

**FIRST  
LEGO  
LEAGUE**

**CHALLENGE**

# ROBOT GAME RULEBOOK

**MASTER  
PIECE**







FIRST® LEGO® LEAGUE GLOBAL SPONSORS



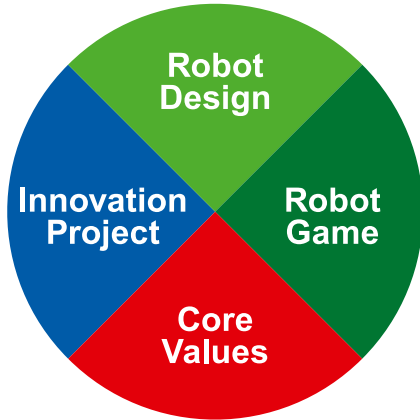
The LEGO Foundation

CHALLENGE DIVISION SPONSOR



# Introduction

Welcome to *FIRST*® IN SHOW<sup>SM</sup> presented by Qualcomm. This year's *FIRST*® LEGO® League Challenge is called MASTERPIECE<sup>SM</sup>. Your team will work together on many different tasks in preparation for an incredible experience at your tournament.



Each of these four equally weighted parts of *FIRST* LEGO League Challenge accounts for 25 percent of your total performance.

Find out more in the *Engineering Notebook*. It guides teams through their journey. It provides inspiration for the Innovation Project through the Project Sparks.

Teams can use the LEGO® Education SPIKE™ app to learn how to build and code their robot. Also, the guided mission provides the program needed to complete Mission 02 Theater Scene Change.

## MASTERPIECE<sup>SM</sup> Robot Game

In this season's game, points are scored for activating the technology that will enhance an audience's experience of a creative production. The experts involved in designing the shows and the audience members need to be delivered to various venues.



# How to Get Started

1. Build your mission models using the **Mission Model Building Information** pages (p. 22-23).



2. Decide whether to put your field mat on a table or on the floor. Instructions to build your own table can be found on p. 24.



3. Follow the field setup instructions on **Field Mat Placement** (p. 24), **3M™ Dual Lock™ Reclosable Fastener Placement** (p. 25), and the **Mission Model Setup** (p. 26-28).

4. Learn how to play! Read the **Rules** (p. 16-21) and **Missions** (p. 7-15) and watch the season videos.



5. Check out what is **New This Year** (p. 16), read the **Robot Game Guiding Principles** (p. 6), and monitor any challenge updates online.



6. Review this guide. You will find useful resources like a **Glossary** (p. 16), **Robot Path Diagram** (p. 29), and **Scoresheet** (p. 30-31).

For a fully guided experience of the FIRST® LEGO® League Challenge, students can refer to the *Engineering Notebook* and the facilitator can use the *Team Meeting Guide*.

See where missions are located on the field as shown by the mission numbers below.



# Robot Game Guiding Principles

1. The team works together to design and build a LEGO® robot and then program it to complete a series of missions autonomously to score points in a 2.5-minute robot game match.
2. The team launches their robot from one of the two launch areas, and it moves around the field attempting to complete the missions in the order chosen by the team.
3. The robot is programmed to return to either home area at any time. The team can modify it while it is in a home area before launching again to try other missions.
4. The team starts the match with six precision tokens that are worth points. If needed, the robot can be brought back to home by hand, but the team will lose a token for the interruption.
5. During a match, only the robot can move objects from one home area to another. Teams may not pass anything from one home area to another. When a robot is interrupted completely outside of a home area, it may be returned to either area.
6. Mission requirements must be visible at the end of the match to score unless otherwise stated in the mission.
7. The team will have three official matches, but only their highest score will count.
8. We express Core Values through *Gracious Professionalism*®. Referees will assess your *Gracious Professionalism* at every match.

## Gracious Professionalism®

### Gracious Professionalism displayed at the robot game table

Referees will evaluate *Gracious Professionalism* for every team at each one of their matches.

The *Gracious Professionalism* points will be added to the points scored on the Core Values rubric during the judging session and will make up a portion of the total Core Values score.

It will be assumed that every team will start with *Gracious Professionalism* that is **ACCOMPLISHED** (3 points). If a referee observes behavior that is above and beyond what is expected, they will score the team's *Gracious Professionalism* as **EXCEEDS** (4 points). Equally, if a team's behavior shows that their *Gracious Professionalism* is still evolving, they will be scored as **DEVELOPING** (2 points).

DEVELOPING	ACCOMPLISHED	EXCEEDS
2	3	4

If a team does not show for their match, they will score no points for *Gracious Professionalism*. However, if a team arrives and does not run the robot but does explain what has happened, they can get a

*Gracious Professionalism* score of 2, 3, or 4 points depending on the *Gracious Professionalism* they demonstrate.

# Missions

Now it's time to play the MASTERPIECE<sup>SM</sup> robot game! Missions are tasks that can be completed for points. The missions are explained in this section, which should be read by the team as they stand next to the field.

Check your score using the Official Scoring Calculator.



Before the match, the referee will conduct an equipment inspection.



Robot  
Game  
Video

## EXAMPLE MISSION LAYOUT

*Model Picture*

*Field Location*

The story or background to the mission

Basic description of each mission (not used for scoring).

- Regular black text under the mission description lists the main requirements: **XX points are in bold red.**
- If the referee sees these things performed or completed: **XX points as described.**

*Blue italic text is for very important added requirements, leniency, or other helpful facts.*

*Sometimes, pictures teach you with an example score.*

**XX points are in bold red.**

*Sometimes, a picture has a description to help explain it.*

**XX points are in bold red.**

*The pictures may not show you all the scoring possibilities, just some examples!*

**XX points are in bold red.**

## MASTERPIECE<sup>SM</sup> Missions

### EQUIPMENT INSPECTION

If your robot and all your equipment fit completely in one launch area and are under a height limit of 12 in. (305 mm) during the pre-match inspection: **20**

*(See Rules, Match Setup 1)*

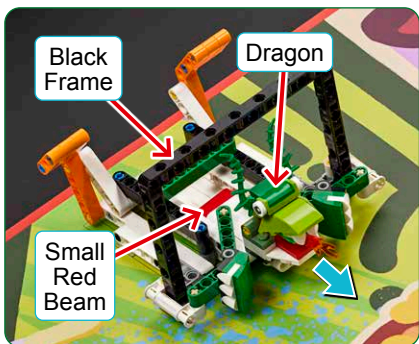
## Mission 01 3D CINEMA



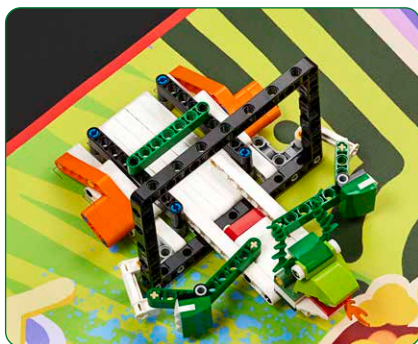
3D technology adds depth and interactivity to the cinema experience, making it more enjoyable.

Trigger the 2D cinema screen to become a 3D experience.

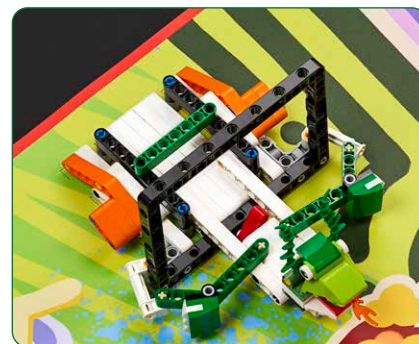
- If the 3D cinema's small red beam is completely to the right of the black frame: **20**



0



20



20

## Mission 02 THEATER SCENE CHANGE



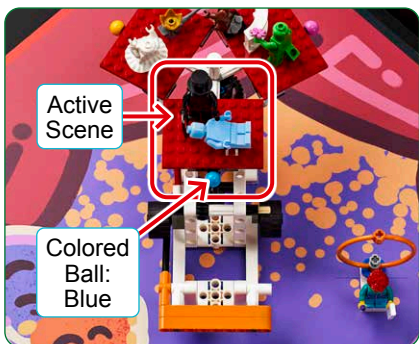
Mechanical technology can support a theater performance by seamlessly changing the scenery, keeping the audience focused on the story.

Change the scenery to a different configuration, and consider what the other team will do so that you end with matching scenes.

