FIRST® LEGO® LEAGUE 2011

FIRST® LEGO® League

Robot Design Judging Pre-Tournament Preparation Pack
Smaller Qualifying Tournament Edition

www.firstlegoleague.org

FLL 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 in everything we do.

We have fun.

10 Things to Know As an FLL Judge

Please be sure to check out www.firstlegoleague.org for additional information, including Judging and other official Q & A from throughout the season:

Robot Game Updates: http://firstlegoleague.org/media/twocol.aspx?id=268
Project FAQ: http://www.firstlegoleague.org/media/twocol.aspx?id=314
Judging Questions: flljudge@usfirst.org

Thank you for agreeing to be a judge with *FIRST*® LEGO® League. The information in this packet is designed to help you prepare as an FLL Judge this season. It is intended to offer background information that will be useful to review prior to your tournament. You should also participate in training sessions that may be offered through your local tournament organizer and/or FLL. We hope your experience as an FLL Judge is rewarding and enjoyable!

10. Have fun – you and the kids
The most important thing to know about an FLL tournament is that it is supposed to be **FUN**. The mission of *FIRST* is to get kids excited about science and technology. A competition is a celebration of what the children have accomplished throughout the season. It should be serious and competitive, but not so much that the fun is lost.

9. Exhibit Gracious Professionalism and honor FLL Core Values
These are the basic foundations of *FIRST* LEGO League, and should always be at the forefront in everyone's minds. We offer specific awards to recognize FLL Core Values excellence, but a significant concern can impact team eligibility in *any* award category.

8. Be a good role model for technology and engineering careers
Give the kids a chance to see what makes engineers, scientists, computer programmers and educators special. Share your experiences without sharing your agendas. Be professional – show the kids that what they have accomplished is appreciated and valuable. Show interest in their presentations and discussions, and be personable.

7. Respect the children
Please keep negative comments to yourself, away from the ears of the kids, parents, and coaches. All teams should be given the benefit of the doubt when questions arise about adult involvement. If you suspect the kids did not do the work, it is your job to probe further to prove it, rather than assuming that the kids did not do the work. Remember that these are kids who worked hard all season to make it to the tournament. Treat their accomplishments with respect, and be sure that other judges do so as well. One negative comment from a judge can have a devastating effect on teams. Make it your goal as a judge to ensure that the teams know what they did well, and that they have a positive experience showcasing their achievements.

6. Respect the judging process
Stay on schedule. The kids have a more challenging schedule than you do. Remember the FLL awards philosophy. Remember that the whole judging process is subjective. Concentrate on providing a great experience for the kids and try not to get caught up in the mechanics of the process. Do not share scores or awards discussions with the kids, coaches or parents.

5. Evaluate teams completely and fairly
Each rubric is designed to evaluate many areas of a team's performance, and gives equal weighting to several factors tied to specific awards. All Core Awards are of equal importance, except for our Champion's Award that recognizes all-around excellence. Be objective, both on a team-by-team basis and a total rubric evaluation basis. Familiarize yourself with the levels of achievement. Identify any conflicts of interest you have before the competition, and refrain from involving yourself in discussions about any team when you have a conflict.

4. Consider age appropriateness and experience
Consider age when evaluating teams. Certain skills, knowledge, and capabilities are more likely to be exhibited by the kids as they get older and more experienced in general and in FLL in particular. You may also see rookie teams that are more polished and understand FLL better than experienced teams.

3. Reward excellence and celebrate achievement
For a team to be considered for an award, they should be evaluated at an Exemplary level of achievement in that category whenever possible. Award distribution is spread as equitably as possible among the teams, with the goal of no team winning more than one judged award.

2. Provide specific and constructive feedback
Please be specific when providing feedback comments to teams. This will also help when it comes to awards deliberations – specific examples are very helpful when differentiating between teams. "This team's willingness to help other teams (by providing programming mentorship, for example) is exemplary" is more descriptive and helpful than "that team was so nice and polite and exhibited gracious professionalism." Take lots of notes if you need to!

1. See #1 again!

Robot Design Judging Primer

Robot Design judging in FLL can be compared to an engineering design review in the "real world". Design teams present their robots to panels tasked with selecting the robots that best meet the requirements (completion of missions) given constraints like size, parts usage and software. The natural inclination for engineers and technical people is to say, "There is an easy test to see which robots are best – the competition!" However, in FLL, and often in the "real world", decisions are made based on how well a team can explain their design and all the things they considered while developing it. The FLL Robot Design rubric represents a set of criteria that we feel are important "takeaways" from participating in the design of an FLL competition robot. They are analogous to evaluation criteria used when selecting between competing designs. Judges gather information about teams' mechanical design, programming and overall design process to evaluate a team and its robot.

As a judge, here are some overall things to consider:

- The Robot Design judging session is more about the team's ability to present the robot and all the thoughts and considerations that went into their final product than it is about its performance. The performance is covered under the Robot Performance Award. The judging session is the time for the judges to learn from the teams the design processes they used to make decisions and gain understanding; it also allows discussion so that judges can be sure that the teams did the work.
- You may ask teams to perform missions with their robot on the judging table. Give teams the benefit of the doubt should these missions not work successfully all the time. Judging tables and field setup kits are not usually built or maintained to the same standards as competition ones. There is also a tendency for Murphy's Law to rule in these sessions and for teams to be nervous and mistake prone when running missions in a judging setting.
- Teams may bring additional prototypes of their robot or attachments into a judging session. Sometimes these prototypes utilize additional electrical parts beyond those allowable in competition. Remember that electrical parts and software rules apply only to the robot used in the competition itself, and that extra parts or software used by teams to demonstrate designs are perfectly allowable.
- Simpler is usually better. Don't be overly impressed with complicated robots. The complication must be used for a purpose.
- Remember that this is an engineering challenge for autonomous robots. Small imperfections in the field, mission models and environmental variations must be considered by Accomplished and Exemplary teams.

Mechanical Design

Durability – The robot should be able to withstand the rigors of the competition, for example it should be able to contact walls or missions models without pieces falling off or breaking. Attachments should be similarly robust. Long arms that delicately grip a lever aren't very effective if they don't stay attached to the robot.

Mechanical Efficiency – Here the judges are looking for robot structures and attachments which show a judicious use of parts. For example, using six pins to tie two beams together is not as efficient as using one at each end. One note here: don't over penalize the teams for adding small bits of "flair" or pieces that are fun for them to use to express their creativity. Remember the Core Value "We have fun!"

Mechanization – Judges look here for how the robot moves and operates. They look to see whether the robot balances speed and power.

Programming

Just as with Mechanical Design, simplicity is desired when it comes to programs. Teams can develop amazing programs that aren't necessarily better than simple programs that perform the same purpose.

Programming Quality – The robot's programs should work consistently, producing the same results every time. Examples of quality code could include audible checks or a simplified menu system that teams use to make sure they are running the appropriate section of code for a particular mission. Be careful to attempt to assess how the robot's programs would operate independent of mechanical faults.

Programming Efficiency – The goal here is to encourage teams to develop code that is modular, portable and flexible, so that it can be used in multiple situations. This criterion also addresses readability and documentation of code, both of which are good programming practices.

Automation/Navigation – Autonomy in FLL means that the robot operates with minimal driver intervention. Retrieving a robot and taking a touch penalty may be part of an acceptable strategy for a team, but it is still driver intervention. So for this instance, a team might have an Accomplished Mission Strategy, but only score Developing for Automation. This criterion also doesn't distinguish between sensor use/feedback and mechanical feedback. For example, it is valid for a team to use an aligning jig in base followed by a robot using the wall or a mission model to align itself before activating an attachment. It is also just as valid for a team to use a light sensor to follow a line to the same mission model. Teams should try to avoid just using driver aiming, motor rotations and timing to navigate the field, as these methods often become unreliable under variations in field or environmental conditions. Remember that lack of sensors isn't necessarily a bad thing. Lack of Automation, however, should be considered.

Strategy & Innovation

Remember that Strategy and Innovation can be seen in Mechanical Design or Programming, as well as the integration of both.

Design Process – Accomplished teams move beyond a trial and error approach to robot improvements to utilize testing cycles where systematic processes are used. Frequently you will hear teams say, "We tried a lot of different things and this one was the best." You are looking for more details and more organization to their process than that for teams who are Accomplished or Exemplary.

