

Building Mission Models

for FIRST LEGO League Challenge



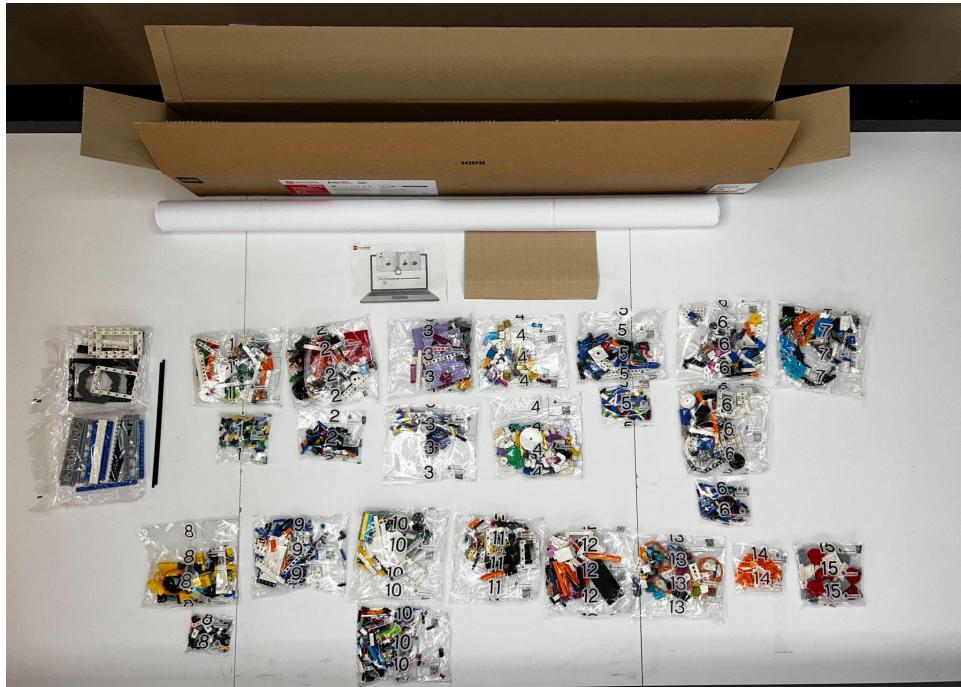
Getting Organized

Sort Your Bags by Number

For the MASTERPIECE season,
you should find the following
items in your Challenge set box

Bag #1 - 2	Bag #10 - 2
Bag #2 - 2	Bag #11 - 1
Bag #3 - 2	Bag #12 - 1
Bag #4 - 2	Bag #13 - 1
Bag #5 - 2	Bag #14 - 1
Bag #6 - 3	Bag #15 - 1
Bag #7 - 1	2 unnumbered bags
Bag #8 - 2	2 loose black axles
Bag #9 - 1	1 sheet of 3M Dual Lock

1 rolled up Challenge Mat



Open and Sort by Number

- Open only one set of numbered bags at a time. E.g. all bags numbered 1.
- There can be multiple bags with the same number (See previous page to check how many there should be)
- Building instructions are by bag number.

Bag Number
Element Overview
Prepack Overview
Bag 1
Bag 2
Bag 3
Bag 4
Bag 5



Sorting Can Save You Time

- Sort the parts in each bag into general part types so that they are easier to find (axles, liftarms, frames, pins, etc.)
- You can use LEGO sorting trays, paper plates, small bowls, box lids, trays, etc.
- This step is will help find the part you need as you build



