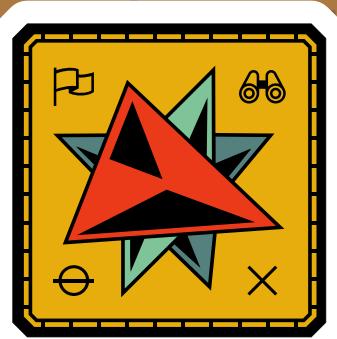


**FIRST®
LEGO®
LEAGUE
CHALLENGE**

Team Meeting Guide

PRESENTED BY:



Dear teams and coaches,

Are you ready for an exciting journey into the past? In the new *FIRST LEGO League* season **UNEARTHED**, you will become archaeologists. You will immerse yourself in ancient times, investigate mysterious sites, and discover how people used to live. Your own research project will be the main focus: you will choose an aspect that particularly interests you and develop creative solutions and ideas for it.

At the same time, you will show what your robots are capable of. Using LEGO Education SPIKE™ Essential or Prime, you will design, program, and test clever models or autonomous robots that solve tasks related to the season's theme. You combine technical know-how with your imagination – always working together as a team.

FIRST LEGO League is about more than just technology. It's about working together, learning from each other, and daring to try new things. You'll grow beyond your expectations through teamwork – whether you're just starting out or already an experienced tinkerer.

At the end, you present your results with a team poster at an exhibition or research presentation at a tournament, and show what you have achieved together.

We at **HANDS on TECHNOLOGY e. V.** have been organizing the *FIRST LEGO League* in Germany, Austria, and Switzerland for over 20 years. We firmly believe that curiosity, creativity, and team spirit can change the world, and that you have what it takes!

We wish you a season full of ideas, exciting discoveries, strong robots, real research, and of course lots of fun!

Your team at



For more information, visit
www.hands-on-technology.org



FIRST® LEGO® League Global Sponsors

The LEGO Foundation



CHALLENGE DIVISION SPONSOR



Intro to FIRST® LEGO® League Challenge

Friendly competition is at the heart of FIRST® LEGO® League Challenge, as teams of up to 10 children engage in research, problem-solving, coding, and engineering as they build and code a LEGO® robot that navigates the missions of the robot game. Teams also participate in an Research Project to identify and propose a solution to a relevant real-world problem.

FIRST LEGO League Challenge is one of three divisions by age group of the FIRST LEGO League program. This program inspires young people to experiment and grow their confidence, critical thinking, and design skills through hands-on learning. FIRST LEGO League was created through an alliance between FIRST® and LEGO® Education.



FIRST
LEGO
LEAGUE
DISCOVER

FIRST
LEGO
LEAGUE
EXPLORE

FIRST
LEGO
LEAGUE
CHALLENGE

FIRST® AGE™ presented by Qualcomm and UNEARTHED™

Robots. LEGO bricks. Game pieces. Tools. Team T-shirts. Volunteer pins. Engineering notebooks. Pizza boxes. Banners. Remove the people from a FIRST community event, and these are some of the objects you might see left behind. They are the **artifacts** future archaeologists can use to put together the pieces of the FIRST story.

Archaeology helps **uncover cultural histories** through the study of artifacts. The field provides

insight into how living beings have interacted with our planet and each other throughout history. It reconstructs the stories of our communities so we can learn from our past.

During our archaeology-inspired season, FIRST teams and supporters will use STEM and collaboration skills to unearth new findings about ourselves and our collective communities to help build a better world. **Dig in with FIRST!**



UNEARTHED

Any questions?

Every first Wednesday of the month, we offer a remote open Q&A session for teams and coaches. We help clarify any unclear or open questions and topics you might have.



[Q&A Session](#)

Stay tuned

To sign up for the newsletter, simply scan the QR code on the left. Once a month we report on everything new concerning the FIRST LEGO League.

[All news](#)



International Tournaments ...

We recommend checking our website regularly as there are more opportunities for the winning teams of the DACH final to move on to international tournaments!

[More Challenges](#)



The Coach's Role

As a coach in *FIRST*® LEGO® League Challenge, your job is to guide and support your team while allowing them to take ownership of their work. The team will look to you to help them stay organized, ask thoughtful questions, and provide tools or resources when needed.

You don't need to be an engineer to be a great coach – your goal is to create a space where creativity, curiosity, and teamwork thrive and every team member feels empowered to contribute.

Coaches in *FIRST*® LEGO® League Challenge will:

- **Facilitate Problem-Solving and Exploration:** Guide the team as they design and program their robot, tackle the robot game missions, and develop their research project solution.
- **Promote Teamwork:** Encourage team members to share ideas, collaborate, and respect each other's contributions. Ensure every voice is heard and every team member feels valued.
- **Champion Core Values:** Model the *FIRST*® Core Values of discovery, innovation, impact, inclusion, teamwork, and fun. Celebrate how your team demonstrates these values inside and outside of team meetings.
- **Prepare the Team for Events:** Help the team organize their work, practice presenting to judges, and get comfortable explaining their robot, programming, and project solution.
- **Be a Role Model:** Celebrate every step of progress, no matter how big or small. Encourage resilience, a growth mindset, and a willingness to tackle new challenges.

Using this Guide

The sessions provide a guided experience for the *FIRST* LEGO League Challenge. The sessions are designed to be flexible so that teams of varying experiences can use the materials. Your role is to facilitate and guide the team during the sessions as they complete each task. The Sessions at a Glance page describes the sequence of objectives, while each session page shares specific outcomes. Remember, the tips and timing within this guide are just suggestions, and you can do whatever is best for your team.

FIRST® Core Values

The *FIRST* Core Values are fundamental to *FIRST* and unique to its programs. They emphasize friendly collaboration, respect for the contributions of others, teamwork, learning, and community involvement and are part of our commitment to fostering, cultivating, and preserving a culture of equity, diversity, and inclusion.

Our community expresses the *FIRST* philosophies of Gracious Professionalism® and Coopertition® through the *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.

FIRST® LEGO® League Challenge Overview

At the event, your team will present your robot design and research project work to the judges during the judging session, and your robot performance will be evaluated at

the robot game. Core Values are evaluated in all parts of your work, and you will receive scores from the judges and referees for how you apply them.

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

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!

RESEARCH

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

Your team will:

- **Identify** and research a problem.
- **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 potential impact.

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 programming 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 set up the field 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!

What Does the Team Need?

LEGO® Education SPIKE™ Prime Set



SPIKE Prime set



Expansion set

Note: Other LEGO® Education sets such as MINDSTORMS® and Robot Inventor are also allowed.

Electronic Device

Each team will need at least one compatible device such as a laptop, tablet, or computer. Prior to starting Session 1, you need to download the appropriate software (LEGO® Education SPIKE™ or other compatible software) on to the device.

