Universal Robotics Challenge 2025

Real Robotics

Advanced Division Rulebook

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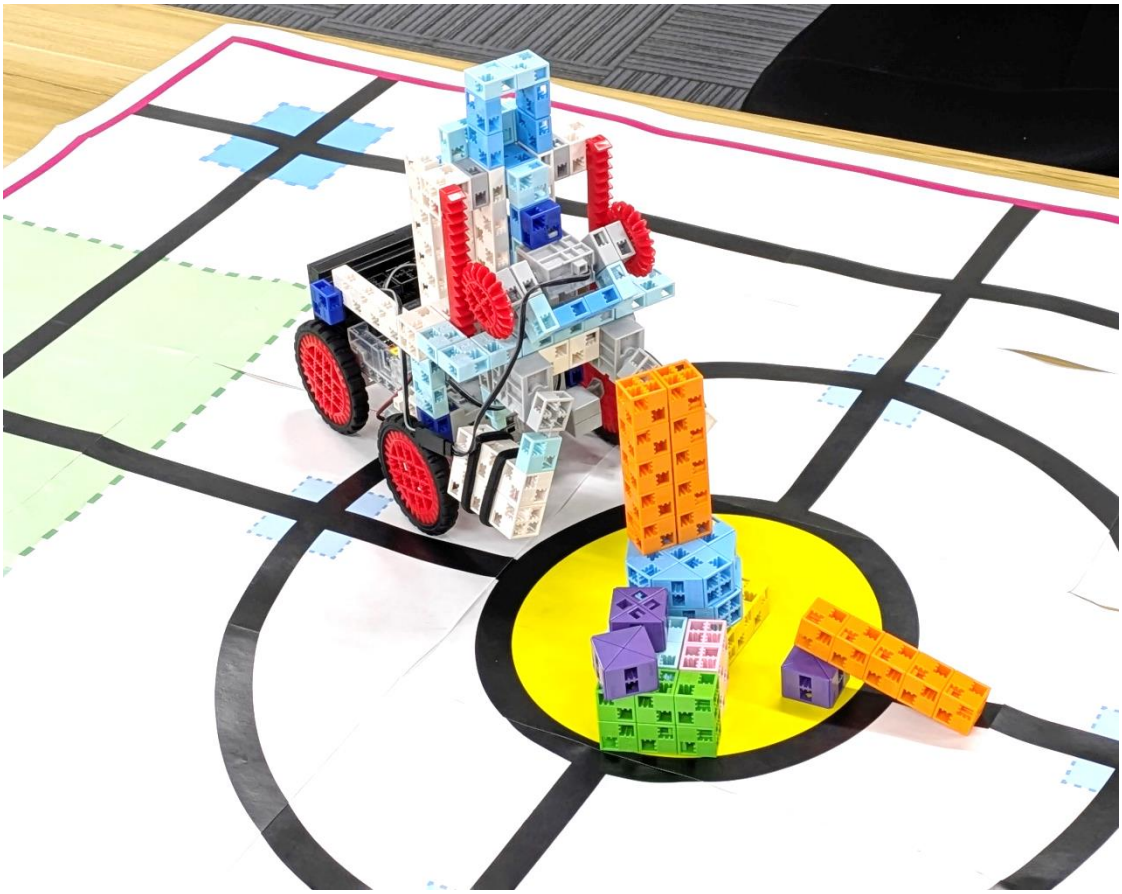

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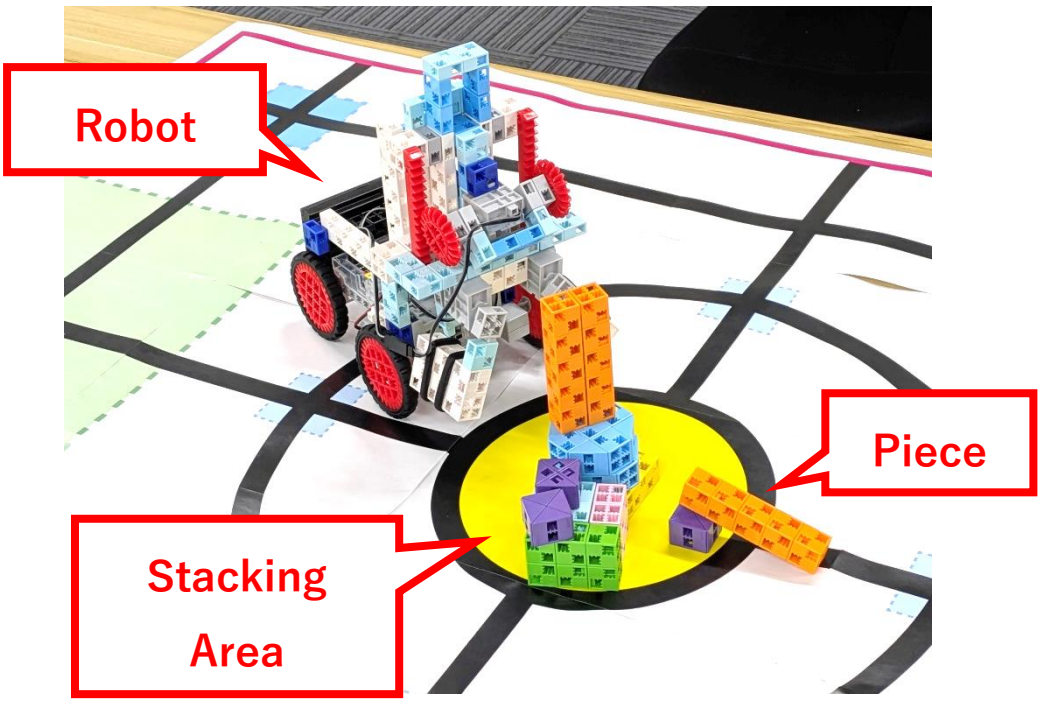
Overview

Inspired by Sustainable Development Goal 9, Industry, Innovation, and Infrastructure, this competition challenges

participants to create the communications and transportation infrastructure which paves the way for innovation by making robots which can transport and stack block pieces!

1. Robots at Work

Design and build a robot which can build the tallest building at a construction site. Rankings are determined by score using the number and height of pieces stacked within the time limit!



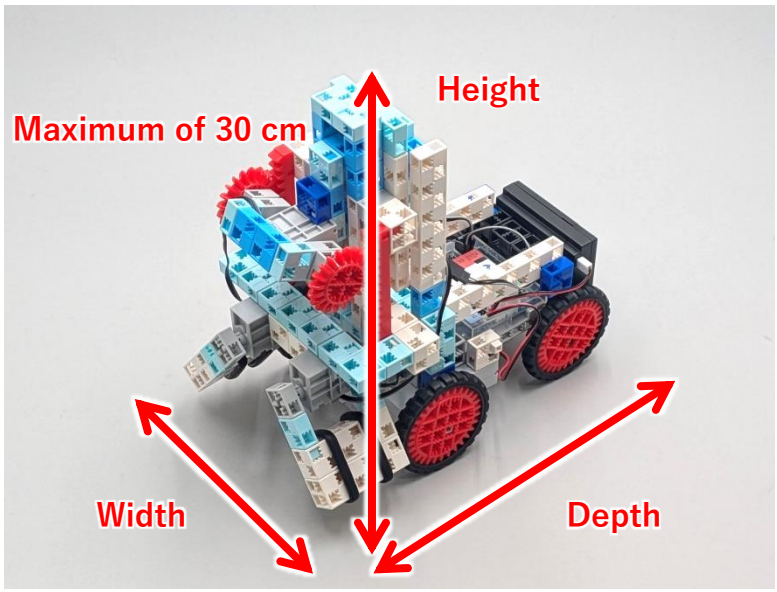
2. Competition Robots

Each team uses a robot they made for the competition.

Only **1 robot** is allowed per team.

○ Robot Specifications

・Robots may not exceed **30 cm** in height, width, or depth.



・Robots may transform or break apart to become larger than 30 cm once the round has started.

・Separated parts are considered to be a part of the robot, but cannot move away from the main body.

・Robots must not use any power sources aside from the **ArtecRobo power sources** listed in **Appendix 3**. Commercially available power backs are also prohibited.

