

**FIRST  
LEGO  
LEAGUE**

# Coaches' Handbook



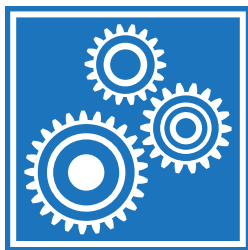
The **Core Values** are the heart of *FIRST*® LEGO® League. By embracing the Core Values, participants learn that friendly competition and mutual gain are not separate goals, and that helping one another is the foundation of teamwork. Learn more about the Core Values in [Chapter 4](#).

## ***FIRST*® LEGO® League Core Values:**

- ▲ We are a team.
- ▲ We do the work to find solutions with guidance from our Coaches and Mentors.
- ▲ We know our Coaches and Mentors don't have all the answers; we learn together.
- ▲ We honor the spirit of friendly competition.
- ▲ What we discover is more important than what we win.
- ▲ We share our experiences with others.
- ▲ We display *Gracious Professionalism*® and *Coopertition*® in everything we do.
- ▲ We have FUN!



CORE VALUES



ROBOT GAME



PROJECT

FIRST® LEGO® League

# Coaches' Handbook



## HYDRO DYNAMICS<sup>SM</sup> Challenge

13th Edition, 2017 printing

[www.firstlegoleague.org](http://www.firstlegoleague.org)

*FIRST® LEGO® League* is the result of an exciting alliance between *FIRST®* and the LEGO Group. LEGO Education is a Strategic Partner of *FIRST*.



education

# 2017 FIRST® LEGO® League Coaches' Handbook

13TH EDITION, 2017 PRINTING

FIRST® LEGO® League

[www.firstlegoleague.org](http://www.firstlegoleague.org)

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## ***Team Registration Payments***

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### **FIRST® FINANCE**

**Phone:** 1-800-871-8326

**Fax:** (603) 206-2079

**Email:** [ar@firstinspires.org](mailto:ar@firstinspires.org)

**Mail Checks & Purchase Orders to:**

*FIRST*  
Attn: Finance  
200 Bedford Street  
Manchester, NH 03101 USA

## ***LEGO® Education Product***

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### **LEGO EDUCATION (U.S. TEAMS ONLY)**

**Phone:** 1-800-362-4308

**Fax:** 1-888-534-6784

**Email:** [orders@legoeducation.us](mailto:orders@legoeducation.us)

**Mail Purchase Orders to:**

LEGO Education  
501 Boylston St Suite 4103  
Boston, MA 02116 USA

**Mail Checks (ONLY) to:**

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Chicago, IL 60693 USA

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**Phone:** 1-800-668-0600

**Fax:** 1-800-668-0602

**Email:** [customerservice@spectrumed.com](mailto:customerservice@spectrumed.com)

**Address:** SPECTRUM Educational Supplies Ltd.  
150 Pony Drive  
Newmarket, Ontario L3Y 7B6 Canada

(CONTINUED)

## **BRAULT & BOUTHILLIER (CANADIAN TEAMS IN QUEBEC)**

Phone: 1-800-361-0378

Fax: 1-514-273-8627

or 1-514-273-9186

Address: Attn: Eric Patenaude  
700 Avenue Beaumont  
Montreal, Quebec H3N 1V5 Canada

## **Replacement LEGO® Parts**

Web: <http://service.lego.com/en-US/replacementparts/#BasicInfo>

Phone: 1-866-349-5346

## **Questions on the Challenge or Judging**

FIRST® LEGO® League Robot Game Questions: [flrobotgame@firstinspires.org](mailto:flrobotgame@firstinspires.org)

FIRST® LEGO® League Project Questions: [flprojects@firstinspires.org](mailto:flprojects@firstinspires.org)

FIRST® LEGO® League Judging Questions: [fljudge@firstinspires.org](mailto:fljudge@firstinspires.org)

## **LEGO MINDSTORMS® Help**

Please see contact information listed in your registration materials  
or at [www.firstinspires.org/fl](http://www.firstinspires.org/fl).

## **FIRST® LEGO® League Team Support (General Questions, Registration and Tournaments)**

FIRST® LEGO® League Team Support & General Information: 1-800-871-8326

Email: [flteams@firstinspires.org](mailto:flteams@firstinspires.org)

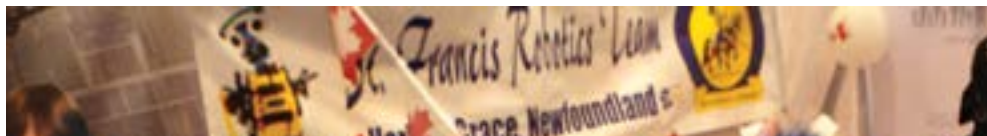
Websites: [www.firstlegoleague.org](http://www.firstlegoleague.org)

[www.firstinspires.org/fl](http://www.firstinspires.org/fl)

## **Find your Local Contact by Country and Region**

Website: [www.firstlegoleague.org](http://www.firstlegoleague.org)





# 1

## Getting Started



# 1

# Getting Started

Coaches are a huge part of what makes *FIRST*® LEGO® League possible. Whether you are a teacher, parent, or Volunteer, you help us bring *FIRST* LEGO League to your team. This program would not succeed without you. We just cannot say it enough – we think you are awesome!

We created this Coaches' Handbook as a guide to help you navigate the complete *FIRST* LEGO League season. From recruiting your team through celebrating at the end of your season, we have collected suggestions to help you along the way.



## New to *FIRST*® LEGO® League?

As a new Coach, we recommend that you read all chapters of the Coaches' Handbook. Coaches who know what to expect guide their teams with more confidence and have more fun. Chapter 1 will give you an overview of the adventure you are about to begin, and the chapters that follow will give you more detail about what to expect at each step.



*Is this your first season?  
Create a *FIRST*® Steps account  
and use the modules to guide  
you through your first season.*

[info.firstinspires.org/  
filfirststepsrequest](http://info.firstinspires.org/filfirststepsrequest)

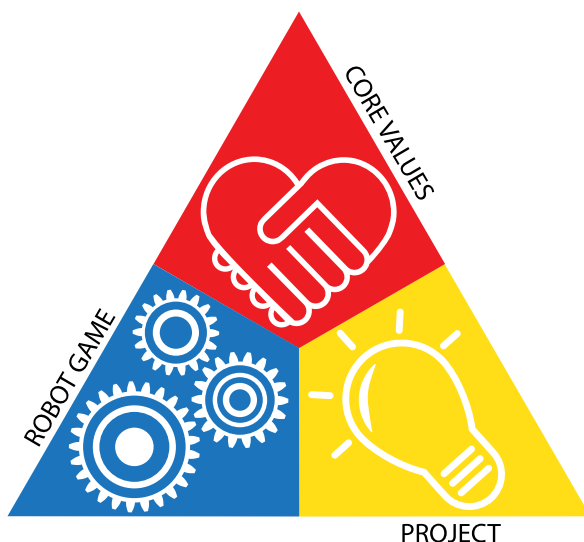
# Coached before?

As an experienced Coach, you may not need to read the first few chapters in detail. However, we highly recommend that you take another look at [Chapters 4-8](#). Even after you have gone through 1 (or more) seasons, you may find some helpful new tips and ideas to incorporate this year.

Remember though, this handbook is only a guide. One of our Core Values is “We know our Coaches and Mentors don’t have all the answers; we learn together.” Use the Coaches’ Handbook to help you guide your team, but also enjoy the experience of learning alongside the kids. This is going to be fun!

With our greatest admiration,

**FIRST LEGO League Staff**



***The Project and the Robot Game are what the students do. Core Values are how they do it.***

# Cornerstones

At its basic level, *FIRST* LEGO League is a program of exploration for children age 9 to 16 (ages vary by country), which is designed to get children excited about science and technology – and teach them valuable employment and life skills. *FIRST* LEGO League can be used in a classroom setting but is not solely designed for this purpose. Teams can also be associated with a pre-existing club or organization, or just be a group of friends who wish to do something awesome.

## FIRST LEGO League Core Values



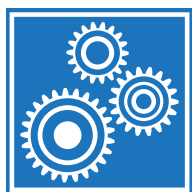
CORE VALUES

The **Core Values**, found inside the cover of this book, are the heart of *FIRST* LEGO League. They help to distinguish *FIRST* LEGO League from other programs. By embracing the Core Values, participants learn that friendly competition and mutual gain are not separate goals, and that helping each other is the foundation of teamwork. All *FIRST* LEGO League participants, including Coaches, Mentors, Volunteers, team parents, and

team members, are expected to uphold and display Core Values in all they do. Learn more in [Chapter 4](#).

## The FIRST LEGO League Challenge

Each August, we provide teams around the world with an annual Challenge on [www.firstlegoleague.org](http://www.firstlegoleague.org). The Challenge is based on a set of real-world problems facing scientists and engineers today. Coaches and team members should read the Challenge together. The Challenge description is not a lesson plan; it is meant to be shared so that all team members and Coaches can learn together. The Challenge has 2 parts: the Robot Game and the Project.



ROBOT GAME

In the **Robot Game**, teams design, build, program, and test autonomous robots using LEGO® MINDSTORMS® technology. The robots are designed and programmed by team members to perform a series of missions during



### TIP

*Autonomous means the robot moves and operates by itself. Your team will program the robot using a computer and then run the programs at the tournament.*

2½-minute matches. The Robot Game playing field reflects the real-world theme for this season. Learn more in [Chapter 5](#).



PROJECT

In the **Project**, teams research a real-world problem in the field of this season’s Challenge theme. Then they create an innovative solution to that problem (either by creating something that doesn’t exist or building upon something that does). And finally, teams share their findings with others. Learn more in [Chapter 6](#).


*The FIRST LEGO League Season*

For at least 8 fast-paced weeks, teams work as a group to find creative solutions to the problems presented in the *FIRST* LEGO League Challenge. They then compete in optional local and regional tournaments where they celebrate their accomplishments with other teams, family, and friends. Learn more about scheduling your season in [Chapter 3](#).

*FIRST LEGO League Partners Make it Possible*

*FIRST* LEGO League relies on great people to run the program at many levels, from managing a region to coaching an individual team. We call the leaders in each region the Partners. They are a tremendous resource for you as a Coach, and *FIRST* LEGO League would not exist without them.

Our Partners agree to maintain *FIRST* LEGO League standards for tournaments, the Challenge, and overall program administration. Your local Partner is an important resource for information. We highly recommend contacting them if you have any questions about training, events, or other resources available in your area.

**FIND ONLINE**

To locate your *FIRST* LEGO League Partner, please visit [www.firstlegoleague.org](http://www.firstlegoleague.org).

# Quick-Start Guide

Running any team takes organization and planning, but it is also a lot of fun! Below we have provided checklists of essential tasks to help you prepare for the season. If you are new to *FIRST* LEGO League, you may want to focus only on these tasks. You can add more activities as you and your team gain experience.

Please keep in mind that these checklists are only intended as a starting point. Some processes may be slightly different in your region and there may be additional opportunities for your team. Check with your Partner if you have any questions.

## Pre-Season Preparation for the Coach

- ☐ **Register** your team with *FIRST* LEGO League (Check your region's website for instructions on how to do this).
- ☐ **Pay** your registration fee and **order** the materials you need. ([Chapter 3](#))
- ☐ *FIRST* LEGO League will usually contact you by email with important updates. Make sure you provide a valid email address when you register, and **check that inbox** often throughout the season.
- ☐ **Read** this Coaches' Handbook.
- ☐ **Review** the Core Values. (Inside the front cover of this handbook)
- ☐ **Decide** how team members will be identified or selected. ([Chapter 2](#))
- ☐ **Identify** at least 1 computer your team may use (must have Internet access). ([Chapter 3](#))
- ☐ **Find out** about your region's tournament structure and event registration process. ([Chapter 7](#))



### TIP

*Do not worry if you are not an expert on some skill or aspect of the Challenge. You can work through it with your team. In fact, children love to solve problems that befuddle adults. Encourage them to find their own answers.*

## Begin Meeting with Your Team

- ☐ **Create** a meeting schedule. ([Chapter 3](#) and [Appendix B](#))
- ☐ **Review** the Core Values with parents and team members (and keep discussing them at each meeting!). ([Chapter 4](#))
- ☐ **Set up** a practice competition area and storage for equipment between meetings. ([Chapter 3](#))
- ☐ Have team members **begin researching** this year's Challenge theme to get a head start on the Project. ([Chapter 6](#))

- ☐ **Build** a Robot Game table or just the borders. ([Chapter 5](#))
- ☐ Use the Mission Model building instructions on [www.firstlegoleague.org](http://www.firstlegoleague.org) to **build** the Mission Models. ([Chapter 5](#)) (Available **noon EDT August 1**)
- ☐ **Install** robot programming software on the computer(s) your team will use. ([Chapter 5](#))

## Complete the Challenge

- ☐ **Download** the new Challenge from [www.firstlegoleague.org](http://www.firstlegoleague.org) and review it as a team. (Available **noon EDT August 29**)
- ☐ Have team members **begin designing, building, and programming** your team's robot. ([Chapter 5](#))
- ☐ Have team members begin **researching for the Project** and **brainstorming ideas** for innovative solutions. ([Chapter 6](#))
- ☐ **Register** for a tournament. Contact your *FIRST* LEGO League Partner if you are not sure how to apply for a tournament in your area. ([Chapter 7](#))
- ☐ **Review** the rubrics that will be used to judge your team at tournaments. Discuss them with your team. ([Chapter 8](#) and [www.firstlegoleague.org](http://www.firstlegoleague.org))
- ☐ **Check your email** regularly for communication from *FIRST* LEGO League.
- ☐ Assign a team member to **check the Challenge Updates and Judging FAQ** frequently for any new information. ([www.firstlegoleague.org](http://www.firstlegoleague.org))
- ☐ **Practice**, practice, practice!
- ☐ **Prepare** any documents required by your tournament organizers. ([Chapter 7](#))
- ☐ Make a plan to **celebrate** at the end of your season. ([Chapter 9](#))

## Optional Tasks

If you have time, you may want to add these optional items to your checklist.