<https://education.lego.com/en-us/downloads>



UNEARTHED™ Challenge Set

The Challenge Set comes in a box that contains the mission models, challenge mat, and 3M™ Dual Lock™ Reclosable Fasteners, coach pins, and season tiles for the team members. The team should build the models very carefully using the building instructions.

Season Resources



Challenge Mat and Table

Set up a table with the challenge mat in your classroom or meeting space. Teams can practice on the mat by placing it on the floor. However, robot game matches at official events will be played on a table complete with sidewalls. Instructions to build a table can be found on the Season Resources page.



Managing the Team



Facilitator Tips

- The team will be doing the work. You will facilitate their journey and remove any major obstacles and ensure their safety. Guide them as they work independently through the tasks provided in each session.
- Some sessions might take two hours or more to complete. You might need to work on a session in multiple team meetings depending on how long you meet. Be flexible!
- Set team guidelines, procedures, and expected behaviors for your meetings.
- Use the guiding questions in the sessions to provide focus and direction to the team.
- Jobs in the Project Sparks connect to the Career Connections page in the back of the *Engineering Notebook*.
- Teammates should be encouraged to work with each other, listen to each other, take turns, and share ideas.

Material Management



- Place any extra or found LEGO® pieces in a cup. Have children who are missing pieces come to the cup to look for them.
- Wait to dismiss your team until you look over their SPIKE™ and Challenge Set.
- The lid of the SPIKE Prime set can be used as a tray to keep pieces from rolling away.
- Use plastic bags or containers to store any unfinished builds or assembled models.
- Designate a storage space for the built mission models, challenge mat, and table.
- The teammate in the material manager role can help with the process of clearing away and storing materials.

Engineering Notebook Tips

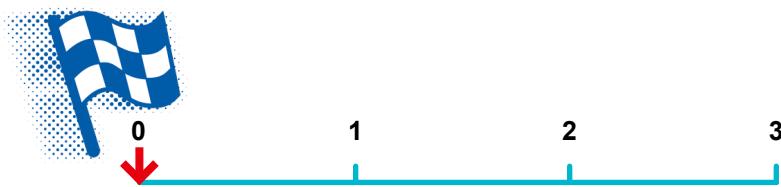


- Read the *Engineering Notebook* carefully. The team will share the notebooks and work on them collaboratively.
- The notebook contains relevant information and guides the team through the sessions.
- The tips in this *Team Meeting Guide* will direct you how to support each session.
- As facilitator, guide the team members in the performance of their roles during each session. Team roles are outlined in the *Engineering Notebook*. Using roles helps your team function more efficiently and ensures that everyone on the team is involved.



Pre-Season Checkpoint

Here are some helpful steps for getting started with coaching FIRST® LEGO® League Challenge. Use this checkpoint to help you get ready before your first session with the team.



- Confirm your team is officially registered with your local Program Delivery Partner.
- Ensure you have received all materials needed to implement the program. See page 6 for what you need.
- Decide how often and where your team will meet. Communicate this schedule with team members.
- Familiarize yourself with the contents of the **Challenge Set** and watch the **season videos** on the FIRST LEGO League YouTube channel.
- Read the **Engineering Notebook** and all pages of this **Team Meeting Guide**. These guides are full of helpful tips and resources to guide you through the sessions.
- Explore the **FIRST® Core Values**. These are the essential foundations for your team.
- Ensure you have at least one device with internet access and the **SPIKE™ app** installed.
- Unpack the LEGO® Education set and sort the elements into the trays. Make sure the controller is charged and all updates are completed.
- Browse the available content on the **Season Resources** page and **Multimedia Resources** list.
- Look over the **judging rubrics** to see the evaluation criteria for robot design and research project solutions.

Sessions 1–4 Tips



CORE VALUES

Have the team set goals for what they want to accomplish together and have individual team members set their personal goals.



RESEARCH

Explore the Project Sparks and narrow the team's focus on which problem they want to work on. They can select a Project Spark problem or choose one of their own.



ROBOT DESIGN

If the team is new to using their LEGO Education set, take some time to get them acquainted with it. Have the team complete the Tutorial Activities.



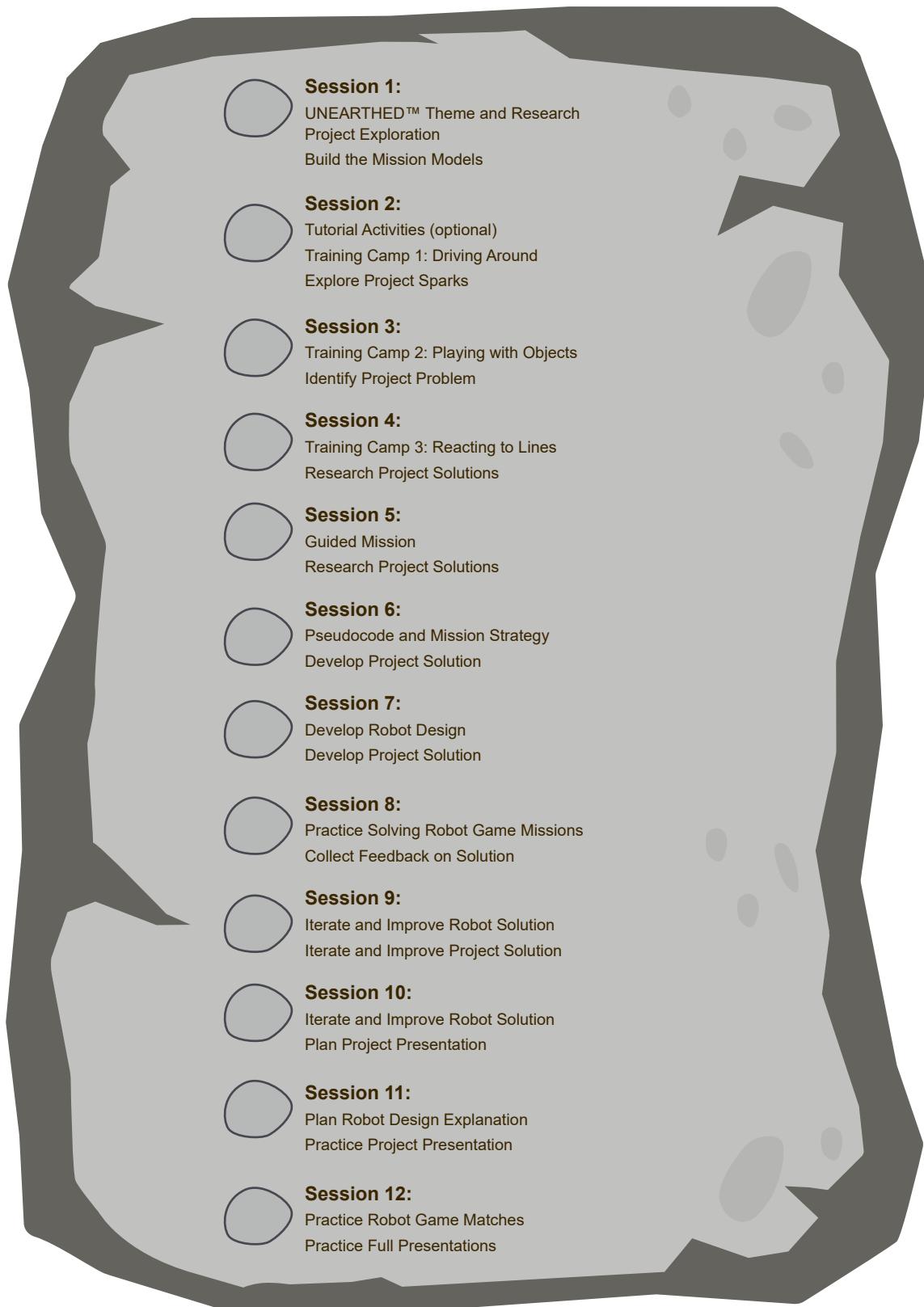
ROBOT GAME

Place the mat and models in a safe location after each session if they have to be stored.