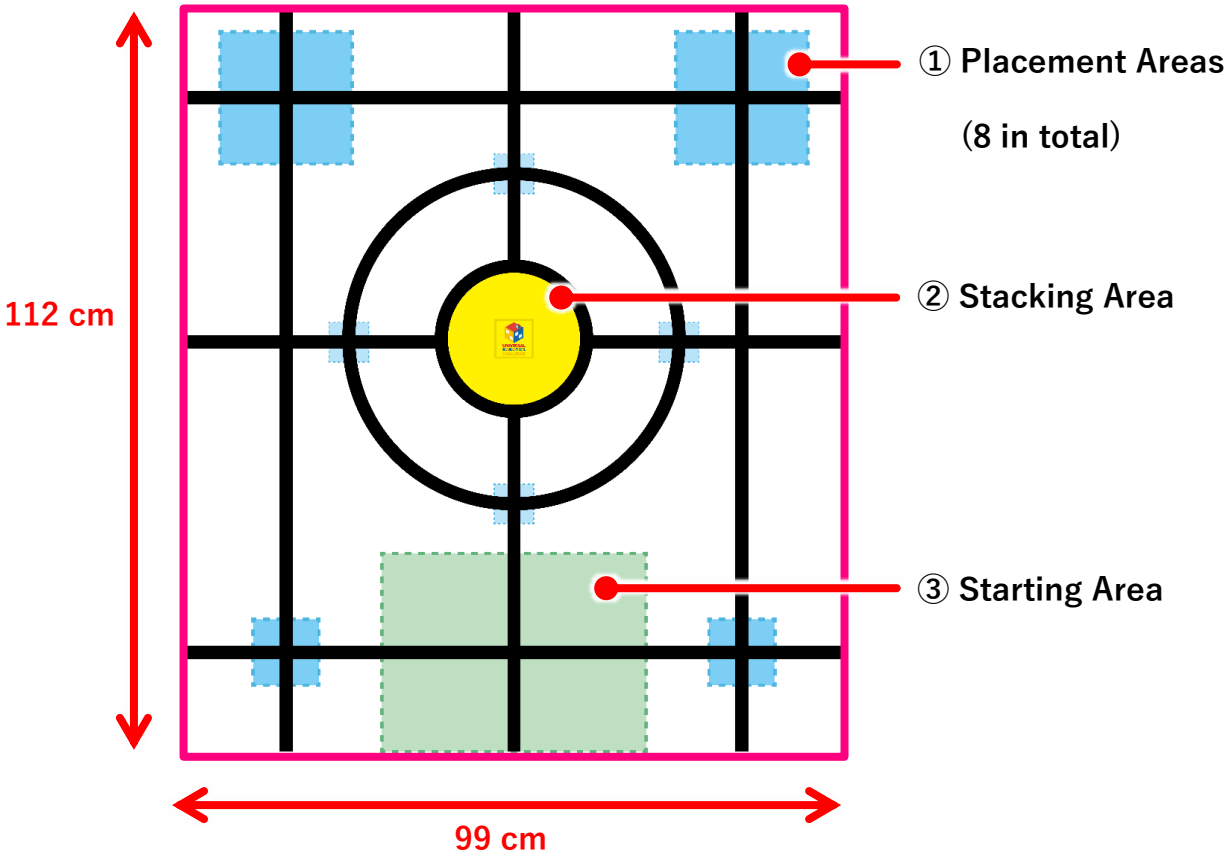
・Any program which controls the robot must be transferred to allow the robot to operate independently. Use of controllers or other devices to control robots is prohibited.

○ Approved Parts

- Robots may only use the microcontrollers and expansion boards listed in Appendix 2. All other circuit boards and parts are prohibited.
- Robots may use multiple microcontrollers and expansion boards with no restriction on the type or number.
- Parts which you can use to build your robot are listed in Appendix 3 along with the Artec Blocks you can use in Appendix 4.
- Modified or broken parts are prohibited.
- You can use rubber bands or zip ties to keep your cables together, but not to reinforce your blocks.

3. The Field

The competition will use the field shown below:



① Placement Areas (aqua)

Place your pieces here before the round starts. The color of the area determines how high the pieces can be stacked. Light aqua areas can hold stacks up to **3 blocks** high, while aqua areas can hold stacks up to **5 blocks** high (a block height is the height of 1 Artec Block).

★ The picking area also includes the black line.

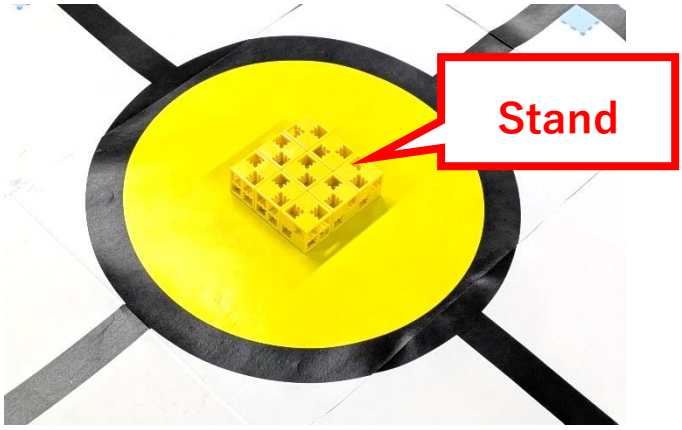
② Stacking Area (yellow)

Robots stack the pieces they take from picking areas here.

The stacking area holds a 3 x 3 stand made of Artec Blocks.

Secure the stand with tape to prevent movement.

★ The stacking area does not include the black line.



③ Starting Area (green)

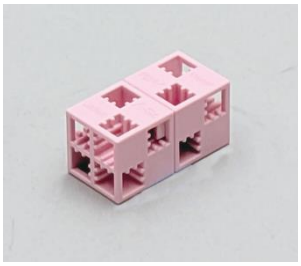
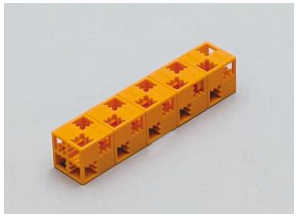
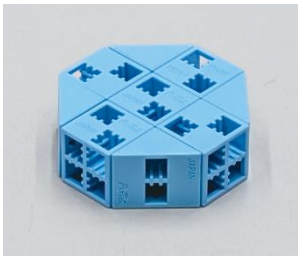
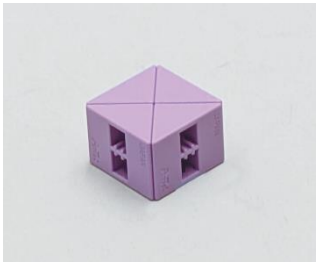
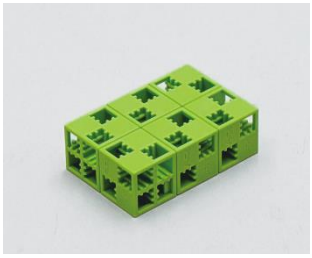
This is where the robot starts.

★ The starting area also includes the black line.

4. The Pieces

Your robot's job is to transport pieces from different points around the field. Each piece gives a different number of points when stacked in the stacking area.

- Pieces are made from multiple Artec Blocks.
- There are 6 types of pieces, and the shape and color of each piece is shown in the table below.
- Up to 6 of each piece can be used per round.

		
20 points	**30 points**	**40 points**
		
20 points	**30 points**	**40 points**

Competition Flow

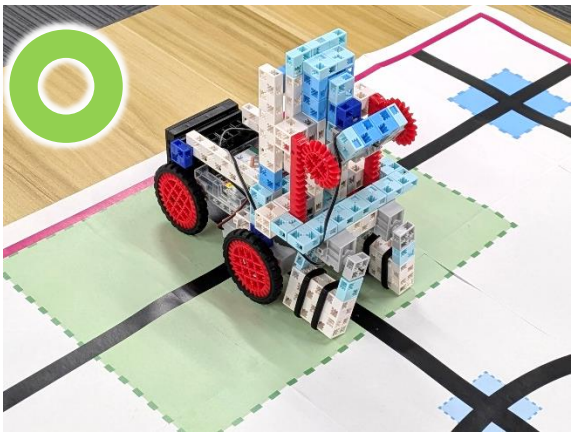
1. Before the Round

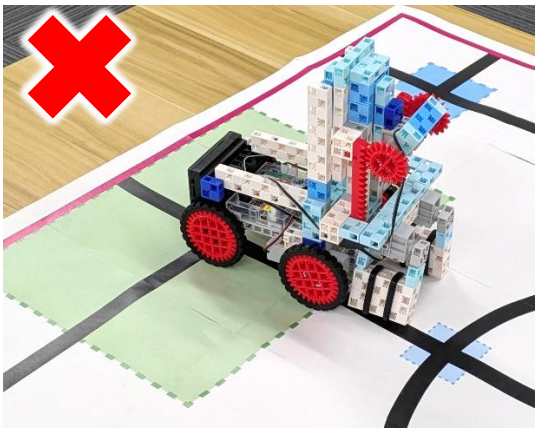
Before the round starts, each team prepares by setting down their robot and pieces.

