



FLL TEAM HANDBOOK

The FLL team manual provides the coach with a lot of information about FLL and helps the coach to prepare the team for the FLL season. It is very important that the FLL coach reads the team manual and circulates the information to the team members.

FIRST LEGO League Central Europe (A, BG, CH, CZ, D, H, PL, SK)



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1. The FLL Challenge

Each September, we provide FLL teams with an annual Challenge. The Challenge is based on a set of real-world problems facing scientists and engineers today. It has two main parts: the Robot Game and the Research Project.

In the Robot Game, teams design, build, program, and test autonomous robots that must perform a series of tasks or missions. In the Research Project, teams conduct research to identify a real world problem in the field of the Challenge theme, and create an innovative solution and share their findings in their community.

For roughly eight weeks the FLL Teams are working on the missions of the Robot-Game and the presentation of the Research Project. Each team is guided by at least one adult coach. They then compete in Regional Tournaments where they celebrate their accomplishments with other FLL teams.



2. BUILDING A TEAM

The children need the coach to give them guidance and provide structure, encouragement, and most of all, a fun experience.

Teams require at least one adult coach. As a coach, you must be 18 years or older. It requires no special skill, just patience, dedication, and a willingness to learn alongside the team. You will need to direct the process the team follows to solve the Challenge without providing the solution yourself. In case you do not have any knowledge of the programming environment and LEGO robot building we encourage you to enlist the support of a technology mentor for additional assistance.

2.1 Advise for Coaches

Don't take this too seriously! We want you to enjoy the experience. Our goal is for you to help the children have fun with robots while they get comfortable with technology and learn something about a real-world problem. Whether or not your team scores high marks at a competition, team members win just for participating.

2.2 The Children, the Mentors and the Parents

The Children

A FLL team consists of five to ten children, ages 10 to 16. A child cannot be older than 16 and younger than 10 on 3rd September of the year the Challenge is announced.

The Mentors

A mentor is any person who works with the team in his area of expertise.

The Parents

Parents of team members should be called upon to help. Their cooperation and support are invaluable. They can help with fundraising, logistics, team building, mentoring, opening their homes for a team meeting or they support with coordinating the team's travel arrangements.

2.3 Team Size & Age Variation

Team Size

There are advantages and disadvantages to any team size. Some coaches believe small teams may concentrate better, work as a unit more easily, and provide team members with more opportunities for attention from the coach or mentors. Other coaches believe that larger teams have an advantage because they share the workload and can break into sub-teams to work on tasks. Breaking larger teams into smaller workgroups works well with this age group as it encourages collaboration.

Age Variations

Depending on the age and development of the team members, you may see two distinct developmental phases with mixed-age teams. Younger children often want to take apart and completely rebuild a robot that isn't working, while older children will often want to stick with the current design and alter it. When working together, the two groups may frustrate each other. Neither method is right or wrong; the children are just at different developmental stages.

For **team members 11 years of age and younger**, you and the mentors may consider:

- Presenting problems or explanations visually or with hands-on examples.
- Allowing the students for time to understand the game and missions through manipulating and testing repeatedly.

For **team members older than 11 years**, you and the mentors may want to:

- Create a structure that encourages crazier, out of the box ideas.
- Provide older team members leadership opportunities, such as explaining ideas and the next steps to the rest of the team.

2.4 Time Commitment

FLL teams meet for as little as one hour to up to ten hours a week. The time commitment will vary due to your coaching experience and your team's dynamics. It is up to you and the team to decide what your meeting schedule should be. A rookie team typically needs to meet more often than a veteran team. We suggest starting with two meetings per week that are two hours long, and adding or subtracting time as your team's needs indicate. As the coach, you may need additional time each week to prepare for team meetings.

2.5 Roles and Responsibilities: The Coach & the Team

The Coach

FLL defines children doing the work, as children making all critical decisions in the robot-building, programming, project development and presentation.

This does not mean you should stand idly by while your team struggles with the Challenge. You must be involved, but you cannot be involved in a direct way. Instead of telling the team what to do you could ask the team to brainstorm ideas.

A successful FLL coach controls the process, not the content. One useful coaching method is to reply to a question with another carefully considered question. You are the liaison between team members, mentors, parents, and volunteers.