Sessions at a Glance



Each session starts with an Introduction and ends with a Share activity. Details for these activities are provided in the session pages that follow. Tips and notes are provided in this guide to assist you in facilitating each team meeting.



It may take two hours or more to complete the tasks in a session. If needed, split sessions into two separate meetings.

Session 1 Get Started

Outcomes

- 1 Have the team watch the season videos on the FIRST® LEGO® League YouTube channel and read pages 3-9 in their *Engineering Notebooks*.
- 2 Provide the model building instructions and show the field setup video to the team.
- 3 The team can work together or as individuals to build the models. Be sure to inspect and test the models to ensure they function correctly. Use the *Robot Game Rulebook* and mission video to understand how the models work.
- 4 Encourage the team to investigate the mat and the mission models to inspire them. The team should record ideas for possible research project problems.
- 5 Lead a discussion about the Project Sparks and Challenge story and how they relate to the mission models.



Season Videos

In this session, the team will ...

- Explore the UNEARTHED™ season theme and get to know each other.
- Build the mission models and make connections to the Challenge story and Project Sparks.

1 → Introduction

- Get to know your team members and select your team name.
- Watch the season videos and read pages 3-9 to learn how FIRST® LEGO® League Challenge works and about the UNEARTHED™ robot game and research project.

2 → Tasks

- Learn more about the season theme by building the robot game mission models.
- Place each model where it belongs on the Challenge mat. Read page 7 of the *Robot Game Rulebook* to learn how to set up the table.
- Explore how the models work. Connect them to the Project Sparks on page 6.
- Use the space on this page to write notes about the mission models or to answer the reflection questions.

3 → Share

- Discuss the reflection questions.
- Get together at the mat. Talk about how the mission models connect to the UNEARTHED theme.
- Clean up your space.

4 → Reflection Questions

- What ideas does your team have after reading about the research project?
- How do the mission models relate to the Challenge story or Project Sparks?
- Which mission models look interesting to you?

5

→

Reflection Questions

- What ideas does your team have after reading about the research project?
- How do the mission models relate to the Challenge story or Project Sparks?
- Which mission models look interesting to you?



Session 1

Record information about your team here.

Sessions begin with an introduction prompt for the team to discuss or record ideas.

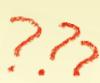
Our notes:

Open space is provided in each session for the team to collaboratively capture their thoughts, ideas, diagrams, and notes.

Some sessions will have helpful tips for the team.

Tips

- Use the checkboxes to mark when you are finished with a task.
- During each meeting, record what you have learned and what you want to improve.



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

Session 2

Outcomes

In this session, the team will ...

- Build a driving base and code it to move forward, move backward, and turn.
- Explore and research ideas for their research project.

Session 2

Discovery: We explore new skills and ideas.

Our notes:

The team should discuss the reflection questions during the Share time. Reflecting and sharing at the end of the session is an important way for the team to summarize their knowledge and identify next steps.

Tips

Planning is important to keep your team and ideas organized.

Use these goal prompts for inspiration!

We will use Core Values to ...
We want to experience ...
We want our robot to ...
We want our research project to ...



1 → Introduction

- Think about how you will use the Core Value of **discovery** in your team's journey.
- Record what your goals are and what you hope to learn on the Team Progress sheet on page 8.

2 → Tasks

- Open the SPIKE™ app. Click the Start button.
- Find your lesson.



Tutorial Activities:
1–6 (optional)



Competition Ready
Unit: Training
Camp 1: Driving
Around

- Use the skills you learned to navigate your robot to one of the mission models.
- Determine what **coding** and **building** skills you can apply in the robot game. Use the notes section to record your ideas.
- As you navigate around the mat, talk with your team about any research project ideas sparked by the mission models.

3

4 → Share

- Discuss the reflection questions.
- Get together at the mat. Share the robot skills you learned in this session.
- Clean up your space.

5 → Reflection Questions

- How can aiming your robot at a model help your team in the robot game?
- How did you use the **engineering design process** in this session?
- What Project Sparks interest your team? Does your team want to explore a different problem?

1 Teams will explore the six Core Values throughout their season.

2 The Tutorial Activities are optional but recommended if your team has minimal coding and building experience.

3 After a program is downloaded onto the controller, it cannot be transferred back to be opened and edited.

4 Have the team practice their new skills by trying to drive the robot to a model and return to home.

5 The team should reference the research project page and begin identifying problems. The team will need to have their problem statement finalized by Session 3.

Session 3

Outcomes

In this session, the team will ...

- Identify their research project problem to solve and then research solutions. (Revisit page 6 of the *Engineering Notebook*.)
- Code their robot to power an attachment and avoid obstacles using a sensor.

- 1 If your team has already agreed on the focus of their project, encourage them to begin researching the topic. You can find helpful resources on the Season Resource page.
- 2 While the team might not choose every member's preferred problem, they should choose something everyone supports.
- 3 The team will write their problem statement here. Remember, they can choose one of the problems from the Project Sparks if they are unable to come up with their own idea. If the team has multiple ideas, they could use a voting process to narrow it down to one.
- 4 Encourage the team use their *Engineering Notebooks* and to take notes when researching their ideas.
- 5 Have the team think about how to use the attachment from the robot lesson to complete missions.

- 1 → **Introduction**
 - Review the research project page and the Project Sparks.
 - Share your ideas for the project with your team. Make sure everyone has a chance to share.
- 2 → **Tasks**
 - Record your team's problem statement.
 - Open the SPIKE™ app. Find your lesson.
- 3 → **Competition Ready Unit: Training Camp 2: Playing with Objects**
 - Reflect on the skills you learned in this unit. Talk about how they will help you in the robot game.
 - Try it out! See if you can code your robot to attempt a mission.
- 4 → **Share**
 - Discuss the reflection questions.
 - Get together at the mat. Share the robot skills you learned in this session.
 - Clean up your space.
- 5 → **Reflection Questions**
 - What additional research is necessary to select an idea for the project?
 - What objects does your robot need to avoid in the robot game?
 - What missions does your team want to attempt next?