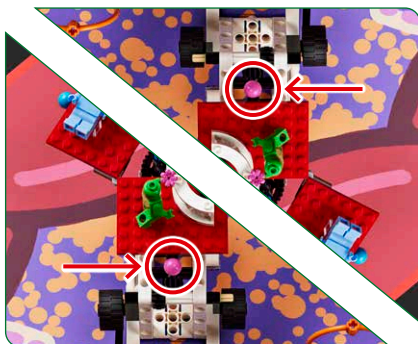
- If your theater's red flag is down and the active scene color is: **Blue: 10 Pink: 20 Orange: 30**
- **Bonus:** And if both teams' active scenes match: **Blue: 20 ADDED Pink: 30 ADDED Orange: 10 ADDED**

*Teams may activate only their own model.*

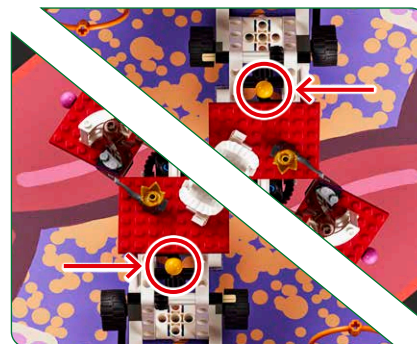
*It is not possible to earn the bonus in remote competitions or if there is no opposing team.*



10



20 + 30



30 + 10



## Mission 03 IMMERSIVE EXPERIENCE



Immersing viewers so they are surrounded by the art allows them to experience and appreciate it in new ways.

Trigger the immersive experience for the viewer in the model.

- If the three immersive experience screens are raised: **20**

*To score, team equipment may not be touching the immersive experience model at the end of the match.*



0



0

Equipment



20

## Mission 04 MASTERPIECE<sup>SM</sup>



What makes something art? Create an amazing art piece worthy of being displayed in a museum.

You can use the bricks in Bag 4 to build your team's LEGO® art piece. Bring it to the match and then deliver it on the pedestal to the museum.

- If your team's LEGO art piece is at least partly in the museum target area: **10**
  - **Bonus:** And if the art piece is completely supported by the pedestal: **20 ADDED**

*To score the bonus, at the end of the match, the art piece may only be touching the pedestal and the pedestal may not be touching any team equipment except the art piece*



Museum Target Area



10



10+20

## Mission 05 AUGMENTED REALITY STATUE



Augmented reality transforms a piece of art into an experience.

Rotate the statue to reveal an augmented reality experience.

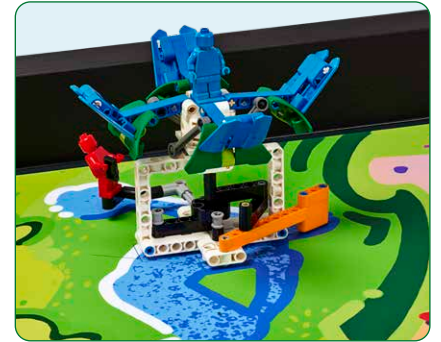
- If the augmented reality statue's orange lever is rotated completely to the right: **30**



**0**

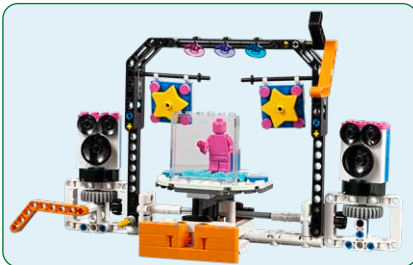


**0**



**30**

## Mission 06 MUSIC CONCERT LIGHTS AND SOUNDS



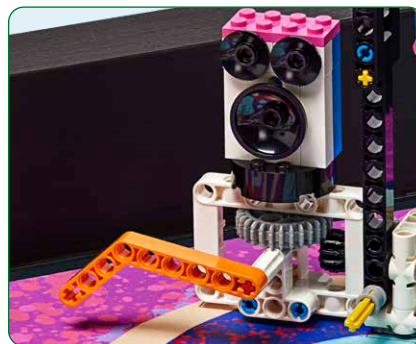
Visual and audio effects make a powerful impact and can be used to help the audience focus on different parts of the performance.

Set up the music concert by switching on the lights and sound.

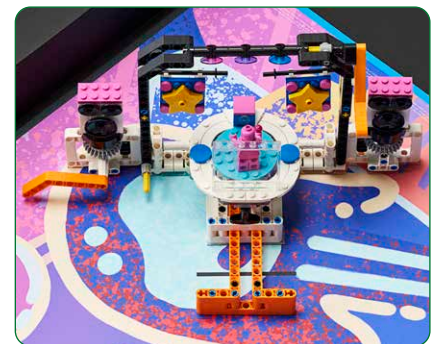
- If the lights' orange lever is rotated completely downwards: **10**
- If the speakers' orange lever is rotated completely to the left: **10**



**10**  
**Lights**



**10**  
**Speakers**  
**Benefit of the Doubt**



**10 + 10**

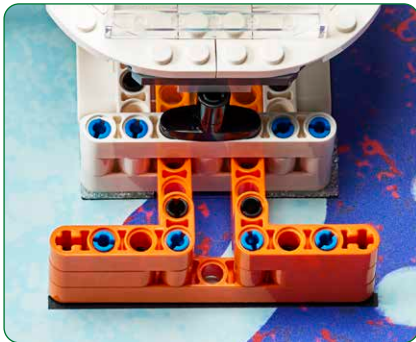
## Mission 07 HOLOGRAM PERFORMER



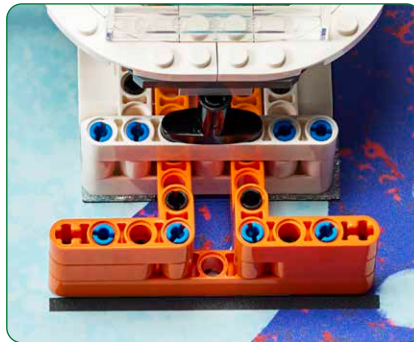
Innovative audiovisual technology can bring new characters to life through the use of holograms.

Set the stage for the hologram performer to start the show.

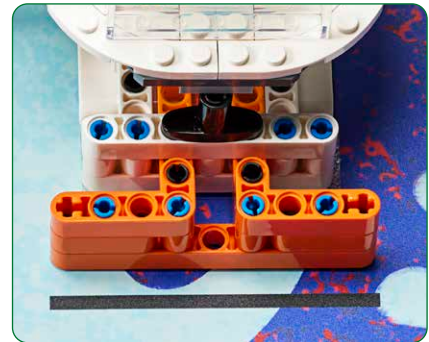
- If the hologram performer's orange push activator is completely past the black stage set line: **20**



0



20



20

## Mission 08 ROLLING CAMERA

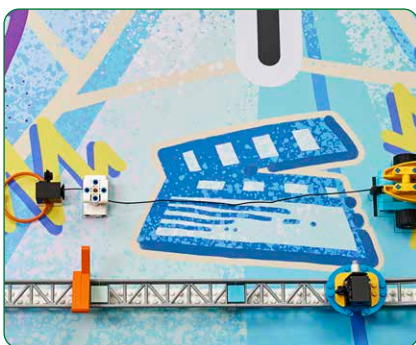


Getting a camera into exactly the right position to capture a shot requires a lot of precise movement and great communication with the actors.

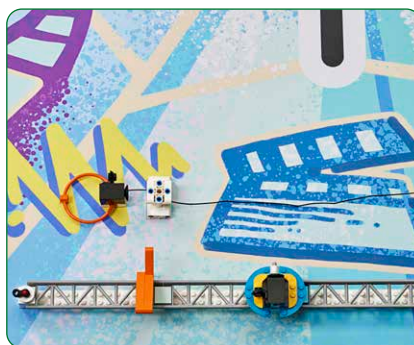
Release the camera down the track to shoot the movie scene.

- If the rolling camera's white pointer is:
  - Left of dark blue, but right of medium and light blue: **10**
  - Left of dark and medium blue, but right of light blue: **20**
  - Left of dark, medium, and light blue: **30**

*If the white pointer is on a colored tile, you earn points for the higher scoring area of the track.*



10

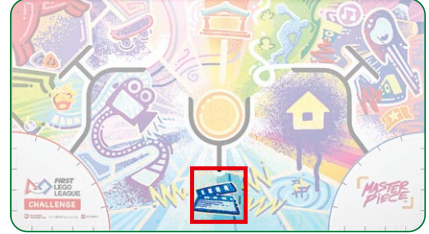


20



30

## Mission 09 MOVIE SET

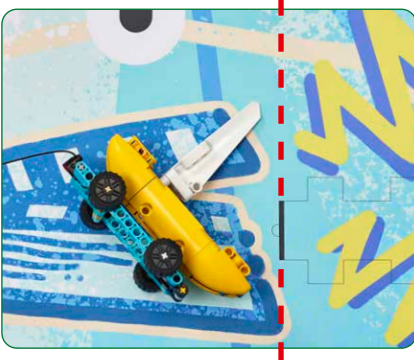


Pulleys, gears, and levers are some of the mechanical technologies used to move props to create the special effects for a movie.