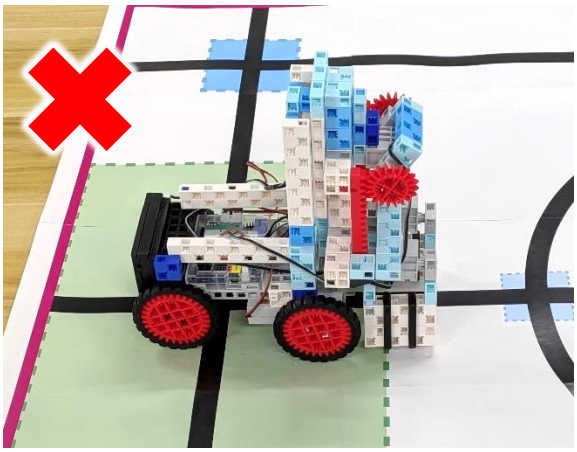
◯ Placing the Robot

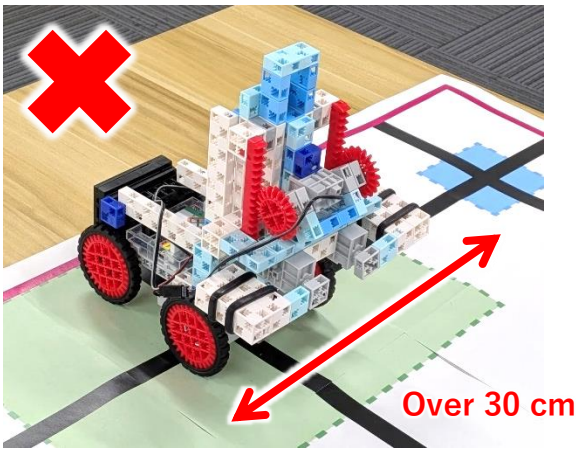
Participants place their robot in the **Starting Area** before the round starts.

- The robot can be placed facing any direction anywhere within the Starting Area.
- The robot should be 30 cm or less in height, width, or depth.
- The robot must be completely inside of Starting Area.
- The robot can’t be powered on until the round starts.





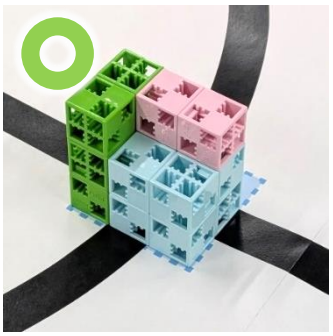


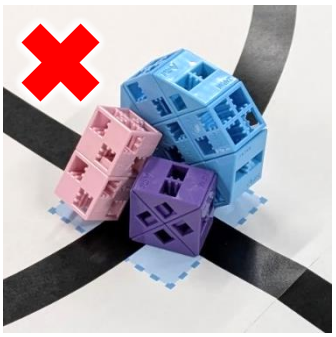


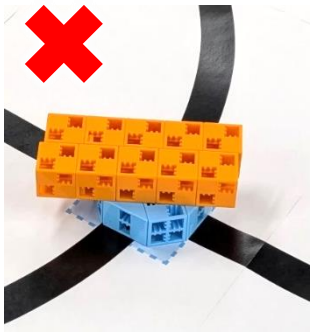
○ Placing Pieces

Participants place their pieces in the **Placement Areas** before the round starts.

- Pieces must be placed **flat along the field** and must not be leaning.
- Light aqua areas can hold stacks up to **3 blocks** high, while aqua areas can hold stacks up to **5 blocks** high.
- Pieces should not stick out of Placement Areas, including parts in the air.







- If any pieces are sticking out the areas at the start of the round, the round will be declared a retry and the pieces will have to be reset.
- Pieces which aren't placed should be kept off of the field. These pieces can't be used even in the event of a retry.
- Once placed, participants can't touch pieces until scoring has been completed.

★ During the World Finals, **1 player** from each team will have **1 minute** to place their pieces.

2. Starting the Round

Participants can turn on their robot once the round has started.

- After turning on their robot, participants must leave the field until the round is over.

○ Retries

Touching the robot or pieces during the round will result in a retry, and participants will be able to enter the field.

Any team member can declare a retry, but only **1 team member** can enter the field to touch the robot and pieces during **each retry**.

- Participants can move pieces back to or rearrange them within the Placement Areas during a retry.
- Participants can also touch their robot and reset it back to its original form.
- Participants can choose to **leave any pieces that the robot has already grabbed where they are** or **move them back to a Placement Area**.
- There is no limit on the number of retries. However, each retry will result in a **40-point** deduction from the team's final score.
- The clock for the round will continue running during the retry.
- Once the retry is finished, participants will have to move their robot back to the Starting Area to continue.

3. Ending the Round

The round will end automatically after **3 minutes**.

- The round can also be considered over if all pieces are transported before the time limit is up.
- Once the round is over, participants must stop their robot immediately and leave the field. If any pieces in the Stacking Area fall, they will be scored in this state.

4. Scoring

The score is calculated using each valid piece at the end of the round. Bonus points are awarded for height, and deductions will be made for retries to calculate the final score.

○ Valid Pieces

A piece is valid if it satisfies one of 2 conditions:

① It touches the Stacking Area.

② It touches another valid piece.

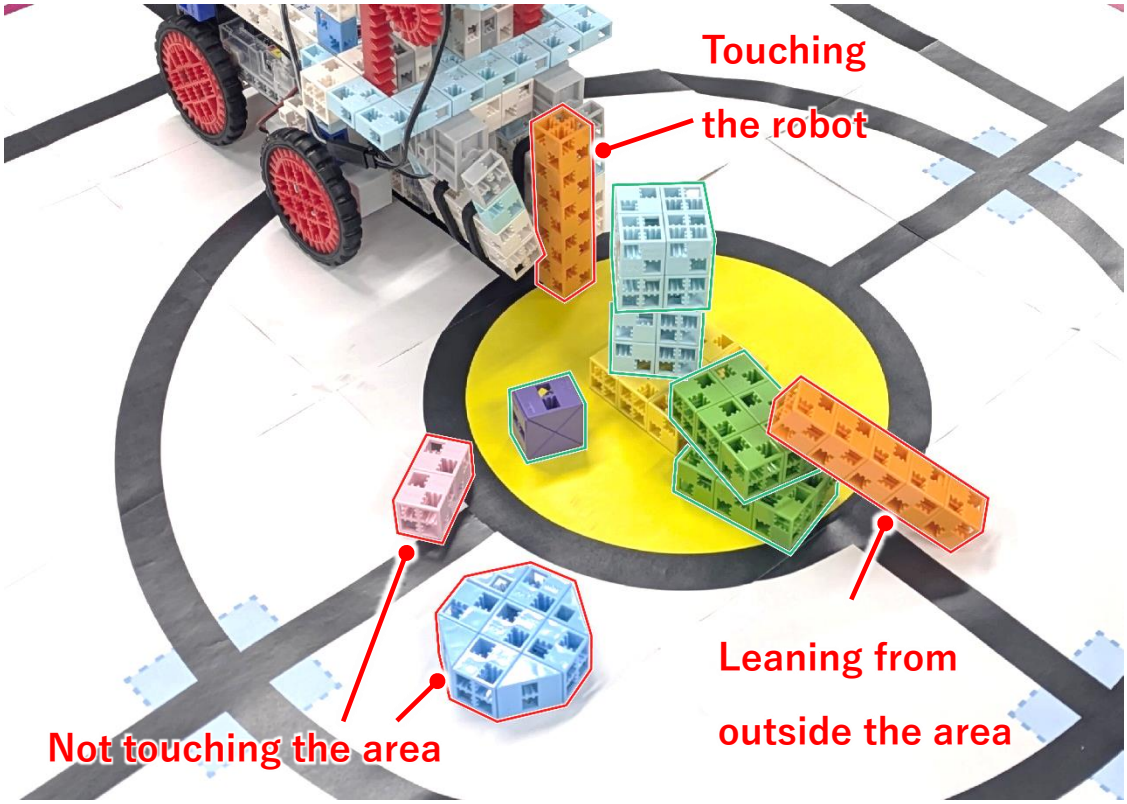
A piece is considered invalid in the case of the following:

★ It is still touching the robot.

★ It is leaning against a valid piece from outside of the Stacking Area.

★ It is placed in the Stacking Area after the round ends.