Mission Strategy – This is fairly straightforward. Judges can ask teams, "What is your strategy to complete the missions?" and "How did you make decisions to support that strategy when designing your robot?"

Innovation – This is often a hard area for judges to judge. Things to be on the lookout for here include creativity, uniqueness, a cool attachment or programming trick, or something similar. Most competitions will have one or more robots that will have some feature that captures the judges' attention. Remember that Innovation implies added benefit, so make sure that the team can state the benefits of their cool feature.

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Robot Design
Small Qualifiers

Team Number
Judging Room

Directions: For each skill area, clearly mark the box that best describes the team's accomplishments. If the team does not demonstrate skill in a particular area, then put an 'X' in the first box for Not Demonstrated (ND). Please provide as many written comments as you can to acknowledge each team's hard work and to help teams improve.

Mechanical Design

	Beginning	Developing	Accomplished	Exemplary
Durability	Evidence of structural integrity; ability to withstand rigors of competition			
ND	quite fragile; breaks a lot	frequent or significant faults/repairs	rare faults/repairs	sound construction; no repairs
Mechanical Efficiency	Economic use of parts and time; easy to repair and modify			
ND	excessive parts or time to repair/modify	inefficient parts or time to repair/modify	appropriate use of parts and time to repair/modify	streamlined use of parts and time to repair/modify
Mechanization	Ability of robot mechanisms to move or act with appropriate speed, strength and accuracy for intended tasks (propulsion and execution)			
ND	imbalance of speed, strength and accuracy on most tasks	imbalance of speed, strength and accuracy on some tasks	appropriate balance of speed, strength and accuracy on most tasks	appropriate balance of speed, strength and accuracy on every task

Comments:

Programming

Programming Quality	Programs are appropriate for the intended purpose and would achieve consistent results, assuming no mechanical faults			
ND	would not achieve purpose AND would be inconsistent	would not achieve purpose OR would be inconsistent	should achieve purpose repeatedly	should achieve purpose every time
Programming Efficiency	Programs are modular, streamlined, and understandable			
ND	excessive code and difficult to understand	inefficient code and challenge to understand	appropriate code and easy to understand	streamlined code and easy for anyone to understand
Automation/Navigation	Ability of the robot to move or act as intended using mechanical and/or sensor feedback (with minimal reliance on driver intervention and/or program timing)			
ND	frequent driver intervention to aim AND retrieve robot	frequent driver intervention to aim OR retrieve robot	robot moves/acts as intended repeatedly w/ occasional driver intervention	robot moves/acts as intended every time with no driver intervention

Comments:

Strategy & Innovation

Design Process	Ability to develop and explain improvement cycles where alternatives are considered and narrowed, selections tested, designs improved (applies to programming as well as mechanical design)			
ND	disorganized AND poorly explained improvement cycles	disorganized OR poorly explained improvement cycles	systematic and well-explained improvement cycles	systematic, well-explained and well-documented improvement cycles
Mission Strategy	Ability to clearly define and describe the team's game strategy			
ND	no clear goals AND no clear strategy	no clear goals OR no clear strategy	clear strategy to accomplish the team's well defined goals	clear strategy to accomplish most/all game missions
Innovation	Creation of new, unique, or unexpected feature(s) (e.g. designs, programs, strategies or applications) that are beneficial in performing the specified tasks			
ND	original feature(s) with no added value or potential	original feature(s) with some added value or potential	original feature(s) with the potential to add significant	original feature(s) that add significant value

Comments:

What to Expect as a Judge

Day of the Event

Before Judging Sessions

- Meeting with the Judge Advisor to review
  - Event schedule
  - Judging procedures
  - Judging Deliverables
  - Last minute items
- Meet your judging partner(s) and the rest of the panel
- Attend the Opening Ceremonies

During Team Evaluations

- Interview teams
- Make sure sessions stay on schedule
- Evaluate each team according to rubric criteria and note constructive comments
- Keep additional notes of team specifics if needed
- Note and report:
  - cases of adult intervention
  - demonstrations of GP & FLL Core Values

During Deliberations

- Submit award nominations and rankings by your judging pair
- Participate with all area judges to determine award candidates/merged preliminary ranking
- Work with judges of other categories to determine the Champion's Award winner(s)
- Work with all judges to finalize remaining awards and prepare scripts

During the Awards Ceremony

- Attend the Awards Ceremony (if possible)
- Help distribute medals, awards and other team recognition
- Join the high-five line, congratulate all teams and have fun!

Judging Process

You will work with other judges throughout the tournament using FLL's process to evaluate teams and determine awards

Note that you may work with different judges at different times

Judging Pairs

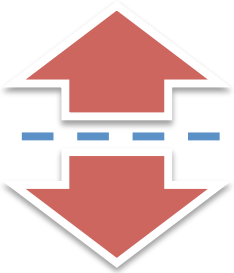
Three Judging Areas

All Judges

Judging Process

Team Evaluation and Feedback

Awards Deliberations



Judging Sessions
Evaluate Teams | Provide Feedback

Nominate and Rank Teams
Determine Top Teams Seen by Each Pair

Call-Backs and Additional Information
Review and Discuss Top Teams

Initial Deliberations
Determine Preliminary Rankings for Each Area Award

Final Awards Deliberations
Determine Champion's Then All Other Award Winners

Awards Ceremony
Develop Script & Distribute Awards

During Team Evaluation and Feedback, the focus of the judges is on evaluating each team and providing them with constructive feedback

During Awards Deliberations, the focus of the judges is on determining the teams worthy of awards and recognition

FLL Core Awards-Small Qualifier Structure

Champion's Award

This award recognizes a team that embodies the FLL experience, by fully embracing our Core Values while achieving excellence and innovation in both the Robot Game and Project.

Project Award

This award recognizes a team that excels across the Research, Innovative Solution and Presentation categories. This team utilized diverse resources for their Project to help them gain a comprehensive understanding of the problem they identified, develop a creative, well-researched solution and effectively communicate their findings to judges and the community.

Core Values Award

This award recognizes a team that excels across the Inspiration, Teamwork and Gracious Professionalism® categories. This team displays extraordinary enthusiasm and spirit, knows they can accomplish more together than they could as individuals, and shows each other and other teams respect at all times.

Robot Design Award

This award recognizes a team that excels across the Mechanical Design, Programming and Strategy & Innovation categories. This team uses outstanding programming principles and solid engineering practices to develop a robot that is mechanically sound, durable, efficient and highly capable of performing challenge missions.

Robot Performance Award

This award recognizes a team that scores the most points during the Robot Game. Teams have a chance to compete in at least three 2.5 minute matches and their highest score counts.

Judges Awards

During the course of competition the judges may encounter teams whose unique efforts, performance or dynamics merit recognition. Some teams have a story that sets them apart in a noteworthy way. Sometimes a team is so close to winning an award that the judges choose to give special recognition to the team. Judges Awards allow the freedom to recognize remarkable teams that stand out for reasons other than the Core Award categories.

Examples include:

Against All Odds *or* Overcoming Adversity *or* Perseverance

This award goes to the team that improvises and overcomes a difficult situation while still making a respectable showing, with an attitude that shows, “We can overcome incredible odds if we never give up, no matter what!”

Rising Star

This award recognizes a team that the judges notice and expect great things from in the future.

Special Recognition Awards

Outstanding Volunteer Award

The FLL program would not exist without its volunteers. This award honors an extraordinary volunteer(s) whose dedication to the FLL program has a positive impact on the team experience.

Adult Coach/Mentor Award

Many teams reach significant milestones thanks to their close relationship with an adult mentor. This award goes to the coach or mentor whose wisdom, guidance, and devotion are most clearly evident in the team’s discussion with the judges.

Young Adult Mentor Award

FLL presents this award to the young adult, high school or college mentor whose support, impact, inspiration, and guidance are most clearly evident in the team’s discussion with the judges.

Robot Design Sample Questions

Mechanical Design

Durability

- How did you get your robot to stay together?
- How often does your robot fall apart? What happens and have you thought about ways to fix this?

Mechanical Efficiency

- Would it be possible to use fewer pieces or components for your robot and still accomplish the same missions?
- If your robot has attachments, tell us about them.

Mechanization

- Tell us about how your robot uses attachments or other mechanisms to complete missions.
- Describe how your robot moves from place to place, or overcomes obstacles, and balances speed and power.

Programming

Programming Quality

- What program do you feel is your best? Why?
- Do your robot's programs achieve the same result every time? If not, why do you think this might happen?

