

FLL “ANIMAL ALLIES” – RULES & ROBOT GAME

At the Robot Game, the teams compete with robots they have built in advance out of LEGO parts and programmed by themselves. Within 2½ minutes they try on the approximately 2m² large playing field, to get as many points. The robot must act autonomously, all movements must be independently by the program. Remote controls are not allowed.

At all competitions of a season the same playing fields and tasks are used worldwide. The way in which the objects are achieved and the order in which they are dissolved, are not prescribed. Accordingly, the robots of the team look completely different, even though they are all built from LEGO.

CONTENT

1. RULES	3
1.1 Guiding principles	3
GP01 – Gracious professionalism	3
GP02 – Interpretation	3
GP03 – Benefit of the doubt	3
GP04 – Variability	3
GP05 – Information Superiority	3
1.2 Definitions	4
D01 – Match	4
D02 – mission	4
D03 – Equipment	4
D04 – Robot	4
D05 – mission model	4
D06 – Field	4
D07 – Base	4
D08 – Launch	5
D09 – Interruption	5
D10 – Transporting	5
1.3 Equipment, software, and people	5
R01 – All equipment	5
R02 – Controllers	5
R03 – Motors	6
R04 – External sensors	6
R05 – Other electric/electronic things	7
R06 – Non-electric elements	7
R07 – Software	7
R08 – Technicians	7

1.4 Robot Game	7
R09 – Before the match timer starts	7
R10 – Handling during the match	7
R11 – mission model handling	8
R12 – Storage	8
R13 – Launching	8
R14 – Interrupting	8
R15 – Stranding	8
R16 – Interference	9
R17 – Field damage	9
R18 – End of the match	9
R19 – Scoring	9
1.5 Questions regarding Rules, Robot Game & Field Setup	10
1.6 Serious changes for 2016/2017	10
2. ROBOT GAME FLL 2016/17 – “Animal Allies”	11
2.1 General FLL Field Set up & Placement	11
Overview	11
Field Mat Placement	11
Mission Model Construction	12
Dual Lock	13
Arrangement of Models and Setup	13
Field Maintenance	13
2.2 Missions: Field Setup & Placement, Tasks Description, Constraints & Evaluation	14
BASE	14
M01. SHARK TRANSPORT	15
M02. SERVICE DOG	16
M03. ANIMAL CONSERVATION	17
M04. FEEDING	19
M05. BIOMIMICRY	20
M06. MILKING AUTOMATION	21
M07. PANDA RELEASE	22
M08. CAMERA RECOVERY	23
M09. TRAINING AND RESEARCH	24
M10. BEE KEEPING	26
M11. PROSTHESIS	27
M12. SEAL	28
M13. MILK IN BASE	29
M14. MILK ON THE RAMP	30
M15. MANURE	31
PENALTIES	32

1. RULES

1.1 Guiding principles

GP01 – Gracious professionalism

- The FLL tournament should be driven by fairness.
- You compete hard against problems, while treating all people with respect and kindness.
- If you joined FIRST® LEGO® League with a main goal of “winning a robotics competition”, you’re in the wrong place!

GP02 – Interpretation

- If a detail isn’t mentioned, it doesn’t matter.
- Robot Game text means exactly and only what it says.
- If a word isn’t given a game definition, use its common conversational meaning.

GP03 – Benefit of the doubt

- If the referee feels something is a “very tough call,” and no one can point to strong text in any particular direction, you get the “benefit of the doubt”.
- This good-faith courtesy is not to be used as a strategy.

GP04 – Variability

- Our partners and volunteers try hard to make all fields correct and identical, but you should always expect little defects and differences.
- Top teams design with these in mind.
- Examples include border wall splinters, lighting changes, and field mat wrinkles.
- Questions about conditions at a particular tournament should be directed to that tournament’s officials, the contact dates you can find at the [FLL Regional Websites](#).

GP05 – Information Superiority

- If two official facts disagree, or confuse you when read together, here’s the order of their authority (with 1 being the strongest):
 - 1 = [Current Robot Game updates](#)
 - 2 = [Missions and Field Setup](#)
 - 3 = [Rules](#)
 - 4 = Local head referees - In unclear situations, local head referees may make good-faith decisions after discussion, with rule GP3 in mind.
- Pictures and video have no authority, except when talked about in one, two or three.
- Emails and forum comments have no authority.

1.2 Definitions

D01 – Match

- A “match” is when two teams play opposite each other on two fields placed north to north.
- Matches last 2-1/2 minutes, and the timer never pauses.
- Your robot launches one or more times from base and tries as many missions as possible.