Example)


Touching
the robot
Not touching the area
Leaning from
outside the area

○ Height Bonus

Once the round ends, judges will determine and award bonus points based on the valid pieces at the highest level in the stack. Bonus points are calculated as follows:

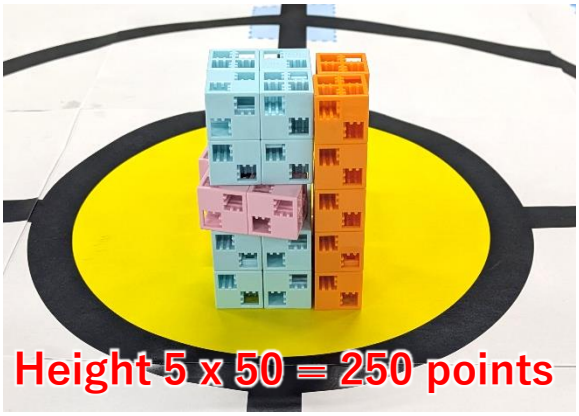
① < 5 blocks = **0 points**

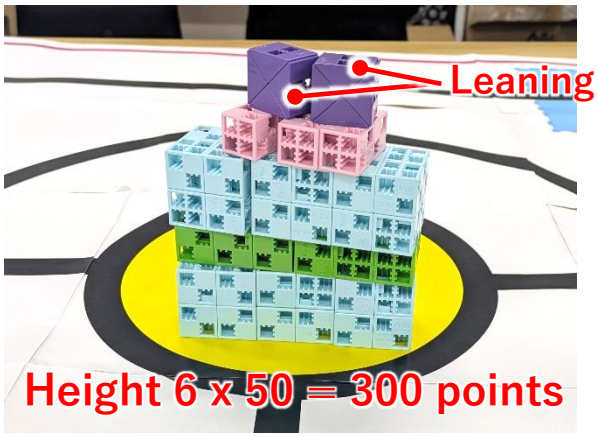
② ≥ 5 blocks = **Stack height x 50 points**

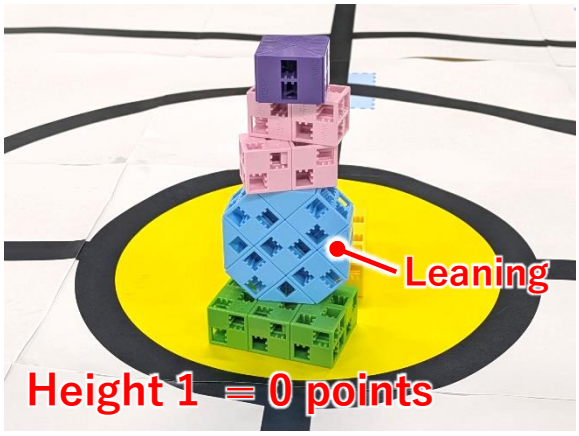
★ Height is calculated based on the height of one Artec Block.

★ Blocks in leaning pieces do not count. This includes pieces stacked on top of leaning pieces (these will be scored as regular pieces).

★ The stand in the Stacking Area also counts as one block height.







○ Ranking

The rank of each team is determined by score from highest to lowest. If multiple teams have the same score, the winner will be decided by the height of their stack. If the team's stacks have the same height, the winner will be chosen by the least number of retries and shortest round time.

★ A draw will be declared if all conditions are equal.

Example)

Team	Score	Height	Retries	Time	Rank
A	1160	13	1	0:56	2nd
B	620	4	2	1:47	4th
C	620	6	1	0:25	3rd
D	1380	16	4	0:00	1st
E	580	7	1	2:00	5th

5. Other Notes

- Participants are allowed to bring only what they need for the round. **Parts or blocks aside from those needed for the robot are prohibited**.
- A **forced retry** will be declared for any contact with robots or pieces outside of a retry.
- Stand that move or pieces that are damaged during the competition will be scored as **0 points**.
- Any breaches of the rules or the flow of the competition may result in a disqualification by the judges. Disqualifying teams will not be scored or ranked.

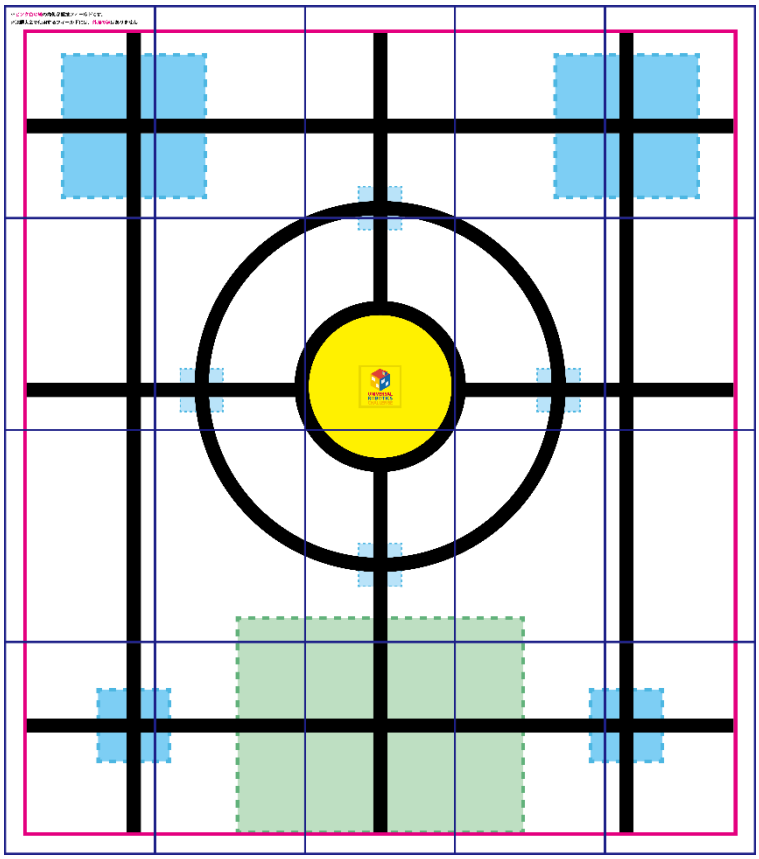
Video Preliminaries

1. Preparing the Video

Robots, fields, and pieces used in the preliminaries are prepared by participants. They will also need to prepare every item needed to make these.

The Field

The PDF for the field can be downloaded from the official website.



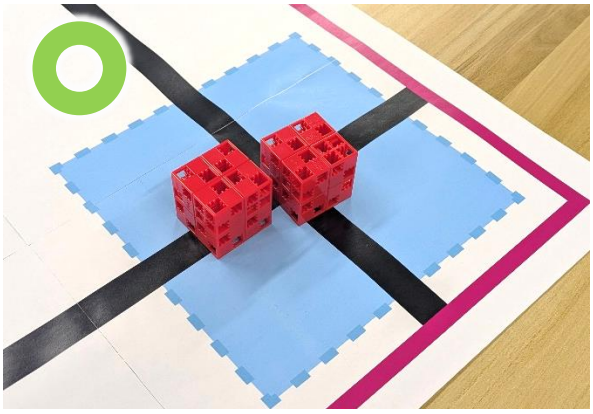
It will need to be printed out on **20 sheets** of A4 paper.

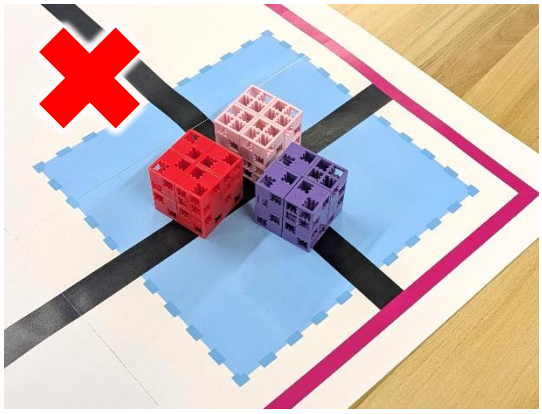
- Use any quality of paper to print out the field.
- Fix any smudges or fill in gaps with markers of the same color.
- Lay the field on a flat surface and tape it in place. It shouldn't have any bumps or slopes.

◯ Pieces

Follow the steps in Appendix 1 to make each piece.

- Preliminary pieces can be of any color, but each type must be made out of a single, distinct color.





