




Robot Game Rules



Philosophy

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 as other teams.
- You build onto other people’s ideas instead of resisting or defeating them.

2 - Interpretation - Robot game text means exactly and only what it says, so take it literally whenever possible.

- Do not interpret text based on your assumption about intent, or on how a situation might be in “real life.”
- If a detail isn’t mentioned, then it doesn’t matter.
- There are no hidden requirements or restrictions. If you’ve read everything, then you know everything.

EXAMPLES:

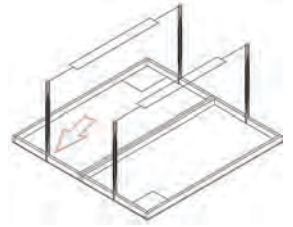
- *If a mission requirement is for the robot to “be on the stairs,” that doesn’t mean the robot needs to climb the steps, or go to the top!*
- *If a river is drawn on the mat but never mentioned anywhere, it’s okay for the robot to drive over it.*
- *If a mission requirement is for a cup to “be on the table,” upside down is okay.*
- *If the robot must use a robotic arm to empty the trash, this will be clearly stated. If not, any method is okay.*
- *If the robot must in fact “use a robotic arm to empty the trash,” it doesn’t matter whether the arm reaches in and grabs the trash, or instead turns the can upside down...*
- *You’re encouraged to think this way - Please learn the requirements and constraints very well, and then realize the many FREEDOMS that are left.*

3 - Benefit of the Doubt - You may get the benefit of the doubt when:

- incorrect model setup or maintenance is a factor.
- 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 referee is tempted to rule based on the “intent” of a requirement or constraint.
- no one’s really sure WHAT just happened!
- Speak up! If you (kids, not coach) disagree with the referee and can respectfully raise sufficient doubt during your post-match chat, you are given the points in question.
- This rule is not an order for the referees to be lenient, but for them to rule in your favor when they’ve done all they can to rule correctly, yet the answer is still unclear. This rule should not be part of a strategy!

4 - Variability - As you build and program, keep in mind that our suppliers, donors, and volunteers try very hard to make all fields correct and identical, but you should always expect some variability, such as:

- flaws in the border walls, including splinters, screws, holes, and tape.
- variety in lighting conditions, from hour to hour, and/or table to table.
- texture/bumps under the mat, due to imperfections, seams, or debris.
- presence or absence of tape at the east and west edges of the mat.
- waviness in the mat itself... At many tournaments, it's 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.
- Expect and design around interference where poles for lights and cameras might be mounted to walls.
- Questions about conditions at a particular tournament should be directed to that tournament's officials.



Information

5 - Precedence/Authority - You get information about the robot game from more than one place. Once in a while, there is conflict...

- 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, assume the most sensible interpretation.
- If two interpretations seem equal, assume the interpretation most favorable for the team.
- 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!

6 - Robot Game Support

- The first place to go for Robot Game support is the [Robot Game Updates page](#).
<http://www.firstlegoleague.org/challenge/robotgameupdates>.
- If that doesn't help, expert support is available directly from the designer/author (Scott - Hi!) at fillrobotgame@usfirst.org (usual response is 0-3 business days).
- When emailing, please state your role in FLL (member, coach, parent, mentor, referee, Partner).
- Questions organized into short simple sentences get the fastest most useful answers.
- Tournament referees are not obligated to read individual response emails.
- 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).
- For questions about LEGO product, call (U.S.) 1-866-349-LEGO.
- Questions posted in the discussion [forum](#) (<http://forums.usfirst.org/forumdisplay.php?24-FIRST-LEGO-League>) 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.

7 - Coaches Meeting - If a question comes 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 referee and coaches meet to identify and settle any differences BEFORE the first match...
- If you have a strategy that might confuse the referee, you should alert the referee in advance of the match if possible to avoid confusion during the actual match.
- For the rest of the day, all referee calls are final when you leave the table.

Competition Definitions

8 - Mission - A *mission* requirement is a condition the robot produces for points, sometimes in a certain way.

- You decide the order in which to try the missions, and how many to try with each software program.
- You don’t have to try every mission.
- 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 even reach the stack, you could try again later, since the stack is undisturbed. But if the robot topples the stack westward, since the stack doesn’t get reset, the mission is impossible to re-try.