D02 – Mission

- A “mission” is an opportunity for the robot to earn points.
- Missions are written in the form of requirements.
- Most are results that must be visible to the referee at the end of the match.
- Some are actions that must be watched/approved by the referee as they happen.
- If a mission has any “more” requirements, they must all be met, or the whole mission scores zero.

D03 – Equipment

- “Equipment” is everything you bring to a match for a mission-related activity.

D04 – Robot

- Your “robot” is your LEGO MINDSTORMS controller and all the equipment you’ve combined with it by hand which is not intended to separate from it, except by hand.

D05 – Mission model

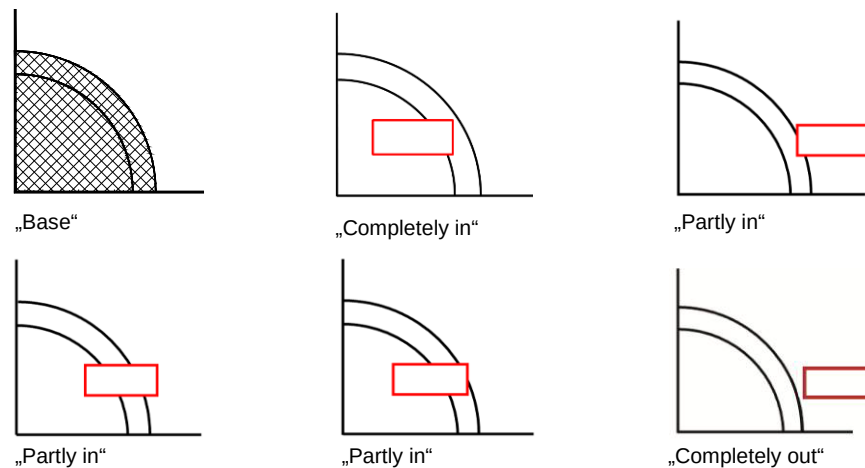
- A “mission model” is any LEGO object already at the field when you get there.
- Mission models are not the same as “equipment”.

D06 – Field

- The “field” is the robot’s game environment, consisting of mission models on a mat, surrounded by border walls, all on a table.
- “Base” is part of the field.
- For full details, [see field setup](#).

D07 – Base

- “Base” is the space directly above the field’s larger quarter-circle region, in the southwest corner.
- It extends southwest from the outer curved line to each wall (no farther), and has no ceiling.
- The diagrams below define “completely in” for base, but apply for any area.



D08 – Launch

- Whenever you're done handling the robot and then you make it go, that's a "Launch".

D09 – Interruption

- The next time you interact with the robot after launching it, that's an "Interruption".

D10 – Transporting

- If the robot is in contact with something for the obvious purpose of taking it, changing its location, or releasing it, the robot is "Transporting" it.

1.3 Equipment, software, and people

R01 – All equipment

All equipment must be made of LEGO-made building parts in original factory condition.

- Except: LEGO string and tubing may be cut shorter.
- Except: Program reminders on paper are okay (off the field).
- Except: Marker may be used in hidden areas for identification.

R02 – Controllers

- You are allowed only one individual controller in any particular match.
- It must exactly match a type shown below (except color).



EV3



NXT



RCX

- All other controllers must be left in the Pit Area for that match.
- All remote control or data exchange with robots (including bluetooth) in the competition area is illegal.
- This rule limits you to **only one individual robot** in any particular match.

R03 – Motors

- You are allowed up to four individual motors in any particular match.
- Each one must exactly match a type shown below.
- You may include more than one of a type, but again, your grand total may not be greater than FOUR.
- ALL other motors must be left in the Pit Area for that match, **no exceptions**.



EV3 "LARGE"



EV3 "MEDIUM"



NXT



RCX

R04 – External sensors

- Use as many external sensors as you like.
- Each one must exactly match a type shown below.
- You may include more than one of each type.



EV3 TOUCH



EV3 COLOR



EV3 ULTRASONIC



EV3 GYRO/ANGLE



NXT TOUCH



NXT LIGHT



NXT COLOR



NXT ULTRASONIC



RCX TOUCH



RCX LIGHT



RCX ROTATION

R05 – Other electric/electronic things

- No other electric/electronic things are allowed in the competition area for mission-related activity.
- Except: LEGO wires and converter cables are allowed as needed.
- Except: Allowable power sources are one controller's power pack or six AA batteries.