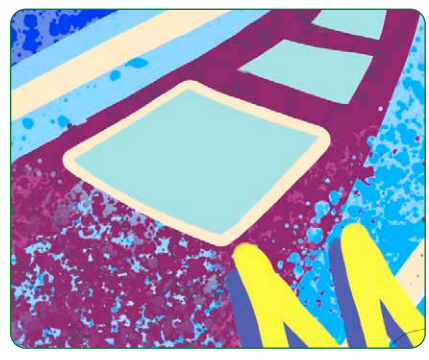
Act out the scene by pulling the boat model along.

- If the boat is touching the mat and is completely past the black scene line: **10**
- If the camera is touching the mat and is at least partly in the camera target area: **10**

*The camera includes the loop, but not the string.*  
*When scoring, the scene line extends vertically from the top to the bottom of the field.*



**10**



**Camera Target Area**



**10**

## Mission 10 SOUND MIXER



Mixing different inputs to produce the right balance of sound for the performance is an important task for any show.

Adjust the sound levels in the studio for ideal audio recording.

- If a sound mixer slider is raised: **10 EACH**

*To score, team equipment may not be touching the sound mixer or sliders at the end of the match.*



**0**  
**Equipment**

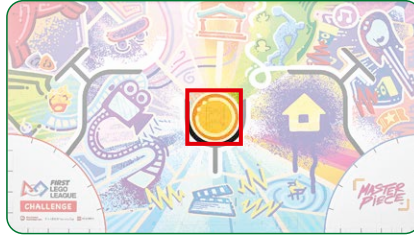


**10**



**10 + 10 + 10**

## Mission 11 LIGHT SHOW

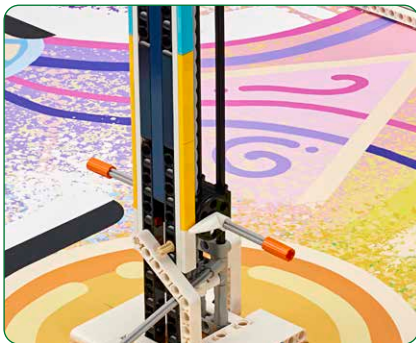


Worm gear technology creates rotation that can enhance the way lights move in a light show.

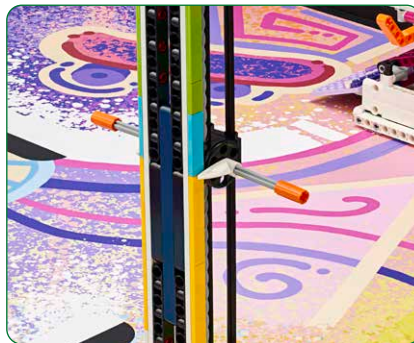
Trigger the light show on the tower by raising the handles.

- If the light show's white pointer is within zone: **Yellow: 10 Green: 20 Blue: 30**

*If the white pointer rests between zones, you earn points for the higher scoring zone of the two.*



10

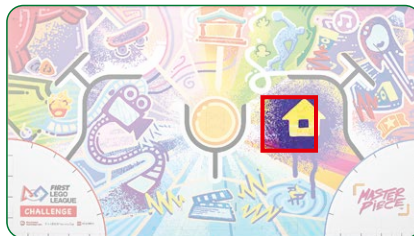


30



30

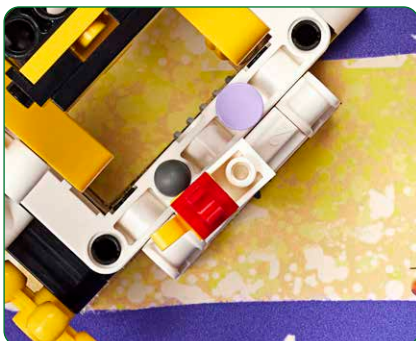
## Mission 12 VIRTUAL REALITY ARTIST



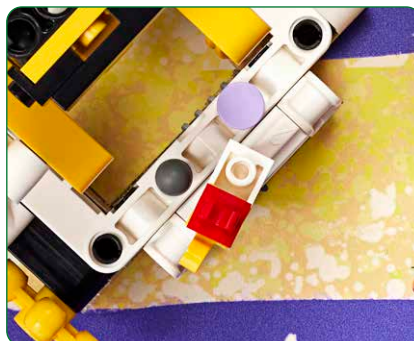
Virtual reality technology can transport an audience into new worlds, making their experience feel real.

Trigger the model repeatedly to create an artistic sculpture.

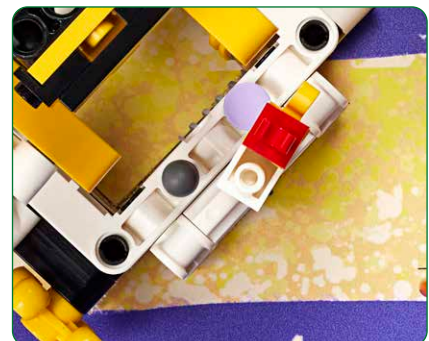
- If the chicken is intact and has moved from its starting position: **10**
- **BONUS:** And is over or completely past the lavender dot: **20 ADDED**



0  
Starting Position



10



10 + 20

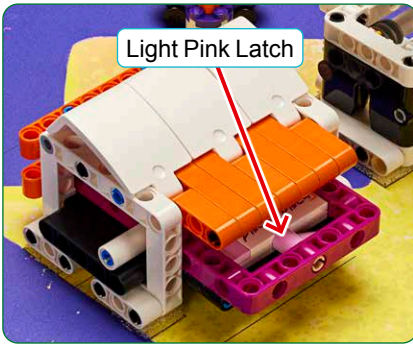
## Mission 13 CRAFT CREATOR



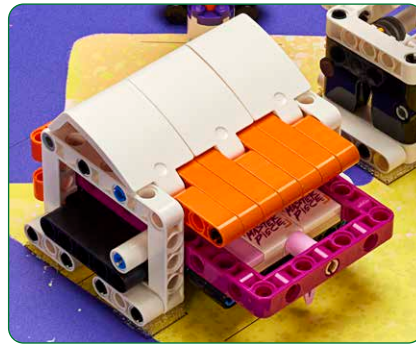
Many technologies are used to enable all sorts of great creations to be made anywhere.

Release the creation from the craft machine.

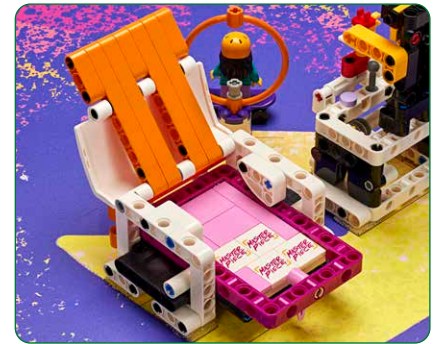
- If the craft machine's orange and white lid is completely open: **10**
- If the craft machine's light pink latch is pointing straight down: **20**



**0**



**20**



**10 + 20**

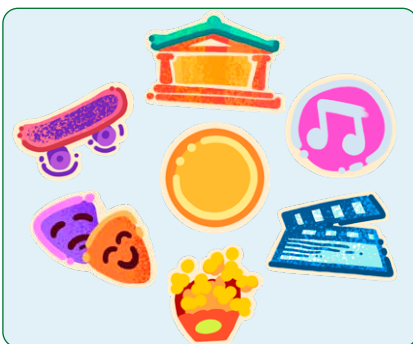
## Mission 14 AUDIENCE DELIVERY



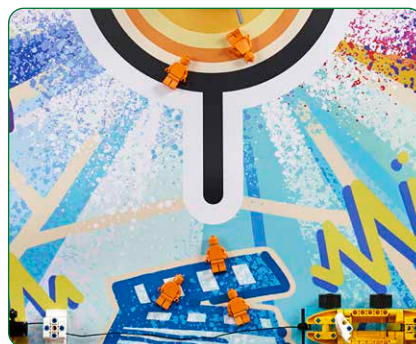
There is no show without an audience! We love to share our artistic creations with others.

Deliver the seven audience members to the target destinations.

- If an audience member is completely in a target destination: **5 EACH MEMBER**
- If a target destination has at least one audience member completely in: **5 EACH DESTINATION**



**Audience Member  
Target Destinations**



**5 + 5 + 5 +  
5 + 5  
(3 Members + 2 Destinations)**



**5 + 5 + 5 +  
5 + 5 + 5  
(3 Members + 3 Destinations)**

## Mission 15 EXPERT DELIVERY

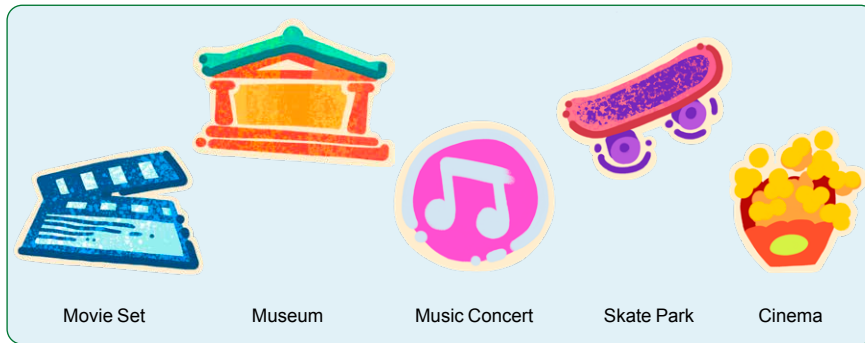


Every type of artistic venue is filled with experts who are just as critical as the artists themselves. What careers would you find interesting?