The Team

Discuss responsibilities with the whole team. Team members will usually have ideas about what they want to do: programming, building, research, marketing, etc. Be mindful of those who avoid certain tasks. Remind the children often about the importance of collaboration and teamwork. Encourage team members to push the limits of their own comfort level and make sure everyone understands or does more than one job. 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.

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

Some children may want to be involved in multiple roles. Do whatever works best for your team, but ensure balanced leadership.

- Research: Gather information about the Challenge theme, related real-world problems and existing solutions. Invite professionals to share their knowledge with the team.
- Presenting: Prepare the project presentation. Design a creative way to show the judges your team's work on the Challenge Project.
- Building: Make decisions about the robot building.
- Programming: Make decisions about programming.
- Strategy Analysis: Analyze the robot playing field and formulate various methods for accomplishing the missions.
- Robot Operators: Operate the robot at a tournament. Two robot operators are permitted at the playing field at any given time.
- Marketing: Design and create the team logo. Write a press release and contact the local media, surrounding schools.
- Fundraising: Think of ways to raise money for the team.

2.6 Team Goals

An early step in preparing for the tournament should be to set goals for the season with your team and to put them on paper. The true goals of FLL have nothing to do with winning medals or trophies. The most important goal that should be reached is: We had fun learning new things!

3. BUILDING A SEASON

Long before the September Kickoff, we announce the theme using a teaser posted on the FLL website (www.hands-on-technology.de/en/firstlegoleague). Take some time with your team to review the teaser. Brainstorm ideas about the new theme and associated real-world problems. You will need to wait until Kickoff to learn the specifics of each year's Challenge assignment but this is helpful groundwork.

Newcomer Tip: Check out past FLL Challenges on the FLL website

3.1 Choosing a Facility

You need a computer, with internet access. This is necessary for viewing the FLL Documents, accessing the website, keeping up to date on the Robot Game Q&A, conducting research for the project and developing programs for the robot.

The FLL website www.hands-on-technology.de/en/firstlegoleague provides a lot of information regarding the tournament throughout the whole year.

Figure out where to host team meetings. Mind the size of the playing field. (point 4.1 & 4.2).



3.2 Challenge Kickoff Meeting

The Kickoff date for the FLL season is in early September. Be sure to check the FLL website www.hands-on-technology.de/en/firstlegoleague for details. At Kickoff, you can access all materials related to the new Challenge. Your team can download the materials together and come up with a game plan for the new season!

3.3 Early Season Meetings

Use the following list of suggestions to help organize your team meetings at the beginning of the season.

- With the FLL Challenge Set you receive a CD with the mission model building instructions. Have the children build the models, and then place the models on the playing field in the appropriate positions.
- After your initial robot brainstorming sessions, the team may have several concepts for the chassis as well as various attachments. Sub-teams can either design or make a prototype during the next few meetings. This allows them to test multiple ideas in a shorter time, than incorporate the best parts of each prototype to make the final robot.
- Brainstorm a variety of sources for researching ideas for this year's Challenge theme, including field trip sites and professionals to invite as guest speakers. Have the children bring ideas on whom to contact to an early meeting. 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 e-mail or phone instead.

3.4 Supportive Learning Environments

Once the Challenge is unveiled, the children will often drive the goals of the team. This is perfectly acceptable and gives you a chance to step back and watch their progress. Encourage the children to brainstorm. It's an important part of a team's planning process, brings out creative ideas and produces better solutions. When you lead discussions or make suggestions, give choices to the team members. Facilitate the process the team follows to reach its goal, but allow choices within that process. Everyone's voice must be heard, and all ideas listened to with a patient and open mind.

Part of your role is to listen to team members and keep lines of communication open. While you may not be able to use every idea or suggestion, hear them out. Clear expression of an idea and convincing others is a great learning experience. Be aware of verbal and non-verbal cues and interpret the conversation to help the team work through communication difficulties.

3.5 Group Awareness

The coach must be aware of and help regulate group dynamics. Be conscious of personalities and interactions between team members. If a dispute arises, help the team resolve it and then re-focus everyone on a productive task. Effective coaches use the similarities and differences of team members as assets to help the team get work done.

4. MATERIALS & MECHANICS

4.1 FLL Challenge Set

The FLL Challenge Set includes:

- LEGO elements mission models (to be built up by the team)
- A CD with the mission models' building instructions
- Field mat: a roll-out mat (237cm x 115 cm)
- Sheet of 3M Dual Lock fastener for attaching LEGO models to the mat

4.2 Playing field

The playing field mat can be put on the floor, on plywood or on an FLL tournament table. Building instructions for the FLL Tournament are downloadable at:

www.hands-on-technology.de/en/firstlegoleague.