- ☐ **New this season?** Create a *FIRST* Steps account and use the modules to guide you through your first season. ([info.firstinspires.org/filfirststepsrequest](http://info.firstinspires.org/filfirststepsrequest))
- ☐ Visit the Resource Library for helpful tools. ([www.firstinspires.org/resource-library/fil/hydro-dynamics-challenge-updates-and-resources](http://www.firstinspires.org/resource-library/fil/hydro-dynamics-challenge-updates-and-resources))
- ☐ Attend an event or Coach training before the season starts. Contact your *FIRST* LEGO League Partner to see what is available in your area.
- ☐ Complete several team building activities with your team. ([Chapter 3](#))
- ☐ View Coach tips and How-to videos on our YouTube channel to help you with your season. ([youtube.com/filglobal](http://youtube.com/filglobal))



- Have your team build a practice robot and try some of the programming tutorials that come with your LEGO MINDSTORMS robot set or online.  
([www.firstlegoleague.org](http://www.firstlegoleague.org) under Team Resources)
- Attend an unofficial event or practice scrimmage if available in your area.  
([Chapter 7](#))





## 2

## Building a Team



# 2

## Building a Team

Coaching can be one of the most rewarding experiences of your life. Our goal is for you to help your team members see the fun in science, technology, engineering, and math. Whether or not your team receives an award at a competition, team members win just by participating.

If it is your rookie year, enjoy it for what it is: a learning experience. Your goal should be to simply experience *FIRST*® LEGO® League for the first time. With a fun experience and meeting realistic goals under your belt, you and the children will be brimming with ideas about what to do next year.

## The Team's Foundation



2 to 10 Kids + 2 Adult Coaches = 1 Team

At its most basic level, an *FIRST* LEGO League team consists of 2 to 10 team members and 2 adult coaches. That's it! We encourage you to recruit more help, but remember that you can always keep it simple if you need to.



### TIP

*If you have a team member who needs some special accommodation to participate in any part of a tournament, speak with the tournament organizer well before the event. They may be able to share relevant information with Judges and other Volunteers to make the event more successful for everyone.*

## The Team Members

Your team may include up to 10 children, and team members may participate on only 1 *FIRST* LEGO League team per season. All children must meet the age requirements in your region. Check with your Partner if you have any questions about age requirements. Participation Rules are found at [www.firstlegoleague.org](http://www.firstlegoleague.org).

Limiting your team to 10 members may be difficult, but it is important to be fair to everyone by limiting the number of children on your team. This kind of decision is often faced by coaches of other team sports. If you have more than 10 children interested in joining your *FIRST* LEGO League team, please consider registering a second team or use a selection process to decide who may participate on your team.



### COACH-TO-COACH

*We had 22 children show up for the initial FIRST LEGO League meeting. They all decided to register, and now we have 3 teams. As far as picking the best combination of children, sometimes your choice as a grownup will lead to a very flat team. Be sure to choose a team with a diverse range of skills, keeping in mind that children who are more challenging in the classroom will often shine in FIRST LEGO League because of the hands-on and self-directed nature of the activities.*

## The Coach

As the Coach, you are a facilitator to help your team complete its work and improve the way it works together. Your team needs you to give them guidance and provide structure, encouragement, and most of all, a fun experience.

You are responsible for guiding the team in developing its goals and timeline, as well as planning and scheduling team meetings. You are the liaison between team members, Mentors, parents, and Volunteers. Inform everyone on your team about what you expect from them throughout the season.

Coaches differ in how much instruction they give their teams. A successful *FIRST* LEGO League

Coach controls the process, not the content. A rookie team might need help learning how to use the programming software, understanding engineering concepts, or learning how to do online research. You and other adults can help your team learn



these skills or concepts as long as you do not tell the children how to solve the Challenge.

**Team members must make all decisions and do all the work on the Robot Game and Project.** This includes deciding on strategy, building, programming, researching, choosing a problem and innovative solution, and presenting at a tournament.

Does this mean you should stand idly by while your team struggles? Absolutely not! Instead of telling the team how to solve a problem, try asking questions like:

- ▲ “What could you change to get the result you want?”
- ▲ “How will that affect...?”
- ▲ “What information do you need to answer that question?”

Children become problem solvers by finding solutions themselves! We understand that adults can become just as passionate about *FIRST* LEGO League as the children, but adults must always remember that *the children come first*.



#### COACH-TO-COACH

**Rookie Coach:** *Our rookie team of 4th- and 5th-graders wants to cut some large wooden boards in order to build a model for the Project. I do not feel comfortable with the kids using power tools. If an adult cuts the boards but the kids assemble the model, is this a violation of the kids do all the work philosophy?*

**Veteran Coach:** *The kids keep all their fingers rule supersedes the “kids do all the work” rule. As a Coach, you are going to do some things for your team that they cannot or should not do for themselves (like writing checks for team expenses or driving to tournaments). Use your best judgment and weigh the value of your contribution to their effort. Cutting a few boards under the instructions of the team should be OK. It does not involve any important decisions. Building the prop yourself, probably not OK. Base your decisions on what provides the best learning experience for the team and you are unlikely to go wrong.*

## The Mentors

A Mentor is any person who works with the team in his or her area of expertise for at least one team meeting. Mentors help expose your team members to potential careers in addition to helping them learn the skills necessary to complete the *FIRST* LEGO League season. The most important quality for a Mentor is someone who enjoys working with young people and wants them to learn.



When recruiting Mentors, consider their ability to work with this age group. They need to be role models and commit to the [Core Values](#). Talk to them about:

- ▲ Adapting their knowledge to an appropriate level for the team members.
- ▲ The team's goals, the timeline, and structure of the meetings.
- ▲ Guiding the team to find the answers to their own questions.
- ▲ The importance of acknowledging all team members, getting everyone to contribute and participate, providing positive feedback, and encouraging responses.

You may want to consider recruiting someone like:

- ▲ **Engineer** – Teaches skills the team can use to design their robot or complete the Project.
- ▲ ***FIRST*® Robotics Competition or *FIRST*® Tech Challenge team member**  
– Helps the team work through a practice programming challenge, shares strategizing methods, serves as a possible youth role model.
- ▲ **Science Professional** – An expert in this year's Challenge theme, presents real examples of science in practice, advises the team on the Project, describes existing solutions, and recommends new sources of information for the team to explore.
- ▲ **Graphic Artist** – Provides advice on the team logo, T-shirts, and presentation material.
- ▲ **Programmer** – Teaches the team about programming principles and helps the team troubleshoot programs.

Potential sources for mentors might include:

- ▲ **Companies in your community.** Many companies encourage their employees to volunteer, and some even have formal programs to match volunteers with groups in the community.
- ▲ **Service-oriented organizations.** There are many social organizations with a focus on community service. You probably have some in your town (for example: Rotary Clubs or Senior Corps).
- ▲ **Parents and relatives** of your team members!

## Parents and Guardians

As a Coach, you can perform all of the planning tasks for your team, but sharing the workload will make your team more efficient, reduce stress, and increase team spirit among all adults involved.

Parents and Guardians may be able to assist your team by:

- ▲ Serving as a Mentor if they have relevant skills or experience.
- ▲ Planning and holding fundraisers.
- ▲ Leading team-building activities.
- ▲ Planning field trips.
- ▲ Providing a place for your team to meet.
- ▲ Making travel arrangements.
- ▲ Or one of the most important tasks – planning snacks so your team never runs out of fuel!



### TIP

*You may want to hold a meeting for team parents at the start of the season to set expectations and recruit their help. Parents may provide valuable help, but remind them they need to let the kids make decisions and do the work themselves.*

## Time Commitment

Most *FIRST* LEGO League teams meet for at least 8 weeks after the Challenge is announced. They may meet for as little as 1 hour or hold multiple meetings up to 10 hours a week. It is up to you and the team to decide what your meeting schedule should be. A rookie team has more to learn and typically needs to meet more often than a veteran team. Some meetings will run like clockwork and others will be more challenging. You should plan to have some of each.



### TIP

*If you are planning to attend an event or tournament, check the dates. Some occur as early as November and some are as late as March. The event date is your team's deadline, so work backwards to figure out when each task must be completed.*



Create a reasonable schedule to start the season. We suggest starting with 2 meetings per week that are 2 hours long. You can add or subtract meetings if you need to. Research when your first tournament will take place, and plan backwards from that date. Don't forget to consider holidays and school events. You can refer to the sample schedule in [Appendix B](#) for an example of how a Coach could plan a team's 8-week season or register for *FIRST* Steps ([nfo.firstinspires.org/flfirststepsrequest](http://nfo.firstinspires.org/flfirststepsrequest)) to help guide you through your season.

As the Coach, you may need additional time each week to prepare for team meetings. Spend this time coordinating help, maintaining equipment, communicating with your Mentors, sponsoring organization(s) and parents, purchasing supplies, and registering for competition.

## Roles & Responsibilities

### Child Safety

As the Coach, you are responsible for the safety of the children while they are in your care. Due to the age of *FIRST* LEGO League team members, Coaches, parents, and guardians are essential to team and child safety. Adults need to educate team members and each other on how to recognize situations that may put a child at risk, and take measures to ensure that adults who work with your team are reliable.



*FIRST* is committed to creating a safe environment for everyone. You may be required to meet specific child safety requirements in your region. Learn more about the *FIRST* Youth Protection Program at [www.firstinspires.org/resource-library/youth-protection-policy](http://www.firstinspires.org/resource-library/youth-protection-policy).

### The Team

Discuss team member responsibilities with the whole team. It is important for you to be specific when talking about each individual's role and responsibilities. Team members will usually have ideas about what they want to do, such as: programming, building, research, marketing, etc.



#### TIP

*Like other team activities, FIRST LEGO League has rules. As the Coach, you can (and should!) remind your team about the rules when appropriate. As long as you are not making decisions for the team or doing the work, keeping the team on track would not be considered adult interference. Find the basic Participation Rules on [www.firstlegoleague.org](http://www.firstlegoleague.org).*

Encourage team members to push the limits of their own comfort zones. Rotate roles so everyone has an opportunity to try different things. Children often discover that they enjoy a task they wouldn't have volunteered for on their own. This can also prevent boys and girls from falling into stereotypical gender roles.

Work together with your team to carefully consider how you want to divide responsibilities. What would happen if someone had to leave the team or was sick on the day of the tournament? Would someone else be able to step in? Be sure to think through how this decision will affect the team as the season develops.

Here are examples of the roles or sub-teams you may want to establish within your team:

▲ **Researching** – Gather information about the Challenge theme, related real-world problems, and existing solutions. Invite professionals to share their knowledge with the team.

▲ **Community Sharing** – Consider who in the community might be impacted by or interested in your team's problem and arrange to share your findings with them.

▲ **Presenting** – Design a 5-minute creative presentation to show the Judges your team's work on the Project.

▲ **Strategy Analysis** – Analyze the robot playing field and formulate various methods for accomplishing the missions. Lead the effort to establish a consensus on the final strategic plan and think about risks and rewards of different strategies.

▲ **Building** – Make decisions about building and work to form consensus on the mechanical design of the robot among team members.

▲ **Programming** – Make decisions about programming and form consensus on programming for the robot.

▲ **Project Management** – Get everyone focused, make sure everyone's ideas are heard, find compromises, and keep everyone on schedule with a timeline.

▲ **Marketing** – Design and create a team logo, T-shirt, or banner. Write a press release and contact the local media to increase public awareness of the team and how the team benefits from the *FIRST* LEGO League experience.



#### TIP

*If your team chooses to attend a tournament, all team members are expected to participate in the judging sessions (Core Values, Project, and Robot Design) and be present for the Robot Game matches. They should know at least a little about all parts of your team's work.*



# Top 10 Tips for Rookie Teams

## *From The Inventioneers, NH, U.S.*

1. Remember, you don't have to be an engineer to be a great Coach.
2. Work with team members to come up with rules for your team at the first meeting.  
A few examples:
  - ▲ Respect others' ideas.
  - ▲ Help others. If a team member is an expert in robot-building, she should be willing to help teach others this skill.
  - ▲ Identify ways to encourage each other.
  - ▲ It's everybody's job to make sure the whole team participates.
3. Let the kids and parents know that the kids do the work.
4. Practice asking questions to guide the kids to their own answers instead of telling them your ideas. Ask probing questions such as:
  - ▲ What's another way to do that?
  - ▲ Everyone watch the robot this time – what do you see?
  - ▲ Where can you find more feedback to increase reliability?
5. Don't try to do everything alone:
  - ▲ Contact veteran teams and Coaches for support and ideas.
  - ▲ Enlist parents as assistant Coaches.
  - ▲ Use the online resources provided in the Resource Library. ([www.firstinspires.org/resource-library/fll/hydro-dynamics-challenge-updates-and-resources](http://www.firstinspires.org/resource-library/fll/hydro-dynamics-challenge-updates-and-resources))
6. Figure out your funding:
  - ▲ Will you need to charge dues to cover startup costs?
  - ▲ Can the parents' employers or other local businesses provide funding?
7. Get the team committed to a meeting schedule before the season starts.  
Members who can't attend meetings make it hard for the whole team.
8. Make sure all parents have roles – even rotating ones (Assistant Coach, snack provider, fundraising lead, photographer) so that they become invested in the progress of your team.

9. Use good time management. Put tournaments on the calendar as soon as the dates are released. Keep the kids focused on how much time they have to accomplish tasks. This way, everything doesn't pile up just before the tournament.
10. **Keep it FUN!!!** This is the most important tip for all teams, rookie and veteran. The kids will learn to handle frustrations and deadlines better if the element of fun is in the mix. Coaches and parents will be less tempted to "help" too much if there is an atmosphere that emphasizes the joy of learning and exploring new ideas.



## 3 Start Your Season



# 3

## Start Your Season

The *FIRST*® LEGO® League Challenge is released to the public at [www.firstlegoleague.org](http://www.firstlegoleague.org) at **noon EDT** on the **last Tuesday in August** each year. Before the Challenge is released, there are a number of things we recommend both new and returning Coaches do to prepare for a successful season. You will need to judge how much you can accomplish in the time you have available. Remember to set reasonable goals for your team and yourself.



### ROOKIE TIP

*Before the season starts, check out past Challenges to get an idea of what to expect:*  
[www.firstlegoleague.org](http://www.firstlegoleague.org).