Programming Efficiency

- What did you do to make your programs more understandable and easier to use?
- What mission is your favorite? Explain the steps in the program for that mission.

Automation/Navigation

- Would you explain how your robot turns (or travels a specific distance, or goes from base to a specific destination)? How satisfied are you with this?
- As your robot moves around the field, was there one area that was more difficult to navigate than another? If so, what did your team do to overcome this challenge?
- Would you explain which sensors you used, and how and why you used them?
- Would you explain how your robot knows where it is on the field? Note: Sensing includes not only touch and rotation sensors, but time (timers in the RCX) and passive sensing such as referencing to walls or other objects, etc.

Strategy & Innovation

Design Process

- What was the greatest design or programming difficulty you encountered? How did you solve that problem?
- How did you test your designs?
- Describe one way your robot got better over the course of the season.

Mission Strategy

- How did your team decide which missions to tackle?
- How many of the missions has ***this*** robot completed successfully in a single match (includes a tournament match, a tournament practice, or home practice)?
- We want to consider the overall strategy behind your robot's design. Tell us about your robot, its attachments and sensors and the missions the robot attempts so that we will understand your team's design strategy.
- Which attachments are most difficult to put on and/or take off?

Innovation

- What part of your design, program or strategy do you think is unique to your team?
- How did you come up with the idea?

Look For:

- Unusual strategy, programming or design.
- Propulsion or steering methods or functional aspects that no one else has or you are surprised someone would try.
- Robot is able to effectively perform the same task over and over.
- Parts or functional aspects that make something difficult look very easy.
- Parts or mechanisms that perform several functions.
- Propulsion, steering methods or functional aspects that work, but children have no understanding how.
- Children can describe what the robot will do based on the program.
- Does the team look to the coach for answers or are they focused on the robot and judges?
- Noteworthy observations about FLL Core Values to share with the judging team.

FIRST® LEGO® League

2011 FLL CHALLENGE

robot game — field setup

OVERVIEW

- The field is where the Robot Game takes place.
- It consists of a field mat, on a table, with mission models arranged on top.
- The field mat and the LEGO® pieces for building the mission models are part of your Field Setup Kit.
- The instructions for building the mission models are on a CD, in the same box as the LEGO pieces.
- The instructions for how to build the table and how to arrange everything on it are in this document.

TABLE CONSTRUCTION

The Robot Game takes place on a specially designed table, so you'll need to build one to practice on if you don't already have access to one. With safety, weight, height, and cost in mind, a simple design is offered here, but as long as your surface is smooth, and your border walls are located properly, how you build the understructure is up to you. The construction is simple, but does require some wood-working skills.

At a tournament, two tables are placed back to back, but you only operate on one table, so you only need to build one table to practice on. However, since a tournament setup has a double wall at the interactive area where the two tables meet, practice tables need an extra wall of type B on the corresponding side. So here are the instructions for building one "half-table" including a double north wall:

MATERIALS

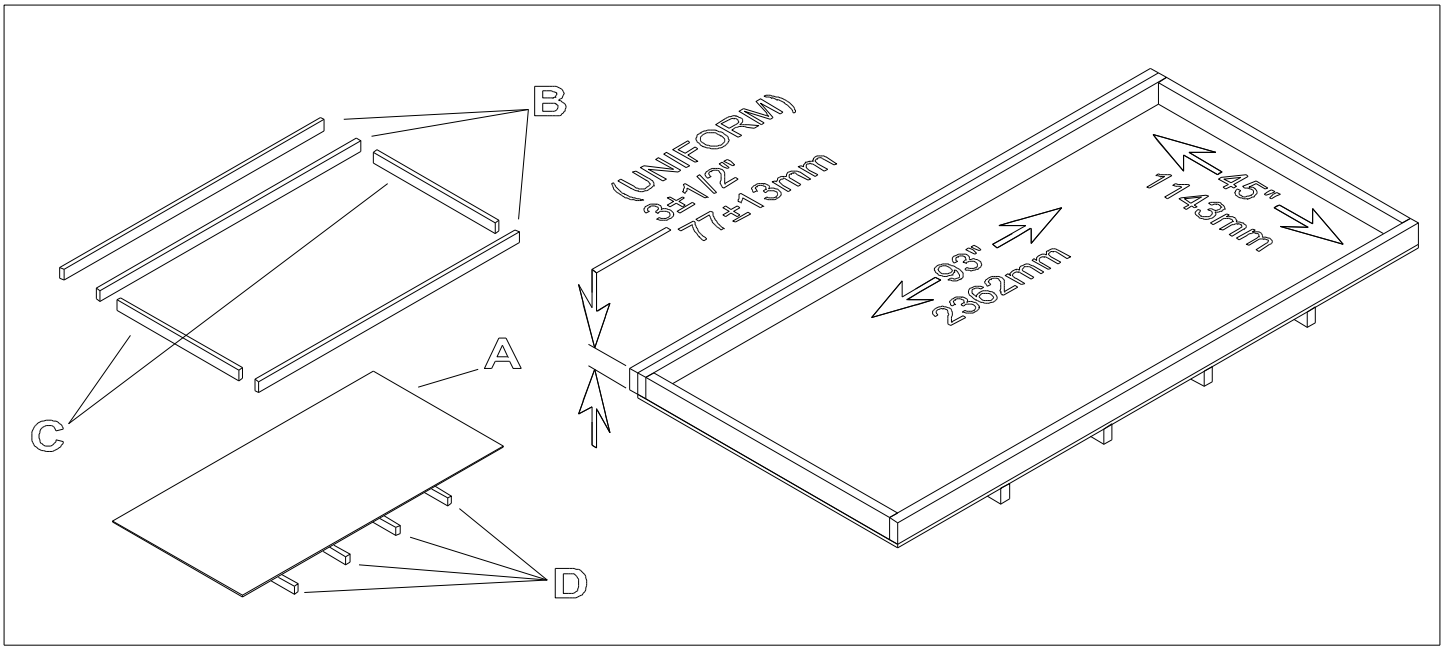
Material	Quantity
Field Setup Kit (mission model LEGO elements, mat, CD, Dual Lock™)	1
sanded plywood (or other very smooth board) 96" X 48" X 3/8" or thicker	1
two-by-three, 8' (actual cross-section = 1-1/2" by 2-1/2")	6
flat black paint	1 pt.
coarse drywall screws, 6 X 2-1/2"	1/2 lb.
saw horses, about 24" high and 36" wide	2

PARTS

Part	Make From	Dimensions	Paint	Quantity
table surface (A)	plywood	96" X 48"	no	1
long border wall (B)	two-by-three	96"	yes	3
short border wall (C)	two-by-three	45"	yes	2
stiffener (D)	two-by-three	48"	no	4
saw horse	purchase	H ≈ 24" W ≈ 36"	no	2

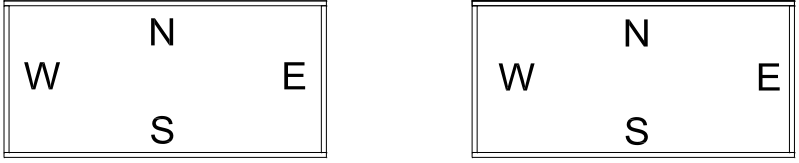
ASSEMBLY

Step 1 — Determine which face of the plywood (**A**) is least smooth, and consider that the bottom face. On the bottom face, locate, clamp, and screw on the stiffeners (**D**) (about every 18 inches). Be sure screw head tops are flush. Sand any splinters.
Step 2 — On the top face of the plywood, locate, clamp, and screw on the border walls (**B**,**C**) around the top perimeter. The wall-to-wall dimensions must measure 93±1/8" by 45±1/8" (2362±3mm by 1143±3mm), and the height of the height of **B** and **C** must measure 3±1/2" (77±13mm), with all border walls being the same height as each other.
Step 3 — With the help of another person, place this table top on short saw horses (or milk crates, or anything else short and solid).