Deliver the experts to their target destinations.

- If the following experts are at least partly in their target destinations: **10 EACH**
  - Sam the Stage Manager in Movie Set
  - Anna the Curator in Museum
  - Noah the Sound Engineer in Music Concert
  - Izzy the Skateboarder in Skate Park
  - Emily the Visual Effects Director in Cinema

*The expert includes the loop and the base.*



Movie Set

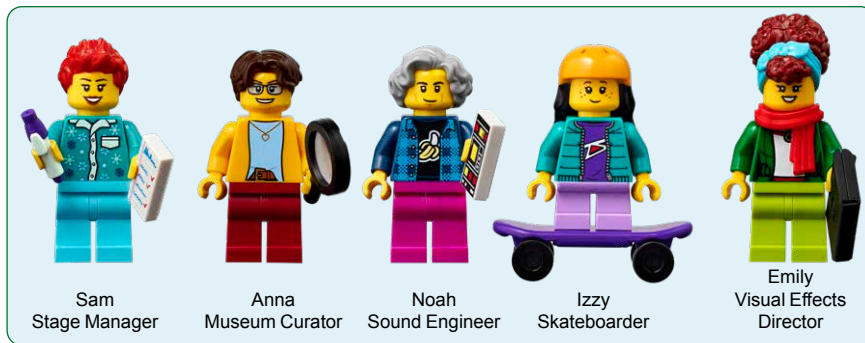
Museum

Music Concert

Skate Park

Cinema

### Expert Target Destinations



Sam  
Stage Manager

Anna  
Museum Curator

Noah  
Sound Engineer

Izzy  
Skateboarder

Emily  
Visual Effects Director

### Experts



0

### Experts in Wrong Locations



20

### Izzy and Emily

## PRECISION TOKENS

You begin the match with six precision tokens worth 50 points. If you interrupt the robot outside of home, the referee will remove one token. You earn points for the number of tokens remaining at the end of the match. If the number remaining is:

**1: 10, 2: 15, 3: 25, 4: 35, 5: 50, 6: 50**

*(See Rules, Outside Home 1 and 2)*

# Rules

## IMPORTANT!

All robot game wording means precisely and only what it says. If a detail is not mentioned, it does not matter. If a situation arises that makes the referee's decision unclear or hard to call, you get the benefit of the doubt.

If rules, missions, or the field setup need adjustment or clarification, a Challenge Update will be issued during the season superseding previous materials. At an event, your head referee makes the final decision. Text always has authority over pictures. (Videos and emails have no authority when scoring.)



Scan the QR code to find the Challenge Updates.

## Glossary

- **Equipment:** Everything teams bring to the match. (See **Rules, Before the Event** for more details.)
- **Field:** This consists of the border walls and everything inside them. The mat, the mission models, and the home areas are all part of the field
- **Interruption:** When technicians interact with the robot, or anything touching it, after launch.
- **Launch:** When technicians activate the robot from completely within a launch area to cause it to move autonomously.
- **Match:** The 2.5 minutes when the robot completes as many missions as possible to earn points.
- **Mission:** One or more tasks that can be completed for points. Teams may try missions in any order or combination.
- **Precision Tokens:** The six red LEGO® discs included in your annual Challenge set. They are worth free points, but in some situations, a referee may remove them one at a time. (See **Rules, Outside Home** for more details)
- **Robot:** Your controller and any equipment combined with it by hand and intended to not separate from it, unless by hand.
- **Technicians:** Team members standing at the table who are handling the robot during a match.

## New This Year

The following rules have been revised:

- Rules, Match Setup - 4
- Rules, Inside Home – 3
- Rules, Outside Home - 1
- Rules, Outside Home – 3 and split into two rules.






## BEFORE THE MATCH | EQUIPMENT

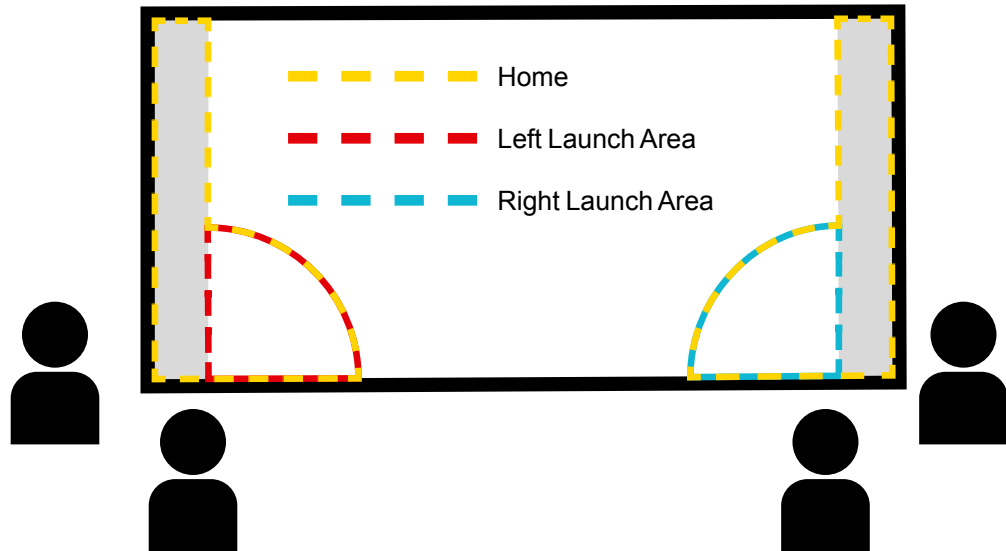
Equipment includes everything teams bring to the match, such as the robot, any attachments or accessories, and the team's LEGO® art piece. This section explains what the robot and its accessories can be built from.

1. All equipment must be LEGO® made building pieces, in original factory condition.  
**Exception:** LEGO string and pneumatic tubes may be cut to length.

2. Non-electric LEGO pieces are allowed from any set. Teams may use as many as they like.
3. Electric LEGO equipment is allowed only as described and shown below. (The LEGO® Education SPIKE™ Prime is shown, but LEGO® Education SPIKE™ Essential, MINDSTORMS® EV3, MINDSTORMS Robot Inventor and equivalent NXT and RCX are also allowed).

<b>Controller</b> Maximum of one in any one match.	<b>Motors</b> Maximum of four (any mix) in any one match.	<b>Sensors</b> Only touch/force, color, distance/ultrasonic, and gyro sensors are allowed (any mix and number) in any one match.
		

4. Teams can also use LEGO wires, one controller's power pack or six AA batteries, and one microSD card.
5. Teams can use any software or programming language. Robots must be autonomous during the match. No remote controllers of any type are allowed.
6. Teams may bring one sheet of notebook paper per home area for program notes, and it does not count as equipment.
7. Additional or duplicate mission models are not allowed.



## BEFORE THE MATCH | MATCH SETUP

At events, matches are likely to be on official tables. Before the match begins, teams will need to pass the pre-match inspection and set all their equipment in place.

1. All the team's equipment must fit into the two launch areas and fit under a height limit of 12 in. (305 mm). However, if the team can fit all their equipment into just one launch area under a height limit of 12 in. (305 mm), they will earn 20 points.
2. Teams will not be given additional storage space. Storage tables or trolleys are not allowed. Everything must stay on the table or in the hands of the technicians. The areas to the left and right of the mat can be used to store equipment and measure approximately 6.75 in. (171 mm) by 45 in. (1,143 mm) (actual measurements may vary). Equipment stored on the table may extend past the left and right walls only, as needed.
3. After the team has passed inspection, they will be given a couple of minutes to set up. They start by distributing their equipment and loose mission model(s) between the two home

areas. (Sometimes, mission models must start in a specific home area. See **Field Setup** for more details.) Next, they place their robot into the launch area they wish to start from. Any remaining time should be used to adjust the robot and equipment for the first launch, to calibrate sensors using any part of the mat, and to ask the referee to check anything on the field.

4. Team members must then divide into two groups and position one group on each side of the field (left and right). These members cannot switch sides during the match. Teams of:
  - Four or more: Position two technicians at each home area. All other team members must stand back. Teams may never have more than two technicians at a single home area, but team members may swap places with technician(s) from the same side at any time.
  - Three: Position two technicians on one side and one on the other (team choice).
  - Two: Position one technician on each side.