R06 – Non-electric elements

- Use as many non-electric LEGO elements as you like, from any set.
- Except: Factory-made wind-up/pull-back “motors” are not allowed.
- Except: Additional/duplicate mission models are not allowed.

R07 – 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.

R08 – Technicians

- Only two team members, called “technicians,” are allowed at the competition field at once.
- Except: Others may step in for true emergency repairs during the match, then step away.
- The rest of the team must stand back as directed by tournament officials, with the expectation of fresh technicians being able to switch places with current technicians at any time if desired.

1.4 Robot Game

R09 – Before the match timer starts

- After getting to the field on time, you have at least one minute to prepare.
- During this special time only, you may also...
 - ask the referee to be sure a mission model or setup is correct.
 - calibrate light/color sensors anywhere you like.

R10 – Handling during the match

- Only the robot is allowed to interact with any part of the field that's not COMPLETELY in Base.
 - Except: You may interrupt the robot any time.
 - Except: You may pick up equipment that broke off the robot unintentionally, anywhere, any time.
- You are not allowed to cause anything to move or extend over the Base line, even partly.
 - Except: Of course, you may **launch** the robot.
 - Except: You may move/handle/**store** things off the field, any time.

- Except: If something accidentally crosses the base line, just calmly take it back - no problem.
- Anything the robot affects (good or bad!) or puts completely outside base stays as is unless the robot changes it. Nothing is ever repositioned so you can “try again.”

R11 – Mission model handling

- You are not allowed to take mission models apart, even temporarily.
- If you combine a mission model with something (including the robot), the combination must be loose enough that if asked to do so, you could pick the mission model up and nothing else would come with it.

R12 – Storage

- Anything completely in base may be moved/stored off the field, but must stay in view of the referee, on a stand.
- Everything in off-field storage “counts” as being completely in Base.

R13 – Launching

A proper launch (or re-launch) goes like this:

- Ready situation
 - Your robot and everything in base it's about to move or use is arranged by hand as you like, all fitting completely in base.
 - The referee can see that nothing on the field is moving or being handled.
- Go!
 - Reach down and touch a button or signal a sensor to activate a program.
- First launch of the match – Here, accurate fair timing is needed, so the exact time to launch is the beginning of the last word / sound in the countdown, such as “Ready, set, GO!” or BEEEEEP!

R14 – Interrupting

- If you interrupt the robot, you must stop it immediately, *then calmly pick it up for a Re-Launch (*if you intend one).
- Here's what happens to the robot and any object it was transporting, depending on where each was at the time:
- Robot
 - Completely in base: re-launch
 - NOT completely in Base: re-launch + penalty
- Transported Object
 - Completely in base: keep it
 - NOT completely in base: give it to the referee.
- The “penalty” is described with the missions .

R15 – Stranding

- If the uninterrupted robot loses something it was transporting, that thing must be allowed to come to rest.

- Once it does, here's what happens to the transported object, depending on its rest location...
- Transported object
 - Completely in base: keep it
 - Partly in base: give it to the referee
 - Completely outside base: leave as is

R16 – Interference

- You are not allowed to negatively affect the other team except as described in a mission.
- Missions the other team tries but fails to get because of illegal action by you or your robot will count for them.

R17 – Field damage

- If the robot separates Dual Lock or breaks a mission model, missions obviously made possible or easier by this damage or the action that caused it do not score.

R18 – End of the match

- As the match ends, everything must be preserved exactly as-is...
 - If your robot is moving, stop it as soon as possible and leave it in place. (Changes after the end don't count.)
 - After that, hands off everything until after the referee has given the okay to reset the table.

R19 – Scoring

- Scoresheet/Scoringsoftware: The referee discusses what happened and inspects the field with you, mission by mission.
 - If you agree with everything, you sign the sheet, and the scoresheet is final.
 - If you don't agree with something, the head referee makes the final decision.
- Impact: Only your best score from regular match play counts toward awards/ advancement.
- Ties: Ties are broken using second, then third best scores. If still not settled, tournament officials decide what to do.

1.5 Questions regarding Rules, Robot Game & Field Setup

- Important questions are published at the "FAQ" section for all teams.
- For official answers to questions send an email to HANDS on TECHNOLOGY e.V. flf@hands-on-technology.org or send a message via Facebook.
- Questions will be answered in due time.