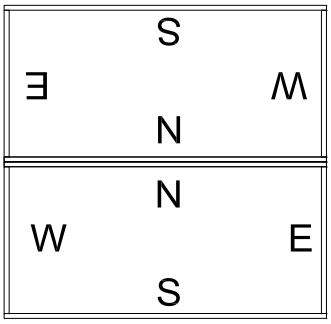


FIELD MAT PLACEMENT

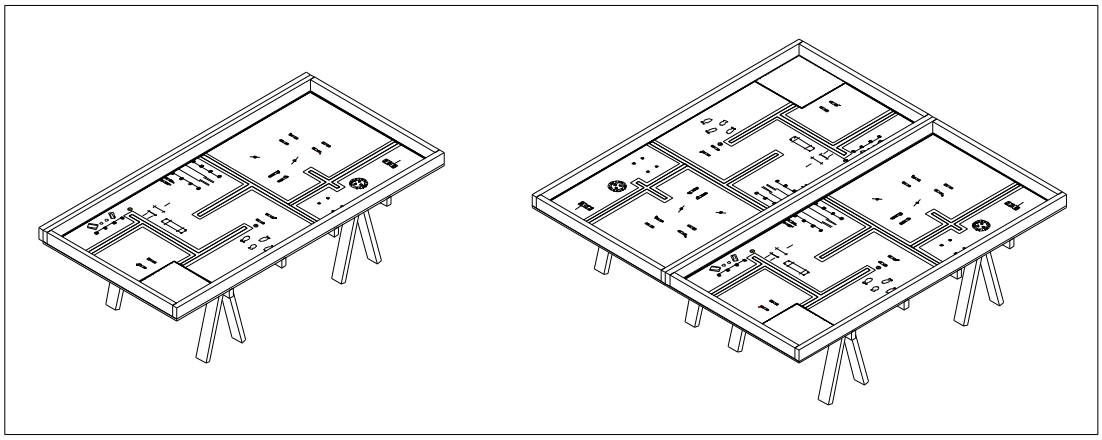
Step 1 — Vacuum the table top. Even the tiniest particle under the mat can give the robot trouble. After vacuuming, run your hand over the surface and sand or file down any protruding imperfections you find. Then vacuum again.
Step 2 — On the vacuumed surface (never unroll the mat in an area where it could pick up particles), unroll the mat so the image is up and its north edge is near the north/double border wall (note the location of the double wall in each table sketch below).
Step 3 — The mat is smaller than the playing surface by design. Slide and align it so that there is no gap between the south edge of the mat and the south border wall. Center the mat in the east-west direction (look for equal gaps at left and right).
Step 4 — With help from others, pull the mat at opposite ends and massage out any waviness away from the center and re-check the requirement of Step 3. It is expected that some waviness will persist, but that should relax over time. Some teams use a hair dryer to speed the relaxation of the waviness.



PRACTICE ("HALF TABLE")



TOURNAMENT ("FULL TABLE")



MISSION MODEL CONSTRUCTION

Build the mission models — Use the LEGO elements and instruction CD from your Field Setup Kit. It should take a single person between two and four hours to do this, so it's best done in a work party. For any team members with little or no experience building with LEGO elements, mission model construction is a great way to learn. This step is also a nice time for new team members to get acquainted with each other.

MISSION MODEL ARRANGEMENT AND SETUP

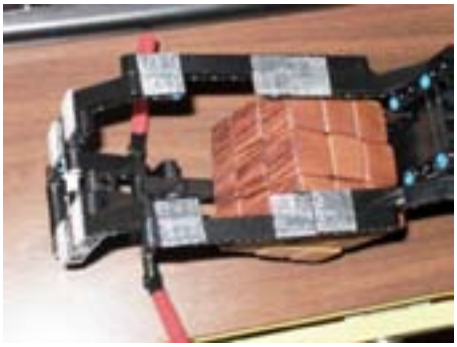
DUAL LOCK

For models where "Dual Lock Needed" appears in the mission model details below, that means the model needs to be secured to the mat during use. The connection is made using the re-usable fastening material from 3M called Dual Lock, which comes in the flat clear bag with the LEGO elements in your Field Setup Kit. Dual Lock is designed to stick or "lock" to itself when two faces of it are pressed together, but you can unlock it too, for ease of transport and storage. The application process for the Dual Lock is only needed once. Later, the models can simply be locked onto the mat or unlocked. To apply Dual Lock:

Step 1 — Stick one square, adhesive side down, on each box you see on the mat with an "X" in it.
Step 2 — Press a second square on top of each of those, "Locking" them on, adhesive side up.
TIP: Instead of using your finger, use a bit of the wax paper the squares came on.
Step 3 — Lower the model onto the squares.
CAUTION — Be sure to place each square precisely on its box, and each model precisely over its marks.
CAUTION — When pressing a model down, press down on its lowest solid structure instead of crushing the whole model. Pull on that same structure if later you need to separate the model from the mat.
TIP: For large and/or flexible models, apply only one or two sets at a time.

DUAL-LOCKED MODELS

Handwash Station (Sink) – See pictures & mat marks.
Fences – One is in the northwest corner, facing south. The remaining two are in the north center, one to the left of the dock, and one to the right. The right fence faces west, and the left one faces east.
Table & Flowers/Centerpiece – See pictures & mat marks.
Timer – See pictures & mat marks.
Thermometer – See pictures & mat marks.
Interactive Models (Rat Slides) – For the east slide, see pictures and mat marks. This model is Dual-Locked to the north border wall as well as to the mat. Dual Lock it to the mat, a coin's thickness from the wall (depending on the exact size of your mat and table, the Dual Lock might not go exactly on its marks – that's okay). Then, add Dual Lock between the model and the wall, as shown. You need to place the second model on the back side of the (double) north wall, diagonal from the first model. Center it on the big black line. Use as much Dual Lock as needed to get it to stick the wall, since there's no actual table back there to hold it.



Contamination Risks (Dispensers) – Before securing these, move two beams on each as follows:

Step 1 – Take the long beam off the outside of its base.
Step 2 – Remove the black pin nearest the end of the base.
Step 3 – Insert the pin one hole from where you took it out (even though the beam itself is moving two holes).
Step 4 – Put the beam back on, such that the newly placed black pin goes in the end hole.
Step 5 – Repeat Steps 1 thru 4 for the other side of the base.
Step 6 – Place Dual Lock as the mat shows, but also in front of those places, as shown.

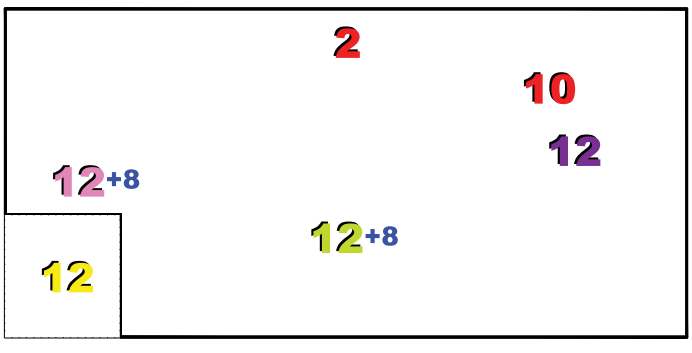
The movement of the beam does not change the location of the model. Align the original back of the base over its mark on the mat before pressing down. Also before pressing down, notice that two of these models are mirrored versions of the others, so be sure that the red axle in the model is over a red cross on the mat.





NON-DUAL-LOCKED (LOOSE) MODELS

Farm Animals – See pictures & mat marks. Be careful – one of the chickens is a complete lunatic.
Bacteria & Virus (Germs) – Bacteria go in the dispensers in the quantities and locations shown, except all yellow go in Base, and two red go in the refrigerated trailer. Eight virus go with the greens and eight with the pinks.
Poison (Blue & Yellow Balls) – See pictures & mat marks.
Refrigeration Trailer – The back of the white refrigeration trailer is pushed against the north border wall, between the two center fences, centered on its marks.



Food (Groceries) – There are twelve units of groceries: Ten in Base, and two specific ones in the yellow truck.
Meat & Fish – The crate of meat goes in Base, and the fish go exactly on their marks east of Base.
Harvester & Corn – See pictures and mat marks. Put the harvester on the west-side ship, facing east, and roll it backward slowly until it resists. Now pick it up without letting the rear wheels spin. Load the four pieces of corn into the back. All four pieces must be individually loose. Now carefully position the harvester over its mark and set it down. TIP: To reduce the chance of corn being stuck in the harvester, every time you load the corn, gently apply some spreading force between the walls to open the gap a little bit. The required spread is so small, you can't tell the difference by eye.
Pickup (Yellow Farm Truck) – Only the bananas, tomatoes, and carrots, in two cases, sit flat in the bed of the truck.
Loops (Pizza & Ice Cream) – Be sure the loops are evenly shaped and not leaning.
Rats – Place the rat loops on their respective slides in the north center. The rats can face randomly north or south, and are pushed as far as they can go toward the color end of their slides. Be sure the loops are evenly shaped and not leaning.