Elements in Bag 3 sorted before building

**Building
Efficiently and
Reliably**

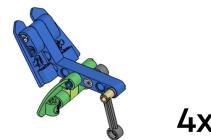
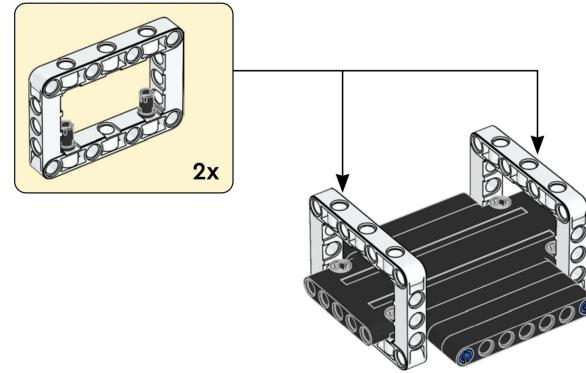
Build in Pairs

- Building in pairs or small groups works well.
- One person finds the parts for the step, one person puts the pieces together, and one person checks to make sure the step was done correctly.
- Change roles every few steps.



Multiplier Symbols

- Be sure to pay attention to the multiplier symbols (e.g. 2x, 4x) symbols at the start of a subset of instructions.
- You can save time by constructing them simultaneously.
- In MASTERPIECE, sometimes the multiplier symbol only shows up after you have built one copy.



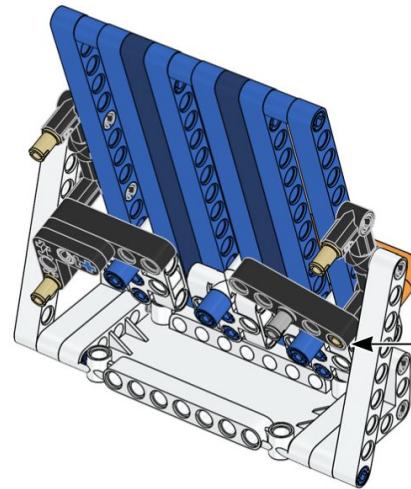
Follow the Instructions

- Take your time and always build exactly what the instructions tell you.
- Do not improvise or “improve” the model.
- Your model must look like and behave exactly the same way as the ones at the competition.

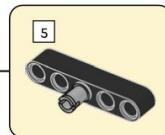


Check Your Work

- Have your coach or adult check the build or compare with another team's set if needed.
- Be careful and use the right part in the right step
- Common mistakes include:
 - Using the wrong length liftarm in a step (e.g. 11M instead of a 13M liftarm)
 - Using the wrong pin (friction vs. frictionless)



TIP: LEGO Technic is measured in "Modules". 5M means it has 5 holes in it.



E.g. Using a black friction pin instead of a frictionless pin in this step will change how the model operates

Some Models Take Longer to Build

- When splitting up the work, note that some models and bag numbers take a lot longer to complete than others.
- You can check ahead and see how many step numbers are in each build instruction and/or refer to this table with approximate build times for the MASTERPIECE season.

TIP: A student who is artistic and enjoys creating designs with LEGO dots will enjoy building the model in Bag 03.

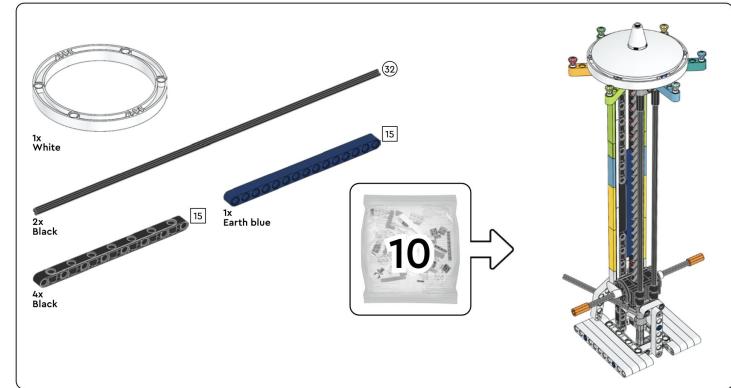


Bag No.	Time	Bag No.	Time
1	16 mins	8	15 mins
2	20 mins	9	13 mins
3	30 mins	10	21 mins
4	6 mins	11	13 mins
5	20 mins	12	10 mins
6	35 mins	13	7 mins
7	15 mins	14	1 min

Unnumbered Bags

- Larger elements such as hoses, long axles, large frames, and 13M/15M beams are just loose in the box or in unnumbered bags. (M = LEGO Modules)
- Check the top of the instructions page for parts needed before you begin.