1.6 Serious changes for 2016/17

- There is no "safety" region now. The whole quarter-circle region is all base. The inner curved line is meaningless now. (D07)
- The ceiling of base has been removed, so there is no limit on how tall a launching robot may be. (D07)
- Transported objects partly in base when the robot is interrupted are always given to the referee, out of play. (R14)
- Stranded objects partly in base are always given to the referee, out of play. (R15)
- On-field storage outside base no longer allowed. (R10)
- There is no "junk" penalty.
- Local head referee responsibility is enhanced. (GP05, R19)
- The "benefit of the doubt" rule is strengthened. (GP03)
- The storage of objects in a brought box and on the floor is permitted. These objects count at the end of the match as "in base". (R12)

2. ROBOT GAME FLL 2016/17 – “Animal Allies”

Get ready. Get set. Roar or bark, quack, or squeak, because the FIRST® LEGO® League (FLL®) 2016 “Animal Allies” season is all about our furry, feathered, and finned friends. Do we need animals, or do they need us? The Answer of both questions is “YES”! This Robot Game showcases just a fraction of our wonderful story with animals. As you work on the missions, pay attention to the many ways innovation and technology have enabled humans and animals to exchange learning, friendship, help, daily needs, protection, amusement, and love. As you’ll see, there are many fun problems left to solve!

2.1 General FLL Field Set up & Placement

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 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 not part of the field but available online:

www.first-lego-league.org/en/fll/robot-game/buildinginstruction.html.

The instructions how to build the table is online:

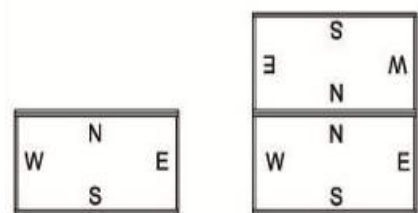
www.first-lego-league.org/en/general/participation.html#4.

How to arrange the mission models on the playing field is explained in this document.

Field Mat Placement

Step 1: Remove any obvious splinters, and cover any obvious holes. Vacuum the table top carefully. 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: Place the mat on a smooth surface (for example, the FLL table) and clearly mark it with a corresponding pitch limit (band), as is common to FLL competitions. 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



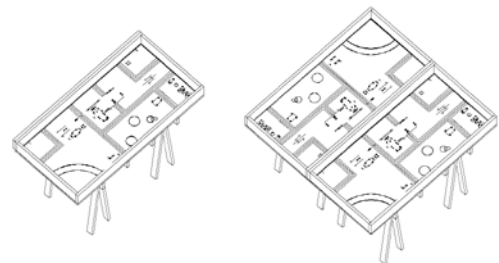
each table sketch below). Be very careful to not let the mat kink from bending in two directions at once.

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).

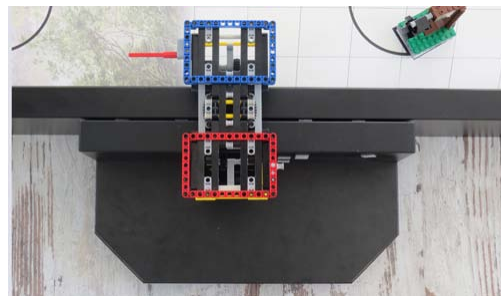
Step 4: With help from others, pull the mat at opposite ends and massage out any waviness away from the center and re-check the requirement of step three. It is expected that some waviness will persist, but that should relax over time. Some teams use a hair dryer to speed the relaxation of the waviness.

Step 5 - OPTIONAL: To hold the mat in place, you may use a thin strip of black tape at the east and west ends. Where the tape sticks to the mat, it may cover the mat's black border only. Where the tape sticks to the table, it may stick to the horizontal surface only, and not the walls.

Step 6: For a competition setup, secure two tables north-to-north. The total span of border between two tables must measure between 76mm and 100mm. 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.



Dummy Wall: All Robot Games have a “shared” mission for both teams, whose mission model(s) rest partly on your table, and partly on the other team's table, which is connected to your table's north side. You don't need to build a second table, but you do need to build the necessary part of the other team's table, so the shared mission model(s) can be positioned correctly. Here are the instructions for building one practice table, including its dummy dall:



Mission Model Construction

Build the mission models. Use the LEGO elements from your field setup kit, and instructions from this page:

www.first-lego-league.org/en/fll/robot-game/buildinginstruction.html.

It will take a single person four to five 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.

The models must be built PERFECTLY. “Almost perfect” is NOT good enough. Many teams make several building errors and practice all season with incorrect models. When these teams later compete on fields with correct models, the robot fails. The team incorrectly blames the robot, the tournament organizers, or bad luck for the failure.

