FIRST® LEGO® League

2010 FLL CHALLENGE

ROBOT GAME – RULES

1 - READ EVERYTHING - All else held equal, experts on the four main documents of the Robot Game do better and have more fun. Read these well, and come back to them often: Field Setup, Missions, Rules, Rulings.

2 - PURPOSE

- Gain interest in science, technology, engineering, and innovation, in a team environment.
- Have fun pushing yourself.

3 - 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.

4 - 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.

5 - 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!

6 - EQUIPMENT

- Your equipment (robot, attachments, and other accessories) must be made entirely of LEGO elements in original factory condition.
  - 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.
- There are no restrictions on the quantities or sources of non-electric LEGO elements, except that factory-made wind-up/pull-back "motors" are not allowed. Pneumatic elements are allowed.
- Electric elements must be the LEGO MINDSTORMS type.
- The total number of each electric element you may use in any one match is limited as listed below.

To understand how these quantity limits are applied, let's consider for example, the motors:

- Imagine that a referee (a "ref") stops your entire team on your way to a match, and counts every motor every team member has - every motor on the robot, and on all separate attachments, and from every cart, and box, and from all your pockets… The total must not exceed three.
- 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 is always illegal, no matter what.
- Even if you only plan to run 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.

For RCX Users:	For NXT Users:
Motors (3)	Motors (3)
RCX Controller (1)	NXT Controller (1)
Touch Sensors (2)	Touch Sensors (2)
Light Sensors (2)	Light Sensors (2)
Rotation Sensors (3)	Rotation Sensors (3 minus the number of NXT motors present)
3rd Touch OR Light Sensor (1)	Ultrasonic Sensor (1)
Lamp (1)	Lamp (1)

- Due to the above limits, 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, earlier or later in the day.
- LEGO wires and converter cables are allowed as needed.
- Spare electrical parts are allowed in the PIT area.
- Computers are not allowed in the competition area.
- Objects functioning as remote controls are not allowed anywhere, at any time.
- Marker may be used for ownership identification, for marks in hidden areas only.
- Paint, tape, glue, oil, etc. are not allowed.
- Stickers are not allowed, except LEGO stickers, applied per LEGO instructions.
- If the robot is in violation - of this rule or Rule 7 - and cannot be corrected, the decision about exactly what to do rests with the tournament officials, but that robot may not win awards.

7 - SOFTWARE

- The robot may only be programmed using LEGO MINDSTORMS, RoboLab, or NXT 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.

8 - MISSION - A mission is a result or action worth points.

- The more missions the robot does, and the more valuable each one is, the higher your score.
- You decide the order you want to try missions in, and how many to try in each robot program.
- You may re-try missions when that's possible, but the field is not reset for that purpose.
- Most teams do anywhere between "some" and "most" of the missions. Very rare teams do them all.

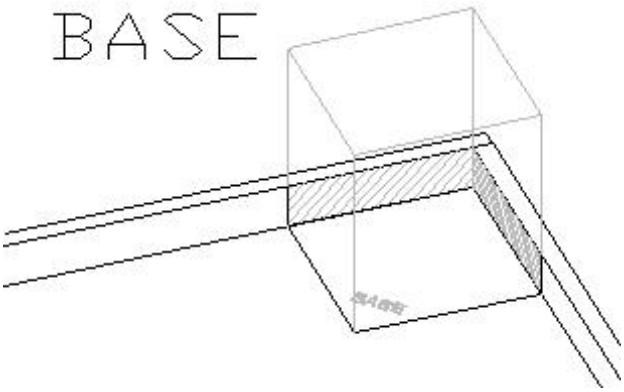
9 - MATCH - At a tournament, two robot game fields are joined back to back, and you are paired opposite another team to compete in a match. Each match lasts 2-1/2 minutes. Here's the process:

- You get to the competition table and have at least one minute to prepare your equipment. See Rule 17.
- The match starts and you start the robot. Once started, the robot is now "active" and is understood to be working on missions, under its own power and programming. See Rules 20, 21, and 16.
- 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 with its cargo to Base if it's not already there. See Rules 16, 17, and 22.
- While the inactive robot is in Base, you prepare it for its next active period, and restart it. See Rule 17.
- 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 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. See Rule 29.
- If it is known in advance that you will not have another team opposite you, a volunteer or "house" team will substitute. If not, and you compete against an empty table, you get the points for any missions that would have involved the missing team.