West Side

East Side

PRACTICE FIELD

FIELD MAINTENANCE

- **Border Walls** — Remove any obvious splinters, and cover any obvious holes.
- **Field Mat** — Make sure the mat touches the south border wall, and is centered east to west. Avoid cleaning the mat with anything that will leave a residue. Any residue, sticky or slippery, will affect the robot's performance compared to a new mat (many tournaments use new mats). Use a vacuum and/or damp cloth for dust and debris (above and below the mat). To get marks off, try a white-plastic pencil eraser. When moving the mat for transport and storage, be sure not to let it bend into a sharp kink point, which could affect the robot's movement. Tournaments using new mats should unroll the mats as far in advance of the tournament day as possible. For control of extreme curl at the east or west edges of the mat, tape is allowed, with a maximum of ¼" (6 mm) overlap. Foam tape is not allowed.
- **Mission Models** — Keep the models in original condition by straightening and tightening solid connections often. Ensure that spinning axles spin freely by checking for end-to-end play and replacing any that are bent.

FIRST® LEGO® League

2011 FLL CHALLENGE

robot game — missions

KEEP IN MIND: If a race were held in late 1903, between the original Ford "Model A" automobile and the Wright brothers' first airplane, it would have been close — but a horse would have beaten them both. If the contest were about transportation value, the plane, with its barely controllable 120-foot flight, would again have been beaten by both the car and the horse. Although that plane had less speed and controllability than a horse, it was immediately obvious that the astonishing engineering innovation and raw potential present in its design would bring travel to previously inconceivable heights. Keep this in mind as you develop your robot. The full FLL robot development experience is only partly about tournament-day game points. In FLL, a crazy fun design that sometimes works is just as good as a dull design that always works. As far as the technical judges are concerned, it really is the THOUGHT that counts!

THEME

Don't be scared, but do be aware… Do you have any idea how many ingredients are in food, how many places those ingredients come from, and how many steps each one has gone through before you eat it? The count is so large and confusing, that almost no one can keep track. And almost every step along the path for every ingredient is a chance for contamination.

Every ingredient has origins either in the ground, the water, or a chemical plant, and most come from other states or countries. Most ingredients are exposed to air. Most are worked on by people and machines, stored in different places, for different times, at different temperatures. Most are shipped, combined, processed, and packaged. Eventually they're prepared and served. Many are held by YOUR HANDS!

For the Food Factor Robot Game, your robot's job is to put some common foods through just a few of the steps they go through in order to get to into your belly, while either avoiding or dealing with contamination.

MISSIONS

MISSION: Read the Rules page, Field Setup page, and the Updates page. Please!
Knowledge Is Power.

MISSION: POLLUTION REVERSAL — No matter where pollution originates, it usually finds its way into water. And of course, all plants and animals take in water. Since we depend on plants and animals for our food, pollution is a source of contamination, not just in what we breathe and drink – but also in what we eat. The yellow and blue balls represent pesticides on the farm and heavy metals in the water. While on their rings, they're off the mat.
SCORING CONDITION(S): Balls touching the mat are worth 4 POINTS EACH.

MISSION: CORN HARVEST — A harvester (combine) is just one of the many huge pieces of machinery that handle massive amounts of food at once. Equipment like this runs on gasoline, and has oil. You can also find hydraulic fluid, nuts & bolts, screens, gaskets, set screws, bearings, sealant, paint chips, and bugs on it – any of these materials and substances could find their way into the food.

SCORING CONDITION(S): Get points for one of these only:
---ANY piece of corn touching the mat is worth 5 POINTS (additional pieces do not add to your score).
----------OR----------
---ANY piece of corn in Base is worth 9 POINTS (additional pieces do not add to your score).

MISSION: FISHING – Fish must be eaten or frozen immediately after being caught. The number of germs that depend on fish is much, much higher than the number of people who do!
SCORING CONDITION(S): Big fish in Base are worth 3 POINTS EACH, if the baby fish is still touching its mark.

MISSION: PIZZA AND ICE CREAM – When you go out in public to eat, you place a lot of trust in the people preparing your food. Do they wash their hands or wear fresh gloves? In what direction do they sneeze? How clean are their storage and preparation areas? At what temperatures are the foods stored and cooked? How old are the ingredients? How are pests controlled?
SCORING CONDITION(S): Pizza and ice cream in Base are worth 7 POINTS EACH.

MISSION: FARM FRESH PRODUCE – In general, the fresher your food is and the fewer ingredients there are in it, the less chance it has had to become contaminated. Small farms and fisheries close to where you live are a good source of fresh food, but many small farms don't get the same level of inspection as large ones do.
SCORING CONDITION(S): The yellow farm truck in Base is worth 9 POINTS.

MISSION: DISTANT TRAVEL – Your body suppresses and eliminates the vast majority of chemicals and germs you eat, and it's especially good at getting rid of stuff it's been exposed to before – stuff it's used to. But when you eat in a city or country that's very far from home, your body's defenses can be caught off guard by contaminants it's never processed before. It's common for travellers to get quite sick after eating certain foods, while other people who ate the same foods right next to them have no problems.
SCORING CONDITION(S): The robot touching the east wall is worth 9 POINTS. Remember Rule 23.

MISSION: COOKING TIME – Before cooking, some foods have more germs, or tougher germs than others. If you're supposed to cook a food for 40 minutes, but you think "it should be okay" after 35 – think again!
SCORING CONDITION(S): The white pointer in the red zone is worth 14 POINTS.

MISSION: STORAGE TEMPERATURE – Germs grow fast. If your refrigerator is set even a few degrees higher than it's supposed to be, the "shelf life" of many of the foods is cut in half, or even further. If you go to play ball instead of helping to put the picnic food back in the cooler – that's bad! If you ever hear the phrase "it's only been out for a few hours" –make some noise!
SCORING CONDITION(S): The thermometer spindle clicked/dropped fully showing the low red temperature is worth 20 POINTS (the spindle needs to drop all the way).

MISSION: PEST REMOVAL – Some animals carry many, many germs that don't bother them, but which are really bad for us. And some animals have extremely unclean habits (enough said about that!). These animals have become very good at infesting population centers and especially food storage, shipping, and preparation areas, living in the shadows, climbing and nesting in the tiniest unseen places. Convince them to live somewhere else! Keep all food well-sealed, and all food areas clean. At the first sign of these pests, it's usually too late!
SCORING CONDITION(S): Rats in your Base are worth 15 POINTS EACH (to you only).

MISSION: REFRIGERATED GROUND TRANSPORT – In shipping, cases of frozen and refrigerated foods are often thrown onto pallets, spilled, torn, and crushed by forklifts, and each other, as they are warehoused and loaded onto trucks bound for the marketplace. Then the cases go on bumpy rides for hours in the sun. Amazingly, only a tiny percentage of the food gets contaminated during all this. The problem is, this tiny percentage totals tens of thousands of tons a year! And while most of that is discovered and thrown away, "some" is not.
SCORING CONDITION(S): Get points for one of these only…
---The trailer in Base is worth 12 POINTS.
----------OR----------

---The trailer with meat inside, and no germs inside, with any of its wheels touching the port dock north of the white line is worth 20 POINTS, and 6 ADDITIONAL POINTS for each big fish inside. For fish points, the baby fish must still be touching its mark.

MISSION: GROCERIES – Here's your chance to buy undamaged goods, as fresh as possible, with the fewest ingredients possible, from trustable places, and get your cold stuff home and put away as soon as possible!
SCORING CONDITION(S): EACH grocery unit is worth 2 POINTS if the table is supporting all of its weight, and no weight other than grocery units (the flower centerpiece can be there too).

MISSION: DISINFECT – It would be very tough to eliminate food contamination from all sources, but you can probably do more than you think, and if you can at least avoid making it worse, that would be a great start.
SCORING CONDITION(S): Empty dispensers are worth
---12 POINTS EACH, if NO bacteria is touching the mat outside Base.
----------OR----------
---7 POINTS EACH, if ANY bacteria is touching the mat outside Base.