Since 2009 lighting of the tournament table is not obligatory. There is no way to ensure that

your lighting will be the same as the lighting at a tournament, and no way to ensure that the lighting at one tournament will be the same as the lighting at another. Teams that use light sensors on their robots need to test in a variety of conditions and be prepared for changing lighting conditions. Regarding lighting at the tables and the exact measurements of the tournament tables at your FLL Regional Tournament, please ask your regional organizer.

4.3 FLL Robot Set Choices

Both LEGO Mindstorms RCX System and LEGO Mindstorms NXT System may be used. The details of the robot sets are included on the FLL website:
www.hands-on-technology.de/en/firstlegoleague.

4.4 Software

For the NXT, there is one software package that combines elements from RIS and ROBOLAB. There are two different types of software (RIS 2.0 and ROBOLAB 2.5.4) provided in your RCX. Additionally, ROBOLAB 2.9 may be purchased separately for use with either the RCX or NXT kit. All three packages allow you to program your LEGO brick in a drag-and-drop manner.

5. THE PROJECT

The FLL Challenge Topic changes every year. Teams have to research and work like real scientists.

5.1 Real World Problem

Your team will research the science underlying the challenge theme, identify a related problem that professionals face in the real world, investigate the problem, and explore existing solutions. It is critical not only to complete all steps in the assignment but also to communicate all aspects of a team's project to the judges.

5.2 Create an Innovative Solution

As a result of your team's investigation, they may come up with a number of unique solutions to the real world problem they identified. The next step is to agree on one innovative solution that will address the problem.

Innovative means the solution is not already in use by someone else. Instead, it is a new

idea or an improvement on an existing idea that your team develops based on their analysis of the problem and existing solutions. Your team needs to be able to show the panel of judges that their solution was well researched and thought out, as well as innovative.

Hint: Be sure to visit the Project Resources available on the FLL website (www.hands-on-technology.de/en/firstlegoleague) before starting your research. The list can provide helpful websites, publications, and experts in the field of the Challenge theme.

5.3 Share Your Research and Solution

In order to complete the third step of the project, the team needs to share its research and solution with the community. This can be an outside organization, their school or the public. Presenting this material allows the kids to showcase what they have achieved.

5.4 Prepare a Presentation

Be sure your team prepares a presentation about their project, which gives the information in a creative and thoughtful way. We have seen projects presented as songs, skits, radio broadcasts, TV interviews, poems, stories, dances and plays. Judging panels are always interested in unique presentations. Each team must find its own way to show cleverness and demonstrate its knowledge.

If your team needs special equipment, call the tournament organizers ahead of time to see if it will be available. If not, your team is responsible for bringing everything they need.

Reminder: Your team will have five minutes to present its project to a panel of judges. Be sure to rehearse and time the presentation beforehand.

6. THE TOURNAMENT

For many FLL teams, the tournament is the reward for all their hard work throughout the season. There are several types of FLL events. They all offer a fun and exciting way for teams to demonstrate the result of their efforts.

6.1 Qualification Mode

Regional tournaments, Semi Finals and the FLL Final Central Europe

The FLL season culminates from Regional tournaments, to Semi Finals and the FLL Final Central Europe.

A Regional tournament is run by a Regional Partner. From a Regional tournament teams advance to a Semi Final or directly to the FLL Final Central Europe. From the Regional

tournaments in Austria the Regional FLL Champion qualifies for the FLL Final Central Europe.

From the Regional tournaments in the Czech Republic, Germany, Hungary, Poland, Slovakia and Switzerland one to three teams (depending on the number of teams in the region) go to one of the 5 FLL Semi Finals (Germany East/West/Southwest, Switzerland and V4). From each of the Semi Finals the 3 best teams qualify for the FLL Final Central Europe.

FLL World Festival and the Open European Championship

From the FLL Final some teams advance to the FLL World Festival and the Open European Championship. The selection process for these Championships will change from year to year, depending on the number of spaces available and the number of teams participating in FLL.

Newcomer Teams

Participating in an FLL tournament is the best way for your team to learn! Even if your team doesn't complete as much as it wants to this season, take part in a competition anyway.