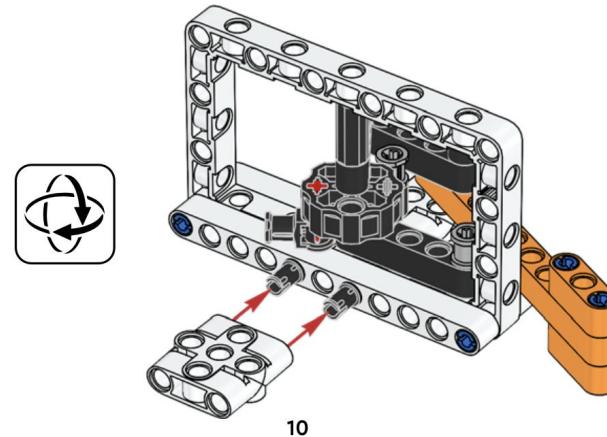
TIP: If you are trying to presort by mission model so that a student can take elements home and build, be sure you look for all the larger items in the unnumbered bags or loose items at the bottom of the box.



**6 Elements in Unnumbered Bags
+ 2 Loose Items (black axles)
+ Everything in Bag 10**

Flip Symbol

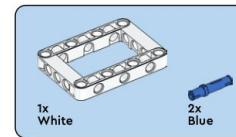
- The model sometimes requires flipping before the next element is added. Check before you add the pins/next element



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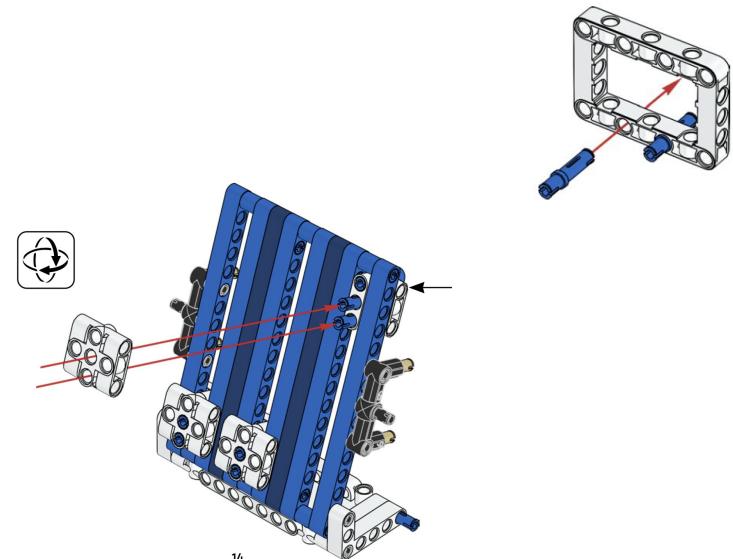
Arrows

- Sometimes instructions have arrows or show where one element is added.
- However, pay attention to how many items are in the blue box and look for them in the image.
- Pay attention to which pins/holes you need to use. It is easy to put a peg in the wrong hole.
- Sometimes there is no arrow indicator, but if you look closely, elements were added in the step.



