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Innovation Project

In the *FIRST*® LEGO League TRASH TREKSM Innovation Project, your team will:

- **Identify** a problem with the way we make or handle trash
- **Design** an innovative solution to the problem you select
- **Share** your problem and solution with others

Think About It

Have you ever thought about the disposable plastic straw in your drink at a restaurant? When you finish your meal and leave, what happens to the straw?

9-year-old Milo Cress started asking these questions when he noticed that restaurants usually gave him a disposable straw with each beverage. The straw was there even if he didn't need or want it. Milo recycled a lot of his trash at home, but he was not able to recycle disposable straws. This seemed like a problem that needed some investigation.

From Milo's research, he estimated that people in his country use over 500 million straws every day. That adds up to about 9,300 large buses full of disposable straws. Milo thought that added up to too much unnecessary trash in landfills!

To solve this problem, Milo thought maybe restaurants could stop giving straws automatically. Some people would decide not to take a straw, and fewer straws would go into the trash. Milo's Be Straw Free campaign encourages everyone – especially kids – to say “no straw, please” at restaurants.

As Milo said “I'm not the straw police. I'm not saying ‘no straws at all!’” Milo just encourages people to consider other options, like buying a reusable or biodegradable straw. “That's something kids can do something about!”

Even if you do not use disposable straws, you definitely make some sort of trash every day. You might call it garbage, rubbish, or even Municipal Solid Waste (MSW). **For the TRASH TREK Challenge, trash is any item you are done with and want to dispose of.**

Have you thrown away any of these items today?

- Food scraps (like a banana peel or a chicken bone)
- Plastic bags or wrappers
- Used items (like a pen that won't write or an old school notebook)
- Clothes that are too small or ruined

Where you live, maybe most trash items go into a recycle bin. Maybe most go into a trash bag. Maybe most are burned. Whatever type of bin you put them into, those pieces of trash go somewhere when they leave your house. Do you know where they go?

Your Innovation Project mission this season is to make less trash or improve the way people handle the trash we make.



THINK ABOUT IT:
have you ever
recycled a used
straw?

Identify a Problem

To begin your TRASH TREK Innovation Project, choose a piece of trash and identify a problem with the way it is currently handled. Look for problems with the way we make, transport, store, or turn trash into something new. Then find out what is being done to solve the problem.

Not sure where to start? Try this process to choose and explore your trash problem:

AS A TEAM – Choose a piece of trash. It might be something gross and stinky, something old and worn out, or something left over after you finish a project. It could be an item that is used in manufacturing, building, or some other business. It could be any item that is considered “trash” by the owner. (See box at right for exceptions.)

AS A TEAM – Find out where your piece of trash goes after it leaves the owner. Think about questions like:

- Does someone collect this item from you, or do you need to take it somewhere?
- Could you follow the path your trash takes (either in person or through websites, books, and magazines)?
- What happens to the trash in the end?
- Do you notice any parts of the process that could be better – more efficient, cleaner, or better in some other way? Look for these problems as you research.

This might be a great time to interview a professional. The professional could be someone who works in the waste management industry or researches trash problems for their job. Can a professional help you learn about trash collection, recycling, composting, reusing, or processing your trash in some other way?

AS A TEAM – Identify a problem with the way trash is handled and learn about it. You might select a problem in one of these areas (or add your own):

- Collecting trash
- Finding new uses for old items (repurposing)
- Food waste
- Electronics waste (phones, computers, etc.)
- Hazardous waste (medical, chemical, etc.)
- How trash impacts your community
- Landfills
- Making zero-waste products
- Recycling process
- Sorting

AS A TEAM – After you select a problem, find out about the current solutions. Why aren't the current solutions working? Why does this problem still exist?

Design an Innovative Solution

Next, design an innovative solution to your problem – **a solution that adds value to society by improving something that already exists, using something that exists in a new way, or inventing something totally new.**

AS A TEAM – Think about:

- What could be done better? What could be done in a new way?
- Could your solution make it more cool, fun, or easy to be responsible about trash?
- How can you reimagine disposing of trash to make it more efficient or safe?
- Could your solution prevent an item from becoming trash in the first place?

Think of your problem like a puzzle. Brainstorm! Try one idea (or more), but be prepared that your first idea may not work as you expect. Then turn the problem upside down and think about it in a completely different way. Imagine! Get silly! Even a “silly idea” might inspire the perfect solution.