## Groundwork

### Choosing a Facility

When choosing a place for your team to meet, try to choose a facility that will provide the following:

- ▲ **Computer, either a Macintosh or PC.** You will use the computer for research, programming, and communication.
- ▲ **Internet access.** Your team will need to download the Challenge, receive emails, research, and keep up to date on the Challenge Updates. *FIRST* LEGO League posts many videos and other resources online, so try to find a facility where you can access all materials. Some public buildings, such as schools and libraries, block Internet sites like YouTube.



▲ **Enough room for your team to set up.**

Part of the Robot Game is a 4- x 8-foot mission mat which you will need to lay out on a level floor or table. Without the optional legs, the table is simply a 4- x 8-foot sheet of plywood with a 2- x 4-inch border around the perimeter of the plywood.



**FIND ONLINE**

Find the Table Building  
Instructions in the  
Resource Library on  
[www.firstlegoleague.org](http://www.firstlegoleague.org)

▲ **A secure place to store team supplies and work in progress between meetings.**

If your team is school-based, the school itself is often an ideal meeting place. Schools can usually provide computers and space to set up your playing field. For teams not based in schools, you may meet in a private home, a meeting hall, or a company conference room. You may need special authorization to use some of these buildings after hours or on the weekend. Make sure you check on any restrictions before agreeing to meet there.



**COACH-TO-COACH**

*We are lucky to have the school's science teacher as a team Mentor. He allows us to store our supplies in his classroom. When we don't want to leave something in the classroom, we store materials in my car. We store everything except the Robot Game table in a large plastic bin for easy hauling.*

## **Purchasing Your Materials**

Your team will need certain required materials to participate in *FIRST* LEGO League. The process to obtain these materials may be different in some regions, so check with your Partner if you have any questions.

- ▲ **Team Registration** – Register your team first. This gives your team access to purchase the exclusive materials you will need as well as team support services and resources.
- ▲ **LEGO® MINDSTORMS® set** – Each team must have a LEGO MINDSTORMS set to participate in the Robot Game (EV3, NXT, or RCX). Some regions offer a special set for teams to purchase, but you are not required to purchase an official robot set. You may use your own LEGO MINDSTORMS set if you have one.

▲ **Challenge Set** – All teams must have access to an official *FIRST* LEGO League Challenge Set. This is the practice field for your team's robot. The Challenge Set contains an exclusive set of LEGO elements to build your Mission Models, a mat to put your Mission Models on, and a sheet of 3M Dual Lock fasteners to attach your models to the mat. You will need a new Challenge Set each Challenge year. Read more about the Challenge Set in [Chapter 5](#).

▲ **Robot Programming Software** – Your robot may only be programmed using LEGO MINDSTORMS EV3, NXT, or RoboLab software (any release).

**No other software is allowed.** Check whether your robot set includes programming software. Additional software purchases can be made directly from LEGO Education dealers. Visit [www.legoeducation.com](http://www.legoeducation.com) for sources in your region.



#### TIP

*Teams may share a Challenge Set – you do not need to purchase 1 for each team. However, each team will need time to work on the Robot Game missions, so consider whether sharing will give each team fair access.*

## Funding a Team

There are many ways to fund your team. Many teams are sponsored by a school while other teams pay their own fees. You could write a check from your personal funds or split the bill between the team members. Splitting the bill may be a large expense for some families, and you run the risk of excluding some children if you use this method.

Many teams need to fundraise to pay for team registration, materials, or tournament fees. Fundraising as a team gives children and parents a sense of ownership in the team. Brainstorm ways to raise money with your team members. They may surprise you with some fresh ideas. You may also want to approach businesses in your community to support your efforts.

Read more about fundraising in [Appendix A](#).



#### COACH-TO-COACH

*I coached for 7 years (and the teams did well) and we never had enough time. Never. And that's how life is. If we can teach our kids how to make the most of the limited resources they have, then we have truly taught them a life lesson. I wish more people in my professional life had learned how to manage their time better. The FIRST LEGO League season timeline may seem overwhelming, but remember that even the time crunch teaches an important skill: time management!*



# Early Season Meetings

It's time to get started. Here are a few suggestions for what you could do in your first meetings with your team.



- ▲ Get a large sheet of paper and make a calendar of the *FIRST* LEGO League season. Be sure to add meetings and important dates. Bring the calendar to each meeting and update it to include any changes as the season progresses.
- ▲ Play a game to learn each other's names.
- ▲ Print and hand out the Mission Model building instructions (**released Aug. 1**). Have the children build the models, then place the models on the playing field in the appropriate positions.
- ▲ Brainstorm a variety of ways to learn about this year's Challenge theme. As a group, decide if you will invite a guest speaker or go on a team field trip. If this isn't possible, consider connecting with professionals via email or phone instead.

## Challenge Release Meeting

The *FIRST* LEGO League Challenge is released at noon EDT on the last Tuesday in August on [www.firstlegoleague.org](http://www.firstlegoleague.org). Once it is released, you can download the Challenge document, which contains essential details about what your team will need to solve this season. See [Chapters 5](#) and [6](#) for definitions of the parts of the Challenge.

Many teams gather on the day the Challenge is released for a team party to celebrate the new Challenge. Download the materials together and start brainstorming. If your team begins meeting after the Challenge is released, don't despair! Simply download the Challenge materials as soon as you can.

### FIND ONLINE

*The Challenge is released at noon EDT on the final Tuesday in August on [www.firstlegoleague.org](http://www.firstlegoleague.org).*



### TIP

*Refer to the sample schedules in [Appendix B](#) for ideas on how to schedule your team meetings.*

## Team Goals

Work with your team to set goals for the season and put them on paper. Include expectations for the group's success, functioning as a team, and exhibiting Core Values. Write down what concepts you expect to learn and what your team would like to accomplish on the Challenge by the end of the season.

Tournaments provide excitement and recognition and celebrate each team's accomplishments. However, the true goals of *FIRST* LEGO League have nothing to do with winning medals or trophies. If your team members can look back at the end of the season and say even 1 of the following, you have achieved an important goal:

- ▲ We learned how useful and fun technology and science can be.
- ▲ We did something we didn't think we could do.
- ▲ We helped our community.
- ▲ We improved over last year.
- ▲ We figured out how to manage time, deal with setbacks, or communicate ideas.
- ▲ We had fun!

## Team Building

Team-building exercises allow members to communicate feelings in a positive and healthy manner and encourage [\*Gracious Professionalism\*](#)<sup>®</sup> as they work together toward a common goal. They're also fun. Team building can be difficult with a schedule that is very structured. Sometimes letting children have fun together allows them to develop communication and respect, leading to smoother progress when work resumes.

Team-building activities might include:

- ▲ Have team members interview each other and share what they learn with the whole group. Provide some questions to get them started.
- ▲ Have each team member write down the steps required to move around an obstacle in the room. Create pairs, and have one child read his or her instructions while the other child acts as the robot. The "robot" must follow the instructions exactly, even if they don't work. This demonstrates what it is like to program a real robot.
- ▲ Work together to come up with a team name and logo.
- ▲ Create unique team hats, a handshake, or a cheer.



### COACH-TO-COACH

**Rookie Coach:** *I have a team of 9 children who love to chatter, and after 2 minutes without instruction, they kind of get off track. I have some ideas for activities to keep them focused, but the team needs to start cracking down on the Challenge. Any suggestions?*

**Veteran Coach:** *Each meeting, have a practice tournament and have the children run the robot on the table and give their Project presentation. It is a powerful way to have them realize how much work is left to do. This year I started doing this from the second meeting. I gave them 5 minutes to prepare, 2½ minutes at the table, and 5 minutes for the Project. At first, the team objected, but quickly got to work to better their performance for the next meeting.*



## 4 The Core Values



# 4

## The Core Values



### CORE VALUES

You may have noticed that the Core Values are the first thing you see when you open this handbook (on the inside of the front cover). This is because the Core Values are central to everything we do in *FIRST*® LEGO® League. They help to make this program a fun and rewarding experience for everyone involved. Team members, parents, Coaches, Mentors, Volunteers, and staff are all expected to uphold the Core Values whenever they participate in *FIRST* LEGO League activities.

The Core Values describe a way of working together and respecting each other that helps to define the *FIRST* LEGO League experience. We hear stories every year about a team that drops their robot at a tournament and watches the pieces scatter in every direction. Team members from other teams rush in to help them put their robot back together before their next match. This is because *FIRST* LEGO League teams want to compete fairly and have fun together.

Keep in mind that the Core Values apply to everyone involved with your team. Please talk to parents, Mentors, and other Volunteers about what the Core Values are and why they are so important. By embracing the Core Values, anyone involved in *FIRST* LEGO League may find that they begin to treat people more fairly and respectfully in other areas of their lives.



## OUR CORE VALUES



- ▲ We are a team.
- ▲ We do the work to find solutions with guidance from our Coaches and Mentors.
- ▲ We know our Coaches and Mentors don't have all the answers; we learn together.
- ▲ We honor the spirit of friendly competition.
- ▲ What we discover is more important than what we win.
- ▲ We share our experiences with others.
- ▲ We display *Gracious Professionalism*® and *Coopertition*® in everything we do.
- ▲ We have fun.

### Gracious Professionalism®

Gracious Professionalism means teams compete like crazy against challenges but appreciate and treat each other with respect. Your real opponent is the problem you're trying to solve — not any other team or person. Gracious professionals lend a helping hand to an opponent when needed because they want everyone to have a chance to compete. Even when a team wins the competition, they avoid treating anyone like losers.

In the long run, *Gracious Professionalism* is part of pursuing a meaningful life. You can enjoy personal success while also making a contribution to society. *FIRST* LEGO League team members will learn that they can succeed while still acting with integrity.

### Coopertition®

*Coopertition*® combines the concepts of cooperation and competition. *Coopertition* is founded on the philosophy that teams can (and should!) cooperate with each other even as they compete.

Once you have mastered a skill, you teach it to someone else so that everyone can do better next time. It will make the competition more meaningful by pushing everyone to excel. Sometimes it even means sharing a spare part or battery charger with another team so they have a chance to compete. You still do your best to win, just not at the other team's expense.



#### TRY IT

Ask your team members what each Core Value means to them. Can they think of any situations when this behavior might help in their lives outside of the team?

## Benefit of the Doubt

Just as we expect teams to display the Core Values throughout the season, tournament organizers, Judges, Referees, and others are expected to uphold the Core Values too. Under this philosophy, teams should receive the benefit of the doubt whenever possible.

Teams will be given the opportunity to explain themselves if an issue arises during the season. Judges or Referees may ask your team questions about who worked on your robot or Project idea. Whenever possible, teams will be given the points or the higher Judges' rating if there is no evidence that a team broke the rules.

Sometimes teams assume that another team could not have done the work they present without the direct involvement of adults. Remember that children are remarkably creative, and some are highly sophisticated at programming or software applications for presentations. Don't assume that you know what another team is capable of, and don't let your team members make assumptions either.

## Prepare for a Tournament

Unlike other areas of FIRST LEGO League, teams usually do not have tangible results (like a robot or a Project idea) to show to the Core Values Judges at a tournament. So how do teams prepare for Core Values Judging? By incorporating the Core Values into all you do and talking about the Core Values throughout the season.

All teams operate differently, and teams can be successful with different styles. Some teams have a strong leader, some have a democratic approach, on some teams each child has a specialized role, and other teams share all responsibilities equally. The Core Values can be incorporated into all of these styles and teams can be successful using all of them. As long as team members understand and use the Core Values in their interactions, no particular working style is better than the others.



### COACH-TO-COACH

*As we prepared for the tournament, we were working with the kids to remember examples that support the Core Values. We realized that the Core Values describe powerful behavior that should be embraced on a daily basis and in our weekly sessions – not just for the tournaments.*

*We developed our own Core Values award for our team. This way each team member consciously works on demonstrating Core Values in each category with specific examples. When we get to the competition, talking about the Core Values happens naturally and each kid has examples of how they demonstrated Core Values on a weekly basis.*

*At 1 meeting per week, each team member gives a specific example of how he or she demonstrated 1 of the Core Values. Then team members either agree or they tell their own stories about how that team member demonstrated the Core Values in other ways.*

## Core Values Judging

When you attend a tournament, your team will meet with Core Values Judges at some point during the day. There are multiple formats for Core Values judging, so check with your tournament organizer if you have any questions about how your team will be judged. Teams generally do not need to bring their robot or Project materials to Core Values Judging sessions.

Regardless of what judging format your event will use, it is always a good idea for your team members to prepare some examples of how they demonstrated the Core Values throughout the season. These might be about each team member individually, a few team members together, or about the whole team. Have team members take turns telling about these examples in front of the group, and ask other children to give feedback. Remember to keep the feedback constructive. Team members should be especially careful about displaying the Core Values when providing Core Values feedback!



### TIP

*Some regions may ask your team to prepare something to share with the Core Values Judges. Pay attention to the guidelines given to you by the tournament organizer.*

Learn more about how your team's demonstration of Core Values knowledge and skills will be judged in [Chapter 8](#) and by reviewing the rubrics found at [www.firstlegoleague.org/awards](http://www.firstlegoleague.org/awards).



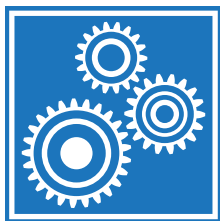


## 5 The Robot Game



# 5

## The Robot Game



### ROBOT GAME

As you learned in [Chapter 1](#), the *FIRST*® LEGO® League Challenge has 2 parts: the Robot Game and the Project. In the Robot Game, the kids build and program an autonomous LEGO® MINDSTORMS® robot to score points by performing mission tasks. These missions will be inspired by the Challenge theme, so you will see many concepts that may get your team thinking about this year's topic.

Missions require the robot to navigate, capture, transport, activate, or deliver objects precisely on a printed mat on a special table. The robot has 2½ minutes to complete as many mission tasks as possible.

The team and robot must follow a set of rules, which you will be able to download from the [FIRST LEGO League website](#) in the Challenge Guide released with the Challenge. For example, if team members touch the robot while it's working, it must be stopped and carried to Base. At tournaments, a Referee oversees the action to ensure that everyone is following the rules.