Session 3

Project Spark ideas:

Problem statement: 3

Continue to reference the *Robot Game Rulebook* to understand how to score points in the game.

Tips

- A problem statement describes the problem that your team wants to solve.
- Consider why the problem exists, why it is important to fix, and who would be affected if the problem were solved.
- You can select one of the Project Sparks or your own idea for the research project.

Session 4

Outcomes

In this session, the team will ...

- Determine what kind of research is necessary to learn about the problem.
- Code their driving base to detect a line using a sensor.
- Begin to think about their strategy for the robot game.

Session 4

Research project problem ideas:

Our notes:

→ Introduction

- Work as a team to identify what kind of research is needed to learn about existing solutions.
- Determine how your team will use the information collected to create your research project solution.

→ Tasks

- Open the SPIKE™ app. Find your lesson.

 Competition Ready
Unit: Training Camp 3:
Reacting to Lines

- Reflect on the skills you learned in this unit. Talk about how they will help you in the robot game.
- Try it out! See if you can use the skills you learned to attempt another mission.

→ Share

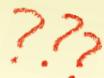
- Discuss the reflection questions.
- Get together at the mat. Share the robot skills you learned in this session.
- Clean up your space.

→ Reflection Questions

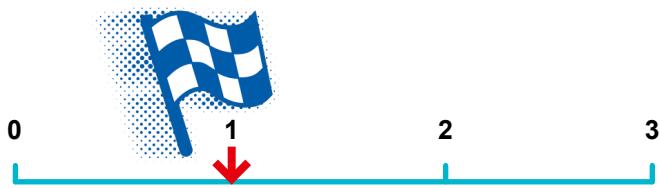
- How will your team record your research on your project problem?
- How did testing your program help make your robot more accurate?
- How could you use the lines on the mat in your **mission strategy**?

Tips

Recording your progress will help you build a strategy for the game. As you try to complete missions in the robot game, record what works and what your team wants to improve.



Checkpoint 1



- The team has bonded and are working well together. If they need more support to achieve this, do some extra team-building activities.
- The team should continue practicing the new robot skills they have learned.
- All models should be built, placed on the mat, and secured with Dual Lock squares as needed.
- The team can spend extra time on the robot lessons before moving on. Remember to be flexible with the sessions.
- The team has reviewed the missions and rules in the *Robot Game Rulebook*.
- The team has selected the focus of their research project and has written their problem statement. They should now be researching their problem and any existing solutions.
- The team can complete the exploration activity listed in the *Engineering Notebook Career Connections* page.
- Check in with the team on their progress on their personal and team goals. They can adjust their goals based on information they have learned in the first four sessions.

Sessions 5–8 Tips



CORE VALUES

Remember that the Core Values are about how the team behaves and works together. They should be demonstrated by all team members all the time.



RESEARCH

The team will begin to develop their innovative solution and share their ideas with others for feedback. Remind the team to take notes during the development process so they can present their progress to the judges.



ROBOT DESIGN

At the robot game matches, two robot game tables will be set up next to each other. However, during the sessions, you can work with a single robot game table.

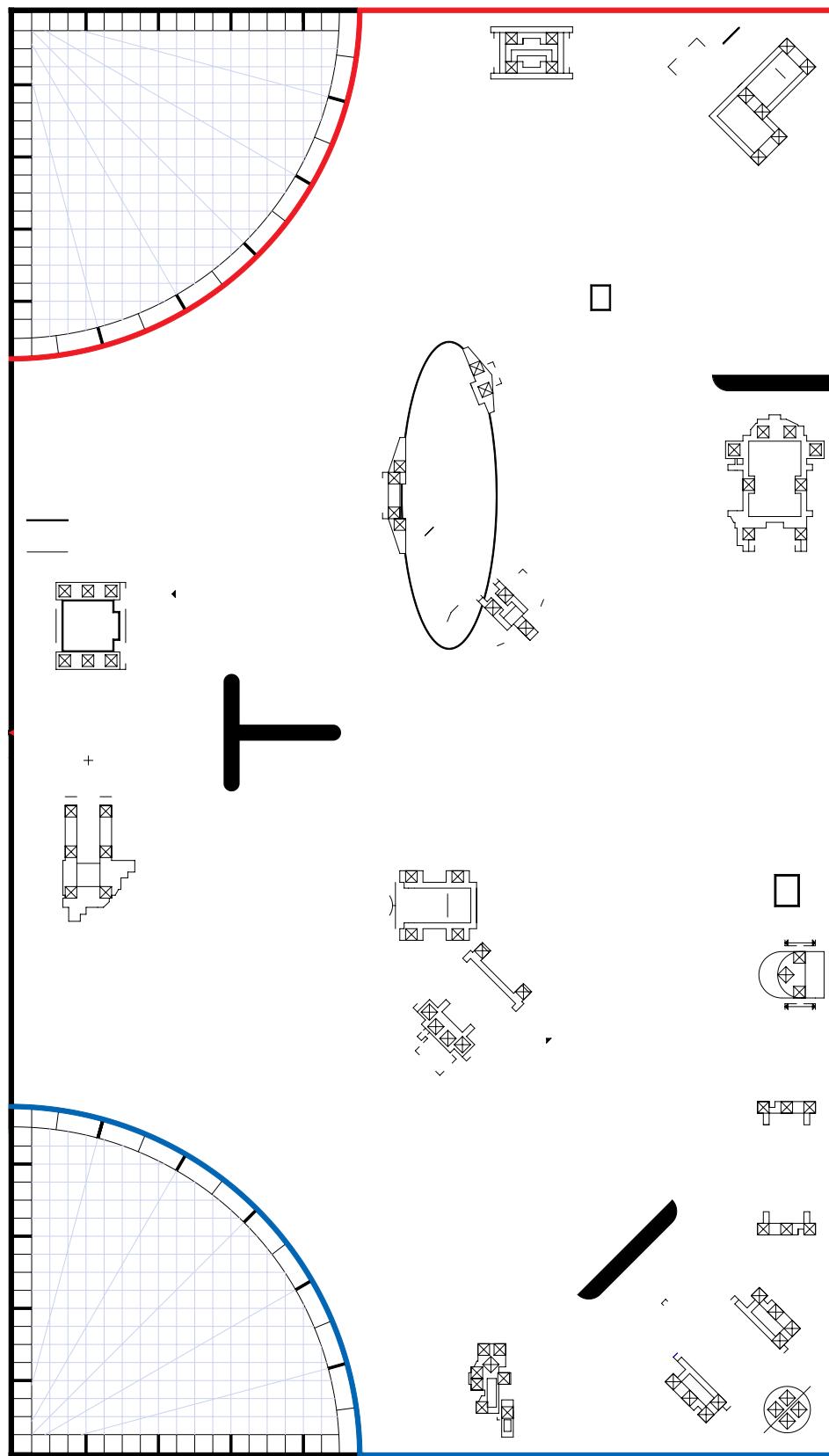


ROBOT GAME

Look for missions that:

- Use basic robot skills like push, pull, or lift.
- Have models close to a launch area.
- Involve navigation with line following.
- Have easy access to home.