MISSION: HAND WASH/BACTERIAL – Innovative ideas in the future may help us reduce germs, chemicals, and particles, in natural, farming, processing, and public food settings, but studies have shown that one of the biggest source of contamination to your food is your own hands. So wash them! Front and back, with soap, in hot water, for three times longer than you do now! As this mission should show, you can never wash your hands enough.
SCORING CONDITION(S): Bacteria in or on the sink are worth 3 POINTS, only if all of these are true:
---All were in Base at some time prior to being in the sink.
---While between Base and the sink, each was the only one in motion.
---All equipment involved with each bacterium's trip to the sink was
--completely in Base at the beginning of the trip.
--completely out of Base at the end of the trip.
---The sink is supporting all the weight of every germ, and not supporting any weight except germs.
Bacteria getting to the sink any other way are given back to the team in Base by the referee (the "ref").

MISSION: HAND WASH/VIRAL – Viruses almost always need a "host" (another living thing) to live on. They are almost always bad, and they're also somewhat harder to deal with than bacterial germs. Alcohol sanitizer, bleach sanitizer, and high heat are the better weapons against viral germs, but hand washing is also helpful.
SCORING CONDITION(S): Get points for one of these only…
---One to eight viral germs in the sink are worth exactly 6 POINTS only.
----------OR----------
---Nine or more viral germs in the sink are worth exactly 13 POINTS only.

MISSION: GOOD BACTERIA – Not all bacteria are bad. There are about a thousand types of good bacteria living on/in your body, which total in the tens of trillions! Bacteria do all sorts of good work for you, and help process your food, both before and after you eat it. How do we get rid of bad bacteria without upsetting the good bacteria? Bacteria are this year's "touch penalty objects" as described in the Rules. When you cause a touch penalty, the ref takes one yellow bacterium.
SCORING CONDITION(S): Yellow bacteria are worth 6 POINTS EACH in Base only.

FIRST® LEGO® League

2011 FLL CHALLENGE

robot game — rules, procedures, philosophies and definitions

1 — GRACIOUS PROFESSIONALISM™

- You are "Gracious Professionals." You are competing hard against PROBLEMS, while treating PEOPLE with respect and kindness — people from your own team, as well people from other teams.
- You build onto other people's ideas instead of resisting or defeating them.

2 — PARTICIPATION

- The maximum allowable team size is ten members, not including coaches and mentors.
- See the *FIRST* LEGO League Coaches' Handbook for allowable ages.
- At the tournament, only TWO team members at a time are allowed right up at the competition table except during repair emergencies.
- The rest of the team must stay back from the table, but close enough for different members to tag in or out as desired at any time. Specific positioning is decided by the tournament officials.

3 – INTERPRETATION

- Robot game text means exactly and only what it says, so it should be taken literally whenever possible.
- Do not interpret text based on your assumption about intent, or on how a situation might be in "real life."
  — Example: If a mission is to "enter the house," the window is just as valid an entry point as the door.
- If a detail isn't mentioned, then it doesn't matter.
  — Example: If a mission is to "put the cup on the table," upside down is just as valid as right side up.
- There are no hidden requirements or restrictions, but there are hidden freedoms, and you're encouraged to find them!

4 — EQUIPMENT

Your robot, attachments, and other accessories must be made entirely of LEGO-manufactured elements in original factory condition. Stickers are not allowed, except LEGO stickers, applied per LEGO instructions. Paint, tape, glue, oil, etc. are not allowed.

- Exception 1: You may reference a paper list to keep track of robot programs.
- Exception 2: LEGO string and tubing may be cut to length.
- Exception 3: Marker may be used for ownership identification, for marks in hidden areas only.

REGULAR ELEMENTS

- You may use as many non-electric LEGO elements as you like, including pneumatics, and they may be from any source or set. Exception: Factory-made wind-up/pull-back "motors" are not allowed.

ELECTRIC ELEMENTS

- You are allowed a maximum of six non-rotation sensors in the competition area. Choose your favorite combination from among the LEGO-manufactured Mindstorms touch sensors, light sensors, color sensors, and ultrasonic sensors.
- You are allowed a maximum of three MINDSTORMS™ motors in the competition area.
- These quantity limits don't just apply to what's on your robot "right now." The referee (the "ref") adds up everything you have with you in your boxes, your hands, your trays, and on the table too. All of it counts towards your total.
  — Example: If you have multiple motorized attachments, but it takes two motors to drive the robot, you must find a way to switch that third/last legal motor from one attachment to the next.
  — A fourth motor in the competition area is always illegal, no matter what.
  — Even if you plan to run only three motors at a time, the fourth motor is illegal.
  — Even if the fourth motor is a spare, or used as weight, or as decoration, the fourth motor is illegal.
- "RCX" robots are allowed, with a max of eight sensors from among touch, rotation, and light.
- You may not use more than one robot in any one match, but it's okay to use a different robot in a different match.
- LEGO wires and converter cables are allowed as needed.
- No other electric elements nor devices are allowed for use in any way in the competition area.
- Spare electrical parts are allowed in the PIT area.
- Objects functioning as remote controls are not allowed anywhere, any time.

NON-ROBOT EQUIPMENT

- Your equipment may include LEGO elements or devices other than the robot and it attachments.
  — Example 1: You may use a gauge to help set a feature on your robot in Base.
  — Example 2: The robot may carry a ramp out to help itself cross a barrier.
  If outside Base, such "strategic objects" are left wherever the robot leaves them.

SOFTWARE

- The robot may only be programmed using LEGO MINDSTORMS, RoboLab, or NXT-G software (any release). No other software is allowed.
- Patches, add-ons, and new versions of the allowable software from the manufacturers (LEGO and National Instruments) are allowed, but tool kits, including the LabVIEW tool kit, are not allowed.

If the robot is in violation of this rule and cannot be corrected, the decision about exactly what to do rests with the tournament officials, but it is possible the team may not be eligible for awards.

5 — MISSION

A mission is one or more achievable objectives/results worth points, as detailed on the "Missions" page.

- You decide the order in which to try the missions, and how many to try with each program on the robot.
- You may re-try missions when that's possible, but the field is not reset for that purpose. Example: If a mission is for the robot to topple a stack eastward, and the robot doesn't reach it, you could try again later, since the stack is undisturbed. But if the active robot topples the stack westward, the mission is impossible to re-try, and does not get reset.

6 — MATCH

At a tournament, two robot game fields are joined back to back, and you are paired opposite another team to compete in a match. There are at least three matches. Each match lasts 2-1/2 minutes. Here's the process:

- You get to the competition table and have at least one minute to prepare your equipment.
- The match starts and you start the robot from Base. Once started, the robot is "active" and is understood to be working "autonomously" on missions, under its own power and programming, allowed to grow to any size and go anywhere it wants.

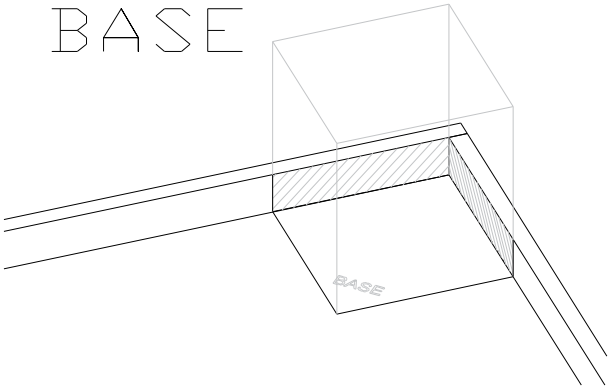
- The robot might get a lot done, or a little, but eventually you are likely to need/want to handle it. For example, it might get stuck, or you might want to add an attachment or unload some cargo.
- If you do decide to touch the robot while it's active, no matter where it is or what it's doing, that makes it "inactive," and it must immediately be carried to Base if it's not already there.
- While the inactive robot is in Base, you prepare it for its next active period, and restart it.
- These steps repeat (often with music, an announcer, and cheering in the background!) until the match end signal sounds. The timer never pauses during a match.
- You play at least three matches a tournament, each one being a fresh chance for you to get your best score.
- No match has anything to do with another, and only your best score counts specifically toward the Robot Performance Award. Exceptions: playoff matches and tie-breakers.
- If it is known in advance that you will not have another team opposite you, a volunteer or "house" team substitutes. If not, and you compete against an empty table, you get the points for any missions that would have involved the missing team.
- After the match, no one is allowed to touch anything on the field until the ref has recorded the condition of the field and come to agreement with you (kids only) about what points were scored or missed and why.
- Data is marked on a sheet which you initial, making the sheet final.
- The scores are tallied by computer, with ties being broken using 2nd, then 3rd highest scores.
- In the rare occasion of a tie across all three matches, tournament officials decide what to do. Options include a variety of playoffs, or simply awarding multiple same-place awards.