10 - ROUND - The process of cycling all teams through one match each is called a round.
- Tournaments run at least three rounds.
- Between your match in one round and the next, you usually have time to go to the pit area and work on the robot and its programs as needed, but this time might be limited, depending on the schedule of other proceedings, such as judging.

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 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.



12 - FIELD - 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 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.
- Other critical field setup instructions are on the Field Setup page – read them, please.

13 - 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 are limited as to how you may connect anything to a mission model. Gently flipping and/or shaking one (the heavier if the two are different) must allow gravity to completely separate them. The ref does not allow a start with an illegal connection. See Rule 20.
- Don't walk away with mission models from the competition area. Bring them back if you do. Thanks.

14 - CARGO - Cargo is anything the robot has with it for transport.

15 - 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 in Base. See Rule 16.
- If this was planned, and the robot and its cargo are already in Base, no problem.
- But touching the robot outside Base is seen as a rescue, so there can be penalties. See Rule 22.

16 - ACTIVE ROBOT < > INACTIVE ROBOT

- At the moment the robot is started, it becomes "ACTIVE" (understood to be autonomous), and remains so until the next time you touch it.
- At the moment of that touch, the robot becomes "INACTIVE" (understood to need help), and must be carried to Base unless it's already there. See Rule 22.
- The inactive robot in Base may then be handled/prepared and restarted, so it's active again, etc. See Rule 17.

17 - HANDLING ALLOWED

- Before the match, and whenever else the robot is inactive, you may handle and prepare it by hand in Base for its next active period.
  - Typical robot handling and preparation includes repairs, switching attachments, selecting programs, resetting features, loading/unloading cargo, and aiming.
  - This work must take place in Base, but if some space right outside Base is needed, that's okay, just be sure not to disturb the field in any way.
- Objects in Base are yours to store, prepare, or stage for future interaction with the active robot. Just be sure they're stationary and you let go of them before the robot touches them.
- The only things you may do by hand OUTSIDE Base are:
  - Stop and lift the robot, any time. Consequences: See Rule 16.
  - Recover debris from accidental robot damage any time, as needed. See Rule 22.
  - Calibrate light sensors (before the match start only). See Rule 9.

18 - HANDLING NOT ALLOWED

- You may not cause things to extend, leave, or be placed outside Base, even partially, even temporarily, except as described in Rules 19 and 21.
- You may not move or adjust anything outside Base, before, during, or after the match.
- You may not request a field setup outside the range of specified setups, but you may ask the ref to double-check that a particular setup is correct/within spec.
- In the case of non-robot accidents: If your elbow, hip, clothing, or even the ref messes something up, this gets "undone" as fast and accurately as possible, if possible. Changes to the field caused or allowed by the removal of your inactive robot from the field are treated the same way.
- Objects staying on the field after any touch should be lowered to rest as close as possible to the place and orientation they were at the time of the touch.

