defined mission strategy and required coding and coding while they created <input type="checkbox"/> Create mission strategy <input type="checkbox"/> Explain how mission strategy will be used <input type="checkbox"/> Explain how mission strategy will be used <input type="checkbox"/> Explain how mission strategy will be used DESIGN: Team produced innovative designs and a one-page, working prototype as needed <input type="checkbox"/> Innovative solution of an effect <input type="checkbox"/> Innovative solution of an effect <input type="checkbox"/> Innovative solution of an effect <input type="checkbox"/> Innovative solution of an effect CREATE: Team develops an efficient robot and uses selection matching their mission strategy <input type="checkbox"/> Create a robot that matches the mission strategy <input type="checkbox"/> Create a robot that matches the mission strategy <input type="checkbox"/> Create a robot that matches the mission strategy <input type="checkbox"/> Create a robot that matches the mission strategy ITERATE: Team is continually refining their robot and making it better, able to implement and incorporate findings into their current solution <input type="checkbox"/> Implement and iterate <input type="checkbox"/> Implement and iterate <input type="checkbox"/> Implement and iterate <input type="checkbox"/> Implement and iterate COMMUNICATE: Team communicates their mission strategy and how they implemented it <input type="checkbox"/> Explain how mission strategy will be used <input type="checkbox"/> Explain how mission strategy will be used <input type="checkbox"/> Explain how mission strategy will be used <input type="checkbox"/> Explain how mission strategy will be used Feedback Comments: Great Job Think About: Great job			

Innovation Project			
Beginning	Developing	Accomplished	Exceeds
How has the team exceeded?			
IDENTIFY: Team had a clearly defined problem that was well researched <input type="checkbox"/> Problem not clearly defined <input type="checkbox"/> Problem clearly defined DESIGN: Team developed an original solution or solution to a challenge based on their research <input type="checkbox"/> Original research <input type="checkbox"/> Original research CREATE: Team developed a prototype that matches their design <input type="checkbox"/> Create a prototype that matches their design <input type="checkbox"/> Create a prototype that matches their design <input type="checkbox"/> Create a prototype that matches their design ITERATE: Team is continually refining their prototype and making it better, able to implement and incorporate findings into their current solution <input type="checkbox"/> Implement and iterate <input type="checkbox"/> Implement and iterate <input type="checkbox"/> Implement and iterate <input type="checkbox"/> Implement and iterate COMMUNICATE: Team communicates their problem and how they implemented it <input type="checkbox"/> Explain how problem was identified <input type="checkbox"/> Explain how problem was identified <input type="checkbox"/> Explain how problem was identified <input type="checkbox"/> Explain how problem was identified Feedback Comments: Great Job Think About: Great job			

Core Values			
Beginning	Developing	Accomplished	Exceeds
How has the team exceeded?			
IDENTIFY: Team had a clearly defined problem that was well researched <input type="checkbox"/> Problem not clearly defined <input type="checkbox"/> Problem clearly defined DESIGN: Team developed an original solution or solution to a challenge based on their research <input type="checkbox"/> Original research <input type="checkbox"/> Original research CREATE: Team developed a prototype that matches their design <input type="checkbox"/> Create a prototype that matches their design <input type="checkbox"/> Create a prototype that matches their design <input type="checkbox"/> Create a prototype that matches their design ITERATE: Team is continually refining their prototype and making it better, able to implement and incorporate findings into their current solution <input type="checkbox"/> Implement and iterate <input type="checkbox"/> Implement and iterate <input type="checkbox"/> Implement and iterate <input type="checkbox"/> Implement and iterate COMMUNICATE: Team communicates their problem and how they implemented it <input type="checkbox"/> Explain how problem was identified <input type="checkbox"/> Explain how problem was identified <input type="checkbox"/> Explain how problem was identified <input type="checkbox"/> Explain how problem was identified Feedback Comments: Great Job Think About: Great job			