# DURING THE MATCH | INSIDE HOME

Home is the team's safe space.

1. Home is split into two areas. Each home area contains its own launch area.
2. Technicians may use their hands on the robot, equipment, and mission models when these are completely within their home area.
3. Technicians may not:
  - Hand anything from one home area to the other.
  - Touch anything outside of their home area, except for interrupting the robot.
  - Cause anything to move or extend outside this area, except for launching the robot.

Points scored in these ways will not count.

## 4. When launching:

- Technicians may not keep anything from moving.
- The robot and anything it is about to move must fit completely inside the launch area and be at rest.

## 5. After any launch, technicians should allow the robot and anything it is in contact with to return completely into home before interrupting it (See **Rules, Outside Home** for more details.)



## DURING THE MATCH | OUTSIDE HOME

1. If technicians interrupt their robot, it must be relaunched. If the robot or anything it was in contact with at the time of the interruption was outside home (even partly), the team loses one precision token.

If the robot or any object(s) it was in contact with were:

- **Partly outside home:** They must be brought into that home area.
- **Completely outside home:** They must be returned to either home area (team choice).
  - Any object that was obtained outside home **after** the robot was last launched must be given to the referee for the remainder of the match.

**Exception:** If the team does not plan to launch again, they may stop their robot in place without losing a precision token. The robot and anything it is in contact with should remain in place where it was interrupted.

2. If a piece of equipment or a mission model is dropped or left outside of home by the robot, wait for it to come to rest. If it rests:

- **Completely outside home:** It stays as is unless the robot moves it.
- **Partly inside home:** It stays as is unless the robot moves it. Alternatively, at any time, the technicians may remove it by hand. If the object removed by hand is a mission model, it must be given to the referee for the remainder of the match. If the object is equipment, it must be taken into that home area, and the team will lose one precision token.



3. Teams may not interrupt their robot in such a way that they earn points from it. Points scored in these ways will not count.

4. Teams may not separate the Dual Lock, take models apart, or break a mission model. Missions clearly made possible or easier will not count. If a mission model is combined with anything (including the robot), the combination must be loose or simple enough that, if asked to, a technician could immediately free the mission model in perfect original condition. Points scored using combinations that fail this test will not count.

5. Teams may not interfere with the opposing field or robot unless there is a mission exception. Points failed or lost due to interference will score automatically for the other team.

# AFTER THE MATCH | SCORING

1. After 2.5 minutes, the match ends. Technicians must stop their robot and touch nothing else. This is when scoring begins.
2. For scoring, all mission requirements must be visible at the end of the match unless a method was required in the mission.
3. When something is required to be “completely in” an area, the lines and airspace above that area count as “in” unless otherwise mentioned.
4. If a team cannot run their robot, they can still gain *Gracious Professionalism*<sup>®</sup> points by explaining the situation or being present at the match.
5. The referee will document the results of the match with the team. When there is agreement on the results, it becomes official. If no agreement is reached, the head referee makes the final decision. Only the team’s best score of the three official matches counts toward awards and advancement. Ties are broken using second and third best scores. In the case of all three scores being tied, local tournament officials will decide what to do.

Team #	Match:	Referee:	Table:
TEAM INITIALS:			

	SCORE	
<b>EQUIPMENT INSPECTION</b> If your robot and all your equipment fit completely in one launch area and are under a height limit of 12 in. (305 mm) during the pre-match inspection: <span style="float: right;">20</span>	20	
<b>MISSION 01   3D CINEMA</b> If the 3D cinema's small red beam is completely to the right of the black frame: <span style="float: right;">20</span>	20	
<b>MISSION 02   THEATER SCENE CHANGE</b> If your theater's red flag is down and the active scene color is: Blue: 10    Pink: 20    Orange: 30 • BONUS: And if both teams' active scenes match: Blue: 20 ADDED    Pink: 30 ADDED    Orange: 10 ADDED <i>Teams may activate only their own model. It is not possible to earn the bonus in remote competitions.</i>	20	
<b>MISSION 03   IMMERSIVE EXPERIENCE</b> If the three immersive experience screens are raised: <i>To score, team equipment may not be touching the immersive experience model at the end of the match.</i>	20	
<b>MISSION 04   MASTERPIECE™</b> If your team's LEGO® art piece is at least partly in the museum target area: • BONUS: And if the art piece is completely supported by the pedestal: <i>To score the bonus, at the end of the match, the art piece may only be touching the pedestal and the pedestal may not be touching any team equipment except the art piece.</i>	10 20 ADDED	
<b>MISSION 05   AUGMENTED REALITY STATUE</b> If the augmented reality statue's orange lever is rotated completely to the right: <span style="float: right;">30</span>	30	
<b>MISSION 06   MUSIC CONCERT LIGHTS AND SOUNDS</b> If the lights' orange lever is rotated completely downwards: <span style="float: right;">10</span> If the speakers' orange lever is rotated completely to the left: <span style="float: right;">10</span>	10 10	
<b>MISSION 07   HOLOGRAM PERFORMER</b> If the hologram performer's orange push activator is completely past the black stage set line: <span style="float: right;">20</span>	20	
<b>MISSION 08   ROLLING CAMERA</b> If the rolling camera's white pointer is: • Left of dark blue, but right of medium and light blue: <span style="float: right;">10</span> • Left of dark blue, but right of light blue: <span style="float: right;">20</span> • Left of dark and medium blue, but right of light blue: <span style="float: right;">30</span> • Left of dark, medium, and light blue: <i>If the white pointer is on a colored tile, you earn points for the higher scoring area of the track.</i>	10 20 30	
<b>MISSION 09   MOVIE SET</b> If the boat is touching the mat and is completely past the black scene line: <span style="float: right;">10</span> If the camera is touching the mat and is at least partly in the camera target area: <span style="float: right;">10</span> <i>The camera includes the loop, but not the string. When scoring, the scene line extends vertically from the top to the bottom of the field.</i>	10 10	
<b>MISSION 10   SOUND MIXER</b> If a sound mixer slider is raised: <span style="float: right;">10 EACH</span> <i>To score, team equipment may not be touching the sound mixer or sliders at the end of the match.</i>	10 EACH	
<b>MISSION 11   LIGHT SHOW</b> If the light show's white pointer is within zone: Yellow: 10    Green: 20    Blue: 30 <i>If the white pointer rests between zones, you earn points for the higher scoring zone of the two.</i>	10 20 30	
<b>MISSION 12   VIRTUAL REALITY ARTIST</b> If the chicken is intact and has moved from its starting position: <span style="float: right;">10</span> • BONUS: And is over or completely past the lavender dot: <span style="float: right;">20 ADDED</span>	10 20 ADDED	
<b>MISSION 13   CRAFT CREATOR</b> If the craft machine's orange and white lid is completely open: <span style="float: right;">10</span> If the craft machine's light pink latch is pointing straight down: <span style="float: right;">20</span>	10 20	
<b>MISSION 14   AUDIENCE DELIVERY</b> If an audience member is completely in a target destination: <b>5 EACH MEMBER</b> If a target destination has at least one audience member completely in it: <b>5 EACH DESTINATION</b>	5 EACH MEMBER 5 EACH DESTINATION	
<b>MISSION 15   EXPERT DELIVERY</b> If the following experts are at least partly in their target destinations: • Sam the Stage Manager in Movie Set • Anna the Curator in Museum • Noah the Sound Engineer in Music Concert • Izzy the Skateboarder in Skate Park • Emily the Visual Effects Director in Cinema <i>The expert includes the loop and the base.</i>	10 EACH	
<b>PRECISION TOKENS</b> If the number of precision tokens remaining is: 1: 10, 2: 15, 3: 25, 4: 35, 5: 50, 6: 50	10 15 25 35 50 50	
<b>FINAL SCORE</b> <i>Final score is equal to the sum of all values in the score columns.</i>		31
<b>Gracious Professionalism<sup>®</sup> displayed at the robot game table:</b>		
DEVELOPING	ACCOMPLISHED	EXCEEDS
2	3	4

MASTERPIECE™ 31

See pages 30-31 for scoresheet.

# Mission Models

To build the mission models, use the LEGO® pieces from your Challenge set and building instructions. The robot interacts with

mission models on the field for points. The mission models are built in Sessions 1-4 in the *Engineering Notebook*.

Now it's time to build! Have fun and be sure to build carefully!



**Caution:** It's important to build the models as accurately as possible because practicing with incorrect models could cause problems. Work as a team to build the models, and check each other as you build.