11

In Step 11 you can see an arrow for 1 pin. However another pin was also added in this step



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Setting Up the Mat

Setting up the Challenge Mat

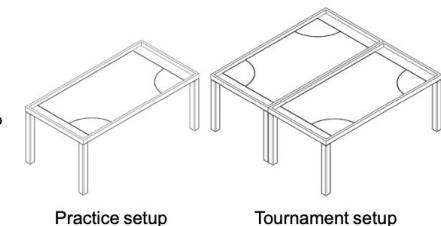
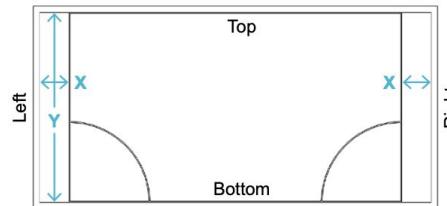
- Placement of the challenge mat is a very important step before placing the models on it.
- The rules for placement can vary every year (Check the Robot Game Rulebook and see image on right)
- The instructions will tell you how far East-to-West and North-to-South the mat should be placed relative to the table.

Field Mat Placement

1. Check the table surface for bumps. Sand or file them away and then vacuum well.
2. On the vacuumed table only, unroll and place the mat as shown below. Never fold the mat, and never crush or bend a rolled mat.
3. Slide the mat against the bottom border wall and align it centrally. There should be no gaps except for one at

the top wall of about 1/4 in. (6 mm). When table size and mat placement are correct, the areas to the left and right of the mat each measure about $X = 6.75$ in. by $Y = 45$ in. (171 mm by 1,143 mm).

4. Optional – To hold the mat in place, you can use thin strips of black tape, covering only the mat's left and right borders.



Setting up the Models

- Place finished models loosely on the challenge mat.
- Be sure to follow the text and images in the Field Setup section of the Robot Game Rulebook very carefully. They will tell you which way a model should face.
- Use the markings on the challenge mat itself as alignment points. If it doesn't align, it is probably an indication of something wrong with the build itself.



Tip: Watch [this YouTube video](#) to see how to align the models on the Challenge Mat.

Pressing Models into Place

- Once everything looks correct, follow the set-up instructions to place the dual-lock (square with X) on the Challenge mat as shown in the Robot Game Rulebook.
- Press the models down in place holding and pressing as close to the dual lock as possible.
- Not all models will need to be dual-locked. Some will stay loose on the markings on the mat.

3M™ DUAL LOCK™ RECLOSEABLE FASTENER PLACEMENT



You will find sheets of Dual Lock™ squares in your Challenge set to secure the models to the mat. Dual Lock is an important part of field setup. If the models are not secured properly, you will have difficulty completing the missions.

SECURING MODELS – The squares on the mat with the X inside show where to apply the Dual Lock. Use the Dual Lock as shown in this example and be very exact. When pressing down a model, press on its base instead of pressing from higher up, which might crush the model. To remove the model from the mat, lift it from its base to separate the Dual Lock.

Tip: Watch this [YouTube video](#) if you need an example of how to apply the dual lock and place mission models.

Packing Away Models

- You can pack up and put away your challenge set if you need to. The models are generally very durable
- Remove models from as close to the dual lock as possible.
- One side of the dual lock should come off with the model. The other side stays on the mat.
- Place all smaller items such as minifigures in ziplock bags so that you do not lose the accessories

Standard size Bankers Box



Packing instructions created by MK Baldwin are available on [FLLTutorials](https://FLLTutorials.com)

Common Questions and Issues

Is my model operating correctly?

- You can compare your model with another local team's models.
- If you do not have a local team to consult, use [this video](#) to make sure the model is operating correctly.
- If it does not look and behave in the same way, rebuild your model.



Leftovers

- There are always some small leftover elements
- The image on the right shows all the leftover elements from every bag number once you have finished building the models
- There should be no large elements leftover
- Bag 4 of MASTERPIECE contains a lot of extra LEGO bricks that are used in Mission 04 (MASTERPIECE) (see the Robot Game Rulebook for further instructions on this mission.)