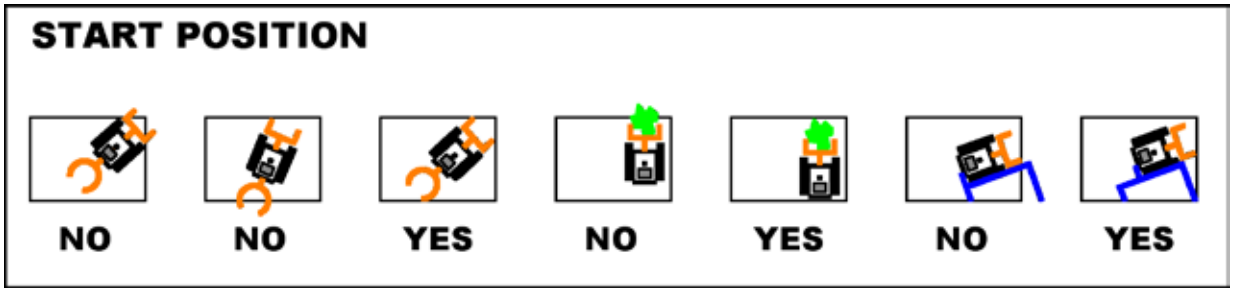
19 - STORAGE

- Once the ref inspects your equipment, you may store things as needed in Base, or in a box, either held by one of the two people at the table, or possibly on a stand, if stands are allowed at your event (decided by your tournament's officials – check with them in advance).
- In rare situations of objects crowding in Base, the ref allows you to store them on the field away from Base, but only if it is obvious their placement is purely for storage.
- Team members other than the two at the table may not hold equipment.
- Mission models and objects worth points in Base always need to stay in view of the ref.
- Nothing is allowed on the floor.

- At any time, objects in Base may be handled or stored, or even staged (completely in Base) for the robot to interact with later. Just be sure that your action has no real-time influence on the robot (that would be treated as if you touch it). See Rule 22.

20 - START POSITION

- For the match start and all restarts, EVERY BIT of the robot, including its installed attachments, 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.
- There must not be any illegal connections. See Rule 13.



21 - START 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)…
      - 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 or after the countdown, except for the single action needed to get the program running. If you do, the ref has you restart.

22 - TOUCH PENALTIES

If you touch the active robot or anything it's touching while:

- the ROBOT is outside Base, you lose one "touch penalty object" (identified in the Missions), if any are available at the time.
- a piece of CARGO is outside Base, you lose that piece of cargo, unless it was with the robot the last time the robot left Base.

If the only part of the robot crossing into 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.

When you touch the active robot, be sure to stop it immediately. If the INACTIVE robot makes a change to the field, the ref tries to undo it. If the change can't be undone,

- negative results stay "as is."
- missions benefitting are marked incomplete.

23 - ROBOT ACTIONS STAND - Anything done to your field by the active ROBOT outside Base STAYS that way, unless the active ROBOT changes it.

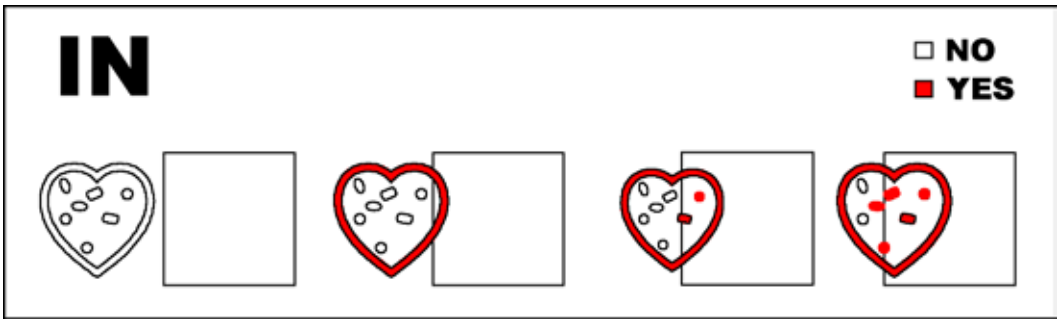
- Objects outside Base are not repaired, reset, recovered, or moved out of the way by hand.
- This means the robot can ruin its own opportunity to accomplish tasks, and it can even spoil previous progress/results
- If your active robot (untouched by you) loses contact with cargo, the cargo stays where it comes to rest unless/until the active robot regains contact with it. It may not be recovered by hand. Anything that comes off the table is kept by the ref.
  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).

24 - INTERFERENCE - Your robot may not have any effect on the other team's robot, field, or strategy.