9 - 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. Here’s the process:

- You get to the competition table and have at least one minute to prepare (see [Rule 36](#)).
- The match starts and the timer runs for 2-1/2 minutes without stopping.
- Each match is 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.
- “Playoffs” - if held - are just for added fun.
- 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 you tried but could not complete because the other team was missing.
- There are at least three matches, and when all teams have cycled through a match, that’s called a “round.”

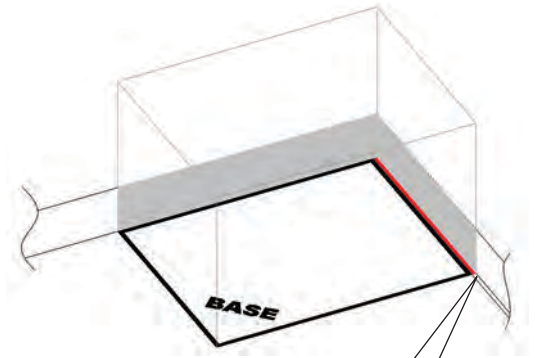
Local Definitions

10 - Field - The field is every reachable place and object in the robot’s match environment.

- This includes the table top, inner border wall surfaces, field mat, and mission models.
- 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 posted on the web.
- For full details about how to set up the Field, visit the [Field Setup](#) section... The fact that you can tell where the models go on the mat does NOT mean you know how to set up the field!

11 - 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 12" (30cm) high.

- This means Base is not just an area on the mat - it's a VOLUME.
- The lines that define Base count as part of Base.
- Usually there is a gap between the mat and a side border wall... Base includes this gap (pictured in red).



A gap between the mat and a side border wall is included in the base.

Object Definitions

12 - Robot - The robot is the LEGO MINDSTORMS® controller and anything joined with it by hand (any method, any configuration) which is designed not to separate from it except by hand.

13 - Attachments - Attachments are robot features you add or remove by hand during the match.

14 - Strategic Objects - Strategic objects are team-supplied objects, either handled by you, in Base, or handled and abandoned by the robot (wherever) by design.

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

16 - Cargo - Cargo is any strategic object or mission model the robot has with it for transport or release. Objects in accidental contact, objects fully released, and objects “all done being pushed” are not cargo.

Robot Allowable Equipment

17 - LEGO Elements in Original Condition - Everything you have at the field for mission-related activity (robot, attachments, and strategic objects) must be made entirely of LEGO-manufactured elements in original factory condition.

Exceptions:

- LEGO string and tubing may be cut to length.
- You may hold/reference a paper list to keep track of robot programs.
- Marker may be used only in hidden areas, for ownership identification.
- Stickers are not allowed, except LEGO stickers, applied per LEGO instructions.
- Paint, tape, glue, lubricants, zip-ties, etc. are not allowed.

18 - Regular Elements - You may use as many non-electric LEGO elements as you like, including pneumatics, rubber bands, and string, and they may be from any source or set (MINDSTORMS®/TECHNIC/DUPLO®/ BIONICLE™/STAR WARS™/HARRY POTTER™/etc.).

Exception: Factory-made wind-up/pull-back “motors” are not allowed.

Exception: You may not bring duplicate mission models to the table if they could confuse scoring.

19 - Controllers - You are allowed a maximum of one controller in the competition area in any one match. Choose one of the three LEGO-manufactured types shown here.



EV3



NXT



RCX

20 - Sensors - You are allowed as many sensors as you like, but the types are limited to touch, light, color, rotation, ultrasonic, or gyro/angle. Choose your favorite combination from among the LEGO-manufactured types shown here. No other sensors are allowed.



EV3 TOUCH



EV3 COLOR



EV3 ULTRASONIC



EV3 GYRO/ANGLE



NXT TOUCH



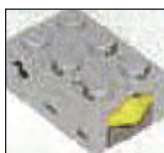
NXT LIGHT



NXT COLOR



NXT ULTRASONIC



RCX TOUCH



RCX LIGHT



RCX ROTATION

21 - Motors - You are allowed a maximum of four motors in any one match. Choose your favorite combination from among the LEGO-manufactured types shown here. **NO** other motors are allowed.



EV3 "LARGE"



EV3 "MEDIUM"



NXT



RCX

22 - Quantity Limits - The quantity limits given above don't just apply to what's on your robot "right now."

- The referee adds up everything you have with you in the competition area altogether, on and off the field.
- All of it counts toward your total for the current match.