Have you thought about how someone could make your solution a reality? The research you have done will help you answer questions like:

- Why would your solution succeed when others have failed?
- What would it cost?
- Do you need any special technology to make your solution?
- Can anyone use your solution, or only some people?

Remember, your idea does not need to be completely new. Inventors often improve an idea that already exists or use something that exists in a new way.



EXCEPTIONS:

For the TRASH TREKSM Innovation Project, trash does NOT include:

- Sewage (Ex: waste water, human or animal excrement)
- Gasses (Ex: car exhaust)



IDENTIFY A PROBLEM:

How does a city planner, a sanitation worker, a composter, an anthropologist, an engineer, or a scrap dealer work with trash?



KEEP ASKING QUESTIONS

Lots of questions – and tweaking your ideas to create something even better.

Share with Others

Once you design your solution, share it!

AS A TEAM – Think about who your solution might help. How can you let them know? Can you present your research and solution to people who recycle, transport, store, reuse, or create trash? Can you share with a professional or someone who helped you learn about your problem? Can you think of any other groups of people who might be interested in your idea?

Consider including someone who could provide feedback about your solution. Getting input and improving are part of the design process for any engineer. Don't be afraid to revise your idea if you receive some helpful feedback.

When you present, use the talents of your team members. Find a creative way to explain your problem and solution. Your sharing can be simple or elaborate, serious or designed to make people laugh while they learn.

No matter what presentation style you choose, remember to have fun!

Present Your Solution at an Event

Finally, prepare a presentation to share your work with the judges at a tournament. Your presentation can include posters, slideshows, models, multimedia clips, props, costumes, and more. Be creative, but also make sure you cover all the essential information.

To be eligible for Innovation Project Awards, your team must:

- Identify your problem.
- Explain your team's innovative solution.
- Describe how you shared your team's findings with others.
- Meet the presentation requirements:
 - Give your presentation live; you may use media equipment (if available) only to enhance the live presentation.
 - Include all team members; each team member must participate in the Innovation Project judging session.
 - Set up and complete your presentation in 5 minutes or less with no adult help.



All of us have items we are done using and need to dispose of. How we make and handle those items — that trash — can make a difference for people, businesses, and the planet. How do you want to clean up the trash?

Robot Game: Field Setup

The Field is where the Robot Game takes place.

- It consists of a Field Mat, on a Table with Border Walls, with Mission Models arranged on top.
- The Field Mat and the LEGO® pieces (elements) for building the Mission Models are part of your Challenge Set.
- The instructions for building the Mission Models are [here](#).
- The instructions for how to build the Table and how to arrange everything are [here](#).

Mission Model Construction

Build The Mission Models – Use the LEGO elements from your Challenge Set. It will take a single person four to five hours to do this, so it's best done in a team construction 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™ – Some Models are “secured” to the Mat; others are simply “placed” on the Mat. Each place on the Mat 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 Challenge Set. 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...

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.

STEP 3 – Align the Model exactly over its mark, and lower/press it onto the squares.

CAUTION – Pay attention... Some Models which seem symmetrical do have a directional 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.



TIP

For STEP 2, instead of using your finger, use a bit of the wax paper the squares came on.



TIP

For large and/or flexible Models, apply only one or two Dual Lock squares at a time. There's no need to do it all at once.

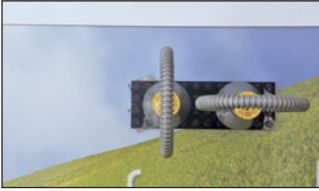
Models (Any details not shown or mentioned are left to chance and officially don't matter.)

Methane – Secure the Holder exactly on its marks, then place the two Methane Loops in their holes, aligned as shown.

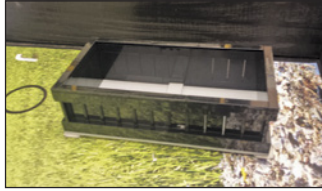
Landfill Bin – Secure as shown.

Turtle + Plastic Bag – Place exactly on their marks as shown.

Toys In Packaging – Place one Toy Plane in the Small Package on its mark as shown, and place the other Toy Plane in the Large Package which gets inserted in the Factory...