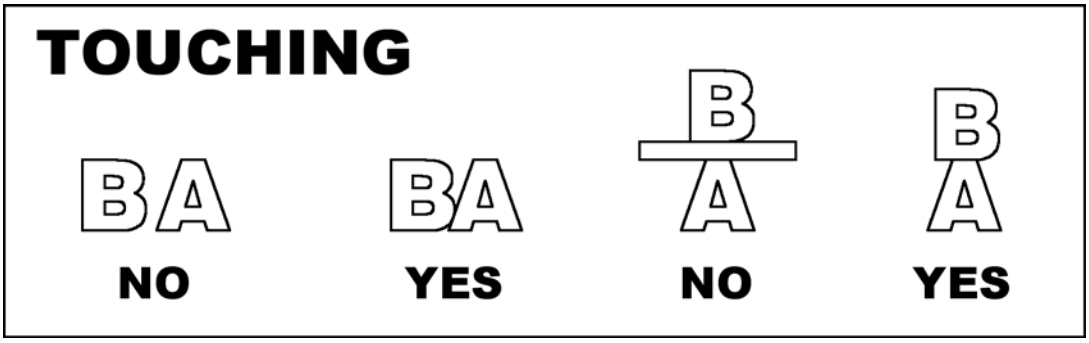
- Near the model(s) shared between both teams…
  - Exception: If your robot is simply trying to complete missions there, interference is expected and acceptable.
  - If Robot X deliberately blocks or un-scores Robot Y's progress/results, Robot X's mission(s) in that area are marked as incomplete, and Robot Y's are marked as complete.
  - As a matter of luck, the other team might be able to out-perform you in the shared area, or might fail to cooperate with you there. This is not considered interference.

25 - IN - A is "in," "into," or has "reached" area B if ANY BIT of A is OVER area B.

- To be "in" an area is to penetrate the volume over that area. Base is a special case; see Rule 11.
- Barely "in" is considered "in" unless the phrase "completely in" is used.
- Touching (direct contact) isn't needed/doesn't matter when assessing if something is "in."
- Objects are ruled on independent of each other, and independent of their transports/containers.



26 - TOUCHING (for objects other than the robot) - A is "touching" B only if A is making direct contact with B. Any amount of direct contact counts as touching. Exception: See Rule 19, last bullet.



27 - FINAL FIELD CONDITION SCORING - To minimize controversy about what happened during a match, the overall score is determined at the END of the match, by the SNAPSHOT condition of the field at that EXACT time only.

- This means that points are not given for results the robot produces early in the match but then trashes before the match ends.
- Rarely, a method is required as well as a result. In that case, the ref notes whether the required method is used.

28 - 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, among options such as holding "first-to-perfect" playoffs, or awarding multiple Performance Awards.

29 - 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, the 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 it is a license for them to make judgment calls in your favor when it's reasonable to do so.

30 - DOWNLOADING AND WIRELESS SIGNALS

- Downloading programs to robots may take place in the pits only - never in the competition area.
- If downloading to an RCX controller, make sure the process is shielded, and that there are no other RCX robots in range. RCX robots must be turned off when not in use.
- If downloading to an NXT controller, do so by cable. Bluetooth must be switched off at all times.

31 - 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 tournament officials.

32 - 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 Rulings page
  2 = Missions and Field Setup pages
  3 = Rules page
- If something on a page conflicts with something else on the same page, the most sensible interpretation is assumed. If they 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.

33 - 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 requirement/restriction-based paths of logic/reason for assessing special strategies or situations in terms of legality and scoring.
- The ref is not obligated to read response e-mails, but your case might prompt a posting on the Robot Game Rulings page if it's popular, reveals missing or confusing text, reveals a flaw in the game, reveals an unresolvable conflict, or is amazing or entertaining.
- No new Robot Game Ruling entries 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 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.

34 - 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.

Summary Of Significant Content Changes For 2010 (bold underlined denotes serious changes)

A - No longer need definitions for the robot, attachments, or strategic objects – "Cargo" introduced, Rule 14.
B - Light sensor calibration specifically allowed, Rule 17.
C - Housekeeping and Muscle Action rules rolled into Rules 17, 18, and 19.
D - Loss Of Contact rolled into Rule 23.
E - Referees no longer expected to fix active robot field damage, Rule 23.
F - Stray Objects rule removed, Rule 23.
G - Leniency promoting objects to be taken into Base when the robot reaches Base is removed, Rule 22.
H - Tether rule strengthened to include solid extensions and remove loopholes, Rule 22.