7 — ROUND

The process of cycling all teams through one match each is called a round.

8 — BASE

Base is an imaginary box formed by vertical walls that rise from the perimeter of the Base area, including the inside surface of the border walls, and by an invisible ceiling 16 in (40 cm) high.



- This means Base is not just an area on the mat – it's a VOLUME.
- Usually there is a gap between the mat and a side border wall… Base includes this gap.
- Anything in the team's possession is understood to count as being in Base, and is okay to store or handle.

9 — FIELD

The field is where the robot game takes place. It consists of mission models on a field mat on a table.

- The field mat and the LEGO elements for building the mission models are part of your Field Setup Kit.
- The instructions for building the mission models are on a CD which comes in the same box as the LEGO elements and mat.
- All other field setup instructions are on the Field Setup page.

10 — MISSION MODELS

Mission models are the objects that are already on the field when you walk up to it.

- You may not bring duplicate mission models to the table if they could confuse scoring.
- You may not take mission models apart, even temporarily.
- You may not add to nor trap mission models as to cause a failure of the "gravity test."

- GRAVITY TEST — Any time you (by HAND) make an individual mission model touch, trap, or be trapped by ANY other object (including the robot, other team-supplied parts, and other models) — Gravity alone should be able to separate them if the heavier were picked up and/or turned over.
  - — In the case of identical models, it doesn't matter which is picked up.
  - — The team performs this "gravity test," only if asked by the ref, and only when failure looks probable.
  - — The ref does not allow a start unless all mission models could pass the gravity test.
  - — Only if there is no hand-help at all, the ROBOT is allowed to cause models to fail the gravity test.
- Don't walk away with mission models from the competition area. Bring them back if you do. Thanks.

11 — CARGO

Cargo is anything the robot has with it for transport or release.

12 – AUTONOMY

The robot game is played by an "autonomous" robot.

- That means the robot must do its work without any influence/help from you while it's working. You PREPARE the robot, but it PERFORMS on its own.
- The robot may PERFORM ANYWHERE, but it may only be PREPARED in BASE.
- Any time you touch it, it is assumed to need your help and preparation, so it must be carried to Base.
- If this was planned, and the robot and its cargo are already in Base, no problem. However, touching the robot while it, or its cargo is outside Base is seen as a rescue, so there can be penalties.

13 — ACTIVE ROBOT <> INACTIVE ROBOT

- The moment the robot is started, it becomes "ACTIVE," and remains so until the next time you touch/influence it.
- At the moment of that touch, the robot becomes "INACTIVE," and is hand-prepared for restart from Base.

14 – HANDLING (MISCELLANEOUS)

Calibration – During your pre-match setup time only, you may calibrate light & color sensors outside Base.

Quality Control – During your pre-match setup time only, you may ask the ref to double-check that a particular setup is correct/within spec, but you may not request any custom setup, in or out of the range specified in the setup instructions.

Changing Things Outside Base — You may not hand-place, extend, roll, topple, drop, throw, eject, slide, or shoot things outside Base, even partly. You may not hand-change the position, motion, quantity, or other status of things outside Base. Only the robot may make changes outside Base, including the addition and removal of objects. See exceptions in the "Touch Penalties," "Storage And Workspace," and "Failure And Loss" rules.

Illegal Changes – If you or your robot cause illegal changes to the field other than mission model destruction, either by accident or on purpose, the action is "undone" as quickly and accurately as possible---if possible. But if the pre-change condition is unknown, or the changes are too confusing or severe to undo, the changes are left as is. Obviously, previous accomplishments can be ruined because of this, but intended missions can be ruined too, and missions that obviously benefit from such destruction are marked scoreless.

Mission Model Destruction – If you or the robot damage a mission model or defeat its Dual Lock connection, by accident or not, the situation is left as-is. Obviously, previous accomplishments can be ruined because of this, but intended missions can be ruined too, and missions that obviously benefit from such destruction are marked scoreless.

Inactive Robot Handling – During setup, and whenever else the robot is inactive, you may repair it, aim it, switch attachments, select programs, reset features, and load/unload cargo in Base, or wherever your equipment is stored.

Separated/Stored Objects — You may at any time, in Base, or wherever your equipment is stored, handle things the robot is not currently touching or using, except as described in the "Start/Restart Procedure" rule.

Aiming – You may use a device to aim the robot, but its use must be completely in Base at all times, and you must let go of it prior to starting/restarting.

Staging – You are allowed to place objects in the robot's path, completely in Base only.

Chain Reactions — If moving the robot by hand outside Base will unavoidably allow/cause the movement of any non-cargo object, such as something being "held up" or "held back," the movement of that retained object (the chain reaction) must be kept to an absolute minimum. Allow the stored energy to dissipate slowly over as little distance as possible.

Strategic Rescue — Stopping the robot during a strategically precise window of opportunity for progress toward a mission task is illegal and causes related missions to be marked scoreless.

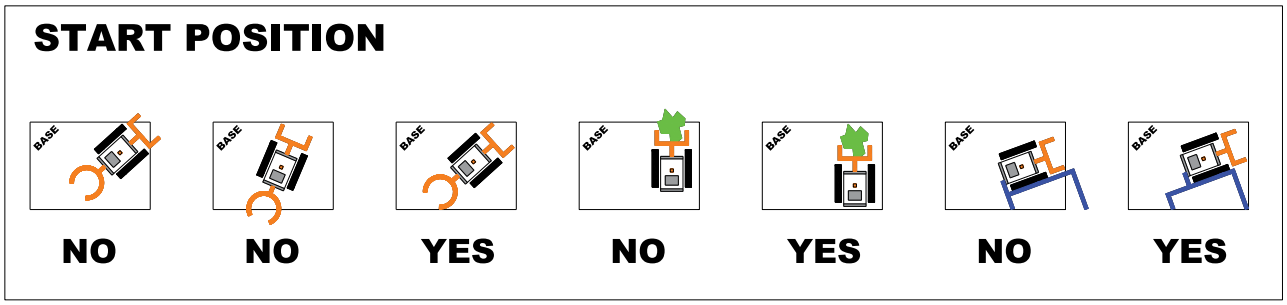
Broken Robot — You may at any time recover pieces of an obviously broken robot.

15 – STORAGE AND WORKSPACE

- Once the ref inspects your equipment, you may store things as needed in Base, or in a box, or by hand, or possibly on a stand, if stands are allowed at your event (decided by your tournament's officials – check with them in advance).
- If you feel crowded in Base, storage and handling of the robot and other objects may extend over Base lines, as long as there is absolutely nothing strategic about this temporary spillover.
- Mission models and objects worth points in Base always need to stay in view of the ref.
- Nothing is allowed on the floor.

16 – START/RESTART POSITION

- For the match start and all restarts, EVERY BIT of the robot, including its installed attachments & wires, everything touching it, and any objects it is about to move or use, must ALL fit COMPLETELY in Base.
- The ROBOT MAY be touching objects it is about to move or use.
- YOU may NOT be touching objects the robot is about to move or use.
- YOU may NOT be touching objects the robot is touching.
- Everything must be motionless.
- All mission models in Base must be able to pass the gravity test.



17 – START/RESTART PROCEDURE

- When it's obvious to the ref that starting position is correct:
- For the first start of the match:
  - The ref asks you if you're ready, then signals your readiness to the announcer.
    - As the countdown starts, you reach in with one hand, ready to either touch a button, or signal a sensor, to start or resume the robot's program.
    - When you hear the sound, you start the robot. The exact time to start is at the beginning of the last word in the countdown, such as "Ready, set, GO!"

    - If a non-word signal is used, like a beep or buzzer, the start is at the beginning of that signal.
  - For all other starts in the same match (restarts):
    - There's no countdown. The ref sees that start position is correct, and you start the robot.
- You may not handle the robot, or anything it's about to move or use, during the countdown, except for the single action needed to get the program running. If you do, the ref has you restart.

18 — TOUCH PENALTIES (THIS RULE IS ABOUT WHAT HAPPENS WHEN YOU TOUCH THE ROBOT)

- If you touch the active robot or anything it's touching while the ROBOT is completely outside Base, you lose one "touch penalty object" (identified in the Missions).
- If you touch the active robot or anything it's touching while its CARGO is completely out of Base:
  - if the cargo was with the robot the last time the robot left Base, it goes to Base.
  - if the cargo was NOT with the robot the last time the robot left Base, the ref takes it away.
- Warning: Avoid touching a robot entering Base until its cargo has also reached Base!