At tournaments, 2 half-tables are attached back to back to form a full competition table, so your team will participate opposite a team on the other side. You are not competing against that team. Rather, both teams will try to earn their own highest score. The robots are isolated from each other by table border walls, but there is always at least 1 mission that causes interaction between robots on adjacent tables.



### ROOKIE TIP

*If this is your team's first year, set achievable goals. Decide on a few Missions you want to master, and then add additional Missions if you have time available.*

# Robot Game Preparation

Before your team can start building and programming a robot, you will need to set up your materials and make sure you have all the Robot Game details.

As you learned in [Chapter 3](#), you will need a LEGO MINDSTORMS set (EV3, NXT, or RCX) and a Challenge Set to participate in the Robot Game. That is not all you need, though! Before your team begins working on their robot, you should:

- ▲ **Download and print the Challenge document.** It contains an overview of the Project and the Robot Game.



## FIND ONLINE

Download and print the Challenge document from [www.firstlegoleague.org](http://www.firstlegoleague.org).

- ▲ **Build your Robot Game table.** The table holds the robot's playing field. You have the option to build a complete table or only the top and borders. Simple but large, the table does require basic carpentry skills for construction. Find the Table Building Instructions in the Resource Library on [www.firstinspires.org](http://www.firstinspires.org).

- ▲ **Build your Mission Models.** The mission models are the official objects the robot interacts with as part of the game. The instructions for building the Mission Models can be found on Aug. 1. on [www.firstlegoleague.org](http://www.firstlegoleague.org). You are free to build these as soon as you receive your Challenge Set. Mission Model construction takes a single person 3 to 6 hours, depending on experience. Many teams build the Mission Models together during their early season meetings.



## TIP

*If your team is new to FIRST LEGO League, you (or a programming Mentor) may need to teach your team about MINDSTORMS programming. This is allowed as long as you do not tell them how to solve the Challenge. Adults may help your team gain new skills or information that may help them be successful.*

- ▲ **Set up your field.** You now have the table, the mat to put on it, and the models to put on that. The last thing to find is the bag of tan sheets of 3M™ Dual Lock™ fastening material that came with the Challenge Set. This material is used to secure some of the models to the mat. You are now ready to follow the [Field Setup instructions](#) to complete the setup of the playing field. Follow these instructions closely to be sure the field you practice on is identical to those found at tournaments.
- ▲ **Guess the Missions.** Before the Challenge is released, have your team guess what tasks they may be asked to complete. Upload a video of your guesses to YouTube and watch your team email blasts for details on how to enter a Guess the Missions contest to win fun prizes!





- ▲ **Read the Missions.** The Missions section of the Challenge document describes what the Mission Models represent and how your team can earn points on the field in Robot Performance. The Missions section describes the condition that will earn you points – it is up to your team to decide how to make those conditions happen. For example, if you can earn 4 points for a Mission Model touching the mat, your team might design a robot that can knock it over onto the mat, place it on the mat gently, roll it onto the mat, etc. If the Missions and Rules do not forbid an idea, then it is allowed. Like the Rules (below), the Missions need to be read carefully and repeatedly throughout the season. A small detail that doesn't mean anything to you in week 1 may turn out to be a big deal in week 4!
- ▲ **Read the Rules.** The Rules section of the Challenge Guide gives *exact* definitions for terms related to the game and to tournament play. They keep things fair and fun, and keep matches running smoothly. They also tell specifically how a match must be conducted, and place constraints on the robot's parts, the team's action, the robot's action, and the scoring. You and any team member dealing with the robot are **HIGHLY** advised to **read the Rules** carefully and **REPEATEDLY**. Rules that may seem confusing or not applicable at the beginning of the season will mean more and more as you gain experience.



#### TIP

*If your team is unsure how to begin building a robot, they can search online for starter ideas. It may be helpful to copy an existing basic chassis design, for example. The team will quickly find that they need to apply this "borrowed" knowledge in innovative ways to solve the missions.*

# Robot Game Execution

Once you have prepared by completing the steps above, your team is ready to begin working on a robot.

▲ **Strategize, build, program, and have FUN!** Plan, build, and program; test, repair, and reassess; repeat! Good coaching requires restraint here. As tempting as it is, don't build the attachment or make the decision. Ask questions to get the team thinking so they can find the answers themselves.

▲ **Check the Challenge Updates for critical new information.** The Updates are a running list of official responses to missing, unclear, or incorrect information about the Robot Game.

Updates posted here SUPERSEDE text from the Challenge document. There are also

answers to frequently asked questions, and official calls on whether or not certain strategies are allowed. Refer to the Robot Game Updates often and carefully.

Find the Challenge Updates on [www.firstlegoleague.org](http://www.firstlegoleague.org).



## FIND ONLINE

Find the Challenge Updates on  
[www.firstlegoleague.org](http://www.firstlegoleague.org).

▲ **Repeat the steps above until your objectives are met.** Whether your goal is to complete 3 missions or to complete all of them, the process always involves many cycles of thinking, trying, failing, improving, and succeeding.

## Prepare for a Tournament

When your team attends a tournament, your robot will compete in 2 different areas: Robot Performance and Robot Design.

### Robot Performance

Unlike other areas of FIRST LEGO League, teams receive a numerical score during Robot Performance matches. The Robot Performance Award recognizes a team that scores the most points in the Robot Game. Your team's score will be determined by the number of points the robot scores during scheduled matches.



## TIP

*Some tournaments may use direct lighting on their tables but others may not. Be prepared for either situation if your team uses a light sensor on the robot.*

Each match is separate and only the highest score will count. You do want to have a robot that can perform well consistently, but your team should not be discouraged if you have 1 bad match. Read more about Robot Performance matches in [Chapter 7](#).

## Robot Design

During the tournament day, Robot Design Judges will interview and observe your team. Some events require formal Robot Design presentations, while at other events the Judges may simply ask your team questions. Either way, it is a good idea for your team to prepare a basic introduction to the robot in case the Judges ask.

Bring your team's programs to the Judging session. They may be on a laptop computer, tablet, or printed on paper. Judges may ask to review some parts of your team's programs.

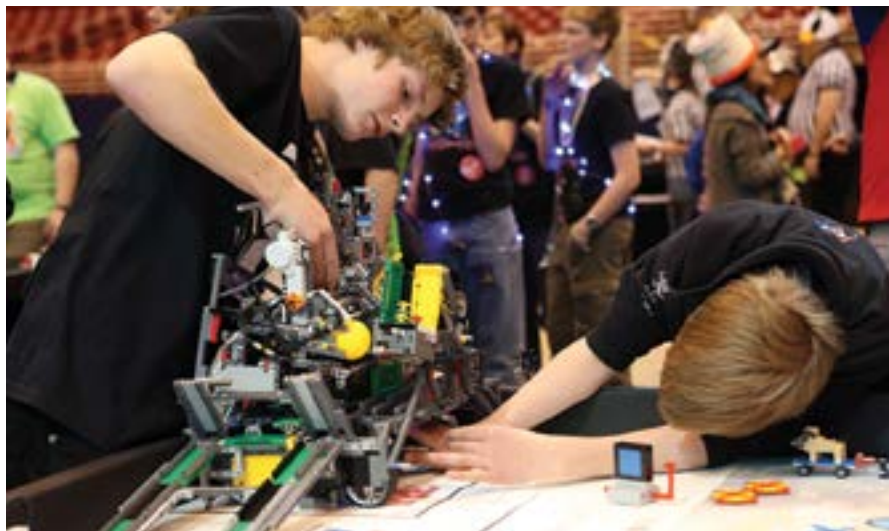
There may be a competition table with Mission Models in the Judging area. Your team should be prepared to demonstrate their solution to at least one of the missions and talk about their strategy. Review the information about your tournament carefully and contact the tournament organizer if you have any questions about what your team should expect.



### TIP

*Some regions may ask you to prepare something to share with the Robot Design Judges. Pay attention to the guidelines given to you by the tournament organizer.*





Learn more about how your team's Robot Design will be judged in [Chapter 8](#) and by reviewing the rubrics found on <http://www.firstlegoleague.org/awards>.

### ROBOT GAME QUESTIONS?

- ▲ Review the Judging rubrics at [www.firstlegoleague.org/awards](http://www.firstlegoleague.org/awards).
- ▲ Check the Challenge Updates on [www.firstlegoleague.org](http://www.firstlegoleague.org).
- ▲ Email questions about the Robot Game to [fllobotgame@firstinspires.org](mailto:fllobotgame@firstinspires.org)
- ▲ Information about LEGO Education products and programming can be found at [education.lego.com](http://education.lego.com)



### ★ TIP

*Find more Coach tips on the Coach Quick Tips playlist on our YouTube Channel at [www.youtube.com/user/FLLGlobal](http://www.youtube.com/user/FLLGlobal)*

# 10 Robot Game Tips

*From FIRST LEGO League Engineer Scott Evans, NH, U.S.*

## 1. **Read the Challenge document carefully and repeatedly!**

Assign a “Documents Expert” or 2 on your team. True, lots of things these days are designed not to need directions, and many times even if something says “Read these directions before starting,” you can figure it out yourself, but... Be warned: The *FIRST* LEGO League Robot Game is *not* one of those things. Experience shows that teams who don’t read the documents repeatedly operate in a fog all season and learn things the hard way at tournaments. On the other hand, teams who know the details save lots of confusion and time, have fewer questions, higher success, and more fun.

## 2. **Use the MINDSTORMS training features.**

The programmer(s) on your team should dedicate some early team meetings to going all the way through the help and tutorials that come with your MINDSTORMS robot set or in the Resource Library on [www.firstinspires.org](http://www.firstinspires.org). Doing so will make you immediately competitive with many veteran teams who never bothered.

## 3. **Set manageable goals.**

When you’re first confronted with the Missions and they seem overwhelming, agree as a team on the 3 (or 1?) you think are the easiest, and pretend they are the whole Robot Game. Master those missions so your robot gets them every time. Congratulate yourselves. Now... if you did 3, you could probably do 4, right? Is there maybe 1 more you figure you can do? Master that 1 without affecting the others, and continue this process until you really do have a feeling for what’s possible.

## 4. **Make your robot’s navigation depend on features of the field whenever possible.**

While it’s true that a robot can be programmed to do a lot using only odometry (counting how many times its motors have turned) and/or timing (counting how many seconds its motors have run), variability in friction and battery strength can throw these methods off track. Instead, learn to complement these methods with techniques and sensors that interact with the field (light, color, touch, and ultrasound). For example, a robot programmed to drive forward 3 rotations and then turn for 2 seconds might go to the right spot and make a 90° turn when you program it, but later, when started from a different place, maybe with low battery strength, it will definitely end up in a different spot on a different angle. But if you program it to drive until it sees a line, then you make it back up against the wall after the turn, it will always end up on the correct spot, at 90°.

5. **Don't try to program more than 1 step at a time.**

Every mission strategy will be a sequence of steps. The robot has to get to a place and do a task, then get to the next place and do the next task, etc. Make sure it can get to and do each task consistently before trying to program for the next. If you program several actions and test them all at once, you'll find yourself fighting confusion, backtracking, and repeating your work.

6. **Build things strong enough that the robot can be knocked over in any direction and not break.**

Make the robot as compact as you can, because large parts make the robot unstable, tough to drive in narrow areas, and act like levers in their own destruction. Make "redundant" (extra) reinforcements when possible. Use gray (loose) pins instead of black (friction) pins when possible – believe it or not, they are LESS likely to separate.

7. **While building, keep access to essential features in mind.**

It seems like a bother, but it's wise to keep all cables attached to your EV3 or NXT brick (the "brain" of your robot) while building. If you don't, you're likely to end up re-doing things when you discover cables don't reach or they interfere with attachments. Also, constantly confirm that you can see the display, access the buttons, and get the batteries out without too much hassle.

8. **Build a shroud around your optical (color and light) sensors.**

A change in ambient (surrounding) light can mess up your optical (color and light) sensor programs. While it is possible to calibrate them, it is even better to avoid the need. Try to build your optical sensors into the center of the robot's shadow, or make a light shield around them.

9. **For consistency in turning, build sliders/casters as close to the drive wheels as you can without giving away stability.**

The farther away their contact with the mat is from the drive wheels, the harder the robot will be to turn. To understand this concept, pick up a broom and sweep the floor next to your feet. Now try to sweep a spot far away from your feet.

10. **Don't try to work for much more than 90 minutes at a time, and be sure to call it a day if you've spent more than 30 minutes frustrated and stuck.**

Your brain will actually work on the problem overnight, and while you're doing other things. When you come back to the problem, very often you'll figure it out quickly.



**TIP**

Follow [@firstlegoleague](https://twitter.com/firstlegoleague) and  
[@LEGO\\_Education](https://twitter.com/LEGO_Education) on Twitter  
to connect with teams  
and share tips.



## 6 The Project





# 6

## The Project



### PROJECT

Teams explore the Challenge theme each year through the Project. *FIRST*® LEGO® League is not just about building and competing with robots. Any successful engineering project requires a wide variety of skills. For example, the NASA engineers who designed the Curiosity Mars rover learned about Mars before they started designing. They researched the atmosphere, gravity, and terrain on Mars in order to design a space craft that could deliver the rover safely. They learned from past Mars rovers and improved on those

designs to create something even better. The Project is your team's opportunity to see what it's like to be scientists, inventors, and engineers.

The Project description will give your team some information about the topic to get them thinking and describe the essential steps each team must take. Your team will choose a problem and research it, design their own innovative solution to the problem, and share their experience with others. At a tournament, your team will have **5 minutes** to summarize all of their work in a presentation for the Judges.

Many teams choose a problem that is very personal. It might be a problem that affects someone on the team or someone they know. It is important to let your team members guide the choice, because choosing something they really care about will help the children see how big scientific concepts connect to their own lives.



### TRY IT

*As an introduction to this year's theme, have your team members explore Challenge-related professions and brainstorm as many careers in that field as they can.*



## Project Preparation

The complete Challenge (including the Project) is released in August. At that time, your team should:

### ▲ Download the Challenge.

The Challenge document contains both the Project and the Robot Game. The Project description will explain the details of this year's Project and the steps your team will need to complete. Coaches and team members should read the Project and Project sections of the Challenge Guide together. Team members should have access to read and interpret the Project materials with your help.