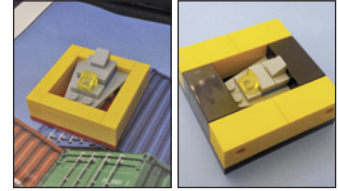
METHANE IN HOLDER



LANDFILL BIN



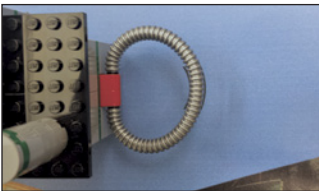
TURTLE + PLASTIC BAG



TOYS IN PACKAGING

SPECIAL NOTE ABOUT THE LARGE PACKAGE: This Model is designed to easily come apart into five pieces. Taking it apart is allowed as an exception to definition D08 below.

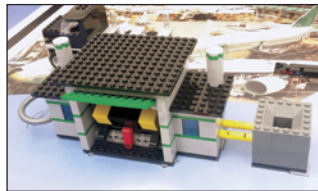
Factory – Secure the Factory, slide the loop fully in, and the Large Package with Toy Plane inside as shown.



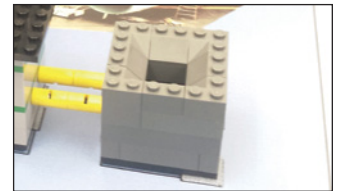
LOOP PUSHED IN



LARGE PACKAGE INSERTED



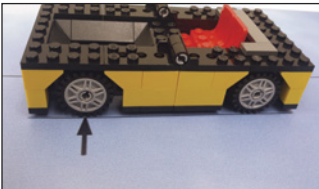
READY



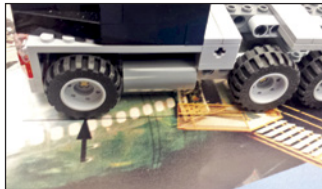
**POWER STATION
(Mission Reference)**

Car + Truck – Place each pointing west, aligned with its marks and arrows at the bottom of the front tires as shown.

Truck Guide – Secure exactly within its mark, with its tail east.



CAR

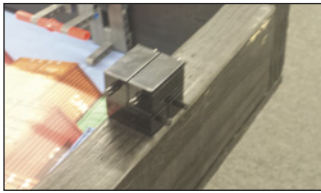


TRUCK



TRUCK GUIDE TAIL

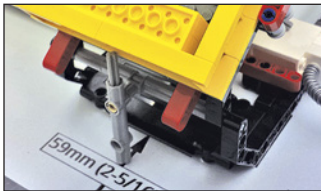
Penalties – Place four Black Bars off the Field out of the way. At a tournament, these are in the Referee’s control.



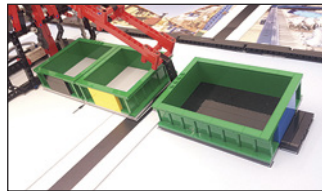
PENALTIES
(Example Placement)

Sorter – Secure exactly within its marks. For ease and accuracy, apply only two pairs of Dual Lock at a time.

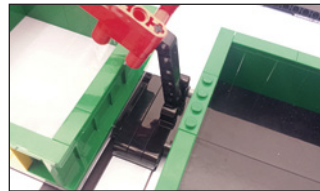
- Be sure alignment at the end of the arrow is as close as possible.
- Secure the Bin Bracket, then place Green Bins as shown, with the north side of each Green Bin resting ON the Bin Bracket’s axle.
- Make sure the foot of the east chute rests between its tabs on the Bin Bracket as shown.
- Insert a Plastic Bag in its slot fully as shown.
- Load two Blue and two Black Bars in the red tray as shown, with studless plates up. Bar color order and axle directions are important; bar alignment is not. Refer to the small reminder on the Mat, south of the Sorter.
- Load the Yellow Bin containing a Yellow Bar as shown, centered east/west, with studless plates down.
- Finally, attach either all white or all black Identification Plates to the Green Bins as shown. Color is not important for practice, but will tell your Bins apart from the other team’s Bins at a tournament.