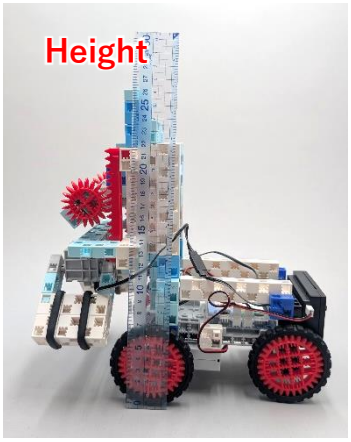
2. Video Rules

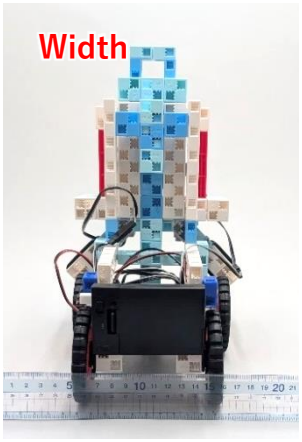
Preliminary submissions must satisfy the follow three conditions:

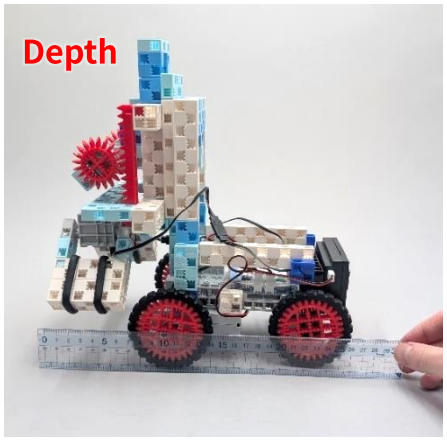
① Robot Size (photo or video)

Participants must use a ruler or tape measure to measure the **height, width, and depth** of the robot.

- Each measurement must be shown for a **minimum of 3 seconds**.



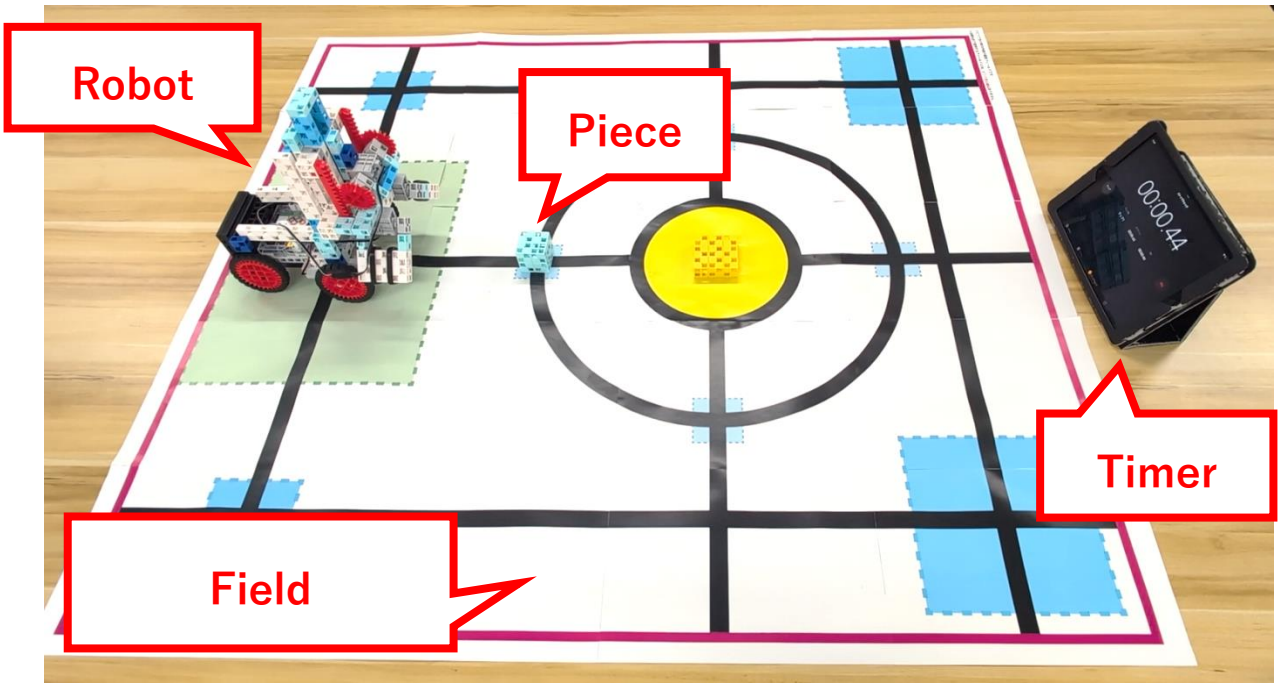




② Round Footage (video)

Each team must set down their robots and pieces before starting the timer for the round.

The video should show the **whole field, the robot, the pieces, and the timer**.

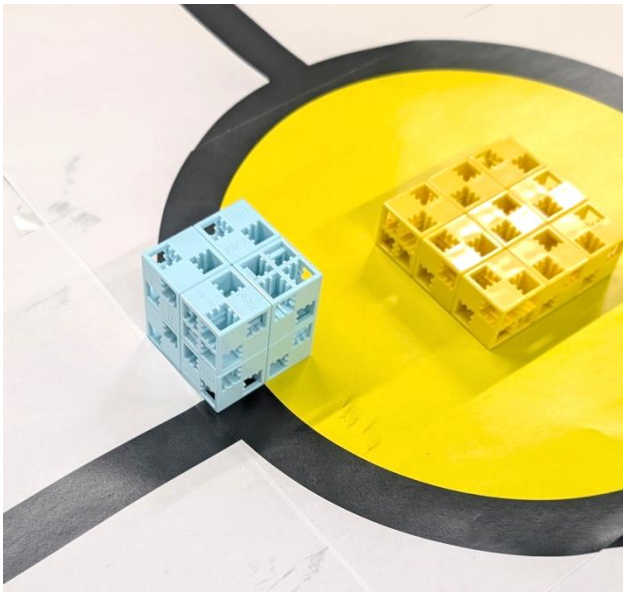


- The video does not have to show participants placing the robot and pieces.
- Timers should be digital and show the time in seconds (smartphone apps are allowed).
- Announce any retries verbally or show it to the camera on a piece of paper.
- Announce any restarts for a retry verbally or show it to the camera on a piece of paper.
- If the time limit is up after 3 minutes, stop the timer and announce the end of the round verbally or using a signal like a raised hand.

③ Scoring (photo or video)

Once the round is finished, show a closeup of the Stacking Area to make sure the valid pieces are visible.

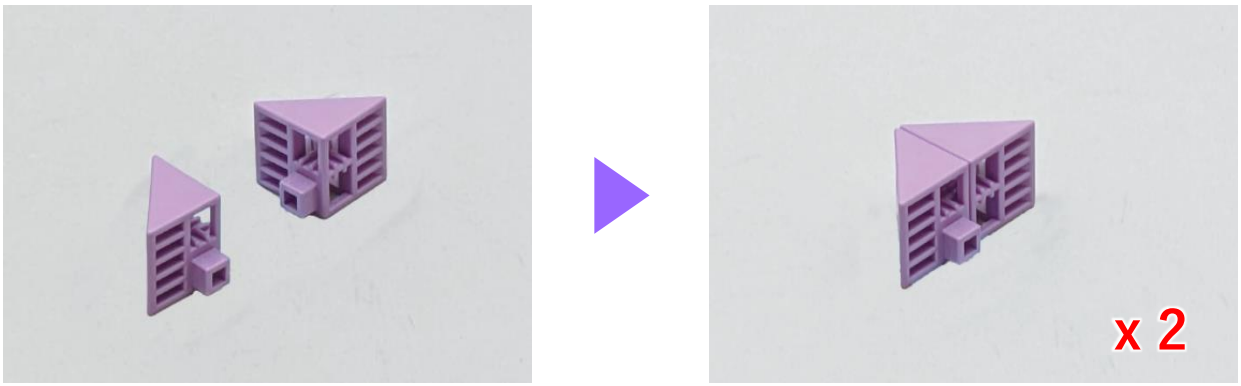
- These pieces can be hard to see from one angle, so take photos from multiple angles or move around the stack as you record the video.