Dual Lock

Some models are secured to the mat, others are simply placed on the mat. Each place where a model needs to be secured has a white box with an X in it. 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 proceed one model at a time as follows:

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. Instead of using your finger, use a bit of the wax paper the squares came on.

Step 3: Lower the model onto the squares.

Hints: Pay attention. Some models look symmetrical, but do indicate a directional model feature somewhere. Be sure to place each square precisely on its box, and each model precisely over its marks. 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. For large and/or flexible models, apply only one or two pairs at a time. There's no need to do it all at once.

Arrangement of Models and Setup

Marks on mat along with the text and pictures in the Robot Game section give most of the info you need to arrange and set the models (place/set as pictured). Any details not shown in pictures or mentioned in the text are left to chance and officially don't matter.

Field Maintenance

Border Walls

Remove any obvious splinters, and cover any obvious holes.

Field Mat

Avoid cleaning the mat with anything that will leave a residue. Any residue, sticky or slippery, will affect the robot's performance. Use a vacuum and/or damp cloth for dust and debris (above and below the mat). 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. Do NOT put Dual Lock under the mat, or use it in any other than securing models as described.

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.

2.2 Missions: Field Setup & Placement, Tasks Description, Constraints & Evaluation

BASE

Before the start the following objects are completely and lose in base:

- Tank & Shark
- Prothesis
- 10 Manure Samples

Hint: Before the Match starts, five manure samples are removed from the referee which he uses as penalty points.

- White Gecko
- Trainer with Dog
- Reindeer



M01. SHARK-TRANSPORT

In their usual environments, animals are very resilient. But in strange environments, they need a lot of care. As we ship our bonnet-head shark e.g. in an aircraft, she needs impact avoidance, specific diet, clean water at proper pressure and temperature, and medical care along the way! She must not be upset.

Field Setup & Placement

Fig. 1: The shark is balanced on the black rubber area in the tank in the base.

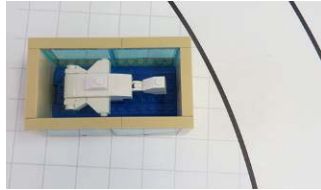


Fig.1

Mission

Task description: Move the shark to her new home not touching her tank's walls.

End of the match:

OPTION 1: Tank and shark are completely in target one.

Points: 7

OPTION 2: Tank and shark are completely in target two.

Points: 10

BONUS: Added only if a target score is earned - shark is touching only the tank floor and no wall.

Points: 20



End Option 1



End Option 2



Bonus

Constraints & Evaluation

- Visible at the end of the match.
- Nothing is ever allowed to touch the shark except the tank!

M02. SERVICE DOG

Visually impaired people become experts at being able to tell when they are about to cross a road, but it's harder to tell when a vehicle is coming. So that part of the job is given to the service dog! If a vehicle is coming, the service dog will stop and sit.

Field Setup & Placement

Fig. 1: Secure the service dog and the person on the mark at the mat, the arm of the person and the dog's head facing down.

Fig. 2: The end of the cane is on the black dot.

Fig. 3: The warning fence is up.



Fig.1

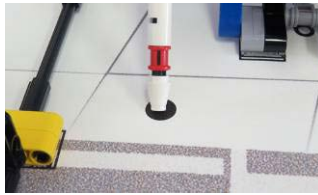


Fig. 2

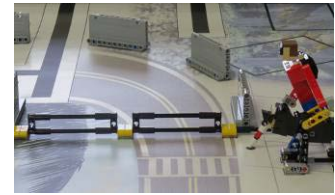


Fig. 3

Mission

Task description: Drive past the visually impaired man, and the dog will do her job.

End of the match:

The warning fence is down.

Points: 15



End

Constraints & Evaluation

- Visible at the end of the match
- The fence is positioned horizontally on the mat because the robot has completely crossed it from the west, after traveling between the barriers.

M03. ANIMAL CONSERVATION

Facilities often exchange animals for behavioral study, mating, health, efficiency, friendship, and the visiting public. But imagine how difficult some animals might be to transport!

Work with the other team to unite identical animals. Every pair united will score for BOTH teams, no matter who worked on that union.

Field Setup & Placement

Step 1: This model is secured with Dual Lock, but not on “X” marks. Instead, **you** find the correct north-south location. Place the model between its red marks on the mat. Then center it over your table’s north border wall and a section of “dummy” wall. Finally, rest the red axle on its stopper.

Step 2: Next, make small pencil marks to show exactly where the model’s feet are.