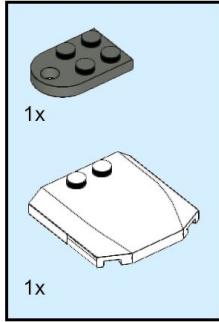
No Build Instructions

- No build instructions for a bag number simply means the bricks are used in some other way
- Bag 15 contains team souvenirs (badges, tiles) as well and 6 precision tokens which are used by the referee (see Robot Game Rulebook).
- See the next page for building instructions for the badges.

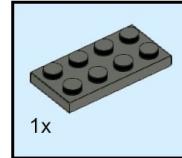


Build Instructions

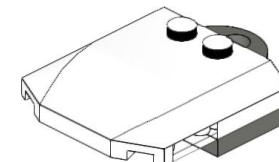
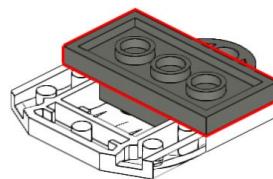
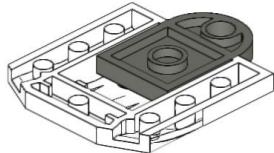
1



2



3



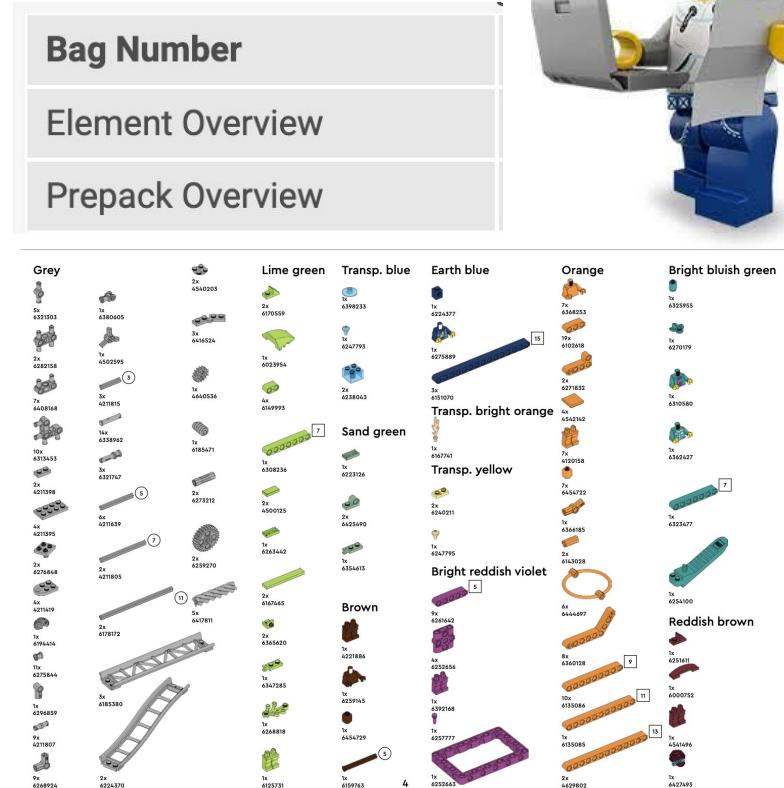
Missing Items

- It is very uncommon to be missing a LEGO element or a whole bag.
- Can't find a small part?
 - Check the bags, check the ground, and check to see that the element was not used earlier in another step by mistake.
- Can't find the dual-lock?
 - Check the box again - it tends to blend in with the cardboard
- Can't find a larger item?
 - Check the unnumbered bags or bottom of the box.

Tip: To prevent losing elements, make sure that you empty the bags of LEGO on to a tray or container of some kind rather than on the floor or table.

Missing Items

- If you really can't find an item, call LEGO for help: 1-800-422-5346 (USA/CAN) or 00800 5346 5555 (International). You can also visit the missing parts/customer service page of the [LEGO website](#)
- You will need to know the set number (45823) and the part you need. The Element Overview document in the Building Instructions section will tell you the part number.