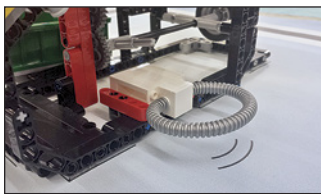
EXACT AT END OF ARROW



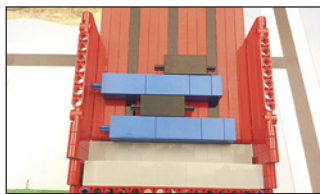
BIN BRACKET AND GREEN BINS



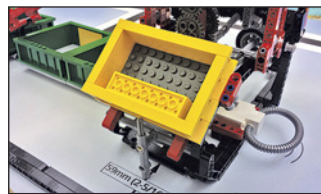
FOOT RESTS BETWEEN TABS



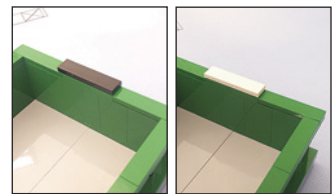
PLASTIC BAG



RED TRAY

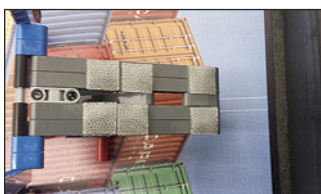


YELLOW BIN + YELLOW BAR



IDENTIFICATION PLATES

East Transfer – Secure to the inner surface of the north Border Wall. Use the Dual Lock pattern shown here, and align the Model’s foot with its marks on the Mat. Be sure the Model is level.



DUAL LOCK



ALIGN FOOT



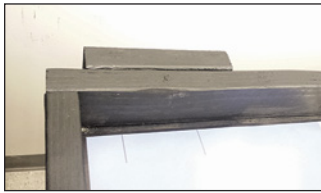
LEVEL



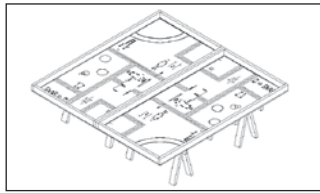
READY



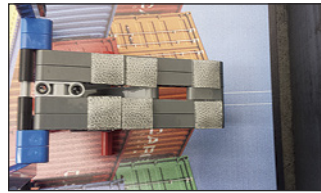
West Transfer – Secure to the FAR side of a SECOND thickness of north Border Wall, known as a “Dummy Wall.” This arrangement is needed to replicate the spacing conditions at a tournament, where the north Border Wall is double-thick (one north wall for your Table, and one for the other team’s Table). Use the Dual Lock pattern shown here, and center the Model over its marks on the Mat. Secure the Model so it’s level, and the bottom of its foot is at the same height as the Mat.



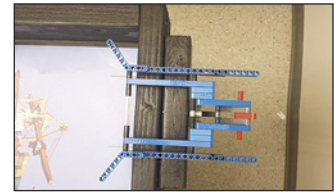
DUMMY WALL



TOURNAMENT SETUP



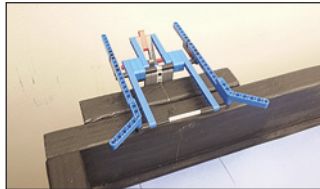
DUAL LOCK PATTERN



ALIGN WITH MAT MARKS



**BOTTOM OF FOOT SAME
HEIGHT AS MAT**

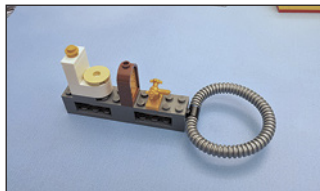


READY

Bracket + Building + Valuables – Secure the bracket exactly within its marks, red lever at northwest. Then use four of each color Bars to make the Building as shown, with studless plates facing west. Perfect Bar alignment is not expected. Finally, insert the Valuables fully onto the ground floor from the east as shown.



BUILDING ON BRACKET



VALUABLES



READY

Composter – Secure exactly on its marks. Be sure the Model is pressed down tightly. The multistep setup for this Model takes a little bit of memory and practice:

STEP 1 – Pivot the red lever lock west.



STEP 1 – BEFORE



STEP 1 – AFTER

STEP 2 – Slide the black rocker arm & rubber tires north to disengage them from the red cross.

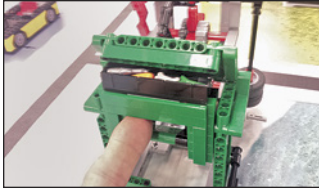


STEP 2 – BEFORE



STEP 2 – AFTER

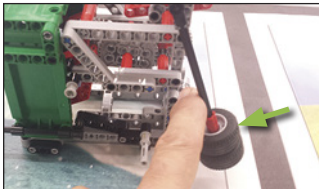
STEP 3 – Raise the food scrap bin gently/slowly all the way up and hold it there...



RAISING...

STEP 4 – While still holding the food scrap bin all the way up, undo Step 2, then undo Step 1.

STEP 5 – Push the rubber tires east out of the way, then slide the yellow plunger west, and let go of the rubber tires.