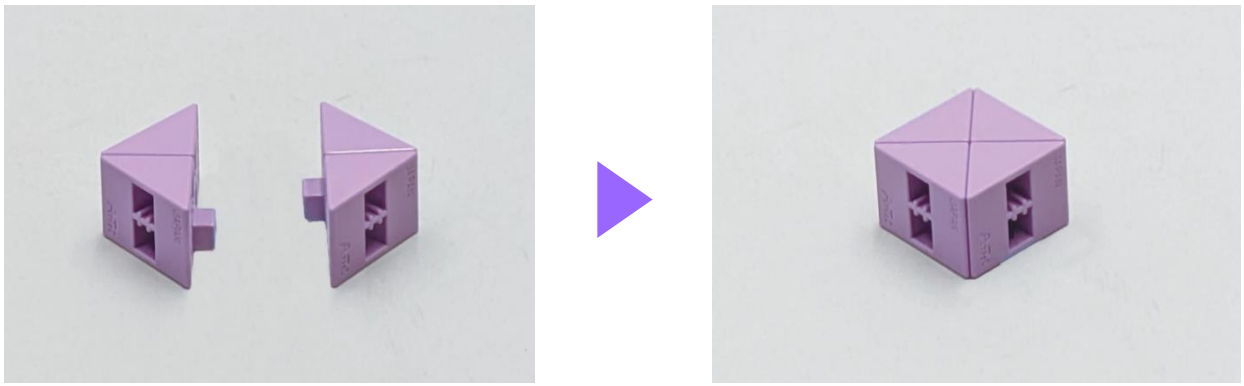


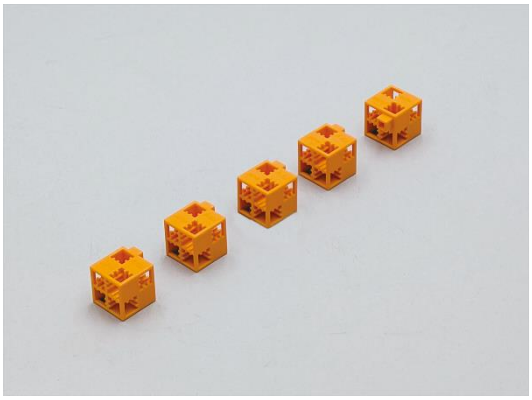
3. Notes on the Preliminaries

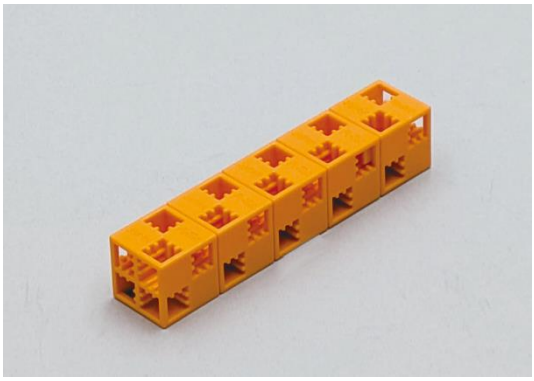
- Videos can be edited. However, edits which make it difficult to judge the submission fast forwarding, cutting, or putting together different videos during the round may result in a disqualification.
- Judges will not score any pieces which can't be determined to be valid by watching the video.

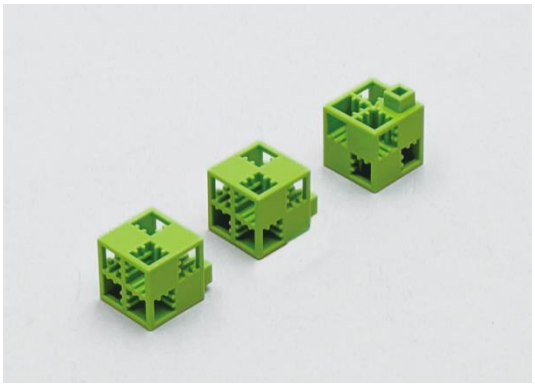
Appendix 1. Making Pieces

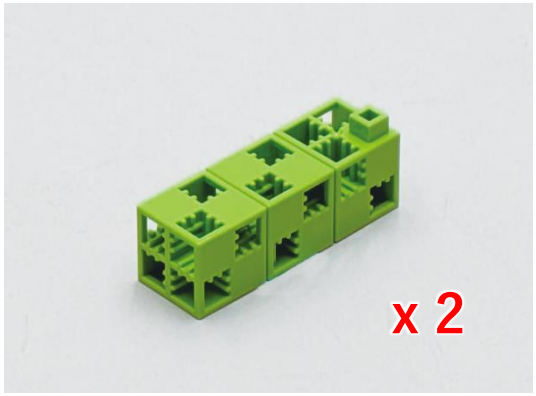








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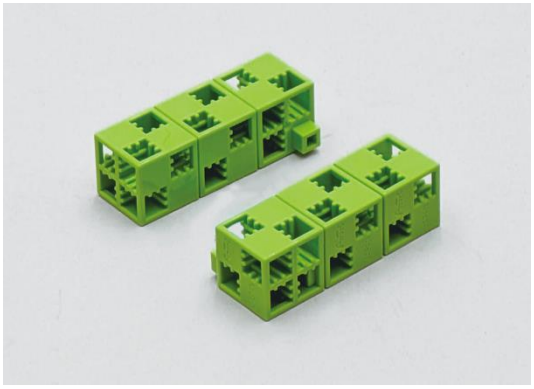
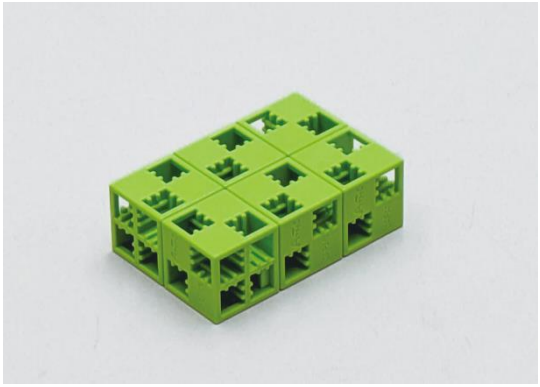
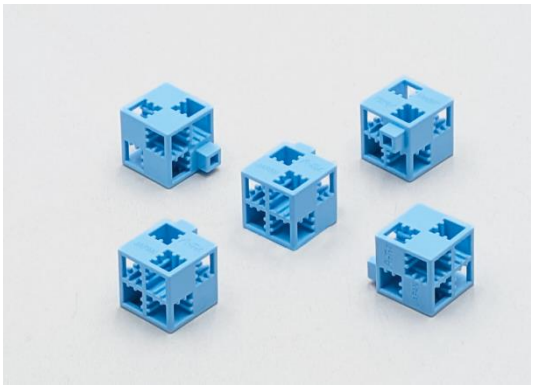
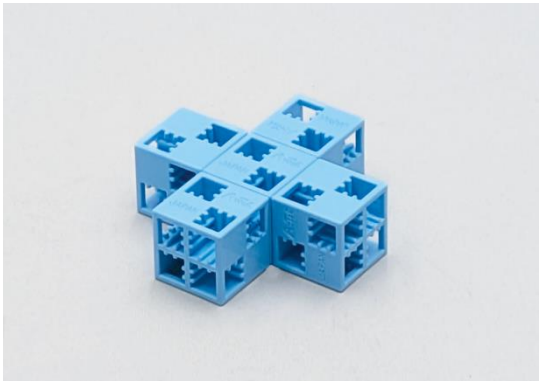
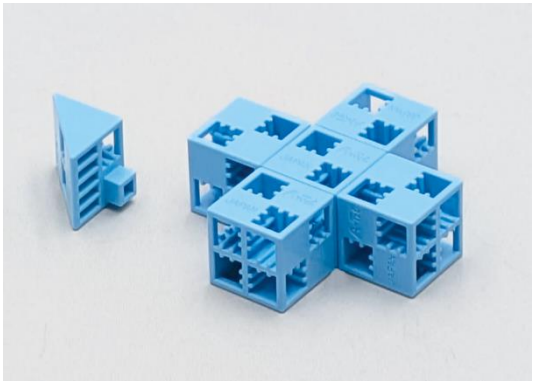
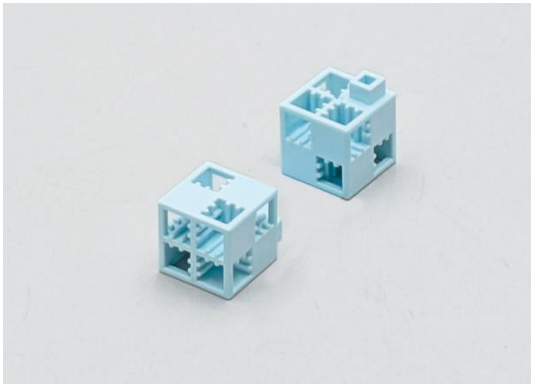