Issues Specific to This Season

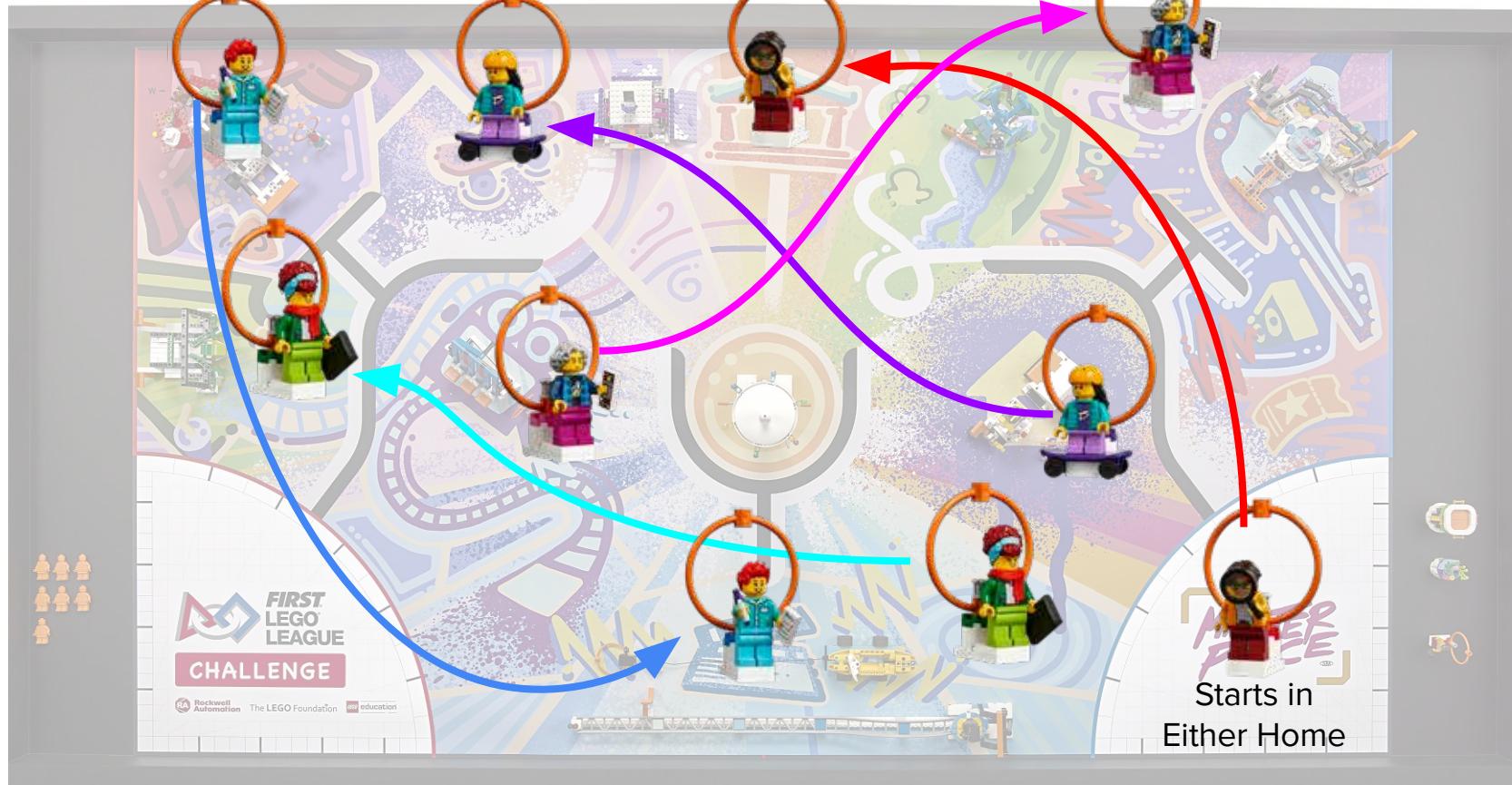
Minifigure Placement

- It is a little challenging to know where to place the minifigures and accessories
- Here is a helpful placement guide