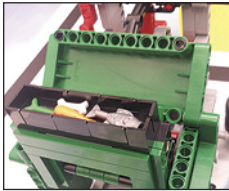


RUBBER TIRES OUT OF THE WAY

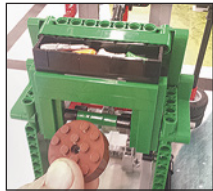
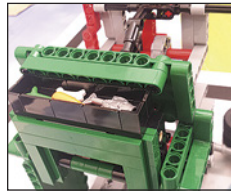


YELLOW PLUNGER WEST, AND LET GO

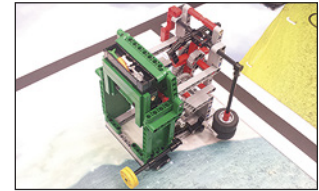
STEP 6 – Push the green lid west onto the food scrap bin and insert the Compost disc, studs up. This is needed!



PUSH GREEN LID ONTO SCRAPS



INSERT COMPOST DISC



READY

Base – Loosely place these things in Base however you like: Octopus, Chicken, Engine/Windshield, two People, and two Yellow Bars. The spare set of Identification Plates are not part of the Field and may not be used as Equipment.

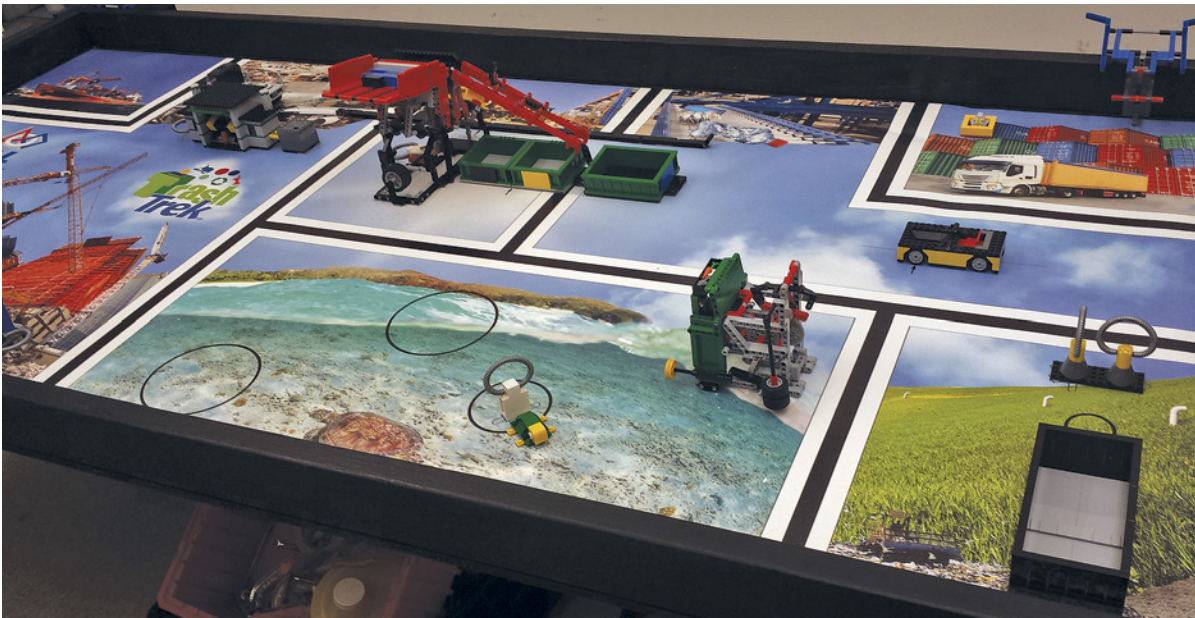


BASE CONTENTS

Loop Quality – Every time you handle a loop, make sure it's rounded as possible, and not rotated/deflected.

Overviews





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, black tape is allowed, with a maximum of ¼" (6mm) overlap. Foam tape is not allowed. Do NOT put Dual Lock under the Mat, or use it for anything 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.



DO NOT

put Dual Lock under the Mat, or use it for anything other than securing Models as described.

Robot Game Rules

Guiding Principles

GP1 - GRACIOUS PROFESSIONALISM® You are “Gracious Professionals.” You compete hard against **problems**, while treating **all people** with respect and kindness.

GP2 - INTERPRETATION

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

GP3 - 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.

GP4 - VARIABILITY Our suppliers 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.

GP5 - 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 = **MISSIONS** and **FIELD SETUP**

#2 = **RULES**

#3 = **REFEREE** In unclear situations, local referees may make good-faith decisions after discussion, with Rule GP3 in mind.

Definitions

D01 - MATCH A “Match” is when two teams play opposite each other on two Fields placed north to north.