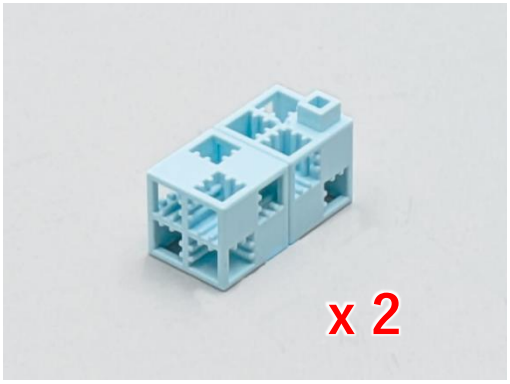


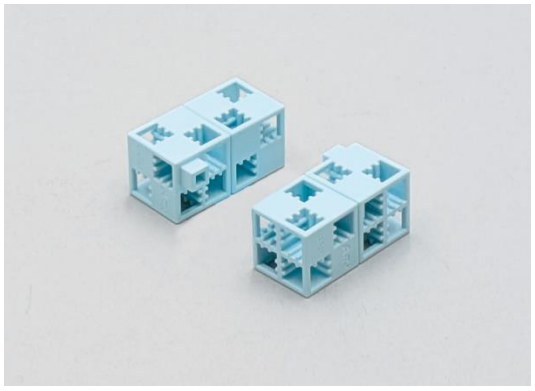


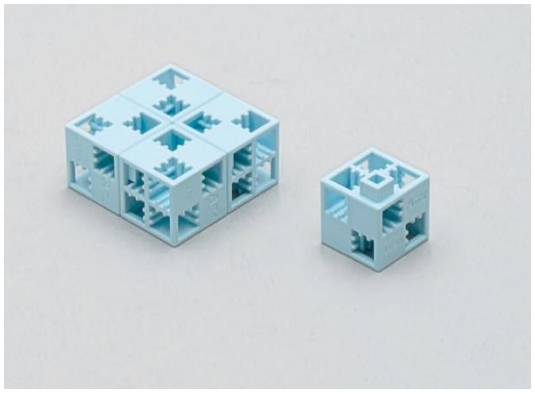




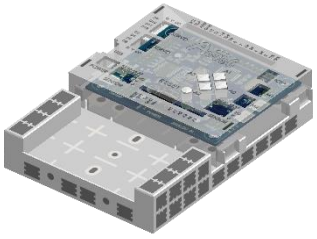
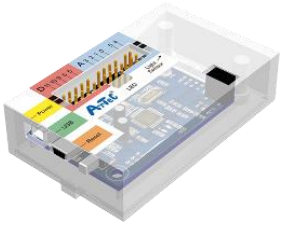
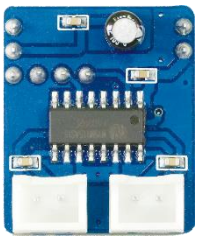
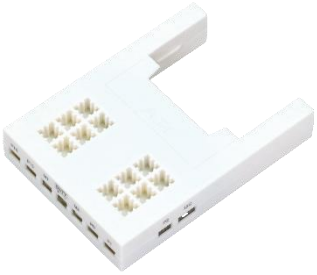
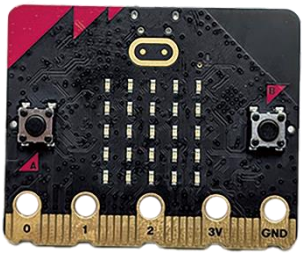
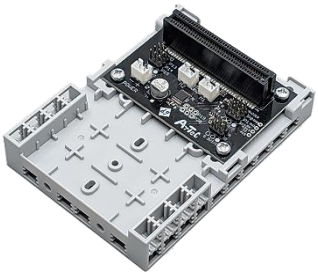



x 2



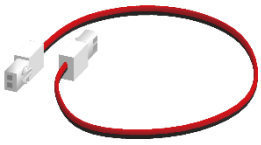
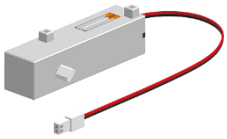
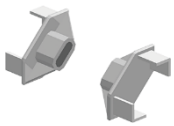
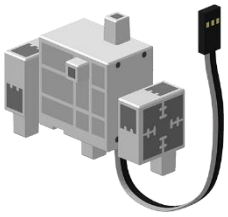
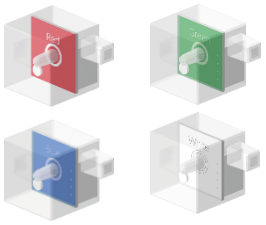
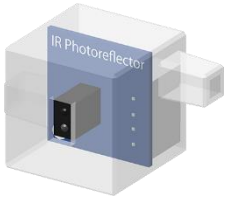
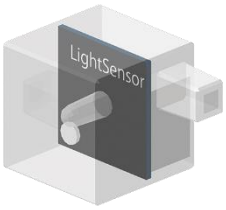
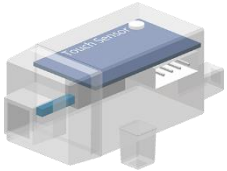
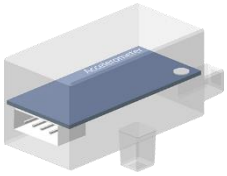
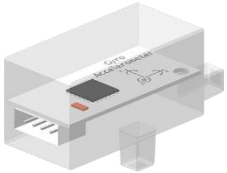


Appendix 2. Competition Boards

Studuino	Studuino:mini	Studuino:mini DC Motor Expansion Board
		
Studuino:bit Core Unit	**Robot Expansion Unit**	**StuduinoLite**
		
micro:bit	**micro:bit Expansion Board**	**Artec Links (including expansion units)**
		

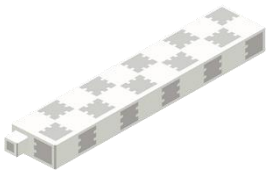
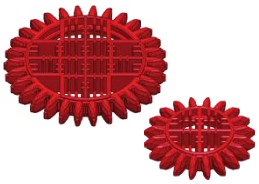
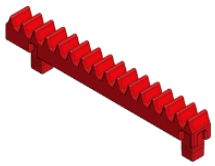
★ Stands, covers, and stickers are optional.

Appendix 3. Electronic Parts

Battery Box	Battery Box Cable	Power Bank	USB Cable
			
DC Motor	DC Motor Parts	Servomotor	LED
			
IR Photoreflector	Light Sensor	Touch Sensor	Accelerometer
			
Gyroscope	Sensor Connecting Cable	Sensor Extension Cable	
			

★ Covers are optional.

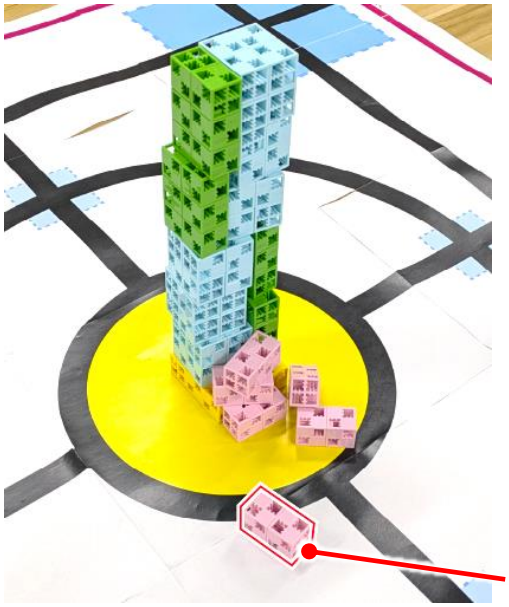
Appendix 4. Artec Blocks

Basic Cube	Mini Cube	Triangle	Beam
			
Half A	**Half B**	**Half C**	**Half D**
			
Bases	**Axle**	**Gears (S and L)**	**Rack**
			
Wheels	**O-Rings and Tires**	**Disks**	
			

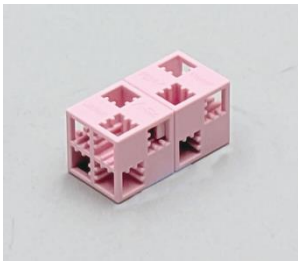
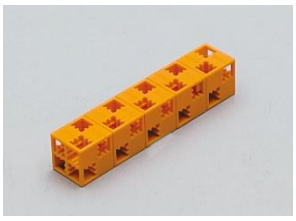
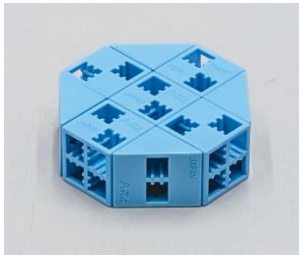
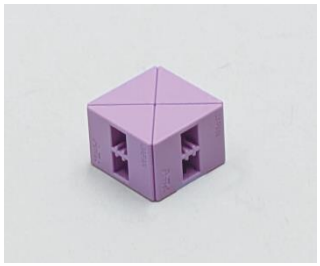
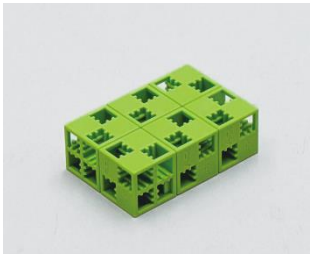
★ Blocks can be of any color.