23 - Other Electrical Elements - No other electric elements nor devices are allowed for use in any way in the competition area. Exception: LEGO wires and converter cables are allowed as needed.

- Spare electrical parts are allowed in the PIT area.
- Objects functioning as remote controls are not allowed anywhere, any time. Bluetooth must be off.

24 - Software - The robot may only be programmed using LEGO MINDSTORMS RCX, NXT, EV3, or RoboLab, 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.
- This rule puts a cap on software-related unfairness, and puts a cap on what we can reasonably ask tournament judges to become versed in - thanks for your understanding!

25 - Violation - If the robot is in violation of the allowable equipment 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.

Status Definitions

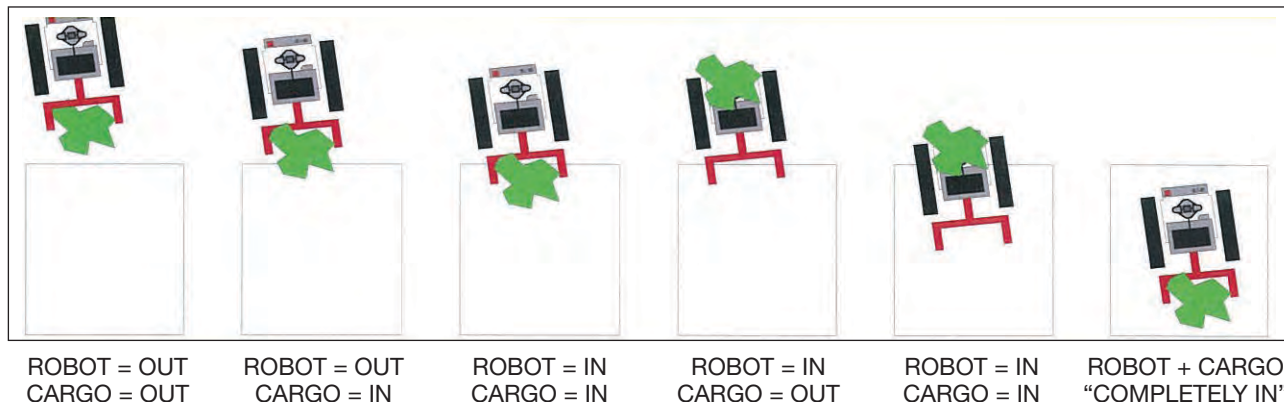
26 - Autonomous → Offline → Autonomous → Offline → Autonomous...

- Following every time you start (or restart) the robot, it is “autonomous” and allowed to perform.
 - All strategic changes to the field outside Base must be caused by an autonomous robot (never by an offline robot, and never by your hands).
- When you next touch your autonomous robot, it is “offline” and must be restarted from Base.
 - While offline, the robot is okay to handle per [Rule 41](#) and restart per [Rules 39](#) and [40](#) when you’re ready.

27 - In - An object is “in,” “into,” or has “reached” an area if any bit of that object crosses the area’s perimeter.

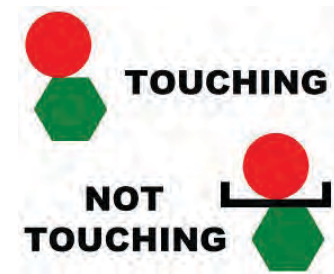
- Said another way... To be “in” an area is to penetrate the volume over or below what defines that area.
- Barely “in” is considered “in” unless “COMPLETELY in” is required.
- “Touching” is not part of the requirement for being “in.”
- Objects are ruled on independent of each other, and independent of their transports/containers.
 - Exception: A cluster of small objects is considered one object.
- “Out” and “outside” always mean COMPLETELY out.

EXAMPLES OF IN AND OUT



28 - Touching

- Only objects in direct contact are considered “touching.”
- Any amount of direct contact counts as touching.
- Touching is not required unless the word “touching” is used.
 - Exception: Only for the robot, an indirect touch counts as a touch.



Robot Action Rules

29 - Success, Loss, Failure, and Chaos - Anything your autonomous robot does to your field outside Base (good or bad) stays that way, unless the ROBOT changes it. Exception: [Rule 50](#).

- Mission models are not fixed or reset. Stray objects are not moved out of the robot's way.
- Cargo the robot loses contact with outside Base is left/stranded wherever it comes to rest.
So... The robot can ruin its own opportunity to accomplish tasks, and can even spoil previous results.