- Your Robot **LAUNCHES** one or more times from Base and tries as many Missions as possible.
- Matches last 2-1/2 minutes, and the timer never pauses.

D02 - MISSION A “Mission” is an opportunity for the Robot to earn points. Requirements are written in the form of

- **RESULTS** that must be visible to the referee at the **END OF THE MATCH**.
- **METHODS** that must be observed by the referee **AS THEY HAPPEN**.

D03 - EQUIPMENT “Equipment” is everything **YOU BRING** to a Match for Mission-related activity.

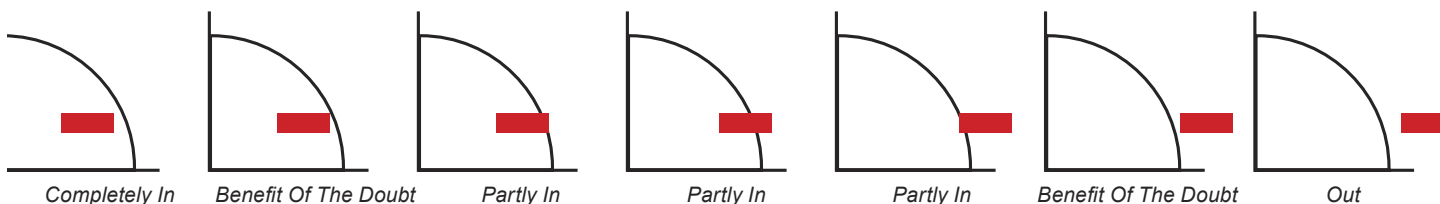
D04 - ROBOT Your “Robot” is your **LEGO**® **MINDSTORMS**® or **SPIKE Prime** controller and all the Equipment you’ve combined with it by hand which is not intended to separate from it, except by hand.

D05 - MISSION MODEL A “Mission Model” is any **LEGO**® element or structure **ALREADY AT THE FIELD** when you get there.

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 quarter-circle region, in the southwest. It extends southwest from the outside of the thin curved line TO the corner walls (no farther). The thin line around any scoring area counts as part of that area. When a precise location related to a line is unclear, the outcome most favorable for the team is assumed. (See diagram below.)

D07 - BASE



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."

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 OK (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 be from a LEGO Education Robot Set (RCX, NXT, EV3 or SPIKE Prime).
- 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 come from a LEGO Education Robot Set.
- 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**.

R04 - EXTERNAL SENSORS Use as many external sensors from a LEGO Education Robot Set as you like.

- You may include more than one of each type.

D10 - TRANSPORTED When a thing (**anything**) is purposefully/strategically being

- taken from its place, and/or
- moved to a new place, and/or
- being released in a new place,

it is being "Transported." The process of being Transported ends when the thing being transported is no longer in contact with whatever was transporting it.

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-made 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 Use any software that allows the Robot to move autonomously – meaning it moves on its own. No form of remote control is 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.

Play

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, and/or
- calibrate light/color sensors anywhere you like.

R10 - HANDLING DURING THE MATCH

- You are not 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.
- Everything in off-Field Storage “counts” as being completely in Base and may be placed on an approved holder.

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**” and measuring no taller than 12 inches” (30.5 cm).

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.

IF FIRST LAUNCH OF THE MATCH – *In this case, 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 BEEEEP!*

R14 - INTERRUPTING If you **INTERRUPT** the Robot, you must stop it immediately, *then calmly pick it up for a re-Launch. Here's what happens to the Robot and anything 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 THING WHICH CAME FROM BASE DURING THE MOST RECENT LAUNCH

Always: Keep it

• TRANSPORTED THING WHICH DID NOT COME FROM BASE DURING THE MOST RECENT LAUNCH

Completely in Base: Keep it

NOT completely in Base: Give it to the referee

The “**PENALTY**” is described with the Missions.

IF YOU DON'T INTEND TO RE-LAUNCH – *In this case, you may shut the Robot down and leave it in place.*

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 that thing, depending on its rest location:

• TRANSPORTED THING

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 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 ASAP and leave it in place. (Changes after the end don't count.)
- After that, hands off everything until after the referee has given the OK to reset the table.

R19 - SCORING

- **SCORESHEET** 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. Playoffs, if held, are just for extra fun.
- **TIES** Ties are broken using 2nd, then 3rd best scores. If still not settled, tournament officials decide what to do.