Wireframe



Session 5

Outcomes

In this session, the team will ...

- Apply coding principles to the guided mission.
- Decide to propose a new solution to the problem or improve on an existing solution.

- 1 Team-building activities are great for teams to develop their Core Values and learn how to work together.
- 2 Teams should be able to clearly define the problem they have chosen. This will be evaluated during the judging session at the event.
- 3 Have the team reference the rubrics often.
- 4 Teams should use design thinking to create their solution to the problem.
- 5 The team should record what they learn and note any questions that still need to be researched to develop their solution.

1 → **Introduction**
 Think about teamwork and your team. Talk about ways your team has been learning and working together.

2 → **Tasks**
 Continue to research the problem you have chosen.
 Decide whether your team will propose a new solution or improve an existing one.
 Use this page to capture your research.
 Select a solution to develop with your team.

3 → **Tips**
• Existing solutions could be adapted and combined with other ideas to create a unique solution to the team's problem.
• List what you learned and the resources you used to learn about the problem (for example, books, news articles, or interviews).



Session 5

Teamwork: We are stronger when we work together.

Research sources and details:

5



Guided mission notes:

→ Tasks

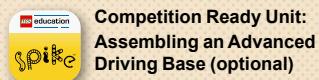
- Open the SPIKE™ app.
Find your lesson.



Competition Ready
Unit: Guided Mission

6

8



Competition Ready Unit:
Assembling an Advanced
Driving Base (optional)

- Have fun practicing the guided mission until it works consistently.
- Continue to practice completing other missions in the robot game.

→ Share

- Discuss the reflection questions.
- Get together at the mat. Share the robot skills you learned in this session.
- Clean up your space.

→ Reflection Questions

- Is there someone on your team can talk to about the problem you selected? What questions would you ask them?
- How will your team work together to develop an innovative solution to the problem?
- What does the guided mission teach you about **Coopertition®**?
- How does the engineering design process help you create a strategy for solving missions in the robot game?

Tips

Coopertition means that teams help and cooperate with each other, even as they compete.

6 The team should be able to describe how everyone contributes to the team.

7 If the team is sharing one robot, they can code on individual devices and then take turns running their programs on the robot.

8 The provided program for the guided mission will not only solve the mission but also be helpful to use on other missions. A guided mission is provided only for SPIKE™ Prime sets.

9 Remind the team to test program changes in small steps instead of changing the entire program at once.

10 If an attachment is needed for a mission, keep it in a plastic bag labeled with the mission number.

Session 6

Outcomes

In this session, the team will ...

- Begin developing the solution to their research project problem.
- Create a mission strategy plan and write pseudocode for a mission.

- 1 Provide extra paper or a shared digital file for the team to capture the process they use to create their robot and research project solutions.
- 2 The team will be judged on their final robot and project solutions as well as the process they used.
- 3 Take some extra time with the team if needed to explore all the solution ideas and narrow it down to one.
- 4 The Research Project Planning sheet on page 29 of the *Engineering Notebook* can be completed over multiple sessions to help the team document their process.
- 5 The team will begin to develop their own research project solution.

1 → **Introduction**

- Talk about what your team has learned so far and what you still want to explore.
- Complete the "Halfway There" section of the Team Progress sheet on page 8.

2 → **Tasks**

- Make a plan for how you will develop a solution to your problem. Use the Research Project Planning sheet on page 29 as a tool.
- Use a variety of sources and keep track of them in this *Engineering Notebook*.
- Determine what materials might be needed to create a prototype of your solution.

Tips

- Use different types of sources, such as trustworthy websites, videos, books, or experts.
- Look at the research project rubric to learn what the judges will ask about your solution.



Session 6



Research project notes:

5



Robot game strategy notes:

→ Tasks

- Review the "Robot Game Missions" video and *Robot Game Rulebook*.
- Discuss which missions your team has attempted so far and which missions you want to try. Start to develop a **mission strategy**.

6

7

8

9

→ Share

- Discuss the reflection questions.
- Get together at the mat. Share the robot skills you learned in this session.
- Clean up your space.

→ Reflection Questions

- How can documenting your progress with the research project help during your team's judging session at the event?
- What are your innovative ideas to solve the problem?
- How can your robot's attachments and program support your team's mission strategy?
- How can you iterate and improve your robot design used in previous tasks?

6 The team should pause to reflect on the last few sessions. Ask the team what they feel most proud of so far. What are they excited about?

7 Provide sticky notes and planning cards for the team to place on the mat to map out their mission strategy.

8 Encourage the team to find the missions where points can be scored most easily and to do them first.

9 The Pseudocode sheet on page 28 of the *Engineering Notebook* can be photocopied. It can be used for each mission the team attempts.

Tips

- A mission strategy determines which missions to attempt and the order you will attempt them.
- Pseudocode is a written description of the steps for your planned robot program.
- Think about what attachments and sensors you will use during the game and if you will need to change them.



Session 7

Outcomes

In this session, the team will ...

- Continue developing their research project solution and create a model or prototype.
- Design and iterate on their robot to complete additional robot game missions.

- 1 Look for opportunities for the team to justify and research their research project ideas.
- 2 Prototypes do not need to be functional when presented to judges. The team should be able to describe in detail how it would work.
- 3 Provide a variety of materials for the team to use to make a prototype or model of their project solution.
- 4 Have the team think of people they would like to get feedback from on their solution.
- 5 Help the team schedule time to share and collect feedback on their ideas.

→ Introduction

- 1 Think about *Gracious Professionalism*. Talk about ways your team demonstrates this in everything you do.

→ Tasks

- 2 Continue to develop your research project solution.
- 3 Draw your solution and explain how it solves the problem.
- 4 Create a prototype model or detailed drawing of your solution. The prototype does not need to be functional, but it should help explain your solution to others.
- 5 Continue to document the process you use to develop your solution on the Research Project Planning sheet and throughout this *Engineering Notebook*.

Tips

- Gracious Professionalism is a way of doing high-quality work, valuing others, and respecting individuals and the community.
- Look over page 18 in the *Robot Game Rulebook* to see how Gracious Professionalism is scored during the robot game.
- Your model or drawing could be created with LEGO® bricks, art supplies, or in a digital program.

Session 7

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

Research project solution drawing and description:



Robot design notes:

6

→ Tasks

7

8

- Continue to test and improve your robot and its attachments to complete missions in the robot game.
- Create a program for each new mission you attempt or combine mission solutions into one program.
- Revisit previous lessons to develop your coding skills or work on solving the missions.

→ Share

- Discuss the reflection questions.
- Get together at the mat. Share the robot skills you practiced in this session and the work completed on the research project.
- Clean up your space.