Appendix 5. Scoring

Example 1)

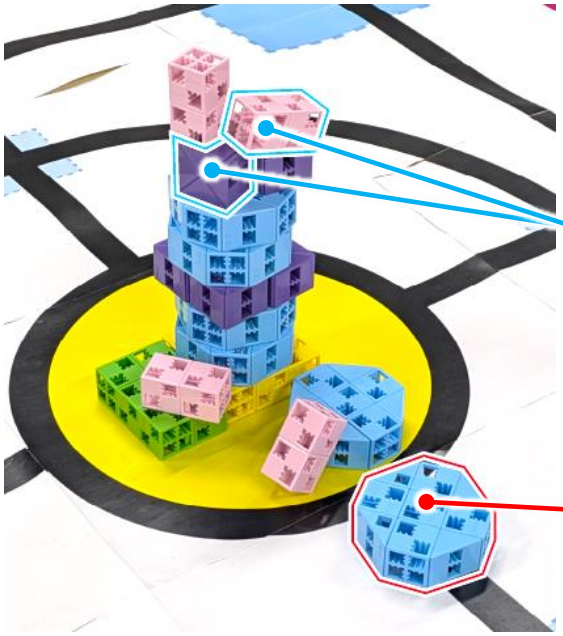


Height 13 x 50 = 650 points

 20 points × 5 = 100 points	 30 points × 0 = 0 points	 40 points × 0 = 0 points
 20 points × 0 = 0 points	 30 points × 4 = 120 points	 40 points × 6 = 240 points

100 points + 120 points + 240 points + 650 points = 1110 points

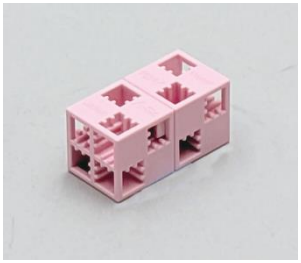
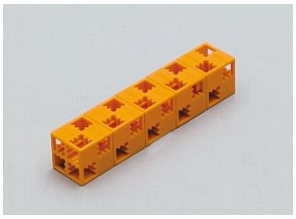
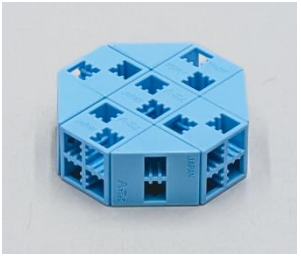
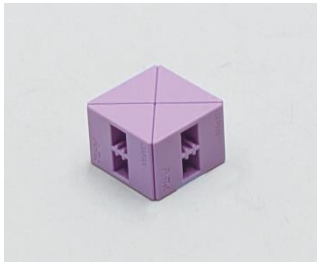
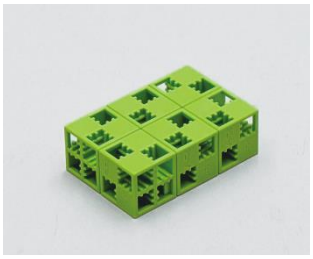
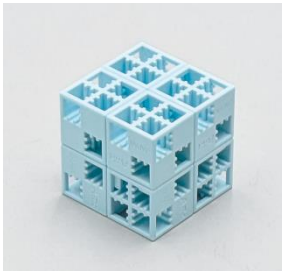
Example 2)



Height 7 x 50 = 350 points

Leaning

Not touching the area

 20 points × 4 = 80 points	 30 points × 0 = 0 points	 40 points × 5 = 200 points
 20 points × 6 = 120 points	 30 points × 1 = 30 points	 40 points × 0 = 0 points

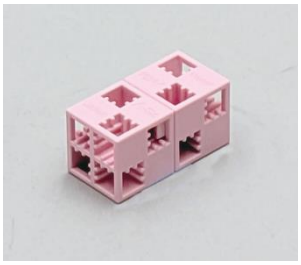
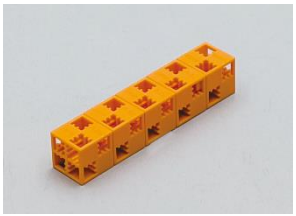
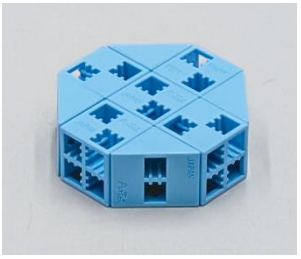
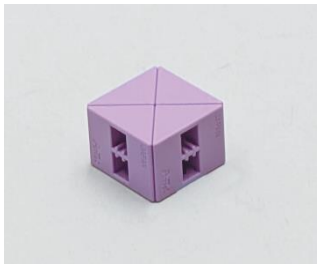
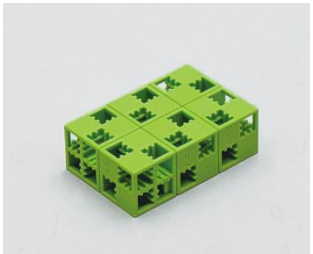
80 points + 120 points + 30 points + 200 points + 350 points = 780 points

Example 3)

Height 9 x 50 = 450 points

Not touching the area

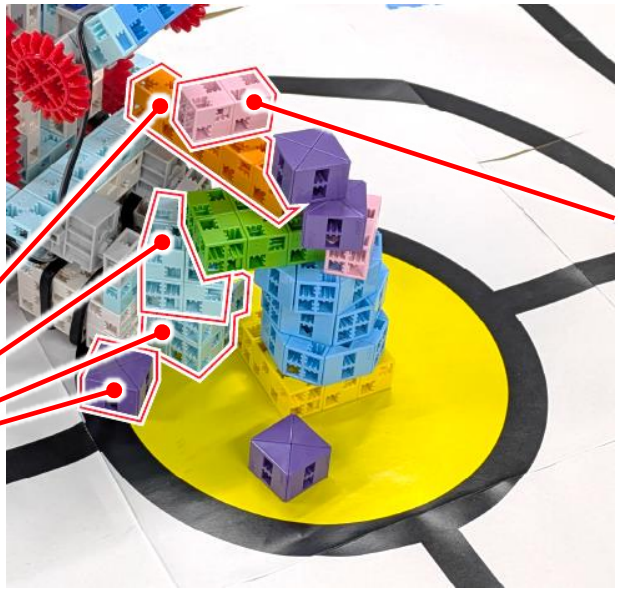
Leaning from outside the area

 20 points × 3 = 60 points	 30 points × 3 = 90 points	 40 points × 1 = 40 points
 20 points × 0 = 0 points	 30 points × 3 = 90 points	 40 points × 0 = 0 points

60 points + 90 points + 90 points + 40 points + 450 points = 730 points

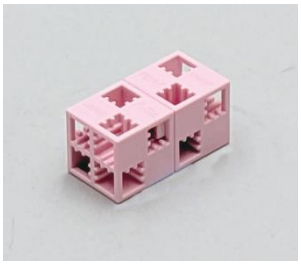
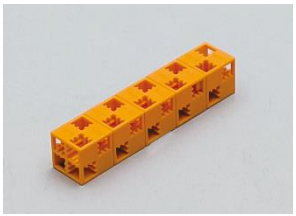
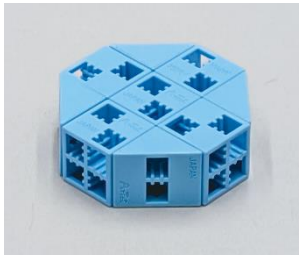
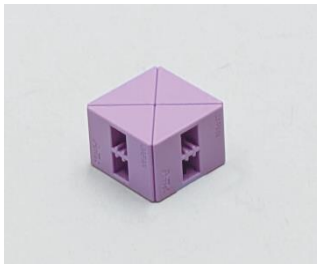
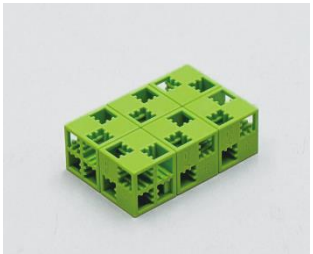
Example 4)

Height 7 x 50
= 350 points



Not touching another valid piece.

Touching the robot

 20 points × 1 = 20 points	 30 points × 0 = 0 points	 40 points × 3 = 120 points
 20 points × 3 = 60 points	 30 points × 1 = 30 points	 40 points × 0 = 0 points

20 points + 60 points + 30 points + 120 points + 350 points = 580 points

◆ Updates

April 23 (Wed), 2025

- Updated placement of stand in Stacking Area.
- Added description of rules when stand moves or pieces break during a round.