Model Building Instructions

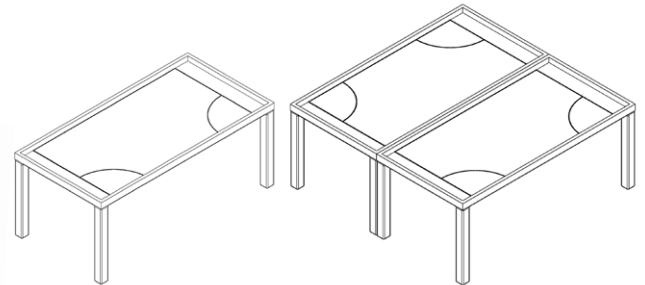
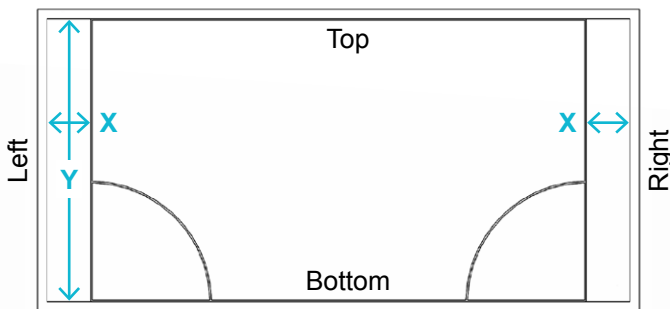
# Mission Model Building Information

Bag Number	Bag Contents	Mission Number
<b>Session 1</b>		
3	Immersive Experience	03
5	Augmented Reality Statue	05
11	Virtual Reality Artist	12
<b>Session 2</b>		
1	3D Cinema	01
7	Rolling Camera	08
8	Movie Set	09
<b>Session 3</b>		
2	Theater Scene Change	02
10	Light Show	11
12	Craft Creator	13
<b>Session 4</b>		
6	Music Concert Lights and Sounds/Hologram Performer	06 07
9	Sound Mixer	10
<b>Miscellaneous</b>		
4	MASTERPIECE <sup>SM</sup>	04
13	Expert Delivery	15
14	Audience Delivery	14
15	Precision tokens	N/A

# Field Setup

## 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.



Practice setup

Tournament setup

**NOTE:** If you compete, remember that volunteers work hard to get the fields just right, but you should expect and design for rare imperfections such as bumps under the mat or changes in light.

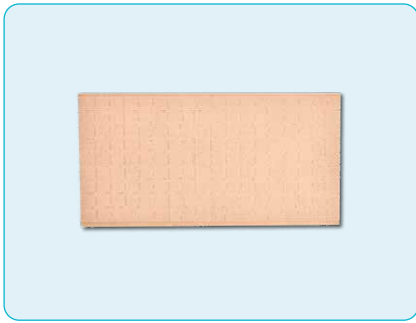


Table Building Instructions

Practicing without an official table or border walls is okay, but competitions will be held on an official table in tournament setup. Please practice with this in mind and remember to mark out the space needed for home on each side of your mat.



## 3M™ DUAL LOCK™ RECLOSABLE 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.



**Step 1:** First Dual Lock square sticky side down.



**Step 2:** Second Dual Lock square sticky side up.

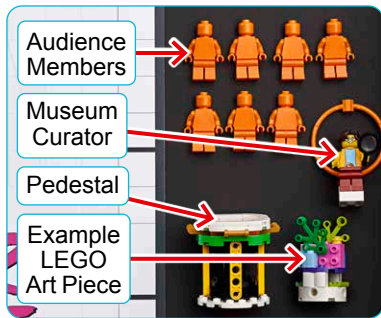


**Step 3:** Align the model and press down.



# Mission Model Setup

## HOME



In either or both home areas, distribute or place the seven audience members, Museum Curator, pedestal, and your LEGO art piece (if you bring one).

See Missions

**04 14 15**

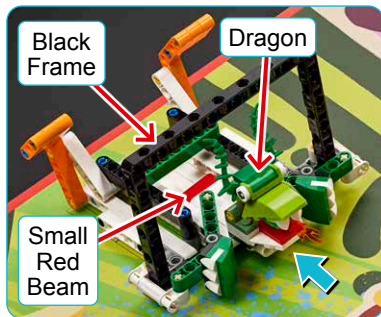
## THEATER SCENE CHANGE



Lift the red flag and set the active scene to blue.

The active scene colored ball, signifying the active scene color, is located at the front of each scene.

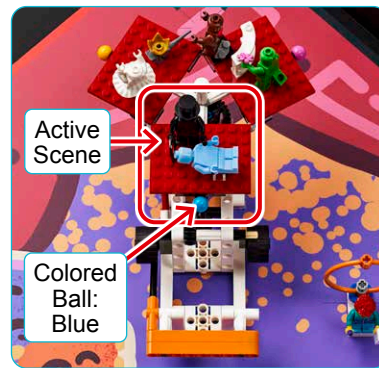
## 3D CINEMA



Make sure the small red beam is horizontal and push the dragon completely in.

See Mission

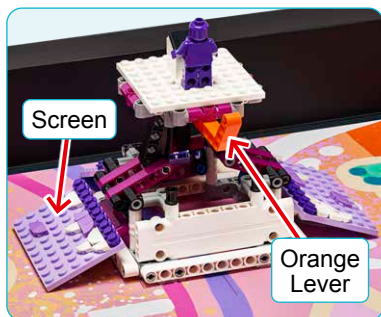
**01**



See Mission

**02**

## IMMERSIVE EXPERIENCE

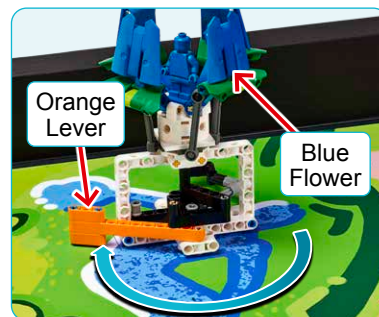


Lift the orange lever such that all three screens are completely lowered.

See Mission

**03**

## AUGMENTED REALITY STATUE

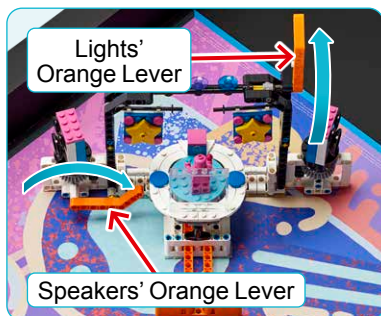


Rotate the orange lever completely clockwise such that the blue flower is closed.

See Mission

**05**

## MUSIC CONCERT LIGHTS AND SOUNDS

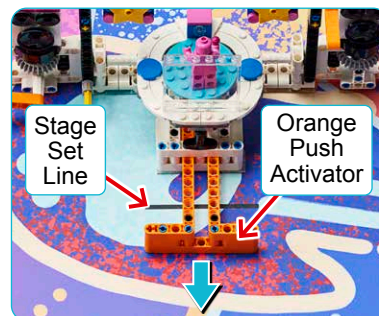


Lift and rotate the concert lights' orange lever upward. Rotate the speakers' orange lever completely clockwise.

See Mission

**06**

## HOLOGRAM PERFORMER

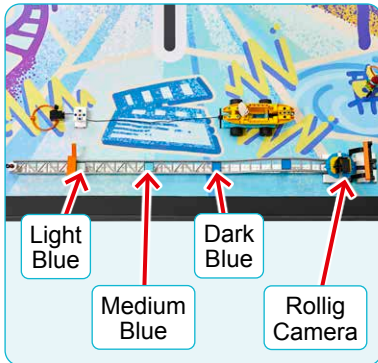


Pull the orange push activator completely outward, past the stage set line, to its designated line on the mat.

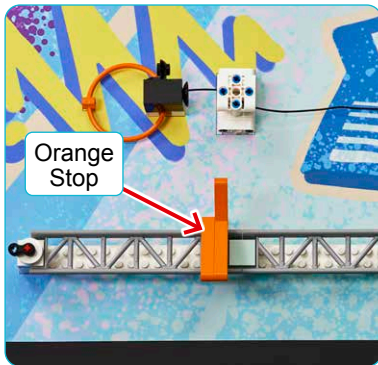
See Mission

**07**

## ROLLING CAMERA



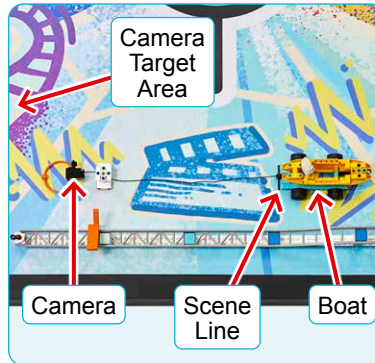
Push the rolling camera completely to the right.



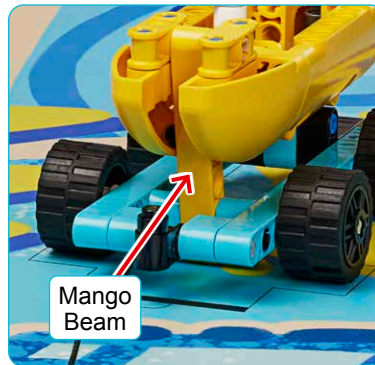
Next, place the orange stop as shown.