6.2 Tournament areas

Registration

The Pit

You may be assigned a specific location to set up your station when you register, but some events have areas that are first-come, first-served. Electricity is provided at the pit.

Practice Playing Field(s)

Tournaments provide access to a practice field where teams take turns running rounds. Please share the practice tables with other teams.

Competition Area

The competition area is where the official robot competition playing fields are located and rounds are scored by official referees. Two teams simultaneously demonstrate their robots, one on each side of a table made up of two playing fields. During each round a number of playing fields may be running rounds simultaneously.

Judging Rooms and Equipment

Judging for the technical awards, teamwork and the project generally, but not always, takes place in rooms separate from the rest of the competition.

Time Management

After you set up your pit station, review the day's schedule with your team members. Competition schedules are usually very tight, so it's important that you are ready and on time. Don't miss your round or judging sessions. If the schedule for the day does fall behind, the tournament organizer may juggle your team's interviews to accommodate the changes. Be flexible, and check in with the pit administration or at the registration table if you have questions about your schedule. As the coach, you will concentrate on getting to scheduled judging appointments and rounds on time.

Hint: By the time you run several rounds, perform for the technical judges, and make and test any programming changes, your batteries may be low. During the day, take every opportunity to check your batteries.

6.3 How the day works

The Opening Ceremony

At most tournaments, teams have about an hour for registration, setup, and time on the practice fields prior to the opening ceremony where judges, referees and special guests are introduced, the Challenge and scoring are explained. After the opening ceremony, teams not immediately scheduled for the competition rounds or a judging session should return to the pit to listen for queuing or prepare to meet with the judges.

Rounds

During the day, you typically get at least three rounds lasting 2½ minutes each at the competition tables. The organizers may pair you with the same team each round or mix up the pairings. When your round begins, have both robot operators move to the table while you get your team settled in the team seating/standing area. FLL expects tournaments to allow team members to rotate out during their rounds. If you rotate operators in and out between missions, make sure all operators are in place to change. Remember that the clock does not stop for your operators to change. Your robot operators should follow the table referee's instructions at the table. If the robot operators have a question about the table setup they should talk to the referee immediately.

Scoring Confirmation

At the end of the match, have the two robot operators witness the referee's scoring of the table. The team's only opportunity to confirm the score is after the referee has recorded the condition of the field at the end of the match. A team member, not an adult, must present any difference of opinion to the head referee. The referee will then confirm your final score. 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. When finished, collect all your robot parts.

FLL Judging

In addition to points scored during competition rounds, each team is judged on its robot design and programming, teamwork, and project presentation. Judges will ask questions, and team members need to articulate and demonstrate various aspects of their FLL experience during interviews and interactions with the judging panel. The focus is on the team members and their ability to express what they have learned.

Usually, teams meet with judges regarding specific awards for a designated time period of 10 to 15 minutes. Some judging is done by observing teams in action.

6.4 How Judging Works

At tournaments, FLL judges use a set of rubrics which represent qualities FLL considers important and useful for evaluating team performance. Judges also refer to a list of judging questions and may even add their own questions. The judges are volunteers, and they receive training from the local FLL Partner before the event.

Adult Intervention

Your role is to facilitate, and adult interference during the judging process is prohibited. By tournament day, your job as a coach is done, and your role is to support and encourage the team.

Technical Judging

During the tournament day, technical judges will interview your team. The judges want to talk to your team members about the robot they built and the programs they wrote. They want to see and hear about any unique solutions or techniques the team came up with to solve problems. The judges want to know about the design process and what the team considers the best and worst parts of the robot. They want to know what sensors were used and why the team chose them.

The evaluation is simply an interview, so you will not need any kind of presentation materials. We recommend that your team brings a print-out of its best programming, to leave with the judges. This gives the judges a sample of your team's work that they can reference during their judging deliberations.

Make sure the children can demonstrate the robot. Some tournaments have a table set up for this interview. If the team will be expected to run a mission on the Challenge field, pick a mission that is difficult and for which you have a good success rate. Finally, the judges may choose to visit teams in the pit and/or watch the competition rounds to further assess your team's robot capabilities.

Project Judging

Each team performs its project presentation before judges. When team members enter the room, they should ask the judges if they are ready for them to start setting up, then introduce

themselves before starting their presentation. After the presentation, there is usually a question and answer period with the judges.