Robot Game: Missions

The TRASH TREK Challenge is about what happens to things when we think we're done with them, or when we think they're no good any more. The truth is that with some imagination, we can get much more use out of them, or the materials they're made from. A really smart time to think about this is before we even make or buy them! Recycling is great, but that's only one part of a very big picture. As you work on the Missions, imagine how we might be able to innovate our way toward ZERO WASTE one day...

Missions

M01 – Using Recycled Material – Get material discarded from someone else, but useful for you. You'll avoid taking from nature, and the material won't become waste.

- **Specific physical requirement, visible at the end of the match:** Green Bin containing at least one matching Yellow or Blue Bar, all from the other team, is completely in your Safety.
 - **Value:** 60 per bin in either safety... for each scoring bin in either safety, the other team gets the points too, and vice versa.

M02 – Methane – Collect Methane from the Landfill Area and use it to help run the Truck and/or the Factory.

- **Specific physical requirement, visible at the end of the match:** Methane is in the Truck's engine compartment, and/or the Factory's Power Station.
 - **Value:** 40 per methane.
- **Leniency:** Full/Exact nesting is not required.

M03 – Transport – Load the all-Yellow Material Bin onto the Truck to be transported east/unloaded.

- **Specific physical requirement, visible at the end of the match (score one or both):**
 - **Value:** 50 The Truck supports all of the Yellow Bin's weight.
 - **Value:** 60 The Yellow Bin is completely east of the Truck's Guide.

M04 – Sorting – Yellow/Blue Bars are recyclable. Black Bars are impurities we have no current way to use. Process Bars through the Sorter. Bars sorted into their matching Green Bins have positive potential.

- **Specific physical requirement, visible at the end of the match:**
 - Yellow/blue bars are in their matching green bin and the bin (bins score independently)...
 - ***Value:** Per Bin (See M01 above) is completely in the other team's Safety, by way of your West Transfer.*
 - Value:** 7 Per Bar is completely in your West Transfer Area and/or completely on your West Transfer.
 - ***Value:** 6 Per Bar was never completely in your West Transfer Area (all "Areas" are defined below).*
 - *Method Constraint: These require sequence/path as described, in addition to final positions.
 - Black bars are (bars score independently)...
 - Value:** 8 Per Bar part of a scoring Flower Box, or in their original Setup position.
 - Value:** 3 Per Bar in their matching Green Bin, or in the Landfill Bin.
 - Value:** Minus 8 Per Bar anywhere else.
- **Method Constraint:** Bars must only enter Green Bins directly from the Sorter's east chute or CAREERS BONUS...

M05 – Careers – Move at least one person to the Sorter Area to earn a helpful exception to the Rules.

- **Specific physical requirement, visible at the end of the match as needed:** At least one Person is completely in the Sorter Area.
 - **Value:** 60 Plus this R10 Leniency Bonus: Team technicians and/or the ref (if needed/asked) are allowed to unclog any east chute blockage by hand, and/or put mis-sorted bars into their correct bin, including bars that didn't land in any bin.

This is a fun, dynamic Model with a small but real error rate, which will be well understood by Tournament season. So that we may all enjoy the Model, please use the [R10](#) leniency for Model errors, handle with care when doing so, use "Benefit Of The Doubt" for hand errors, and use common sense and good will the whole time.

M06 – Scrap Cars – Fix the old Car by installing the Engine/Windshield, or fold the Car and sell it for scrap.

- **Specific physical requirement, visible at the end of the match as needed (Score Only One Way):**
 - **Value:** 65 The Engine/Windshield unit is installed in the unfolded Car in the proper space and direction.*
 - **Value:** 50 The Car is completely folded and completely in the East Transfer Area.
- **Leniency:** Full/exact nesting is not required.
- **Method Constraint:** The Car must never cross into Safety, even partly.

M07 – Cleanup – Move Bags from the Sorter and/or the Beach, and return Animals to their favorite spots.

- **Specific physical requirement, visible at the end of the match as needed (Score Any That Apply):**
 - **Value: 30 Per Bag** Plastic Bags are completely in Safety.
 - **Value: 20 Per Animal** *Animals are completely in any circle which is completely empty of Plastic Bags.
 - **Value: 35** The Chicken is completely in the small circle.
*The fish Food Scrap doesn't count as an Animal.

M08 – Composting – Start the Composting process. After some time, it will eject Compost.

- **Specific physical requirement, visible at the end of the match (Score Only One Way):**
 - **Value: 60** The Compost is ejected, but not completely in Safety.
 - **Value: 80** The Compost is completely in Safety.