9

→ Reflection Questions

- Can you describe your solution in a way that is easy for others to understand?
- How can you improve your drawing or prototype so it represents your solution?
- Who can you share your solution with for feedback?
- How can you iterate and improve your robot design or your attachments?
- How are you using the engineering design process to develop your mission strategy?

Tips

- You can improve the robot used in the previous sessions or create a new design.
- Practice explaining how the program on your device is making your robot move.

6 Check the team knows and understands the Core Values and *Gracious Professionalism*®.

7 Different members of the team can be responsible for specific missions; each member can develop and own the robot run for those missions.

8 When the team has a base robot, they should do a straight drive test. If it doesn't drive straight, troubleshoot by first looking at the robot's center of gravity and balance.

9 When creating their mission strategy, the team should determine which launch area will be the robot's starting position. Make sure there is enough room for the whole robot to fit inside the launch area.

10 Encourage the students to explain their program as the robot moves and make notes about what they observe during testing.

Session 8

Outcomes

In this session, the team will ...

- Evaluate and improve on their research project solution.
- Design robot attachments and create programs to solve missions.

- 1 The team can create a survey to evaluate their solution or ask for feedback from someone affected by the problem.
- 2 The team should iterate and improve their research project solution following the feedback from others.
- 3 Consider joining a webinar or watching interviews to hear from experts.
- 4 The team should reference the rubrics so they can be prepared for judging at the event.
- 5 The team should think about who their innovative project solution is for.

1 → **Introduction**
 Reflect on **Coopertition**.
Talk about ways your team will demonstrate this when competing against other teams.

2 → **Tasks**
 Share and collect feedback on your ideas.
 Decide what feedback to use to iterate on your solution.
 Determine if you can do any testing of your solution.

5 **Tips**

- Coopertition shows that learning is more important than winning.
- Seeking advice from others, including other teams, is a great way to learn and improve your skills.

Session 8

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

Project feedback:



Robot and attachment design notes:

- 6** → **Tasks**
 - Choose another robot game mission to work on.
 - Think about how each new mission fits into your mission strategy.
 - Iterate and refine your program so your robot completes the mission reliably.
 - Be sure to document your design process and testing for each mission!
- 7** → **Share**
 - Discuss the reflection questions.
 - Get together at the mat. Share the robot skills you practiced in this session and the work completed on the research project.
 - Clean up your space.
- 8** → **Reflection Questions**
 - How has your research project solution changed after sharing it with others?
 - How will you know if your solution is going to make a positive impact on others?
 - How has your team used Core Values to develop your robot and project solution?
 - In what order will you run the missions in the robot game?
- 9** → **Tips**
 - It can take lots of practice to build the attachments you need to complete missions.
 - Document the changes and improvements you make and share them with judges at the event.
- 10** → **Use the Core Values** where appropriate to encourage the team. To celebrate the team learning these important values, share examples of when the team demonstrates these principles.
- 11** The team should think about strategy when choosing missions to solve. Multiple missions can be completed on the same run to save time.
- 12** Encourage the team to discuss how their program works. Break the program into blocks that control one movement each.
- 13** Treat the robot game like a sport. The team needs to practice, practice, practice to perform consistently in the robot game.
- 14** The robot's starting point in the launch area strongly influences where it ends up. Have the team keep good notes about where to place the robot. The Pseudocode sheet in the *Engineering Notebook* can be used for this purpose.

You could ...

- Describe the attachments you built.
- Explain your different programs and what the robot will do.
- Explain your robot design while looking at the rubric criteria.

Checkpoint 2

0

1

3



- The team has completed all the robot lessons outlined in Sessions 1–8.
- The team has selected an Research Project problem, conducted research, designed a solution, and shared it with others.
- Visit the Season Resource page to print copies of the judging flowchart, scoresheets, and any other information that will help prepare for your event.
- Provide the team with the judging documents.
- If you are implementing *In the Classroom*, you can make copies of the *In the Classroom* scoresheet from the *In the Classroom Guide*.

Sessions 9–12 Tips



CORE VALUES

Make sure the team can provide concrete examples of the Core Values they use. Don't forget *Coopertition®* and *Gracious Professionalism®*.



RESEARCH

The team will need plenty of time to iterate, improve, and create a model or drawing of their research project solution. From Session 9 on, they should focus on progress toward their research project solution and presentation, using the rubric as a guide.



ROBOT DESIGN

The team should continue to attempt new missions and think about their mission strategy. Practice combining multiple mission attempts during a 2.5-minute game to prepare the team for event day. Remind the team to document changes to their mission strategy so they can share their progress with the judges.



ROBOT GAME

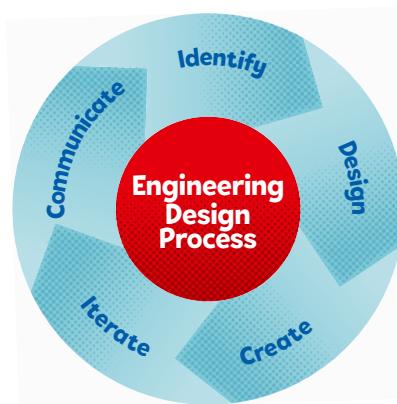
The team needs to practice a reliable and consistent robot run that they know will score them points. Track how much time each run takes to understand what other missions could be attempted in the game.