If the only part of the robot in Base at the time of the touch is a cord, hose, wire, tube, chain, string, or other feature obviously used purely for extension, the robot is treated as if it were outside Base.

19 – FAILURE AND LOSS (THIS RULE HAS NOTHING TO DO WITH YOU TOUCHING THE ROBOT)

- Anything done to your field outside Base by your legally active ROBOT stays that way, unless the ROBOT changes it.
- Objects moved are not replaced or moved out of the way by hand.
- Objects damaged are not repaired or reset by hand.
- Cargo the robot loses contact with, is left wherever it comes to rest (if it goes off the table, the ref keeps it).
- This means the robot can ruin its own opportunity to accomplish tasks, and it can even spoil previous results.

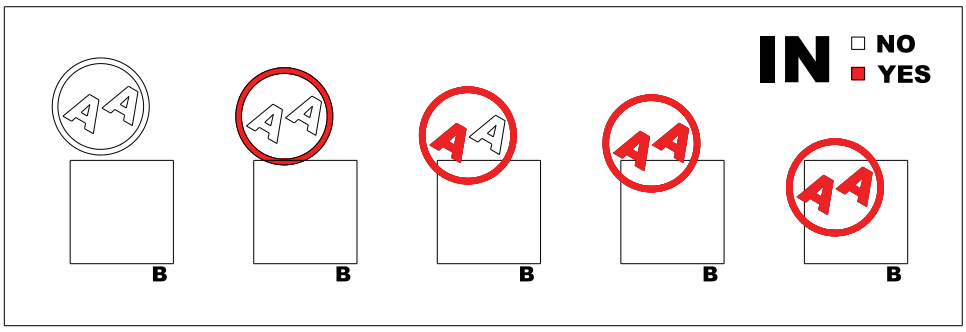
Exception: Parts not designed to separate from the robot, but which separate due to obviously accidental DAMAGE may be recovered by YOU, by hand, at any time – even if they have cargo (gift: you keep any cargo in question).

20 — INTERFERENCE

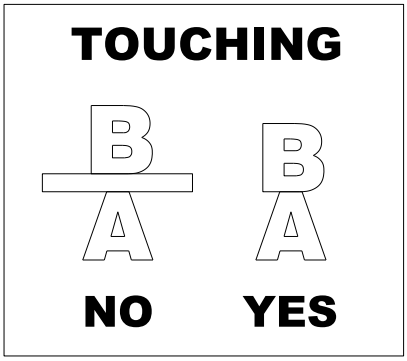
- Your robot may not have any effect on the other team's robot, field, or strategy except near the model(s) shared between both teams, where accidental interference is expected and acceptable.
- If Robot X deliberately blocks or un-scores Robot Y's progress/results, Robot X's mission(s) in that area are marked no score, and Robot Y's are marked as complete.
- If two robots become entangled, they are both allowed to restart without penalty. Any cargo involved is given to the team in Base, whether or not it has ever been there before.
- As a matter of luck, the other team might out-perform you in a competitive interactive mission, or might fail to help you in a cooperative interactive mission. The net effect is the same, and this is not considered interference.

21 – IN

- **A** is "in," "into," or has "reached" **B** if ANY BIT of **A** is OVER **B**.
- To be "in" an area is to penetrate the volume over that area.
- Barely "in" is considered "in" unless "completely in" is required.
- **A** can be "in" **B** without touching **B**.
- Objects are ruled on independent of each other, and independent of their transports/containers.



22 – TOUCHING



- **A** is "touching" **B** only if **A** is making direct contact with **B**. Exception: If **B** were your hand, the 1st example would get a YES, since even an indirect touch from your hand is considered a touch.
- Any amount of direct contact counts as touching.

23 – SCORING

With rare exception, your score is assessed **based on the conditions at the exact time the match ends only**.

- Points are not given for results the robot produces during the match but then trashes before the end.
- Points are not given nor taken away for results produced after the match end signal ends.

24 — AFTER THE MATCH

No one is allowed to touch anything on the field yet:

- The ref first needs time to record the condition of the field, and come to agreement with you (kids only) about what points were scored or missed and why (and to be sure you're not walking away with any of that field's mission models!). Data is marked on a sheet which you initial, making the sheet final.
- The scores are tallied by computer, with ties being broken using 2nd, then 3rd highest scores. If more than one team gets a perfect score in all regular rounds, tournament officials decide what to do. Options include a variety of playoffs, or simply awarding multiple same-place awards.

25 — BENEFIT OF THE DOUBT

You get the benefit of the doubt when:

- a split-second or the thickness of a (thin) line is a factor.
- a situation could "go either way" due to confusing, conflicting, or missing information.
- a ref is tempted to rule based on the "intent" of a requirement or constraint.
- no one's really sure WHAT just happened!

If you (kids, not coach) disagree with the ref and can respectfully raise sufficient doubt in his/her mind during your post-match chat, your ref meets with the head ref, and the resultant decision is final. This rule is not an order for the refs to be lenient, but for them to rule in your favor when they've done all they can to rule correctly, yet the answer's still unclear.

26 — DOWNLOADING

- Downloading programs to robots may take place in the pits only — never in the competition area.
- Always download by cable. Bluetooth must be switched off at all times.

27 — VARIABILITY

As you build and program, keep in mind that our suppliers, donors, and volunteers make every effort to ensure that all fields are correct and identical, but you should always expect some variability, such as:

- flaws in the border walls.
- variety in lighting conditions, from hour to hour, and/or table to table.
- texture/bumps under the mat.
- presence or absence of tape at the East and West edges of the mat.
- waviness in the mat itself. At many tournaments, it is impossible for the mats to be rolled out in time to lose their waviness. Location and severity of waviness varies. You are being warned here. Consider this while designing.
- Two important building techniques you can use to limit the effects of variability are:
- Avoid steering systems that involve something sliding on the mat or border walls.

- Cover your light sensors from surrounding light.
- Questions about conditions at a particular tournament should only be directed to that tournament's officials.

28 — PRECEDENCE/AUTHORITY

- You get information about the robot game from more than one place. Once in a while, information from different places conflicts. So here is the order of precedence for the sources:
  1 = CURRENT Robot Game Updates, 2 = Missions and Field Setup, 3 = Rules
- If something on a page conflicts with something else on the same page, the most sensible interpretation is assumed. If two interpretations seem equal, the interpretation most favorable for the team is assumed.
- On all pages, videos and pictures are for guidance and example only. Often they can not express complete information, and are therefore misleading. When there is conflict between pictures/videos and text, the text takes precedence!
- The head ref at a tournament is required to base decisions on the information above, in the order shown above. No other source of information is official, including e-mails from Robot Game Support.

29 — ROBOT GAME SUPPORT

Professional/expert robot game support is available directly from the designer/author (Scott) at fllrobotgame@usfirst.org (usual response in 1-2 business days).

- When e-mailing, please state your role in FLL (member, coach, parent, mentor, referee).
- You'll get a reply with personalized guidance constructing documentation-based paths of logic/reason for assessing special strategies or situations in terms of legality and scoring.
- The ref is not obligated to read individual response e-mails, but your case might prompt a posting on the Robot Game Updates page if it's popular, reveals missing or confusing text, reveals a flaw in the game, reveals an unresolvable conflict, or is so innovative, it blows everybody away.
- No new Robot Game Updates are posted after 3PM (eastern U.S.) on Fridays.
- You won't get help/advice about building or programming (that's your challenge).
- Questions about LEGO product in general get redirected: Instead call (U.S.) 1-866-349-LEGO.
- Questions posted in the discussion forum are not seen nor responded to by Robot Game Support.

WARNING: The forum is great for sharing ideas and getting tips from other teams, but it is not an official source of answers about anything.

30 — COACHES' MEETING

- If a question does come up right before the tournament, your last chance to ask it is at the "Coaches' Meeting" (if there is one) the morning of the tournament.
- The head ref and coaches meet to identify and settle any differences BEFORE the first match.
- For the rest of the day, the ref's calls are final when you leave the table.

CHANGES OF NOTE FOR 2011

- The limits on sensors have been changed from type and quantity to quantity only.
- Team members not at the table may now hold equipment after inspection.