See Mission  
**08**

## MOVIE SET

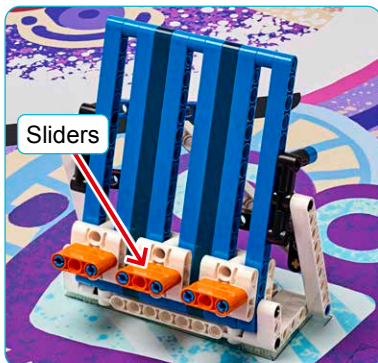


With the string extended, place the camera and boat on their markings on the mat, ensuring the boat's mango beam is completely down.



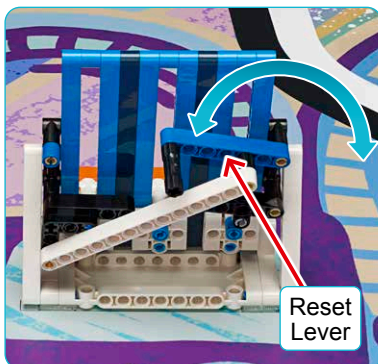
See Mission  
**09**

## SOUND MIXER



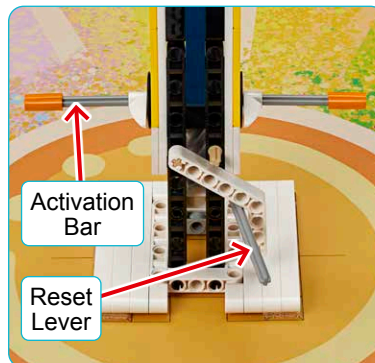
Rotate the sound mixer's reset lever completely outward and lower the sliders down completely.

With the sliders completely down, rotate the sound mixer's reset lever completely inward.

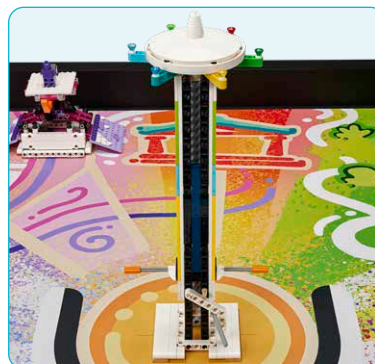


See Mission  
**10**

## LIGHT SHOW



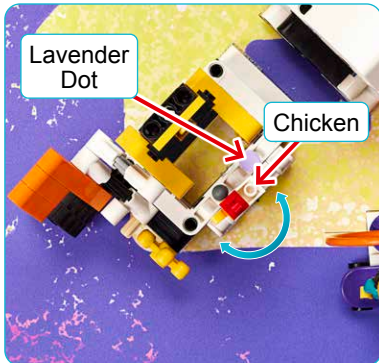
Push the light show's reset lever to the right and lower the light show's activation bar completely downward.



See Mission  
**11**

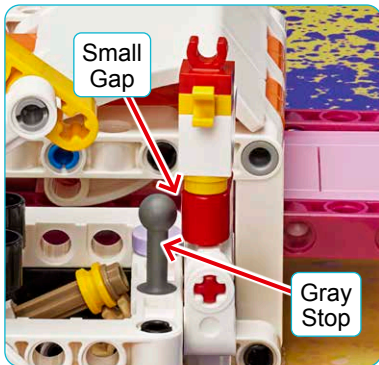
# Mission Model Setup

## VIRTUAL REALITY ARTIST



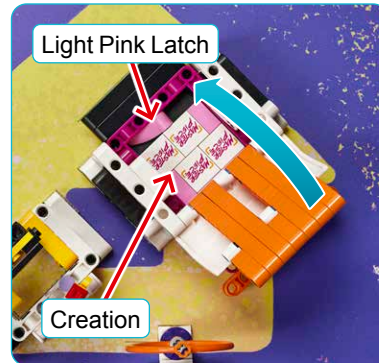
Rotate the chicken completely as shown.

When set, there may be a small gap between the chicken and the gray stop.



See Mission **12**

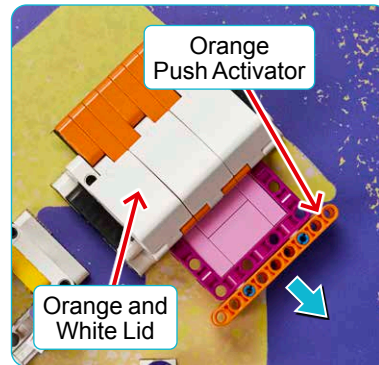
## CRAFT CREATOR



Lift the light pink latch and pull the orange push activator completely outward.

Next, insert the creation into the craft machine as shown.

Then, close the orange and white lid.



See Mission **13**

## EXPERT DELIVERY



Place each expert on their mat markings as shown.

See Mission **15**



## PRECISION TOKENS



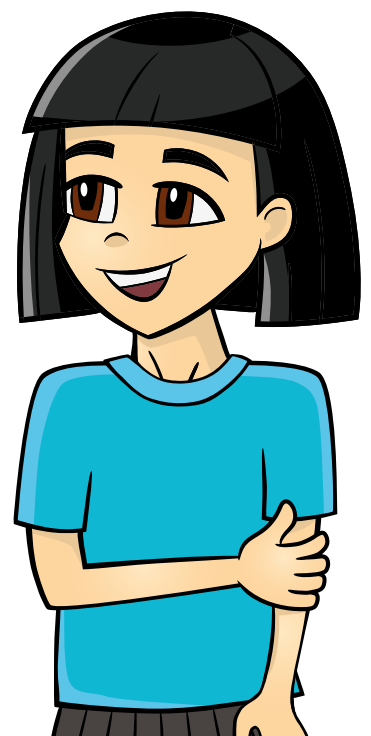
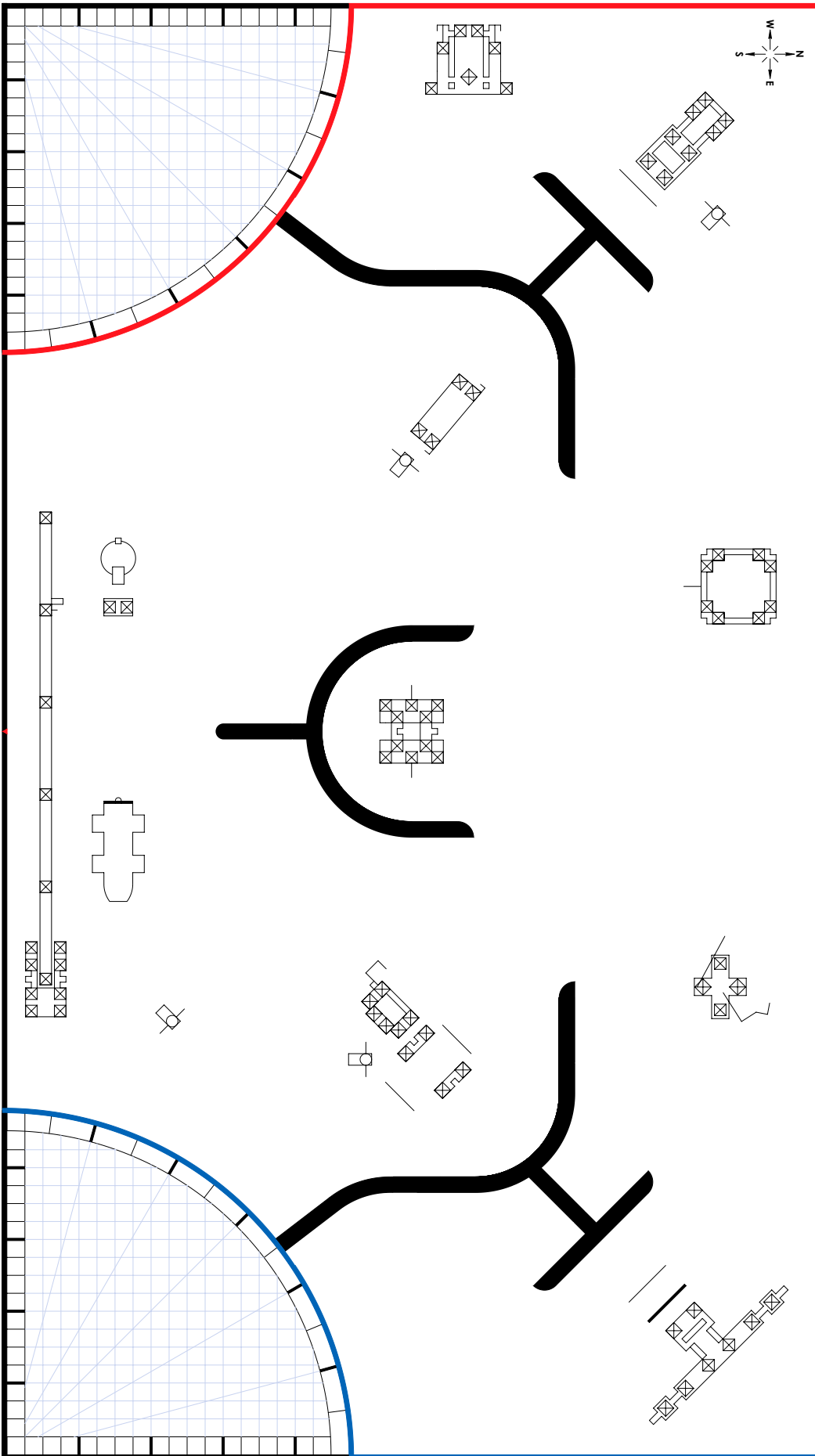
These are managed by the referee.