Class Pack Rubric			
Beginning	Developing	Accomplished	Exceeds
How has the team exceeded?			
INNOVATION PROJECT <input type="checkbox"/> Team generates innovation ideas independently before selecting/giving priority to one <input type="checkbox"/> Team generates innovation ideas independently before selecting/giving priority to one DISCOVERY <input type="checkbox"/> Team explores and experiments with various opportunities IMPACT <input type="checkbox"/> Team applies and/or markets its innovation to the world INCLUSION <input type="checkbox"/> Team demonstrates respect and inclusion of others TEAMWORK <input type="checkbox"/> Team works together to meet challenges and learn throughout their journey FUN <input type="checkbox"/> Team enjoys learning and working together for fun			
Robot Design <input type="checkbox"/> Team had a clearly defined mission strategy and coding strategy <input type="checkbox"/> Team had a clearly defined mission strategy and coding strategy DESIGN <input type="checkbox"/> Team generates an original solution or solution to a challenge based on their research <input type="checkbox"/> Team generates an original solution or solution to a challenge based on their research CREATE <input type="checkbox"/> Team developed a prototype that matches their design <input type="checkbox"/> Team developed a prototype that matches their design ITERATE <input type="checkbox"/> Team is continually refining their prototype and making it better, able to implement and incorporate findings into their current solution <input type="checkbox"/> Team is continually refining their prototype and making it better, able to implement and incorporate findings into their current solution COMMUNICATE <input type="checkbox"/> Team communicates their problem and how they implemented it <input type="checkbox"/> Team communicates their problem and how they implemented it Core Values <input type="checkbox"/> Team respects and values diversity <input type="checkbox"/> Team respects and values diversity DISCOVERY <input type="checkbox"/> Team explores and experiments with various opportunities <input type="checkbox"/> Team explores and experiments with various opportunities INCLUSION <input type="checkbox"/> Team demonstrates respect and inclusion of others <input type="checkbox"/> Team demonstrates respect and inclusion of others IMPACT <input type="checkbox"/> Team applies and/or markets its innovation to the world <input type="checkbox"/> Team applies and/or markets its innovation to the world INCLUSION <input type="checkbox"/> Team demonstrates respect and inclusion of others <input type="checkbox"/> Team demonstrates respect and inclusion of others TEAMWORK <input type="checkbox"/> Team works together to meet challenges and learn throughout their journey <input type="checkbox"/> Team works together to meet challenges and learn throughout their journey FUN <input type="checkbox"/> Team enjoys learning and working together for fun <input type="checkbox"/> Team enjoys learning and working together for fun			
Feedback Comments: Great Job Think About: Great job			

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.



Career Connections



Sound Engineer

A sound or audio engineer mixes different sounds, controls volume, and creates an optimal listening experience.

Links to Session 4



Stage Manager

A stage manager is responsible for making sure the lights, sound, and props are working properly and in the right place.

Links to Session 3



Visual Effects Director

A visual effects director produces images and settings that help the audience engage with the performance.

Links to Session 2



Exploration

(Recommend completing after Session 4 or 9)

Look at the careers on these pages. Choose a job role, research it, and answer the questions.

- Explain the job. What are some of this job's daily tasks?
- What education or training is required?
- What is this job's yearly salary?
- What companies could people in this job work for?

Fields of Study

- Graphic Design
- Audio Engineering
- Sculpture
- Cinematography
- Musical Theater
- Computer Animation
- Photography



Museum Curator

A museum curator selects which objects will be featured in an exhibit that will help teach people about history or the future.

Links to Session 1



Actor

An actor is an artist that performs in front of a camera or an audience. Actors often use costumes, makeup, puppets, or other props to help bring their character to life.

Links to Session 3



Sports Photographer

A sports photographer is skilled at taking pictures of athletes in action. Photographers often use large lenses so they can zoom in while keeping a safe distance.

Links to Session 2



Reflection

(Recommend completing after Session 12)

Look at the careers on these pages. Think about these jobs and what interests you.

- What skills are needed in these jobs?
- What interests you about these jobs?
- Can you think of other jobs that relate to arts?
- Can you explore one of these careers for more information?

Career
Resources



Team Journey

MASTER
PIECESM



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