Step 3: After these location steps, apply Dual Lock - two pair under each foot and stick it on the mat.

Step 4: Hand-place **one** of the following animals in your tray of the animal conservation mission model:

- Reindeer - facing west
- Gorilla - facing south
- Bat - facing south
- Flamingo - facing east
- Frogs - facing south & west

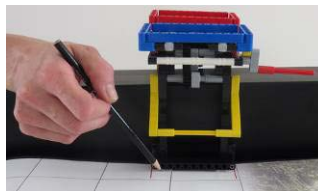
Only these five animals are allowed for exchange.

Step 5: When loading an animal in your tray, push the animal north, and center it east/west.

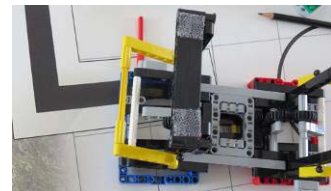
Step 6: Finally, rest the red axle on its stopper.



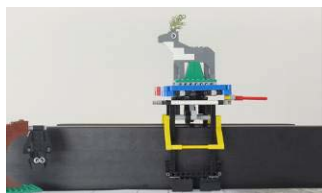
Step 1



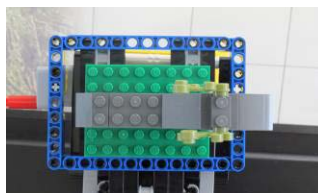
Step 2



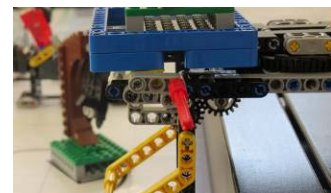
Step 3



Step 4



Step 5



Step 6

If placing another animal other than reindeer, put reindeer on that animal’s mark facing west:

Mission

Task description: During the match, participating robots make the trays switch places. A switch is officially successful when the red axle causes the system to stop. Robots then have the option of removing the received animal and replacing it with a different animal for switching. The referee resets the red axle.

End of the match

Two identical animals are completely on the same side*.

Points: 20 per pair



End

Constraints & Evaluation

- Visible at the end of the match
- Both teams get points for all pairs.
- Each pair must be created through rotation of the animal conservation mission model.
- *Side = is anywhere completely south of the symmetric line between fields, including that field's storage areas.

M04. FEEDING

The responsibility, patience, and organizational skill shown by animal caregivers is unbelievable! Multiple types of animals all need their own exact rations of rare, pure, or exotic foods, with short shelf-lives, at exact temperatures, at all hours of the day or night.

Field Setup & Placement

Fig. 1: 8 Food rations for the animals

Fig. 2: Attach the refrigerator with DualLock on the mark on the mat. Then fill in all the food rations in random order and close the door.

Fig. 3: Place all four animals on their marks on the mat.



Fig. 1 – Food rations

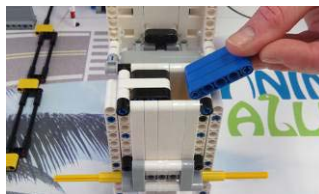


Fig. 2 - Refrigerator



Fig. 3 - Frogs



Fig. 3 - Flamingo



Fig. 3 - Bat



Fig. 3 - Gorilla

Mission

Task description: Deliver the food from the refrigerator to target animal areas.

End of the match:

A piece of food is completely in a target area.

Points: 10 per piece



End

Constraints & Evaluation

- Visible at the end of the match.
- Areas do not include the rectangles.
- If multiple pieces of food are in one area, all must match each other.

M05. BIOMIMICRY

Over many years, animals have solved some tough problems and developed some amazing abilities, so it is wise of us to learn what we can from them. For example, when climbing a smooth, featureless surface, the gecko demonstrates a fascinating mastery of nanotechnology.

Field Setup & Placement

Fig.1: Center the feet of the wall as close to their marks as possible, and keep them parallel. Attach the biomimicry wall with DualLock on the mark on the mat.

Fig. 1+2: Place the green gecko on the wall (see illustrations). Use the holder in the middle of his stomach.

Fig. 3: The white gecko is in base.



Fig. 1



Fig. 2

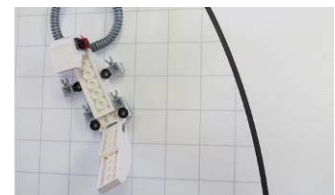


Fig. 3

Mission

Task description: White (mechanical) gecko on the biomimicry wall, and/or by seeing if the robot itself can get onto the wall.