### FIND ONLINE

Download the Challenge, Challenge Guide and Challenge Updates from [www.firstlegoleague.org](http://www.firstlegoleague.org).

### ▲ Check the Challenge Updates.

Here *FIRST* LEGO League staff will clarify common Project questions. Assign a student on your team to check the Updates regularly. You do not want to wait until the tournament to find out about any misunderstandings or corrections to the Project description.

### ▲ Download the Challenge Guide.

The Challenge Guide contains resources to help your team with this season's Project: suggestions about how to complete the Project steps, resources to start your team's research, and tips on contacting professionals.

### TIP

*The details of the Project change each year, so read the Project description carefully. It's not about coming up with the right answer, but about unleashing the passion and creativity of your team members.*

# Project Steps

The Project instructions are purposely a little vague. This is to allow teams to choose a problem and solution that really interest them. However, all teams must follow these basic steps as well as any season-specific requirements described in the Challenge.

## 1. Identify a Real-World Problem

Identifying a problem is an important step in your team's process because it will shape your team's research and solution. The Challenge Guide provides guidance on how to begin this process, so refer to the Challenge Guide often if you need help.

- ▲ Research the Challenge topic using a variety of sources (such as books, magazines, websites, reports, and other resources).
- ▲ Learn about or talk to at least 1 professional working in the field of this year's Challenge. The professional may be a scientist or engineer, or they might be someone working in a local business, university, or nonprofit who uses the Challenge topic in their work. For example, a grocery store manager could be a great resource for a season on food safety because he or she works to keep the food in the store safe every day. Your professional does not need to be an engineer.
- ▲ Discuss and analyze the problem(s) your team finds.
- ▲ Review existing solutions to the problem(s). This will help your team understand what is currently being done to solve the problem(s) they found so they can improve upon a solution that already exists or create their own brand new solution.
- ▲ Decide on 1 real-world problem that your team will try to solve.



### COACH-TO-COACH

*I always ask my team to start researching the new Challenge theme before the Challenge is released in August. That gives us a head start when it's time to choose a problem and brainstorm ideas for the Project. We read the teaser together, and then the kids start researching whatever parts of the topic interest them. They search online, read books, or watch videos on their own time. Once the Challenge is released, we can immediately start narrowing the options because the team already has a background in the topic.*

## 2. Create an Innovative Solution

The next step is to design an innovative solution that will address the problem your team chose.

**For the FIRST LEGO League Project, an innovative solution is an idea that adds value to society by improving something that already exists, using something that exists in a new way, or inventing something totally new.**



There are probably many ways to solve the problem your team chose. There may be disagreements between team members about the best solution. It might be a good idea to agree on a decision-making process ahead of time so that the disagreements do not lead to arguments or hurt feelings.

Once your team members choose a solution, they should also consider what would be required to implement it. Is the idea feasible? What technology, materials, or manufacturing processes would be needed to make their idea a reality? This might be a good time to involve the professional your team identified in step 1. They should not tell your team how to solve the problem, but your team could ask for advice on how to implement the solution they design.



### COACH-TO-COACH

**Rookie Coach:** *My team came up with some great solutions to the problem they chose. However, they always do an internet search and find that someone already had the same idea. They are getting frustrated. What can I do as the Coach?*

**Veteran Coach:** *I like to tell my team one of the universal truths about research and development (R & D) work: Most great ideas are not completely new. Even when seasoned professionals start a new R&D project, they do not know where it will end up – and that is okay. You start working, and then you improve your ideas, and usually you end with something you are proud to share and sell.*

*I would tell your team to pick the solution that excites them the most and keep asking questions about it. Tons of questions. Could they improve it in some way? Could they make it easier or more pleasant to use? Or find a material that makes it cheaper to manufacture? Or make the solution more effective for the people who really need it? Improving an existing solution is still innovative. That's how we got most of the products we use and love today.*

### 3. Share Your Research and Solution

**Share** your team's Project **before** attending a tournament. This is a chance for your team to practice presenting with an audience, but it is also a chance for your team's Project to make a difference. They may motivate others to work on solving your team's real-world problem.

Sharing your team's solution could involve presenting to family and friends, talking with a government official, or meeting with a group of people who might use your team's solution. **At a minimum**, the audience must be someone outside of your team.



#### TIP

*Remind your team members about using good presentation skills. They should speak clearly and slowly when presenting. They should also remember to look up at the audience while they speak. Staring at the floor or mumbling will make it harder for the audience to hear all the great work your team has done this season!*

We especially encourage experienced teams to share their Project with an audience or multiple audiences who can **benefit from the solution**. Brainstorm with your team about who might benefit. It might be someone who is affected by the problem your team identified, scientists or engineers working in the field, or a member of the government who could help pass a law to solve the problem.



# Global Innovation

Designing an exceptional Project solution could lead your team to the *FIRST* LEGO League Global Innovation Award. This special award assists teams to further develop their ideas beyond the competition season. Each year, 20 Semi-Finalist teams will become *FIRST* LEGO League Innovation Ambassadors at a special innovation event. 3 Finalist teams will win a cash prize to help develop their inventions and/or to support team activities related to *FIRST* programs. Teams are nominated for the award from each region. To learn more about the *FIRST* LEGO League Global Innovation Award, visit [www.firstinspires.org/robotics/fll/global-innovation](http://www.firstinspires.org/robotics/fll/global-innovation).



## Prepare a Tournament Presentation

### *Decide How to Share With the Judges*

If your team plans to attend an event or tournament, be sure team members prepare a presentation which shares their project in a creative and thoughtful way. We have seen projects presented as songs, skits, radio broadcasts, TV interviews, poems, stories, dances, and plays. Judges are always interested in unique presentations, but a presentation without substance will not receive high marks. Each team must find its own way to show creativity and demonstrate its knowledge.

- ▲ What talents can your team members contribute to the presentation? Does someone play an instrument? Draw? Sing? Dance?
- ▲ What format will allow your team to show you have met all of the Project requirements?

Many teams also prepare a brochure or other material to leave with the Judges. These materials do not need to be fancy. Keep any handouts to 1 page or less. The Judges will see many teams during a tournament. They do not have time to read a

whole binder full of materials, and they may not have a process to return materials to your team. This is a great opportunity for your team to present its project in a short, easily readable format.



### COACH-TO-COACH

*Teams are allowed to use some video or multimedia clips during their presentations if the equipment is available. However, using technical equipment is risky! What happens if the equipment fails? Your team may get the best results with low-tech solutions like acting, singing, or showing posters and models.*

## Present at a Tournament

When team members enter the Project Judging area at a tournament, they should introduce themselves and ask if the Judges are ready for them. Each team has only **5 minutes** to present—including setup.

Exceeding the time limit is a common mistake. Some Judges will interrupt your team and stop the presentation at **5 minutes** while others may shorten the question time afterward to compensate.

Judges at a tournament will only consider what your team tells them, so make sure your team shows or describes how they met the requirements below. Anything they want the Judges to know should be included in your team's presentation.

After your team's presentation, the Judges may ask questions of your team as a whole or may direct questions to individual team members. Your team should be prepared for either format.



### To be eligible for Project awards your team *must*:

1. Meet any season-specific requirements outlined in the Challenge document.
2. **Identify** the problem your team chose to research.
3. Describe **your team's solution**.
4. Describe how your team **shared** its findings with others.
5. Meet the format requirements:
  - ▲ Present live; teams may use media equipment (if available) but only to enhance the live presentation.



### TIP

*Practice your Project presentation (including setup). 5 minutes is not a lot of time!*



- ▲ Include all team members; each team member must participate during the judging session in **some** way.
- ▲ Setup and presentation must be completed in **5 minutes** or less with **no adult help**.

Learn more about how your team's project will be judged in [Chapter 8](#) and by reviewing the rubrics found at [firstlegoleague.org/awards](http://firstlegoleague.org/awards).

## Audio-Visual Equipment

If your team needs special equipment, such as a projector, call the tournament organizers ahead of time to see if one will be available. If you need to bring your own equipment, make sure there will be a power source available in the Judging room.

If your team decides to use audio-visual equipment, be sure the team members are prepared to present without it if it fails or is not available. This applies no matter what technology the team was planning to use. The entire presentation is only **5 minutes**, including setup time, so they need to be prepared to proceed quickly without the failed or missing equipment. The Judges almost always have a very tight schedule, so no extra time is given for equipment problems.

## After Tournament Season

As part of their project, your team will probably design something that will amaze adults. Do not feel like that great idea is dead at the end of the *FIRST* LEGO League season. We encourage you to consider the following options for your team's idea:

- ▲ Continue to share your team's Project with additional audiences, such as at academic conferences or gatherings.
- ▲ Talk to your local lawmakers about laws that might help to solve the problem you identified.
- ▲ Apply for a patent on your team's invention. (You may need to begin this process before attending a tournament. Check the laws in your region or work with a patent attorney if your team would like to apply for a patent.)

### PROJECT QUESTIONS?

- ▲ Review the rubrics at [firstlegoleague.org/awards](http://firstlegoleague.org/awards).
- ▲ Check the Challenge Updates on [www.firstlegoleague.org](http://www.firstlegoleague.org).
- ▲ Email other Project questions to [flprojects@firstinspires.org](mailto:flprojects@firstinspires.org).
- ▲ Watch Project How-tos and Coach Quick tips at [www.youtube.com/user/FLLGlobal](http://www.youtube.com/user/FLLGlobal).



## 7 Tournaments



# 7

# Tournaments

A tournament is an opportunity for teams to learn, showcase their accomplishments, and celebrate their hard work throughout the season. Even if your team does not feel ready, we encourage all teams to participate in a tournament.

This chapter will provide you with an outline of the tournament day, but expect the unexpected and focus on creating a fun experience for your team members.

## Event Types

There are several types of *FIRST*® LEGO® League events. They all offer a fun and exciting way for teams to demonstrate the result of their efforts, but it is important to understand the differences between them. In many regions, you will be responsible for signing your team up for the event(s) you wish to attend and paying any required event fees. Check with your Partner about what steps you need to complete in your region.



- ▲ **Unofficial (Community) Events** may include demonstrations, practices, scrimmages, or summer camps. Unofficial Events do **not** qualify a team to attend a Championship tournament.
- ▲ **Qualifying Tournaments** (usually called Qualifiers or Regionals) are the early levels of official competition. Qualifying tournaments follow the same judging standards and a similar format to Championship tournaments, but they are



usually much smaller. Some teams from each Qualifier will advance to your region's Championship. See [www.firstlegoleague.org](http://www.firstlegoleague.org) for details of the advancement policy.

- ▲ **Championship Tournaments** are the highest level of competition teams can attend in a state, country, or region. Championships abide by *FIRST* LEGO League standards in format, judging, awards, and overall quality. For many teams, a Championship tournament will be the highest level of *FIRST* LEGO League tournament available.
- ▲ **Open Invitational Championships** are invitational events where the hosts invite specific regions to send a team. "Open" refers to inviting teams from outside the host region's borders. Opens are hosted by *FIRST* LEGO League Partners and abide by Championship standards. They represent another great way for *FIRST* LEGO League teams to get together and showcase their achievements.
- ▲ **The *FIRST* LEGO League World Festivals** are part of the annual *FIRST*® Championships. They are global celebrations of *FIRST* LEGO League teams from around the world.

Most *FIRST* LEGO League events are free and all are open to the public. We recommend that you encourage parents, siblings, sponsors, and friends to attend the tournament and cheer on your team!



#### **TIP**

*Read about events  
and team stories from  
around the world on the  
FIRST LEGO League blog:  
[flblog.wordpress.com/](http://flblog.wordpress.com/)*

# Tournament Applications

## Choose Your Event(s) Carefully

Before you apply to any events, identify your *FIRST* LEGO League primary region. In most situations, this is determined by your address. If you live near the border between 2 regions and wish to compete outside of your primary region, contact the Partner in your primary region for guidance.



### REMINDER

*In the U.S. and Canada, a team's national registration fee **does not** guarantee your team a spot at a tournament.*

Teams are only eligible to win awards or advance through the first official event they attend each season. Teams may not shop for awards by attending multiple Qualifiers or events in different regions.

## Qualifying and Championship Tournament Applications

A listing of tournaments will usually be communicated by your region's leadership after Challenge release. Teams apply either online or directly with the tournament organizer for most of these tournaments. Tournament application or assignment varies by region, so make sure to check if you are unsure of the process.

Some regions may not have a finalized tournament schedule until the season is well under way. Do not let that prevent you from starting to meet with your team. If you do not see any tournaments listed in your area, contact your Partner for more information.





# Tournament Logistics

## Adult Supervision and Safety

Adult supervision is a critical factor for a successful tournament. Whether the team is moving about the site or performing, make sure all team members are supervised. Use the buddy system and have each child travel with at least one other person. Remind each person attending with your team that everyone is expected to demonstrate the Core Values at all times. This includes parents and guests of the team.

In the event that you witness any kind of incident, medical or non-medical, please report it immediately to the tournament organizers. They may have questions or ask you to help them document what happened.



### TIP

*Be warned – FIRST LEGO League tournaments are exciting and very LOUD. Between the children, the music, and the announcers, do not expect any quiet time! If you have anyone on your team with sensitive hearing, bring ear plugs or talk to the tournament organizer about reasonable accommodations.*

## Check in

Upon arrival at the tournament, your team must first find the check-in table and sign in. At most tournaments, all of the teams arrive during the same half hour. It can be very chaotic, and lines sometimes form at the check-in table for a brief period. Keeping your forms organized, and ensuring that you have all the necessary paperwork when you arrive, can help to reduce the wait for everyone.

Pay attention to any messages from your tournament organizer about what forms you are required to bring.



### TIP

*These are common items you may need to bring to your tournament:*

- Forms or documents required by your tournament
- Robot and any attachments
- Spare parts (including spare batteries)
- Materials, props, and equipment needed for Project presentation
- Laptop computer (if available) with batteries and/or power cord
- USB cable
- Team banner, posters, or other decorations for the team's on-site pit space, if desired
- Snacks and drinks

## The Pit

The pit will be your team's home for the day. It will usually include a pit administration table where you can ask questions or get updates during the day. Check with the event Volunteers to find out if spectators are allowed in the pit, as some facilities allow only team members, Coaches, and Mentors in this area.