The most common mistake in project presentations is exceeding the five-minute time limit. Judges will interrupt your team and stop the presentation when time expires.

Your team needs to make sure its presentation demonstrates that all three steps of the project were completed (identified a real-world problem, created an innovative solution and shared their findings with others). The judges can only evaluate what they hear. In other words, your team members must tell the judges how they shared their research, problem and solution with others during their presentation in order for the judges to credit them for doing it.

Reminder: Judges may see as many as 15 presentations in one day with short breaks between teams. Try to make your team's project presentation short, snappy, to the point, and memorable.

Teamwork Judging

Some people think teamwork judging sessions should consist of observing the team in action, and others think that a full question and answer session gives a better overview of their team's work for the entire season. FLL also allows a teamwork judging format where teams are asked to complete a hand on teamwork task for judges in a short period of time. There are advantages to all of these judging formats, and FLL allows all three types at the discretion of the tournament coordinators.

Awards Evaluation Process

During the end of the tournament, the judges fill in the allocated scores into a evaluation matrix. Automatically a ranking is compiled. The ranking as well as all scores will be published on the FLL website after the tournament.

If your team doesn't receive special recognition with an award, remind the children of all the success and achievement that they have experienced over the season. Not every team can win an award. FLL is about an entire season, not just one day.

6.5 The Closing Ceremony

Teams should return to the main competition area for the closing ceremony. Awards and medals are presented and teams are recognized for efforts demonstrated throughout the day. There is plenty of cheering, loud music, and smiling faces to end the tournament and celebrate the children's accomplishments.

7. AWARD & JUDGING CRITERIA

The awards given at tournaments represent the special achievements of particular teams, but the real achievement for FLL teams occurs during the course of the season. For this reason, every child who participates at an FLL Regional tournament receives a medal to signify the successful conclusion of an FLL Challenge Season.

7.1 FLL Awards List

At a FLL tournament the following awards will be handed out:

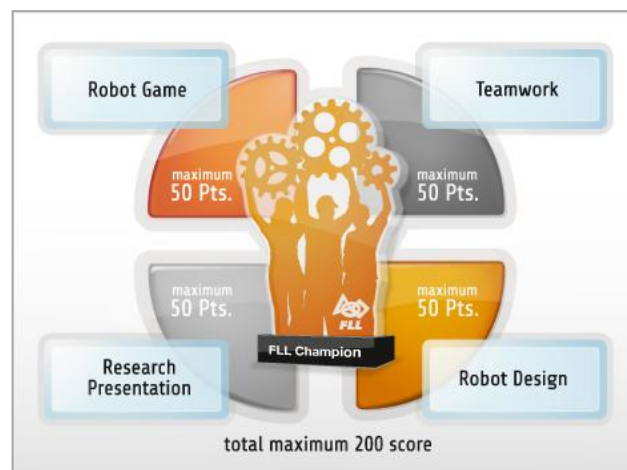
- FLL Champion Award
- Robot Design Award
- Robot Game Award
- Research Presentation Award
- Teamwork Award
- Newcomer or Endurance Award



Champion's Award

The FLL Champion is the highly renowned award honouring the four important elements of FLL (FIRST LEGO League). It celebrates the ultimate success of the FIRST mission and FLL values. The FLL Champion is evaluated by the following core categories: Robot Design, Teamwork, Research Presentations and appraisal of the Robot Game. Basis of the scoring of the Robot Game is the score of the best match from the **3 preliminary rounds** to give each team equal opportunities even if they do not qualify for the final rounds.

See scoring scheme:



Robot Design Award

If the design of the robot is innovative, robust and related to the program it has highest chances to get the Design Award. The price honours the robot fulfilling the criteria below best:

- Innovative Design: The team developed a special strategy or a creative design which helps to fulfill the missions in a innovative way.
- Robot Design: Here is honoured that the team was able to construct a solid, reliable and constant robot.
- Programming: This criterion contains not only comprehension and correct adaption of programming principles, but also a creative and efficient programming.

In the category "Best Robot Design" 50 points can be reached at the maximum. The points are determined on the basis of the FLL Evaluation Sheet "Best Robot Design" which is available for download at

<http://www.hands-on-technology.de/en/firstlegoleague/fllfacts/awards>.