Understanding the Scoresheets

Judging Session Feedback			
 Judging Session Feedback Team Number _____ Team Name _____ Judging Room _____			
Robot Design  Team Number _____ Team Name _____ Judging Room _____			
Instructions Teams should communicate to the judges their achievement in each of the following criteria. This rubric should be filled out according to the Robot Design presentation. Judges are required to tick one box on each separate row to indicate achievement. If the team EXCEEDS, a short comment in the excess column is required.			
Great Job... Core Values - How did the team demonstrate teamwork, respect, and integrity?			
Research - How did the team identify and approach solving their problem?			
Robot Design - How did the team approach solving their problem?			
Robot Design BEGINNING 1 DEVELOPING 2 IDENTIFY - Team determined which measures to attempt, explore and evaluate: <input type="checkbox"/> Minimal evidence of mission strategy <input type="checkbox"/> Partial evidence of mission strategy <input type="checkbox"/> Minimal use of building or design resources <input type="checkbox"/> Some use of building or design resources DESIGN - Team members worked collaboratively on their design: <input type="checkbox"/> Minimal evidence that all team members worked together <input type="checkbox"/> Partial evidence that all team members worked together <input type="checkbox"/> Minimal evidence of building and coding skills in all team members <input type="checkbox"/> Partial evidence of building and coding skills in all team members CREATE - Team developed original designs or improved on existing designs: <input type="checkbox"/> Unclear explanation of attachments and their purpose <input type="checkbox"/> Simple explanation of attachments and their purpose <input type="checkbox"/> Unclear explanation of code <input type="checkbox"/> Simple explanation of code ITERATE - Team repeatedly tested their robot and code to identify problems: <input type="checkbox"/> Minimal evidence of testing their robot and code <input type="checkbox"/> Partial evidence of testing their robot and code <input type="checkbox"/> Minimal evidence of improvements based on testing <input type="checkbox"/> Partial evidence of improvements based on testing COMMUNICATE - Team effectively explained what they have learned: <input type="checkbox"/> Unclear explanation of mission strategy <input type="checkbox"/> Simple explanation of mission strategy <input type="checkbox"/> Team shows minimal pride or enthusiasm for their work <input type="checkbox"/> Team shows partial or no enthusiasm for their work Criterio on this page with this style of check box count dual rankings. Core Values make up 25% of a team's Champion throughout their score and event experience.			
Robot Design  Team Number _____ Team Name _____ Judging Room _____			
Research  Team Number _____ Team Name _____ Research Topic _____ Judging Room _____			
Instructions Teams should communicate to the judges their achievement in each of the following criteria. This rubric should be filled out according to the Research presentation. Judges are required to tick one box on each separate row to indicate achievement. If the team EXCEEDS, a short comment in the excess column is required.			
BEGINNING 1 DEVELOPING 2 ACCOMPLISHED 3 EXCEEDS 4 IDENTIFY - Team had a clearly defined problem that was well researched: <input type="checkbox"/> Previous definition of the problem <input type="checkbox"/> Partially clear definition of the problem <input type="checkbox"/> Clear definition of the problem <input type="checkbox"/> Minimal evidence of research from one or more sources <input type="checkbox"/> Partial evidence of research from one or more sources <input type="checkbox"/> Clear, detailed research from a variety of sources DESIGN - Team worked together while creating a project plan and developing their idea: <input type="checkbox"/> Minimal evidence of an effective project plan <input type="checkbox"/> Partial evidence of an effective project plan <input type="checkbox"/> Clear evidence of an effective project plan <input type="checkbox"/> Minimal evidence that development process involved input from team members <input type="checkbox"/> Partial evidence that development process involved input from team members <input type="checkbox"/> Clear evidence that development process involved input from all team members CREATE - Team developed an original solution built on an existing one with a prototype model/prototype to represent their solution: <input type="checkbox"/> Minimal explanation of innovations in solution <input type="checkbox"/> Simple explanation of innovations in solution <input type="checkbox"/> Detailed explanation of innovations in solution <input type="checkbox"/> Minimal modeling/prototyping that represents the solution <input type="checkbox"/> Simple modeling/prototyping that represents the solution <input type="checkbox"/> Detailed modeling/prototyping that represents the solution ITERATE - Team shared their ideas with others, reflected feedback, and included improvements to their solution: <input type="checkbox"/> Minimal sharing of their solution with others <input type="checkbox"/> Solutions shared with at least one other person <input type="checkbox"/> Solutions shared with multiple others <input type="checkbox"/> Minimal evidence of improvements based on feedback <input type="checkbox"/> Partial evidence of improvements based on feedback <input type="checkbox"/> Clear evidence of improvements based on feedback COMMUNICATE - Team shared an effective presentation of their solution, its impact on others, and celebrated their progress: <input type="checkbox"/> Unclear explanation of the solution and its potential impact on others <input type="checkbox"/> Partially clear explanation of the solution and its potential impact on others <input type="checkbox"/> Presentation shows partial or no enthusiasm for their work <input type="checkbox"/> Presentation clearly shows enthusiasm for their work Criterio on this page with this style of check box count dual rankings. Core Values make up 25% of a team's Champion throughout their score and event experience.			

Research and Robot Design

The scoresheets used to evaluate the teams in these areas are based on the engineering design process. The team uses this process while working on their project and robot. Team members need to demonstrate and explain everything they have worked on during the judging session.



Note: Classrooms may use the *In the Classroom* scoresheets instead of these team scoresheets.

Core Values and *Gracious Professionalism*[®]

Teams express the six Core Values through the way they behave with each other and with people outside the team on their learning journey. In FIRST® LEGO® League Challenge, this is called *Gracious Professionalism*®.

Teams will have their Core Values evaluated during the judging session while they share about their research project and robot design.

Teams will also be scored on their *Gracious Professionalism* at every robot game match. Remember, if they cannot attend a match, they should let the referee know.



**Download
Scoresheets**

Session 9

Outcomes

- 1 Examples recorded here could be used for the research project presentation or robot design explanation.
- 2 The team should have a clear strategy for which programs to run and in what order during the robot game.
- 3 The team can also have a backup of their programs on external drive like a USB stick or an online storage website.
- 4 The Share tasks are important to keep the whole team updated on how the project and the robot are developing.
- 5 Core Values are evaluated throughout the judging session while teams present on their research project and robot design. Review the judging rubrics with the team.

In this session, the team will ...

- Code their robot and test their mission strategy.
- Iterate and improve their research project solution based on testing and feedback.

The page is designed to look like a torn piece of paper from a notebook. At the top right is a large red number '9'. Below it is a yellow section containing a red title 'Innovation' and a white subtitle 'We use creativity and persistence to solve problems.' To the left of the main content area is a pink sticky note with the word 'Tips' and some explanatory text.

Session 9

Innovation: We use creativity and persistence to solve problems.

Iterations and improvements:

1 **→ Introduction**
□ Think about innovation and your team. Talk about examples of how your team has been creative and solved problems.

2 **→ Tasks**
□ Think about your robot mission strategy on the mat and the missions you will solve.
□ Continue to create a solution for each mission as time allows.
□ Iterate and improve your robot design and research project solutions. Be sure to document what happens in each step.

3 **→ Share**
□ Discuss the reflection questions.
□ Get together at the mat. Share the robot skills you practiced in this session and the work completed on the research project.
□ Clean up your space.

4 **→ Reflection Questions**
• How will your team demonstrate Core Values at the event?
• How will your team explain what is innovative about your solution to the judges?
• What features on your robot show your building skills?
• What changes have you made to your research project and robot design based on feedback and testing?

Tips
Your team's Core Values are evaluated on the robot design and research project rubrics. Visit page 3 to see all Core Values listed.

Session 10

Outcomes

In this session, the team will ...

- Iterate and improve their research project solution based on testing and feedback.
- Code their robot and test their mission strategy.

Session 10

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

Presentation outline:

→ Introduction

- Think about **impact** and your team. Talk about examples of how your team has had a positive influence on you and others.

→ Tasks

- 1 Plan out your project presentation. Refer to the research project rubric for what to include in your presentation.
- 2 Write out your research project presentation script.
- 3 Create any props or displays that you need. Engaging your audience can help ensure they remember your key points.
- 4 Continue to create, test, and iterate on your robot solution.
- 5 Continue practicing 2.5-minute robot games with all the missions you have worked on.

→ Share

- Discuss the reflection questions.
- Get together at the mat. Share the robot skills you practiced in this session and the work completed on the research project.
- Clean up your space.