Your team may be assigned a specific location to set up when you register (a pit station or pit table), but some events have areas that are first-come, first-served. Generally, a pit table will be provided so your team can set up a display for other teams to see, showcase your Core Values, robot, and Project, or make minor repairs. If your team has any posters or banners, set them up to show your team spirit. Regardless of the size of your team's pit station, be gracious and keep your team within the borders of your space.

Electricity might be provided at the pit, but some venues do not have convenient electrical outlets. If your team brings a laptop, make sure it's fully charged just in case.

## Important Locations

When your team completes registration at the event, Volunteers will probably provide a map or let you know where to find important areas of the event. Make sure your team knows how to find:

- ▲ **Practice Playing Field(s):** Many tournaments provide access to a practice field where teams take turns running matches with their robot. If a field is provided, scheduling is often tight and teams may need to reserve a time slot to practice.
- ▲ **Competition Area:** The competition area is where the official Robot Game playing fields are located and robot performance matches are scored by official Referees. Competition tables will be set up in pairs. At each full table, 2 teams will compete side-by-side with their robots.
- ▲ **Judging Sessions:** Judging sessions for Core Values, Robot Design, and the Project generally take place in rooms separate from the competition area. Your team will participate in each session at some point during the day, so make sure you understand where and when your team should line up.



### TIP


*Teams must participate in all elements of the competition (Core Values, Project, and Robot Design judging as well as Robot Performance matches) in order to be eligible for any Core Award. Read more about judging in [Chapter 8](#).*



# How the Day Works

## Time Management

Review the day’s schedule with your team members. Competition schedules are usually very tight, so it’s important that your team is ready and on time. The sample schedule below will give you some idea of what to expect.

	<b>SAMPLE TOURNAMENT-DAY SCHEDULE FOR A TEAM</b>	
8:00 – 9:00 am	Team Registration	Building Lobby
8:00 – 9:00 am	Team Setup	Pit Area
9:00 – 9:15 am	Coaches’ Meeting	Auditorium
9:30 – 10:00 am	Opening Ceremony	Gymnasium
10:15 – 10:30 am	Core Values Judging Session	Judging Room 1
10:50 – 10:55 am	Robot Performance Match 1	Gymnasium
11:20 – 11:25 am	Robot Performance Match 2	Gymnasium
11:45 am – 12:00 pm	Robot Design Judging Session	Judging Room 2
12:00 – 12:30 pm	Lunch	Cafeteria
12:45 – 1:00 pm	Project Judging Session	Judging Room 3
1:20 – 1:25 pm	Robot Performance Match 3	Gymnasium
2:00 – 3:45 pm	Possible Judge Call-backs	Judging Rooms
3:00 – 3:45 pm	Team Clean-up	Pit Area
4:00 – 5:00 pm	Closing Ceremony and Awards	Gymnasium

As the Coach, you will concentrate on getting to the scheduled judging appointments and rounds on time. Delegate the responsibility of keeping your team together to other Volunteers.

## The Coaches’ Meeting

Many events hold a meeting for Coaches at the very beginning of the day while teams are setting up their pit areas. Find out where this meeting will take place and make sure you attend or send an adult representative. The tournament organizers often use this time to discuss any changes to the day’s schedule or any logistical concerns. This is also your last opportunity to clarify the rules before the competition begins, so be ready with any last-minute questions your team may have.

## The Opening or Welcome Ceremony

Usually the Opening Ceremony is very high energy and sets the tone for the day. Judges, Referees, and special guests are introduced, the Challenge and scoring are explained, and Tournament organizers tell teams about the exciting day ahead of them.

After the Opening Ceremony, teams not immediately scheduled for robot performance matches or a judging session should return to the pit to listen for queuing, use the practice fields for final robot adjustments, or prepare to meet with the Judges.

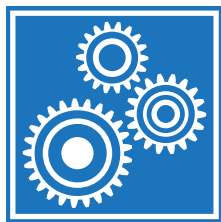
Some Tournaments hold a Welcome Ceremony in the middle of the day instead of an Opening Ceremony. The energy is the same even if the time is different.



### TIP

*Queuing is the process of lining teams up for their robot matches to ensure that they stay on time.*

## Robot Performance Matches



### ROBOT GAME

There are 2 types of Robot Performance matches: practice and competition. Practice matches are optional but may help your team work out any last minute issues. During the day, teams get at least 3 competition matches lasting 2½ minutes each.

Your 2 team members who operate the robot should follow the table Referee's instructions at the table, but they should not be afraid to ask the Referees if they have any questions or

concerns. Before starting, have them scan the table to make sure it is properly set up. If the robot operators have a question about the table setup they should talk to the referee immediately. Once the match starts, it is too late to change the table.

Most tournaments allow teams to rotate robot operators during matches so that more team members get to participate. Your tournament organizer should alert you if tournament policies do not allow switching during a match.

If your team rotates operators in and out between missions, make sure all operators are prepared to change. Remember that the clock does not stop for operators to change. Be aware that most tournaments do not allow Coaches or team members who are not robot operators into the area immediately around the table. You will need to watch from the designated spectator area.



### TIP

*By the time your team runs several matches, performs for the Robot Design Judges, and tests any programming changes, the robot's batteries may be low. Remember to check the batteries throughout the day.*

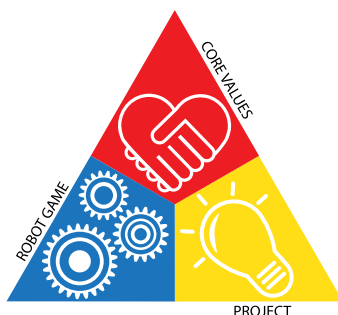
## Scoring Confirmation

At the end of each match, the Referee will record your team's score with the 2 robot operators. They will show your team members the points they earned on each mission. A team member, not an adult, must talk to the Head Referee if there is any disagreement. The Referee will then ensure that the score sheet accurately reflects the condition of the field. This is your team's only opportunity to bring up any difference of opinion.

Once your team leaves the area and the competition table is cleared for the next team, you are no longer permitted to dispute the score. As in other competitions, the Referee's ruling on the field is final. Graciously accept the Referee's final decision.

## Judging

In addition to points scored during competition matches, each team is judged on its Core Values, Project, and Robot Design. This often happens in areas which are separated from the main competition areas to eliminate noise and distractions. Your team will report to each of these sessions at some point during the day, so make sure your team knows where all sessions are located and what time the team needs to be there.



Teams meet with a panel of Judges for 10 to 15 minutes in each judged area. Teams should always ask the Judges if they are ready to begin before starting to set up. Some judging is done by observing teams in action. Check with your tournament organizer to find out what format they use if it isn't mentioned in the information you receive.

There is usually a break between each Judging session so teams can travel to their next location and Judges can have a few minutes to discuss the team they just saw. A timekeeper typically ensures sessions remain on schedule.

Some tournaments have restrictions on the number of adults that accompany children into the judging sessions. Please recognize that these rules are not designed to make the judging or performance process secret, but to ensure fair judging. Your team should be proud of all it has done. Trust the children to represent themselves well.



### TIP

*If the tournament organizer said that there would be audio-visual equipment available in the judging areas, make sure that it is still available. Also double check that any equipment the team brought along is working (such as extension cords and projectors). If anything is not available or not working, prepare your team to present without those items.*

## Awards Selection Process

At the end of judging sessions, the Judges meet to review all teams. They may ask some teams to return to a judging room for a “call-back” or visit you in the pit, so it is a good idea to have at least a few team members at your pit station when you are not competing.

The wait for the final awards decision can be difficult for teams. Prepare your team for a waiting period at the end of the day. This can be an ideal time for your team to pack up your pit table and displays and load up the cars to prepare to leave after the awards ceremony. Your tournament may choose to do a demonstration, have a special guest speaker, or run an exhibition round on the Robot Performance table to keep the crowd occupied while the Judges make their decisions.

### FIND ONLINE

Be sure to review the [rubrics](#) and [advancement policy](#) before you head to your tournament(s).  
Read more about judging in [Chapter 8](#).

## The Closing Ceremony

The Closing Ceremony is a celebration of everything the teams have accomplished all day and all season. Awards are presented and teams are recognized for efforts demonstrated throughout the day. There is plenty of cheering, loud music, and smiling faces.



# Top 10 Tips for Tournaments

## *From The Inventioners, NH, U.S.*

1. **Be enthusiastic** – tournaments are exciting and awesome!
2. **Be prepared for loud noise and a long day.** Pack a good lunch and some fun snacks. Don't forget to drink liquids; it is easy to get dehydrated when you're busy all day.
3. **Don't be nervous.** All the teams and Judges are really nice.
4. **Use the Core Values skills you have gained over the season all day long – even if things don't go exactly as you planned.** That's why *FIRST* LEGO League emphasizes the Core Values – so you can work well together no matter what challenges you face. Remember, judges may observe your team at any time during the day.
5. **Have fun breaks throughout the day, especially before judging sessions.** Have a cheer, a song, or a game ready to get the team energized.
6. **Everyone on the team (including the Coach!) needs a good night's sleep the night before the tournament.**
7. **Go over what you want to say before going into your Judging sessions,** either out loud to team members or silently to yourself.
8. **Bring a checklist of everything you need for each Judging session.** Review it before heading to each session to make sure no one needs to run back to the pit area for a missing item.
9. **Take the time to go around the pits and meet the other teams.** Show your enthusiasm for their projects and robots. Your encouragement can mean a lot to another team.
10. **Most important, have fun!** You've worked hard, so be proud of all you have accomplished!



### **TIP**

*Coming in June:  
Follow [FIRST on Pinterest](#)  
for ideas to use throughout your  
season, and share what your  
team has been doing  
with others!*

# Sample Questions to Ask Your Tournament Organizer

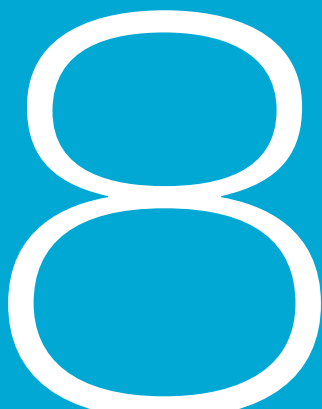
- ☐ How do we sign up for a tournament in our region?
- ☐ How much are tournament registration fees, and how are they paid?
- ☐ Do we need to pack a lunch or will one be provided? Or will there be food and drinks available for purchase?
- ☐ Are there any special forms or information sheets we need to complete before arriving?
- ☐ Is the pit open to the public or just to teams?
- ☐ What format will the tournament use for Core Values, Robot Design, and Project judging?
  - ☐ Does the team need to prepare a poster about the Core Values?
  - ☐ Will there be power or audio-visual equipment in the Project Judging area?
  - ☐ Does the team need to prepare any materials for the Robot Design Judging?
- ☐ Who is allowed in the Judging rooms?
- ☐ How will lunch be handled?
- ☐ Will the tournament schedule be available before the event?
- ☐ How and when will we receive our completed rubrics from the event?



## 8 Judging and Awards







# Judging and Awards

The *FIRST*® LEGO® League tournament experience includes 3 judged components: Core Values, Project, and Robot Design. The Judging process is designed both to evaluate each team's accomplishments throughout the season and to provide feedback through interaction with the Judges.

Awards at official events recognize those teams that demonstrate extraordinary achievement in key areas central to the *FIRST* LEGO League mission. An important part of your role as the Coach is to help each team member to understand that the real reward is what they discover and learn, both from one another and through the *FIRST* LEGO League experience.



## **REMINDER**

*Judges will see everyone's behavior at tournaments. FIRST LEGO League expects Coaches, Mentors, parents, and other family members to model good behavior and Gracious Professionalism®, just like the team members.*

## Judging Roles

Judges at events are usually Volunteers, just like many Coaches. They may be educators, experts in an area related to the Challenge, or perhaps a community member or industry leader who cares about inspiring children.

The Judging process at tournaments is overseen by a key Volunteer known as the Judge Advisor. The Judge Advisor leads the judging team and works with the tournament organizers to ensure that the event meets judging standards. Just as the Head Referee determines the recorded score at the Robot Game table, the Judge Advisor's word is final when it comes to any Judging questions or decisions at an event.



## Judging Sessions

As described in previous chapters, your team will participate in **3 judged sessions** at an official event. While these sessions may take many forms, they are all designed to create an opportunity for Judges to observe and interact with the team. During the Judging sessions, the Judges will ask your team questions about their work and season. Some questions may be standard ones, but Judges are always free to use any questions they feel will help them assess and differentiate teams.



### TIP

*Judges will address questions to team members. In regions where Coaches may join teams in their judging sessions, your job as a Coach is to sit quietly and allow the team to respond.*

## Judging Rubrics

Each judging session is supported by a rubric developed to help Judges record their feedback. The rubrics guide the Judges through key criteria that reflect what we believe is most important about the *FIRST* LEGO League experience. Rubrics also create a consistent way to differentiate between teams at different levels of



### FIND ONLINE

*Learn about how your team will be judged by reviewing the rubrics at [www.firstlegoleague.org](http://www.firstlegoleague.org) under Judging and Awards. The rubrics are worksheets that the judges will use to evaluate your team at a tournament.*

achievement. Your team will be assessed as Beginning, Developing, Accomplished, or Exemplary in each category.

The rubrics are not just a tool for the Judges, however. After the event, completed rubrics should be returned to teams to help them learn their strengths and areas for improvement. In addition, teams are encouraged to use the rubrics as a roadmap throughout the season. Pay close attention to the higher levels of achievement to understand the criteria that will help define a reliable, well-programmed robot design, a thoroughly researched and effective project, and a high-functioning team that embraces the *FIRST* LEGO League Core Values.

## Core Values Judging



### CORE VALUES

*FIRST* LEGO League Core Values are central to our mission. Throughout the tournament and particularly during any scheduled sessions, Core Values Judges will assess how well your team understands and integrates these values into their tournament experience and daily life.