End of the match:

OPTION 1: The biomimicry wall completely supports all the weight of the white gecko.

Points: 15

OPTION 2: The biomimicry wall completely supports all the weight of the robot.

Points: 32



End Option 1



End Option 2

Constraints & Evaluation

- Visible at the end of the match.
- For an object to score, no part of it may be in contact with anything but the biomimicry wall and/or green gecko, except two scoring objects may be in contact with each other.

M06. MILKING AUTOMATION

For hundreds of years, people have designed innovative machines to make work easier. The more work there is to do, the more helpful a machine can be - even if the work is milking! In the milk mission, why are we paying attention to manure? Answer: manure is a type of feces, and in real life, animals routinely produce feces. When you think of animals as interesting or cuddly, don't forget about the smell of a farm, the goo on car windshields, or what a puppy can do to your carpet. Some of us laugh at the idea of manure, and some of us say "Yuck," but for animal handlers, manure will always be a serious challenge.

Field Setup & Placement

Fig. 1: Attach the milking automation with DualLock on the mark on the mat.

Fig. 2: The red lever is aligned over its mark.

Fig. 3: Release-cow is pulled all the way out. Dispenser ramps are loaded with milk and manure (a type of feces).



Fig. 1



Fig. 2



Fig. 3

Mission

Task description: Guide the cow into the machine, then spin the machine until milk comes out. If you spin too far, manure also comes out

End of the match:

OPTION 1: milk and manure have all rolled out.

Points: 15

OPTION 2: milk has all rolled out, but not manure.

Points: 20



End Option 1



End Option 2

Constraints & Evaluation

- Visible at the end of the match.
- The robot's only movement of the milk and/or manure came by moving the red lever.

M07. PANDA RELEASE

After some animals are cared for, studied, and respected, they are returned to their natural habitat. That's usually the best thing for the environment, the animal's population, and the animal itself.

Field Setup & Placement

Fig. 1: The panda station is placed on the mark on the mat.

Fig. 2: Starts with sliding section closed (counter-clockwise).



Fig. 1



Fig. 2

Mission

Task description: Convert the panda's scene from facility care and observation to open wilderness.

End of the match:

The slider looks fully open clockwise.

Points: 10



End

Constraints & Evaluation

- Visible at the end of the match.

M08. CAMERA RECOVERY

Some modern on-board cameras are small and light enough to attach directly to an animal. These cameras can give us amazing new insights into the animal's life, but they do need to come back to the lab sometimes, for maintenance and data retrieval.

Field Setup & Placement

Fig. 1: The camera is placed on the mark on the mat.



Fig. 1

Mission

Task description: Bring the camera into base.

End of the match: The camera is completely in base.

Points: 15



End

Constraints & Evaluation

- Visible at the end of the match.

M09. TRAINING AND RESEARCH

A career working with animals can be fun, dangerous, interesting, gross, and rewarding, all at once. A trainer spends thousands of hours teaching animals entertaining and helpful behaviors. A zoologist might find herself helping a trainer one moment, and analyzing feces the next (feces contains information about an animal's habits and health).

Field Setup & Placement

Fig. 1: The trainer with dog and the 5 manure samples are in base.

Fig. 2: Place each manure sample on the marks on the mat.

Fig. 3: Place the zoologist on the mark on the mat.

Fig. 4: The training & research area is in southeast on the mat.



Fig. 1

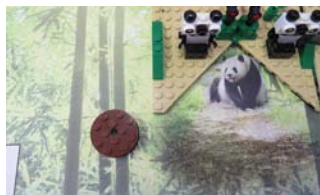


Fig. 2 mark one

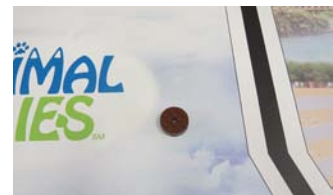


Fig. 2 mark two



Fig. 3



Fig. 4

Mission

Task description: Bring the trainer and the dog and/or the zoologist and/or the manure samples into the training & research area.

End of the match:

OPTION 1: The dog & trainer are completely in the training & research area.

Points: 12

OPTION 2: The zoologist is completely in the training & research area.

Points: 15

OPTION 3: The manure samples* are completely in the training & research area.

Points: 5 per piece



End Option 1



End Option 2



End Option 3

Constraints & Evaluation

- Visible at the end of the match.
- Only one manure sample may be transported at a time.
- *Only disc-shaped manure counts as samples.