Robot Game Award

Each team is running **3 preliminary rounds** in FLL Robot Game. Within each of these rounds the teams can collect points independent of other rounds. The highest of the 3 reached scores of a team will be counted and a ranking will be compiled from these points. The best teams will go on to quarter or semi final. In quarter and semifinal there is only one round. The reached points will be counted and a ranking will be compiled from that. The best two teams from semi final qualify for the Robot Game final, where two rounds are carried out. The reached points from both rounds will be summed up and the winner of the Robot Game is made up from this result: the team with the higher total result will win the award.

Research Presentation Award

On the tournament day every team is given the possibility to present the research results to a selected jury. The jury members want to make sure that more than one team member has worked on the research project.

In the category "Best Research Presentation" 50 points can be reached at the maximum. The points are determined on the basis of the FLL Evaluation Sheet "Research Presentation" which is available for download at

<http://www.hands-on-technology.de/en/firstlegoleague/fllfacts/awards>.

Teamwork Award

Teamwork is inevitable and an essential condition for every team that wants to succeed at FLL. The award honours the team with a maximum of enthusiasm, the best sporting spirit, remarkable respect to the own team members and the highest support and assistance towards other teams. This team gave proof of their ability to show: confidence, motivation and enthusiasm.

In the category "Best Teamwork" 50 points can be reached at the maximum. The points are

determined on the basis of the FLL Evaluation Sheet "Best Teamwork" which is available for download at

<http://www.hands-on-technology.de/en/firstlegoleague/fllfacts/awards>.

Endurance Award

If you do not give up, the trickiest situation is resolvable: come what may! The awarded team was able to cope with very tricky situations by improvising, adjusting, clearing an obstacle out of the way, still performing exceptionally.

Best Newcomer

If you do not give up, the trickiest situation is resolvable: come what may! The awarded team was able to cope with very tricky situations by improvising, adjusting, clearing an obstacle out of the way, still performing exceptionally.

Note: At FLL tournaments the organizer can decide either to grant the Endurance or the Newcomer Award.

7.2 Objective vs. Subjective

Team achievement in Robot Game is objectively determined by scores earned on the competition table. Team achievements in the other award categories are subjectively judged. We continue to improve tools and training for our judges, and the processes that FLL uses for judging yield strong, consistent results. However, the fact remains that judged awards are inherently subjective. For evaluating the categories, the judges use evaluation sheets that include all the different criteria important for the evaluation. Your team can have a look at the sheets of the different categories in advance. They are available at:

<http://www.hands-on-technology.de/en/firstlegoleague/fllfacts/awards>.



8. FLL COACH CHECKLIST

FLL Registration

- Register as a coach at the homepage <http://www.hands-on-technology.de/en/user/login/team.html> (if not done in the former season). You will receive login details for the FLL Coach area (user name and password).
- Register your team at our homepage. The registration starts 1st March 2011 and ends 23rd September 2011.
- Find a team name.
- Find out if you need a FLL Challenge Set, who will pay for it and where it needs to be shipped. Please note: the Challenge Set will only be shipped after payment. Attend vacations.
- Enter your team data until mid October the latest (names of the team members, dates of birth, sexes)

Before the Season Starts

- Find a meeting place and create a meeting schedule.
- Look at past challenges at the FLL website.
- Determine how the team will cover its costs and find sponsorship
- Purchase supplies, i.e., batteries, tackle boxes
- Find out where to build up the Challenge Set (respectively build FLL Tournament Table)

Team Logistics and Challenge Preparation

- Install software on computer(s).
- Build a practice robot.
- Write a simple programme, download to the robot, and test it.
- Publishing of the Challenge documents in the beginning of September: Read through the Robot Game rules and missions, the project and talk about it with your team.
- Brainstorm for Challenge solutions.
- Find a strategy with your team: which missions do you want to solve, etc.?
- Begin brainstorming and working on the project.
- Check the project's proceeding.
- Check Q&A page at least once a week.

Pre-tournament Preparation

- Have your team share their project research, problem and solution with others.
- Publicize your team and the event sponsor.
- Be sure you're up to date on the Q&A.

Tournament Logistics

- Go to the FLL website hands-on-technology.de/en/firstlegoleague for tournament information (schedule, directions, etc.).
- Pack robot and attachments, laptop with batteries and/or AC adaptor; Team banner, posters, or other paraphernalia.
- Print out of programs and robot specification page.
- Pack materials and equipment needed for project presentation.