Some events will rely on interviews, while others will use a hands-on teamwork activity. Your event may require teams to create a Core Values Poster as a tool to communicate

with the Judges, so pay attention to any information provided by your tournament organizer.

Refer to [Chapter 4](#) for more about the Core Values.

## Project Judging



### PROJECT

During their 5-minute Project presentation, the team must clearly demonstrate to the Judges that they completed all required Project steps: they identified a real-world problem, created an innovative solution, and

shared their findings with others. In addition, they must show that any other Challenge-specific requirements from this season's Project description were met.

The second half of each Project Judging session is devoted to a question-and-answer interview. Judges may ask for more detail about anything from the team's presentation.

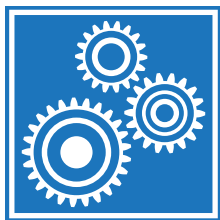
Refer to [Chapter 6](#) for more about the Project.



### REMINDER

*Make sure your team lets the Project Judges know how they shared their work with others before the tournament. Teams often forget to include this in their presentations, but sharing is a required step.*

## Robot Design Judging



### ROBOT GAME

During the Tournament day and any scheduled sessions, Robot Design Judges will observe each robot and ask teams about their mechanical design and the programs they wrote. They will want to see and hear about any innovative techniques or strategies the team came up with to solve problems and complete Missions. Importantly, through their questions they will ensure that the children completed and understand all work associated with building their robot.

Be aware that some events require formal robot presentations, so pay attention to any information provided by your tournament organizer. Even when formal presentations are not required, some Judges simply prefer to start interviews with a general, “Tell us about your robot.” Either way, your team should bring their programs on a laptop computer, tablet, or printout in case the judges ask. Help your team prepare for different scenarios and make sure the children are comfortable demonstrating the robot.

Refer to [Chapter 5](#) for more about the Robot Game.

## Judges Are All Around

In addition to evaluating teams using the rubrics during scheduled interview sessions, Judges may also use less formal conversations and observations throughout the event to learn more about teams.

Remind your team that Judges may not openly demonstrate who they are, but their ears and eyes are wide open. Lending a helping hand to a team that forgot to bring something speaks loudly about your team’s understanding of *Gracious Professionalism*®.

Judges will also consider any input provided throughout the day by Referees, event Volunteers and others who interact with the team. Help your team members to understand the process and encourage them to feel comfortable speaking with Judges and other event Volunteers.



## Call-backs

When time allows, some events incorporate a second round of judging sessions referred to as “call-backs.” The length and format for these sessions is not prescribed and can vary significantly due to event and schedule constraints.

Call-backs may be requested for many reasons, ranging from a Judge wanting additional clarification about a team, project, or robot to multiple Judges needing to see closely ranked teams that may be in consideration for an award. Please be careful not to make assumptions about your team’s chances based on a call-back request. Many awards are decided without the need for them and a call-back never guarantees an award will be given. If your team is asked to participate in a call-back, be sure to find out whether or not the team needs to bring their Project, robot, or other materials to the session.

## Judging Subjectivity

With the exception of Robot Performance, which is objectively determined by scores earned on the competition table, team achievement in all other award categories is subjectively judged. Even the most experienced and skilled Judges will not assess every team in exactly the same way. We have Judges work in pairs or small groups so they create more balance in the way they review teams. In addition, tournament organizers work hard to train their Judges and utilize other tools to create a level playing field for all teams.

*FIRST* LEGO League continues to improve tools and training for our Judges, and the processes we have developed yield fair, strong, and consistent results. However, the fact remains that Judged awards are inherently subjective and this is important for all teams to understand. To account for this, awards are determined through a normalization process, which includes deliberations and discussions among the Judges to help reduce the effect of subjectivity as much as possible.

## Deliberations

Led by the Judge Advisor, *FIRST* LEGO League deliberations rely on an in-depth discussion of all teams eligible for awards. Using observations and evaluations captured by the rubrics as one form of input, Judges consider any and all additional team information gathered throughout the day.

Team achievements are reviewed and contrasted as the Judges engage in an often intense discussion to decide which teams will be recognized with awards. Judges work together as a team to create an initial ranking of award candidates based on a team’s relative strengths and weaknesses compared to other teams and the award criteria as defined in the rubrics.



Once these initial rankings are complete, the Judges enter the final phase of deliberations. As a first step, each Champion's Award candidate is discussed and then a vote is taken by all Judges to determine the winner. After the Champion's Award winner is known, the other awards are determined utilizing the rankings from initial deliberations following the distribution policy outlined in the next section.

## Awards Distribution Policy

The goal of the *FIRST* LEGO League awards distribution process is to congratulate the whole group of teams who most deserve recognition at the tournament. With the exception of Robot Performance (which any team may receive based on the points they earn), **teams may only win 1 Core Award per tournament.**

### REMINDER

*The FIRST® in FIRST® LEGO® League stands for "For Inspiration and Recognition of Science and Technology."*

Judges must consider how to recognize the best set of award candidates. Sometimes this means an award may not go to the individual team with the highest ranking in a category if that team is being recognized with another award. For example, if a team receives the Teamwork Award they will not receive the Presentation Award even if they were initially ranked highest for Presentation. They will receive the award in the area where they excelled the most.

The goal of the *FIRST* LEGO League deliberations process is to recognize the entire field of teams in the most appropriate way possible, to celebrate the achievements of **all** teams.





## Awards Structure

The **Champion's Award** is the most prestigious award that a team can win at an official *FIRST* LEGO League event. It celebrates the ultimate success of the *FIRST* mission. Core Values, Project, and Robot Design are considered equally important for this award. In addition, teams must earn Robot Game scores in the top 40% of teams at the tournament to be considered for the Champion's Award.

### FIND ONLINE

*The full list of awards and their descriptions can be found in the Judging & Awards section of [www.firstlegoleague.org](http://www.firstlegoleague.org).*

The remaining awards fall into 3 categories:

- ▲ **Core Awards:** recognize teams in areas we consider “core” to our mission.
- ▲ **Special Recognition Awards:** honor the service of individuals who support *FIRST* LEGO League and our teams in an exceptional way. A team may win a Special Recognition Award even if they have also won a Core Award.
  - Championship events may nominate a team or teams for the Global Innovation Award. Or, a region may have a separate process to identify its nominee(s). The final selection process for this award happens outside of the competition season.
- ▲ **Optional Awards:** recognize the most remarkable teams for which a standard award does not exist. These may take the form of Judges Awards or a separate local award with criteria established by an individual tournament organizer.

The selection of awards offered at tournaments may vary by event size and type, so please contact your local organizer if you have questions about the specific awards available at your Tournament.



# Awards Eligibility

Teams work extremely hard over the course of a season, and after so much effort, the last thing anyone wants is for a team to be ineligible for tournament awards. Doing well on the rubrics and achieving a high score in the Robot Game are important for winning awards, but they are not the only factors. Your team also needs to follow the *FIRST* LEGO League rules and policies to be eligible for awards.

As the Coach, make sure your team and everyone associated with your team understand policies that may impact award eligibility. If you need clarification, the time to ask questions is **before** an event. Once on site, all decisions impacting award eligibility are determined by the local Judge Advisor and/or event organizer. Just like decisions made by the Head Referee at the table, their authority is final.

## Adult Intervention

It is easy for anyone to get caught up in the excitement at tournaments, but they are the team's opportunity to shine. Adults play an important role in Coaching and supporting the team, but the team's robot and Project must be the work of team members. If Judges or Referees notice adults directing a team's performance, cuing the team, or prompting children, they may ask the adult to leave the immediate area.

Judges are trained both to give any benefit of the doubt to the team and to recognize an overabundance of adult participation. A team's inability to answer questions, or to make robot adjustments without the direct assistance of an adult, will be evident and will impact award eligibility.



### REMINDER

*Most team members understand the importance of Gracious Professionalism® and exhibit it consistently. This is part of what makes FIRST LEGO League events so special. We also expect Coaches, Mentors, parents and other family members to model good behavior and Gracious Professionalism® at all times.*

## Other Rules to Keep in Mind

As relayed throughout this Coaches' Handbook and other materials, there are a number of award eligibility requirements that teams must meet. We have listed some of them here:

- ▲ *FIRST* LEGO League teams may include **up to** 10 children. No team member may exceed the maximum allowed age in your region. See [Chapter 2](#) for details.
- ▲ Teams are only eligible to win awards and advancement at the **first** official Qualifier or tournament they attend each season. Teams who have the opportunity to attend multiple Qualifiers for fun cannot win additional awards or receive multiple chances to advance to a Regional or Championship. Please contact your Partner with any questions about how this works in your region.

- ▲ Teams must participate in all elements of an *FIRST* LEGO League competition to be eligible for any Core Award. This includes Core Values, Project, and Robot Design judging, as well as Robot Performance matches.
- ▲ All team members present at an event are expected to participate in all judged sessions, in addition to showing up as a team for the robot matches.
- ▲ For Core Values award eligibility, teams (including Coaches, Mentors, parents and others associated with the team) must uphold and display *FIRST* LEGO League Core Values throughout the event. Serious Core Values issues may result in a team being disqualified from all awards.
- ▲ For Robot Performance and Robot Design award eligibility, the robot must be built in accordance with all allowable parts, software, and other rules.
- ▲ For Project award eligibility, teams must demonstrate completion of all 3 steps of the Project process (identify a problem, develop an innovative solution, and share results) as part of their presentation, and fulfill any other Project requirements as defined in the annual Challenge documents.

### JUDGING QUESTIONS?

Check the Judging FAQ on [www.firstlegoleague.org](http://www.firstlegoleague.org)

Email other judging questions to [filljudge@firstinspires.org](mailto:filljudge@firstinspires.org)



### COACH-TO-COACH

**Remember:** *What we discover is more important than what we win!*

*If your team doesn't win an award, make sure you stay positive and continue to model the Core Values. If you take the attitude that "we got robbed!" then your team may adopt this attitude too. FIRST LEGO League is about an entire season, not just 1 day.*

*Talk to your team about this before the tournament, but also be prepared to address it at the event. Have some examples ready of things your team accomplished. It might not make the children feel better right away, but the worst possible outcome is for your team to walk away feeling like their hard work was "all for nothing." Take the time to help them see the benefits they got from the season, and start talking about how they are going to do even better next year!*

9

## Celebrate Your Season



# 9

## Celebrate Your Season

Acknowledging and celebrating your team's accomplishments, both individual and collective, is essential. Even if the team didn't reach all its goals, they have accomplished a lot and the members should be proud. Perhaps the team created a unique Project presentation, designed and programmed a robot to perform a task autonomously, or learned how to work together. Celebrate these and their many other accomplishments!

### Celebrations

There are many ways to celebrate. While most teams enjoy attending a tournament, this is just 1 way of celebrating. Whether you use the following suggestions or your team comes up with its own ideas, it is important to celebrate together. Be sure to include a plan for celebrating in your season's schedule.

### ***Acknowledge Each Team Member***

Be sure to make some time for each team member. Tell each child how he or she contributed to the team. Talk about the great ideas each team member had, the problems solved, the way each supported teammates, and the things learned during the season.



As an end-of-the-season teamwork exercise, ask your team to write down what each member contributed. Then present to each child a certificate showing the contributions that other team members cited. Or ask the children to review the list of Core Values and choose the 1 that best describes each team member. One might receive a *Gracious Professionalism*® award, and another might receive the Spirit of Friendly Competition award. This is a great way for members to understand that their contributions to the team are greater than the tasks that each performed. You can find special certificates with the season's logo in the Resource Library on the *FIRST*® LEGO® League website at [www.firstinspires.org](http://www.firstinspires.org).

## Salute the Group

Plan a team celebration. Organize a pizza party or potluck dinner. Invite family and friends to see what your team has accomplished. The team can display its Project, demonstrate its robot, and showcase team mementos, scrapbooks, and photos. This can be an opportunity to hand out the certificates you create that acknowledge each team member's contributions.

## Applaud Your Sponsors, Mentors, Volunteers, and Host Site

Be sure your team recognizes the contributions of Mentors, Sponsors, Volunteers, and your host site. The team can give a personal thank-you gift of a team or robot photograph, framed season certificate, or personal thank-you letters recognizing the special talents or contributions of each.

If your team wants to give a gift with a *FIRST*® logo, access the *FIRST* online store from [www.firstinspires.org](http://www.firstinspires.org). There are clothing, awards, and other customized items available.

Your Challenge Set will include special tiles for teams to recognize their Coaches. We encourage teams to build their Coaches something special to commemorate *their* contributions to the season.



### TIP

Certificate templates to recognize your team members will be available for download in the Resource Library.  
([www.firstinspires.org/resource-library/fll/hydro-dynamics-challenge-updates-and-resources](http://www.firstinspires.org/resource-library/fll/hydro-dynamics-challenge-updates-and-resources))

# Extend Your Season

## *Host an Unofficial (Community) Event*

Your team can host an unofficial tournament in the off-season and invite other teams in the area to attend. These events do not allow teams to qualify for your region's Championship tournament, but they are a great way for teams to demonstrate their talents and share their knowledge in a low-pressure environment. The children enjoy the opportunity to see what others have done and be recognized for their unique results.

Feel free to customize your local event to suit your team's needs and resources. Include special robot challenges, teamwork activities, mini projects, and other special components your team develops. Local events do not have to be expensive to host and you can be as creative as you like. Encourage parents and guardians to become planning members for the event. Whatever your team chooses to do, let other participating teams know what they can expect and how they might be able to help.

## *Participate in Online Contests and Challenges*

Watch your team email blasts for information about contests and Challenges throughout the season. Some of these are hosted by *FIRST* LEGO League, *FIRST*, LEGO Education or *FIRST* LEGO League Global Sponsors. You may have the chance to win prizes for your team.

## *Graduate to Other FIRST Programs*

All *FIRST* LEGO League team members grow up eventually, so it is never too early to start thinking about the next step. The *FIRST* progression of programs spans from 6 years old through high school, so your team will have the opportunity to continue participating with *FIRST* even after they graduate from *FIRST* LEGO League.

You may want to consider attending a *FIRST*® Tech Challenge or *FIRST*® Robotics Competition event in your area. Many occur after the *FIRST* LEGO League tournament season, and they will give your team a great taste of the *FIRST* experience for older students.