30 - Model Damage - Model damage is when a model outside Base is made defective and/or its Dual Lock is separated by an autonomous robot. (It can also happen when a fashion runway collapses!)

- Model damage is not repaired during the match ([Rule 29](#)). Exception: [Rule 50](#).
- If a model is put into a scoring condition, but is damaged in the process, the mission marked scoreless.
- If instead the scoring model gets damaged during an obviously unrelated action later (even just seconds later)...
- If the scoring condition is still visible, it can still score.
- If the scoring condition is no longer visible, it can not score.
- Any scoring success which obviously depended on model damage is marked scoreless.
- Any model damage obviously due to poor field setup/maintenance is scored with benefit of the doubt.

31 - Interference - Interference is when your robot disturbs the other team's field or robot.

- Your robot may not have any effect on the other team's robot, field, or strategy, unless it's allowed in a mission.
- Any points you or your robot potentially cost the other team are given to them automatically.
- 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 effects are the same, and neither is considered interference.

32 - Junk Penalty - A junk penalty is given at the end of the match for each strategic object abandoned outside Base.

33 - Sprawl Penalty [Match End-Based] - A sprawl penalty occurs at the end of the match if either:

- the robot's max dimension is obviously greater than twice the (south/north) width of Base.
- a strategic object extends out of Base obviously farther than the (south/north) width of Base.

The penalty's value is given in the [Missions on page 29](#).

Team/Hand Action

34 - Robot Operators

- Only two team members at a time are allowed right next to the competition table except during repair emergencies.
- The rest of the team must stand back, as directed by tournament officials, but not too far, because different members may tag in or out as desired at any time, as long as the two-member limit is kept.

35 - Storage - You are allowed to store things in Base, outside Base, and even off the table...

- An object in storage is one that you're allowed to handle, and which counts as being in Base, even if it's not actually there. Stored objects are defined as:
 - anything team-supplied, which the robot has not moved out of Base.
 - anything in Base when the match started, which the robot has not moved out of Base.
 - anything brought to Base by the robot.
- You may at any time handle stored objects the robot is not interacting with, including the placement of objects (completely in Base) for the robot to interact with during an autonomous period.
- Stored objects are not allowed to make contact with anything outside Base except other stored objects.
- Off-field storage is usually in a box or tray on a stand.
- On-field storage and handling of the robot and other objects may extend over Base lines, as long as there is absolutely nothing strategic or disruptive about the placement. Please do try to keep all on-field storage in Base.
- Team-supplied objects held by members away from the table must be inspected before the match starts.
- Mission models and objects worth points must always stay in view of the referee.

36 - Pre-Match Preparation - This is the period after you get to the field and before the match starts.

- This is your time (at least 1 minute - it varies) to ready your equipment and compose yourself.
- At this time only, you may calibrate light & color sensors outside Base (this is an exception to [Rule 38](#)), and VISUALLY inspect the field (see [Rule 37](#)).
- At this time (and others – see [Rule 41](#)) you may also store and arrange equipment, charge pneumatics, set mechanisms, select a program, load and aim the robot, and get everything into “starting position” ([Rule 39](#)).

37 - Field Quality Control

- You may not take mission models apart, even temporarily.
- During your pre-match preparation time only, you may ask the referee to double-check that a particular setup is correct/within spec, but you may not request any custom setup, in or out of the specified range.

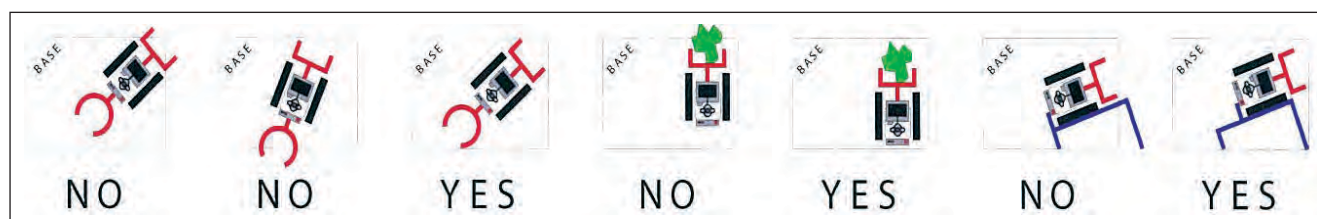
38 - Changes Outside Base - You may not strategically place, send, extend, use, or affect anything outside Base by hand. You may not make any changes outside Base except by:

- storing objects ([Rule 35](#)).
- removing robot fragments ([Rule 46](#)).
- a proper robot start ([Rule 40](#)).
- shutting off your robot ([Rule 47](#)).
- removing your robot ([Rules 42 and 49](#)).
- accident ([Rule 50](#)).