# Robot Path Diagram

Draw the route your robot will take to solve the mission(s).

You could use colors to indicate each run the robot will make and which launch area it will return to.

Decide which side your equipment will start at.





Team #	Match:	Referee:	Table:
--------	--------	----------	--------

**TEAM INITIALS:**

		SCORE
<b>EQUIPMENT INSPECTION</b> If your robot and all your equipment fit completely in one launch area and are under a height limit of 12 in. (305 mm) during the pre-match inspection:		<b>20</b>
<b>MISSION 01</b>	<b>3D CINEMA</b>	
If the 3D cinema's small red beam is completely to the right of the black frame:		<b>20</b>
<b>MISSION 02</b>	<b>THEATER SCENE CHANGE</b>	
If your theater's red flag is down and the active scene color is: <b>Blue: 10      Pink: 20      Orange: 30</b> • <b>BONUS:</b> And if both teams' active scenes match: <b>Blue: 20 ADDED      Pink: 30 ADDED      Orange: 10 ADDED</b> <i>Teams may activate only their own model.</i> <i>It is not possible to earn the bonus in remote competitions.</i>		
<b>MISSION 03</b>	<b>IMMERSIVE EXPERIENCE</b>	
If the three immersive experience screens are raised:		<b>20</b>
<i>To score, team equipment may not be touching the immersive experience model at the end of the match.</i>		
<b>MISSION 04</b>	<b>MASTERPIECE<sup>SM</sup></b>	
If your team's LEGO® art piece is at least partly in the museum target area:		<b>10</b>
• <b>BONUS:</b> And if the art piece is completely supported by the pedestal:		<b>20 ADDED</b>
<i>To score the bonus, at the end of the match, the art piece may only be touching the pedestal and the pedestal may not be touching any team equipment except the art piece.</i>		
<b>MISSION 05</b>	<b>AUGMENTED REALITY STATUE</b>	
If the augmented reality statue's orange lever is rotated completely to the right:		<b>30</b>
<b>MISSION 06</b>	<b>MUSIC CONCERT LIGHTS AND SOUNDS</b>	
If the lights' orange lever is rotated completely downwards:		<b>10</b>
If the speakers' orange lever is rotated completely to the left:		<b>10</b>
<b>MISSION 07</b>	<b>HOLOGRAM PERFORMER</b>	
If the hologram performer's orange push activator is completely past the black stage set line:		<b>20</b>
<b>MISSION 08</b>	<b>ROLLING CAMERA</b>	
If the rolling camera's white pointer is:		
• Left of dark blue, but right of medium and light blue:		<b>10</b>
• Left of dark and medium blue, but right of light blue:		<b>20</b>
• Left of dark, medium, and light blue:		<b>30</b>
<i>If the white pointer is on a colored tile, you earn points for the higher scoring area of the track.</i>		

<b>MISSION 09</b>	<b>MOVIE SET</b>	
If the boat is touching the mat and is completely past the black scene line:		<b>10</b>
If the camera is touching the mat and is at least partly in the camera target area:		<b>10</b>
<i>The camera includes the loop, but not the string.</i>		
<i>When scoring, the scene line extends vertically from the top to the bottom of the field.</i>		

<b>MISSION 10</b>	<b>SOUND MIXER</b>	
If a sound mixer slider is raised:		<b>10 EACH</b>
<i>To score, team equipment may not be touching the sound mixer or sliders at the end of the match.</i>		

<b>MISSION 11</b>	<b>LIGHT SHOW</b>	
If the light show's white pointer is within zone		
<b>Yellow: 10    Green: 20    Blue: 30</b>		
<i>If the white pointer rests between zones, you earn points for the higher scoring zone of the two.</i>		

<b>MISSION 12</b>	<b>VIRTUAL REALITY ARTIST</b>	
If the chicken is intact and has moved from its starting position:		<b>10</b>
• <b>BONUS:</b> And is over or completely past the lavender dot:		<b>20 ADDED</b>

<b>MISSION 13</b>	<b>CRAFT CREATOR</b>	
If the craft machine's orange and white lid is completely open:		<b>10</b>
If the craft machine's light pink latch is pointing straight down		<b>20</b>

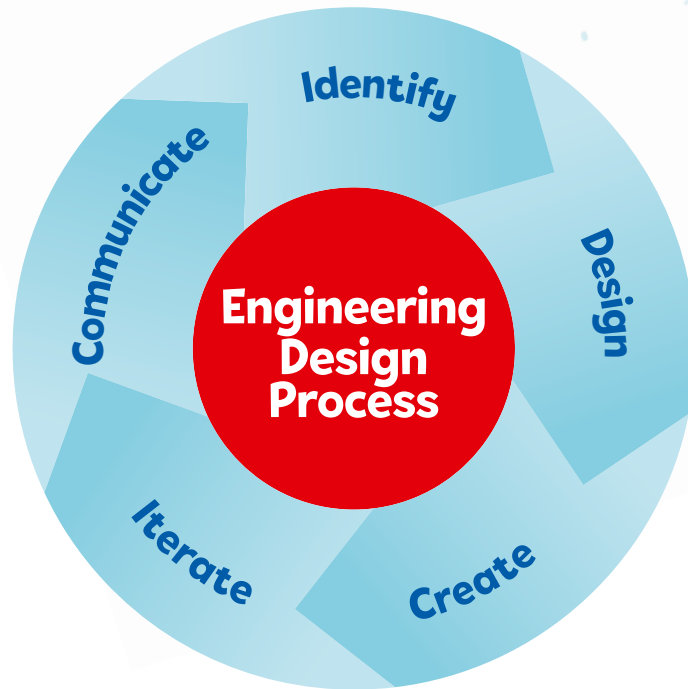
<b>MISSION 14</b>	<b>AUDIENCE DELIVERY</b>	
If an audience member is completely in a target destination:		<b>5 EACH MEMBER</b>
If a target destination has at least one audience member completely in it:		<b>5 EACH DESTINATION</b>

<b>MISSION 15</b>	<b>EXPERT DELIVERY</b>	
If the following experts are at least partly in their target destinations:		
<ul style="list-style-type: none"> <li>• Sam the Stage Manager in Movie Set</li> <li>• Anna the Curator in Museum</li> <li>• Noah the Sound Engineer in Music Concert</li> <li>• Izzy the Skateboarder in Skate Park</li> <li>• Emily the Visual Effects Director in Cinema</li> </ul>		<b>10 EACH</b>
<i>The expert includes the loop and the base.</i>		

<b>PRECISION TOKENS</b>	
If the number of precision tokens remaining is:	
<b>1: 10, 2: 15, 3: 25, 4: 35, 5: 50, 6: 50</b>	

<b>FINAL SCORE</b>	
<i>Final score is equal to the sum of all values in the score columns.</i>	

<b>Gracious Professionalism® displayed at the robot game table:</b>		
<b>DEVELOPING</b>	<b>ACCOMPLISHED</b>	<b>EXCEEDS</b>
<b>2</b>	<b>3</b>	<b>4</b>



# FIRST IN SHOW<sup>SM</sup>

PRESENTED BY **Qualcomm**



LEGO, the LEGO logo, the SPIKE logo, MINDSTORMS and the MINDSTORMS logo are trademarks of the/sont des marques de commerce du/son marcas registradas de LEGO Group. ©2023 The LEGO Group. All rights reserved/Tous droits réservés/Todos los derechos reservados.

FIRST<sup>®</sup>, the FIRST<sup>®</sup> logo, Coopertition<sup>®</sup>, Gracious Professionalism<sup>®</sup>, and FIRST IN SHOW<sup>SM</sup>, are trademarks of For Inspiration and Recognition of Science and Technology (FIRST). LEGO<sup>®</sup> is a registered trademark of the LEGO Group. FIRST<sup>®</sup> LEGO<sup>®</sup> League and MASTERPIECE<sup>SM</sup> are jointly held trademarks of FIRST and the LEGO Group. All other trademarks are the property of their respective owners.

©2023 FIRST and the LEGO Group. All rights reserved. 30082303 V1