To learn more about our programs for older students and search for events in your area, visit the *FIRST* website at [www.firstinspires.org](http://www.firstinspires.org).

# Pat Yourself on the Back

You have been the team's foundation: juggling schedules, providing structure, encouraging everyone's participation, facilitating decision-making, and praising each team member's efforts. In addition, you have negotiated, guided, listened, cajoled, and maybe even consoled. After committing endless hours and significant energy to guiding and managing your team, you deserve a "pat on the back."



Your team had an amazing experience  
with science, engineering,  
inventing, and teamwork because  
**you** made it possible.

**THANK YOU!**



APPENDIX

# A

## Money Management



# Money Management

## Budgeting

Money management is important for every team. Whether your team is supported by a school or organization, or you are self-funded, you are going to have expenses. That means that you will need a system to manage the money you have coming in and the expenses you have going out. We have compiled a few tips from experienced Coaches to help you navigate this process.

### FIND ONLINE

Watch the FIRST fundraising toolkit videos for tips on funding your season at [www.firstinspires.org](http://www.firstinspires.org).

1. **Write a budget.** Every team should write a budget. It should not be long, and it does not need to be complicated, but it should include anything you think your team will need. Write out each big item you will need along with the cost. Also include at least 1 line for other miscellaneous expenses. Even if you only use that extra money for snacks, you will be glad that it was available.

Many teams use a simple spreadsheet to track fundraising and expenses. However, the most important thing is that you write your budget down! Even if it is just on a piece of paper that you can photocopy and hand out to the other adults who will help you, writing down your budget will help you see where you stand and what still needs to be done to meet the team's needs. It will also help you track your progress as you raise money or decide how far you can travel for a tournament.

If your team receives donations from parents, local businesses, or other donors, tracking your budget carefully will allow you to show your donors that you used their money wisely. This may even help you earn their support again next year.

2. **Raise money.** Most teams use fundraising to pay for some or all of their team expenses. You can find some fundraising suggestions on the following pages.

No matter what fundraising method you use, your team will need a responsible adult to collect the money you raise.

If you approach a local business to support your team, you may find that some of them will only donate to officially recognized non-profit organizations. They may ask you for a tax ID number. Teams are not covered by the *FIRST*® 501(c)(3) tax status, so some teams have chosen to set up their own non-profit organization to handle their finances. However, this can be a complicated and expensive process.

If you have any connection to a school or local non-profit, we strongly recommend that you talk to them about your dilemma and request their support with your fundraising efforts. If they are willing to accept donations on behalf of your team, this might make new sources of funding available to you. Just make sure you define the arrangement in writing so that both sides understand how the donations will be handled and how your team will receive the money.

- 3. **Deposit incoming funds.** If your team is handling its own expenses, you will need a way to deposit the money you collect. Many banks and credit unions offer “club” accounts designed for clubs and school groups. You can contact your local bank(s) to find out if they offer these accounts and what requirements they have. Do not be afraid to try a few different banks, because they may offer different options.

Some banks may require you to provide an employer or tax ID number to open a team account. Teams are not covered by the *FIRST* 501(c)(3) tax status, so you will need to work with your school, sponsors, or a local non-profit to obtain a tax number if you need it (see number 2 above).

Some teams have a Coach or parent Volunteer who deposits the funds into their personal bank account and writes checks for the team as needed. If you choose this route, just keep careful track of the budget to ensure that any surplus either gets returned to the donors or used on team activities.

- 4. **Pay bills.** Your team will need to pay for expenses such as team registration, tournament registration fees, a new Challenge Set each year, travel to and from your tournament(s), and other miscellaneous supplies (such as markers, poster board, and snacks).

You might purchase materials from local stores, catalogs, or online, so it may be helpful for your team to have more than 1 method of payment available. If you set up a club account at a local bank, they should offer you a checkbook and possibly a debit or credit card that will draw money from the account. If you have a Coach or parent handling the money through their own bank account or in cash, they will need to make the payments and track the team spending.

## Fundraising Ideas

Pick a fundraiser that is appropriate for your team and your community. Make it fun. The more fun you have holding the fundraiser, the more donors will want to be a part of that excitement.

When raising money for your team, be sure to ask community groups to support you in any way they can. Think of fundraising ideas that don't require additional Volunteers or a big time commitment. A number of major retail franchises match money raised at their locations, while others offer community groups free or discounted products. Be sure to call local businesses and ask them what they might do to help you. Every little bit you raise is helpful!



Some fundraising ideas include:

- ▲ Bake sale or car wash.
- ▲ Raffle items donated by parents or local businesses.
- ▲ Write letters or proposals to foundations that support youth programs.
- ▲ Sell balloons for \$5 each. Some contain donated gift certificates; others have a thank-you note from the team.
- ▲ Organize a reverse raffle. Guests receive a raffle envelope with an assignment inside. They have to sing a song — or buy their way out of it! They pay twice as much to assign the task to another attendee.
- ▲ Kiss the pig. Recruit a few Volunteers at a school or community gathering. Put out jars with each Volunteer's name. Attendees put money in the jar of their choice. The person whose name is on the jar with the most money kisses a pig, frog, or silly object of your choice at the end of the event.

Remember, how your team handles its money is up to your team. *FIRST*® *LEGO*® League does not regulate how teams raise or spend money. However, we recommend keeping it as simple as possible. Although your team will probably need to spend some time raising and spending money, keep the main focus of your team's activities where it belongs — on completing the Challenge and having fun!

## Sample Schedule





# B

## Sample Schedule

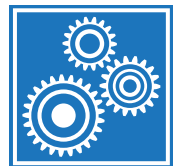
These week-by-week milestones are only a guide. If this is your first year, you may find that your team needs a little more time to get acquainted with the robot set or to find useful Project resources. Just make sure you set some reasonable goals and then reassess as you go along. Having goals will help to keep your team focused even if you need to adjust the goals later.

### *Before the Challenge is Released (if possible)*

- ▲ Review the **FIRST® LEGO® League Core Values** as a team.
- ▲ Choose a team name.
- ▲ **Robot Game**
  - Open your robot set and have team members try building some sample robots.
  - Have your programming team begin working through the tutorials in the LEGO® MINDSTORMS® software.
  - Have team members try to program a simple robot to perform some practice tasks (like moving forward and backward, turning, or climbing a small obstacle).
- ▲ **Project**
  - Have your team watch Project How-to videos on our YouTube channel at [youtube.com/fllglobal](https://youtube.com/fllglobal).
  - Have your team begin researching the general theme of this year's Challenge.
- ▲ As a team, learn about some careers in the field of this year's Challenge.



CORE VALUES



ROBOT GAME



PROJECT

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## WEEK 1

- ▲ Start with team-building exercises.
- ▲ Review the **Core Values** as a team (it never hurts to repeat this!).
- ▲ Review all the team member roles and responsibilities (it is OK if these change over time).
- ▲ Brainstorm team goals and create a season calendar.
- ▲ Download and review the Challenge document and Challenge Guide from [www.firstlegoleague.org](http://www.firstlegoleague.org).
- ▲ **Robot Game**
  - Read the **Robot Game** information (from the Challenge document) with your team. Work together to understand the requirements.
  - Begin constructing the Mission Models from the instructions found on [www.firstlegoleague.org](http://www.firstlegoleague.org). These release **August 1**.
- ▲ **Project**
  - Read the **Project** description (from the Challenge document) with your team. Work together to understand all the steps your team must complete.
  - Have team members share what they know about the Challenge theme.
  - Brainstorm sources to research, possible field trips, or professionals your team could contact.
- ▲ Visit the Judging and Awards page on [www.firstlegoleague.org](http://www.firstlegoleague.org) to download the Rubrics and list of awards offered at tournaments.

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## WEEK 2

- ▲ Check the Challenge Updates and Judging FAQ on [www.firstlegoleague.org](http://www.firstlegoleague.org).
- ▲ **Robot Game**
  - Finish building the Mission Models.
  - Set up your mission mat to create your practice field.
  - Brainstorm possible Mission strategies.
  - Experiment with different chassis designs and simple programming tasks.
- ▲ **Project**
  - Discuss what each team member has learned about the **Project** topic.
  - Select a specific problem to focus on and begin researching existing solutions to that problem.
  - Ask team members to assign themselves research to do at the library, on the internet, or other places before the next meeting.
  - Plan a field trip or a phone call with a professional in the field of this year's Challenge.



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## WEEK 3

- ▲ Check the Challenge Updates and Judging FAQ on [www.firstlegoleague.org](http://www.firstlegoleague.org).
- ▲ Talk about how well your team is displaying the **Core Values** at practices and beyond. Review any **Core Values** that might need a little work.
- ▲ **Robot Game**
  - Design and program the robot to perform the 2 Missions that the team considers the easiest.
  - Test, redesign, and repeat.
  - Consider robot designs and strategies for expansion to other Missions.
  - Save copies and backup programs.
- ▲ **Project**
  - Share team member research on the selected problem, existing solutions, and the results of any professionals contacted by the team.
  - Focus on your team's problem and brainstorm some innovative solutions.

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## WEEK 4

- ▲ Check the Challenge Updates and Judging FAQ on [www.firstlegoleague.org](http://www.firstlegoleague.org).
- ▲ **Robot Game**
  - Design and program the robot to consistently achieve at least 50% of your team's **Robot Game** goals. (Not 50% of the missions – just 50% of your team's goals!)
  - Save copies and backup programs.
- ▲ **Project**
  - Select an innovative solution for your team's problem and begin researching what technology, materials, or expertise would be required to make it a reality.
  - Brainstorm how your team can share their findings with others who could benefit from their solution.

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## WEEK 5

- ▲ Check the Challenge Updates and Judging FAQ on [www.firstlegoleague.org](http://www.firstlegoleague.org).
- ▲ Reassess team goals based on how long you have before you attend your first tournament. Do you need to increase or decrease what your team hopes to accomplish?
- ▲ **Robot Game**
  - Have some team members act as quality control. They should check that all team strategies meet the rules and achieve the team's point goals.

- Try to meet 75% of the team's robot-related goals.
- Begin working on a short introduction to your team's robot for the Robot Design Judges at your tournament.

### ▲ **Project**

- Determine what would be needed to make your team's solution a reality.
- Have team members prepare a presentation to share your team's Project with people who could benefit from the solution.
- Brainstorm creative ways your team can present their Project to the Judges at a tournament. This presentation will probably be slightly different than sharing with people who might benefit from the solution.

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## WEEK 6

- ▲ Check the Challenge Updates and Judging FAQ on [www.firstlegoleague.org](http://www.firstlegoleague.org).

- ▲ Talk about how your team has displayed the **Core Values** throughout the season. Ask team members to talk about specific examples they could share with the Judges.

### ▲ **Robot Game**

- Try to meet 75% of the team's goals consistently while working on the remaining goals.
- Have team members test the robot in different lighting conditions in case the lighting is different at the tournament.
- Save copies and backup programs.

### ▲ **Project**

- Have team members write and practice their tournament presentation.

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## WEEK 7

- ▲ Check the Challenge Updates and Judging FAQ on [www.firstlegoleague.org](http://www.firstlegoleague.org).

- ▲ As a team, make final adjustments to your goals so that you know what you need to achieve in the last weeks.

- ▲ Discuss expectations for your tournament. Remember, even the tournament experience is about discovery and fun!

### ▲ **Robot Game**

- Try to meet 100% of robot-related goals most of the time.
- Run timed practice matches.

### ▲ **Project**

- Share your team's Project with people who could benefit.
- Hold practice tournament presentations with a timer. Make sure team members can set up and present in 5 minutes with no adult help.

- Double check that the presentation addresses everything listed on the **Project** Rubric.
- Have team members practice answering questions about their problem and solution.

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## WEEK 8

- ▲ Check the Challenge Updates and Judging FAQ on [www.firstlegoleague.org](http://www.firstlegoleague.org).
- ▲ Review the Rubrics one last time to make sure the team understands how they will be judged in all areas of the tournament.
- ▲ **Core Values**
  - Review your tournament's **Core Values** judging method with the team.
  - Remind team members to display the **Core Values** at all times while attending a tournament.
- ▲ **Robot Game**
  - Fine tune the robot's design and programming.
  - Make sure the robot can meet all goals consistently.
- ▲ **Project**
  - Make sure the team is comfortable with their presentation and that they can consistently set up and present in **5 minutes**.
- ▲ Hold a dress rehearsal of all aspects of a Tournament with volunteer "Judges":
  - Timed matches for the **Robot Game**.
  - **Robot** Design Judging session.
  - **Project** presentation.
  - **Core Values** Judging session.

APPENDIX

C

## New This Edition



# New This Edition

- ▲ The product formerly known as the Field Setup Kit is now referred to as the Challenge Set.
- ▲ Coaching for the first time? Register for *FIRST* Steps ([info.firstinspires.org/flfirststepsrequest](http://info.firstinspires.org/flfirststepsrequest)) to help guide you through your season.
- ▲ New tips are found throughout this handbook.
- ▲ Challenge release and Mission Model Building Instruction release dates are specified.
- ▲ Fundraising toolkit videos are available at [www.firstinspires.org](http://www.firstinspires.org) to help teams plan to fund their season.
- ▲ Coach tip videos are available on the *FIRST*® LEGO® League YouTube channel. ([www.youtube.com/user/FLLGlobal](http://www.youtube.com/user/FLLGlobal))
- ▲ *FIRST* is launching a Pinterest account for more team-to-team interaction and sharing of ideas. ([www.pinterest.com/firstinspires/](http://www.pinterest.com/firstinspires/))
- ▲ Revised sample questions to ask your tournament organizer. ([Chapter 7](#))

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**I**n 1998, *FIRST*® Founder Dean Kamen and The LEGO® Group's Kjeld Kirk Kristiansen joined forces to create *FIRST*® LEGO® League, a powerful program that engages children in playful and meaningful learning while helping them discover the fun in science and technology through the *FIRST* experience.

Dean and Kjeld have a shared belief that *FIRST* LEGO League inspires teams to research, build, and experiment. By doing so, they live the entire process of creating ideas, solving problems, and overcoming obstacles, while gaining confidence in their abilities to use technology in positive ways.



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