Created by MK Baldwin

Start & End Position for Experts



M05 Model Behavior

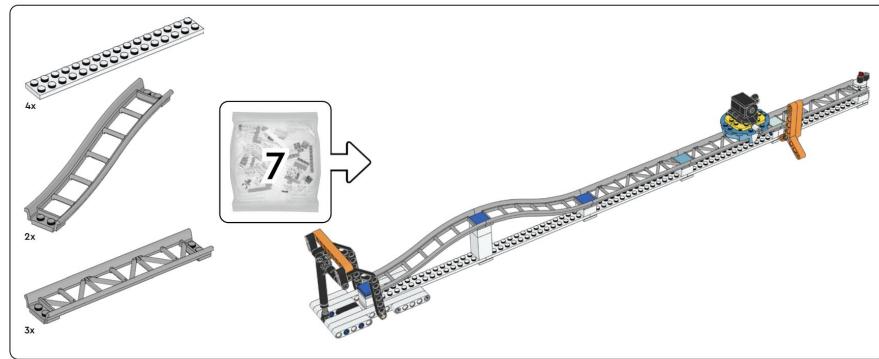
- For some teams, their model requires pushing the lever all the way around and it is having trouble resetting.
- According to a coach who contacted FIRST, the intended movement is for teams to push the lever $\frac{1}{2}$ way, after which it should automatically complete on its own.
- If your model does not behave the same way, check the area around the white circular element and the gear.



TIP: Models get looser over time. A model at a competition may be tighter (if new) or looser (after it has been used at multiple events). Teams need to be prepared for some variation as long as it is within the normal behavior of the model. They can graciously ask the referee to check a model prior to a robot run.

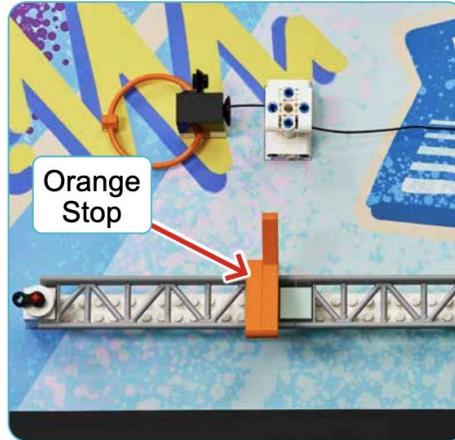
Bag 7 Errors

- The first page indicates that you need four 2X16 white plates from the unnumbered bag, but you need five of them to build the model.
- The opening page also does not mention that you need two 13M lift arms in white from the unnumbered bags.
- The extra parts are in the unnumbered bags.

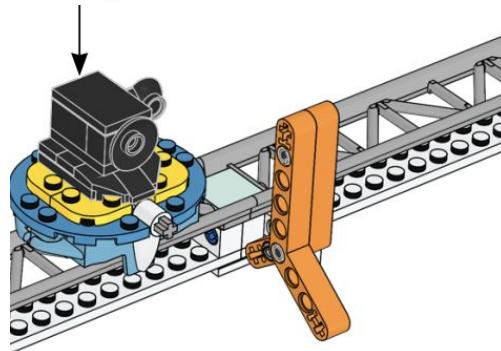


M08 Error

- In the Robot Game Rulebook, the images for M08 seem to indicate that the Orange Stop lies past the light blue tile when down.
- However, if you follow the build instructions, the Orange Stop lays over the light blue tile.
- As per the official Challenge Update, follow the Building Instructions.