39 - Start/Restart Position - For the match start and all restarts:

- EVERY BIT of the robot, including its installed attachments & wires, and 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, but your HANDS may not.
- The robot's program may or may not already be running, but everything must be motionless.
- If the robot is about to move a mission model from Base, you must be able to pick that model up and have NOTHING come with it (only do this if asked).
- You may design/use a LEGO frame/"jig" 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. You may not mark the mat nor use paper for aiming. (Reference [Rules 14](#), [17](#), and [40](#).)

EVERYTHING MUST START COMPLETELY IN BASE




40 - Starting Procedure

- For the match start, the referee checks for proper starting position, 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 prompt the robot's program.
- During the countdown: Except for the button/signal prompt, you may not handle the robot or anything it's touching or about to move or use.
- 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.
- At the exact starting time, you either touch a button or signal a sensor to start or prompt the robot's program. The robot is now considered to be started and autonomous.
- For all other starts (called restarts), there's no countdown. The referee watches to be sure things are in proper starting position, and you activate the robot whenever you like.
- If the robot enters and leaves Base with no interruption or influence from you, this is not considered a restart, so starting position and procedure rules don't apply.
- Once started, the robot may go anywhere or extend to any size, in any direction, including over borders.

41 - Mid-Match Offline Robot - When the robot's offline, in Base... In addition to the important actions allowed in the third part of [Rule 36](#), you may unload, repair, and re-configure it.

42 - Forced Restart - Any time you touch the robot, no matter where it is, it is "offline" and must immediately be picked up and carried to Base (if it's not already there), where Rule 41 applies. When you're ready, follow [Rules 39](#) and [40](#) to make it autonomous again.



43 - Robot Penalty - These occur whenever you touch an autonomous robot which is OUTSIDE BASE.
The penalty's value is given in the Missions, below.

44 - Cargo Penalty - Any time you touch the robot, no matter where it is, if it has cargo OUTSIDE BASE it didn't have during the most recent start, the referee takes that cargo out of play.

45 - Sprawl Penalty [Hand-Based] - A sprawl penalty occurs whenever you either:

- touch the robot while its max dimension is obviously greater than twice the (south/north) width of Base.
- touch a strategic object while it extends out of Base farther than the (south/north) width of Base.

The penalty's value is given in the Missions, below.

46 - Broken Robot - You may pick up fragments of an obviously broken robot any time, anywhere with no penalty.

47 - Motor Strain - If you won't be trying any more missions, and your robot is outside Base, straining its motors, and no longer traveling, you may non-strategically shut it off and leave it in place with no penalty.

48 - Strategic/Precision Stop

- If your eyes are doing the work of a sensor...
- If your window of execution for touching/interrupting the autonomous robot is conveniently precise... (3, 2, 1, GRAB NOW!)...
- If a new scoring condition is produced or preserved by the precision of the grab... and these things are obvious to the referee, missions benefitting are marked scoreless.

EXAMPLE: *If the robot needs to push a lever somewhere between Position 3 and Position 4, and you touch your "healthy" robot while the lever is STILL MOVING between those positions... No score.*

49 - Chain Reactions - If the (hand) movement of the offline robot will unavoidably cause/allow the movement of any non-cargo object outside Base, such as something being "held up" or "held back," the movement of that restrained object (the chain reaction) must be kept to an absolute minimum.

- Allow the stored energy to dissipate slowly, over as little distance as possible.
- Missions obviously benefitting from hand-help are marked scoreless.

50 - Reversible Changes - When things such as a sleeve, table-bump, renegade offline robot, or illegal action disturb the field in a non-trivial way, the referee physically reverses the change if he or she feels that's easy. In cases where the change is too hard to undo...

- If the accident was the team's fault, negative scoring effects stand, and positive scoring effects do not.
- If the accident was not the team's fault, the team gets benefit of the doubt on all dependent scoring.