M09 – Salvage – Move the Valuables to Safety.

- **Specific physical requirement, visible at the end of the match:**
 - **Value: 60** The Valuables are completely in Safety.

M10 – Demolition – Demolish the Building and decide what to do with the materials.

- **Specific physical requirement, visible at the end of the match:**
 - **Value: 85** None of the Building's twelve beams is left standing in Setup position.

M11 – Purchasing Decisions – Decide about buying Toy Planes based on their Packaging.

- **Specific physical requirement, visible at the end of the match:**
 - **Value: 40 Per Plane** Toy Planes are completely in Safety.

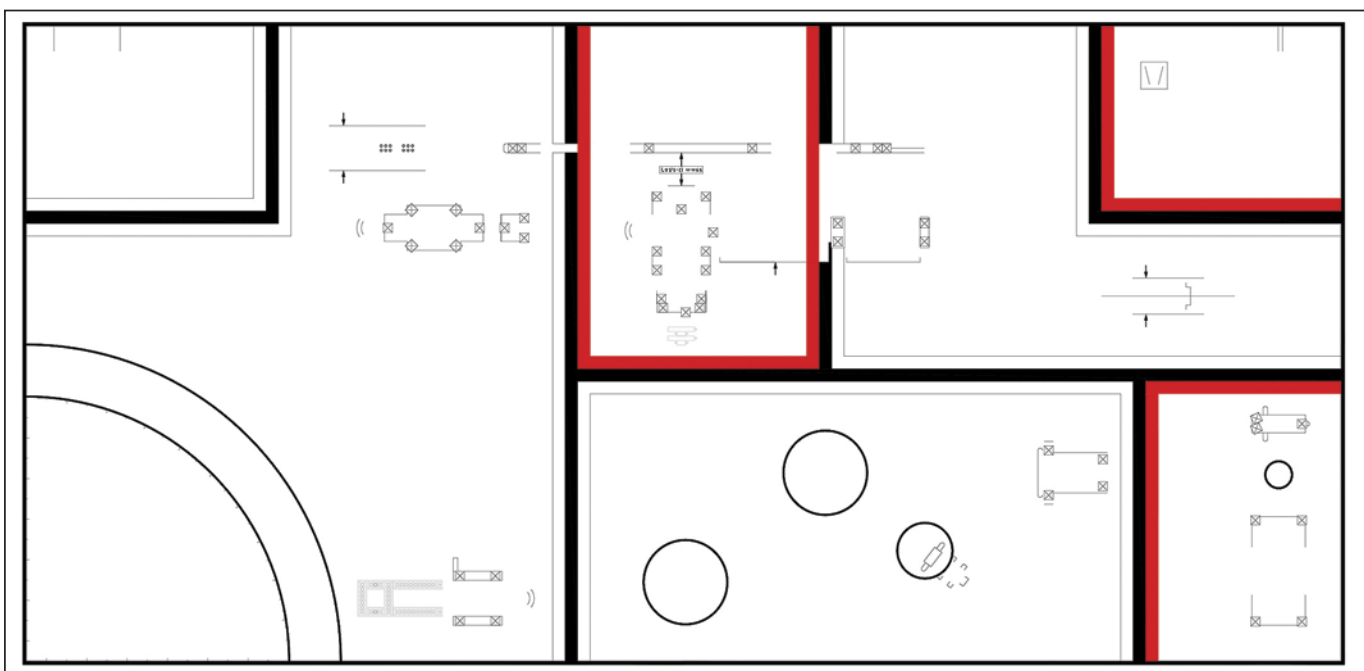
M12 – Repurposing – Use the packaging from a Toy Plane as a flower box by putting compost in it.

- **Specific physical requirement, visible at the end of the match:**
 - **Value: 40** The Compost is perfectly nested inside one of the Packages from which a Toy Plane has been removed. The Package is in original condition.

Penalties – For each Penalty as described in Rule [D09](#), the Ref will place one Black Bar on the Mat in a convenient out-of-the-way place, not to exceed four Bars. The Ref may shift them out of the Robot's way as needed, but they must always stay in a negative scoring position.

- **Value:** See SORTING mission, black bar details above

“Areas” – Where the Missions refers to the Landfill Area, Sorter Area, or East Transfer Area, those areas are defined by the inner white strips, colored red below. Each area is defined as only the space above and inward from those white strips. Anything still partly above the adjacent thick black line doesn't count as being in the area.



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