Robot Game Rulebook

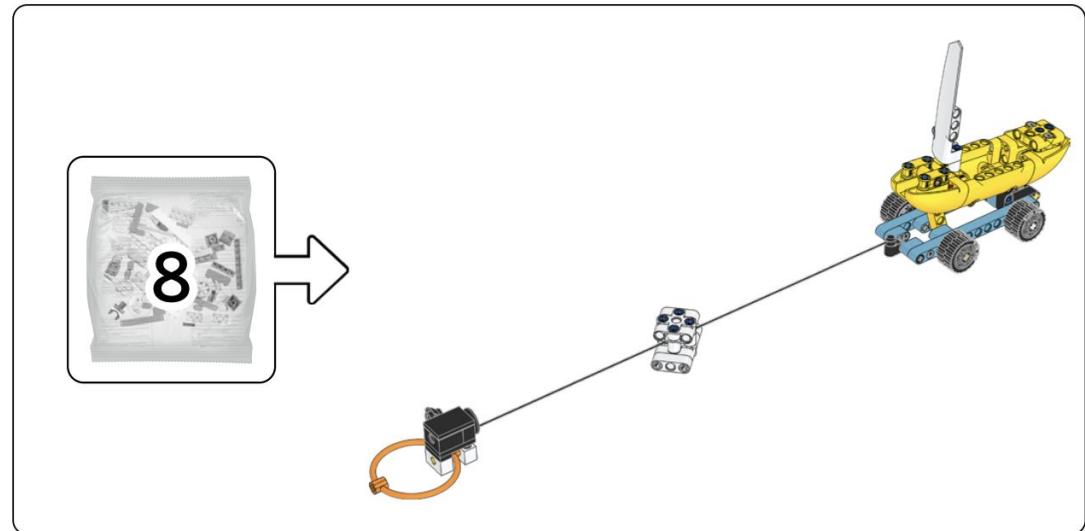


Build Instructions for Bag 7



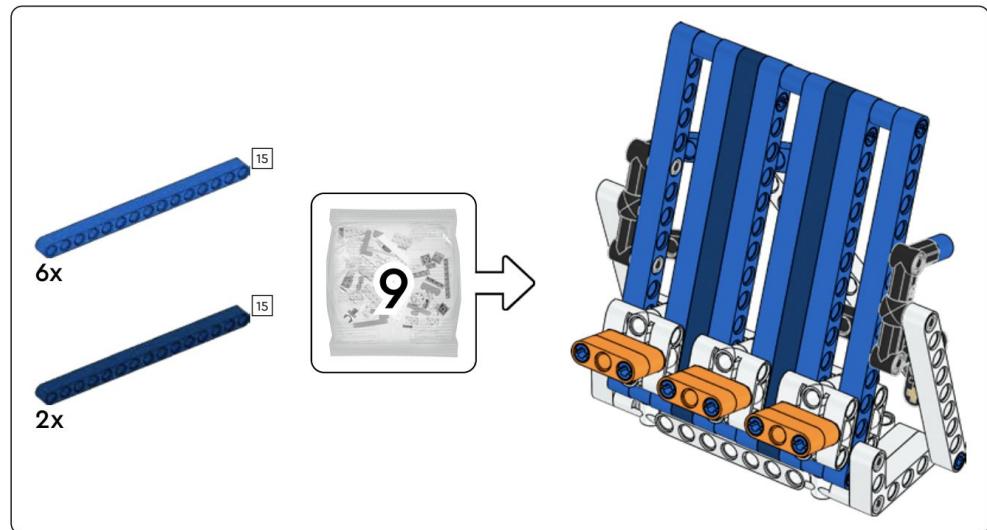
Bag 8 Errors

- The opening page of instructions does not mention that you also need two 13M light blue liftarms from the unnumbered bags.



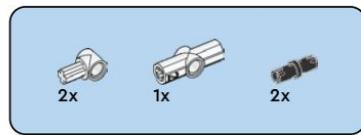
Bag 9 Error

- The opening page of the instructions does not indicate you need a 13M from an unnumbered bag.



Bag 11 Error

- Step 12 points to the wrong part of the model. Be careful.



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