M10. BEE KEEPING

We quickly think of honey and flowers (and maybe pain!) when we see a honey bee, but we shouldn't forget that an unbelievable amount of the world's food supply depends on bee populations. Since beekeepers help bees help.

Field Setup & Placement

Fig. 1: Place the beehive on the mark on the mat. The honey is inside the beehive.

Fig. 2: Place the bee on the mark on the mat.



Fig. 1



Fig. 2

Mission

Task description: Place the bee on the beehive and get the honey out.

End of the match:

OPTION 1: The bee is on the beehive and there is no honey in the beehive.

Points: 12

OR

OPTION 2: The bee is on the beehive and the honey is completely in base.

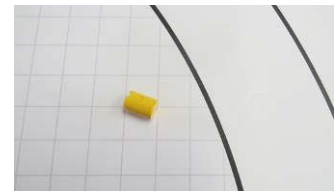
Points: 15



End Option 1



End Option 2



End Option 2

Constraints & Evaluation

- Visible at the end of the match.
- Only one option counts.

M11. PROSTHESIS

The technology and focused dedication needed to provide a prosthesis is not only for humans:

Field Setup & Placement

Fig. 1: The prosthesis is in base.

Fig. 2: Place the pink animal (pig) on the mark on the mat.



Fig. 1



Fig. 2

Mission

Task description: Fit the prosthesis where the legs of the pet (our little friend) should be, and send the pet to its place on the farm.

End of the match:

OPTION 1: The prosthesis is fitted to the pet AND not held by the ref.

Points: 9

OR

OPTION 2: The prosthesis is fitted to the pet AND the pet is completely in its farm target

Points: 15



End Option 1



End Option 2

Constraints & Evaluation

- Visible at the end of the match.
- Only one option counts.

M12. SEAL

Baby seals that are separated from the mother must be saved.

Field Setup & Placement

Fig. 1: The seal is on the mark on the mat.



Fig. 1

Mission

Task description: Bring the seal into base.

End of the match:

The seal is completely in base and not broken.

Points: 1



End

Constraints & Evaluation

- Visible at the end of the match.

M13. MILK IN BASE

Field Setup & Placement

Fig. 1: The milk is in the milking automation on the mat.



Fig. 1

Mission

Task description: Bring all 3 milk container into base.

End of the match:

All 3 milk container are completely in base.

Points: 1



End

Constraints & Evaluation

- Visible at the end of the match.

M14. MILK ON THE RAMP

Field Setup & Placement

Fig. 1: The milk is in the milking automation on the mat.

Fig. 2: The ramp is nearby the south border on the playing field and is tilted all the way down at west.



Fig. 1



Fig. 2

Mission

Task description: Bring all 3 milk container on the ramp.

End of the match:

OPTION 1: All 3 milk container are completely supported by the ramp.

Points: 2

OPTION 2: All 3 milk container are completely supported by the ramp.

AND

They're the only things supported by the ramp.

They're the only things touching the ramp.

Points: 3

OPTION 3: All 3 milk container are completely supported by the ramp.

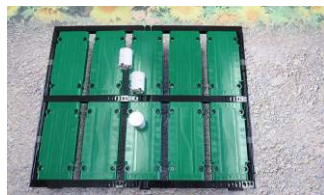
AND

They're the only things supported by the ramp.

They're the only things touching the ramp.

They're all standing.

Points: 4



End Option 1+2



End Option 3

Constraints & Evaluation

- Visible at the end of the match.

M15. MANURE

Field Setup & Placement

Fig. 1: 5 manure samples are in base.

Fig. 2: Two manure samples are on their marks on the mat.



Fig. 1



Fig. 2 mark one



Fig. 2 mark two

Mission

Task description: Transport 7 manure samples into the training and research area.

End of the match:

12 manure samples are completely in the training and research area.

Points: 5 added to mission M09



End

Constraints & Evaluation

- Visible at the end of the match.

PENALTIES

Before the match starts, the ref removes 5 manure samples from base, and holds on to them, leaving five still there.

Field Setup & Placement

Fig. 1: 5 manure samples are at the referee.

Fig. 2: The white triangle is in the southeast on the mat.



Fig. 1



Fig. 2

Description

If the team interrupts the robot, the referee places one manure sample in the white triangle, in the southeast, as a permanent/untouchable interruption penalty. You can get up to five penalties.

Penalty Points: - 6 per piece



Penalty Points

Constraints & Evaluation

- After the match the referee keeps the not given penalties (manure samples). They aren't part of the game anymore.