→ Reflection Questions

- How did your team decide which missions to attempt?
- What is your team most proud of in your work on the project and robot design?
- What skills have you developed throughout your FIRST® LEGO® League experience?

Tips

- Your team will have 5 minutes to present your project solution.
- Create an outline to make sure you are sharing what the judges need to hear. Look at the rubrics and the judging session flowchart for support.

1 Provide the team with the research project rubric.

2 The presentation can be a slideshow, poster, play, or even a skit. Props can be used, such as costumes, shirts, or hats. Make sure teams have a drawing or model that represents their solution to show to judges.

3 Teams may use a script for their judging session presentation. Provide copies for each team member.

4 The team might need more space to store all their materials for the presentation.

5 Encourage the team to run their robot within 2.5-minute practice matches so that they get used to the time limit.

Session 11

Outcomes

In this session, the team will ...

- Finalize their live research project presentation.
- Finalize their robot for the robot game and prepare their robot design explanation.

- 1 Provide the team with the robot design rubric.
- 2 Have the team reflect on their progress and complete the final section of the Team Progress sheet on [page 8](#) of the *Engineering Notebook*.
- 3 It's important for the team to practice communicating their research project and robot design solutions.
- 4 Every team member should participate in the presentation at the judging session. If the team needs any accommodations, contact the organizer of the event.
- 5 As part of their mission strategy, the team should know who will run the robot during the matches.

→ Introduction

- 1 Think about **inclusion** and your team. Talk about examples of how your team makes sure everyone is respected and their voices are heard.
- 2 Complete the "Event Time" section of the Team Progress sheet on [page 8](#).

→ Tasks

- 2 Continue working on your research project presentation.
- 3 Plan and write out your robot design explanation. Refer to the robot design rubric for what to cover.
- 4 Make sure to share how each member of the team contributed to the project and robot design.
- 5 Practice your full explanation.

→ Share

- 5 Discuss the reflection questions.
- Practice your project presentation and collect feedback.
- Clean up your space.

→ Reflection Questions

- What will you do if a mission does not work during a match?
- How are everyone's contributions recognized in the presentation?
- How has FIRST® LEGO® League made a difference for you?

Tips

- It's important to share the progress your team has made and the lessons you have learned during the judging session.
- Have fun with your project presentation.

Session 11

Inclusion: We respect each other and embrace our differences.

Robot design explanation outline:

Session 12

Outcomes

In this session, the team will ...

- Practice their presentation of their research project and robot solutions.
- Run practice robot game matches.

Session 12

Fun: We enjoy and celebrate what we do!

Presentation feedback:

→ Introduction

- Reflect on how your team has had fun while exploring the season theme. Talk about examples of how your team has had fun throughout this experience.

1

- Look at your team's goals listed on page 8. Did you achieve them?

2

→ Tasks

- Rehearse your full presentation communicating your research project and robot design work.
- Collect feedback on your presentation from your coach, a mentor, or another team.
- Practice multiple 2.5-minute robot game matches and calculate the points you score.
- Review page 26, Prepare for Your Event, and page 27, Rubrics & Scoresheets.

3

→ Share

- Discuss the reflection questions.
- Review the judging rubrics and robot game scoresheet.
- Practice presenting your project and robot design explanation.
- Clean up your space.

→ Reflection Questions

- What is your plan for having your team's robot attachments ready for the robot game?
- What has your team accomplished?

4

Tips

- Demonstrate your Core Values during the entire event.
- Plan to talk about your robot design and game strategy without the robot game field.
- You can continue solving missions and working on your research project before your event!

1 Try to split the time in this session equally between rehearsing the presentation and practicing the matches.

2 Encourage the team to practice their presentation before the event. They can practice by sharing their solutions with others. The judging session flowchart tells you how much time is allowed for the presentation.

3 Have the team run their 2.5-minute robot matches. Make sure they practice running their programs in the right order.

4 The team should have a contingency plan for if things don't go as planned during the robot game. They could identify other missions to run.

5 Remind the team about the Core Values and how they will show them throughout the event, including at every robot game match.

Prepare for the Event



Judging Session Flowchart

During judging, team members will present their innovation project and robot design work. Judges will ask questions to help them score the team's progress according to the rubrics, then give positive and constructive feedback to the team.

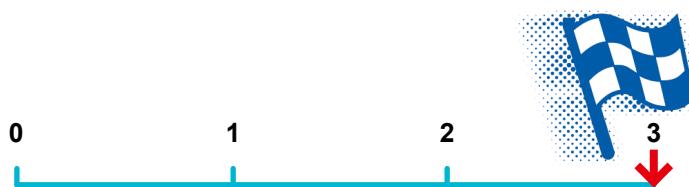
Teams should demonstrate **FIRST® Core Values** in everything they do. Judges will be excited to see how teams used teamwork, discovery, inclusion, innovation, impact, and fun in all aspects of their work.



It's normal to feel like there's still so much to do as your first event approaches. The most important thing is to strive to complete as much as possible and come ready to share what you've accomplished so far. Whether it's your robot design, research project, or Core Values, your event will give you new ideas and inspiration to keep building on what you've started.

If there is too much information for the team to cover in detail, visual aids can be very useful references. Make sure the team practices how they will use them in the judging session, keeping in mind the time limits for sharing their research project and robot design work.

Final Checkpoint



The goal of a Challenge event is for the team to celebrate their hard work, compete to the best of their ability, share what they have learned, and, most importantly, have fun! Here are some helpful steps to help your team prepare.

- Determine what type of event you're attending and identify the organizer of your event. If you purchased a *In the Classroom*, the event will be your responsibility. Check out the *In the Classroom Guide* for more details.
- Decide how your team will get to the event. Confirm what time they need to arrive and how long they are expected to stay. Encourage families and caregivers to attend if possible.
- Review the details and requirements for the event you are attending. They can vary depending on the type of event.
- Ensure each team member knows the key aspects of your work and can contribute to explaining it according to the **rubrics**. You could also practice presenting your work with an adult or another team for feedback.
- Have the team prepare a **checklist of materials** that are needed for the event, including your robot and attachments, research project materials, and any scripts or robot programming notes.
- Take a moment to reflect, celebrate how far you've come, and get excited to share your progress. Every team starts somewhere, and your event is a chance to grow, learn, and have fun!
- Remind the team that *FIRST® LEGO® League* is about the process of learning, experimenting, and improving. Participating in your first event is an important step in this process.
- At the event, encourage the team to engage with other teams to share what they have learned and to support each other.

Finished with Your Season?

Here are some suggestions for wrapping up after your team's last event:

- Hold a team celebration!
- Have the team share their experience with friends and classmates.
- Have the team continue developing their research project.
- Discuss your rubric scores and feedback received.
- Clean up and take apart the robot and mission models.
- Allow time for the team to reflect on their experience.
- Inventory the LEGO® set to make sure all the pieces are there.

We wish you and your team a successful season!



UNEARTHED™



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