World Educational Robot Contest (WER)
Innovation Contest

Task Rules

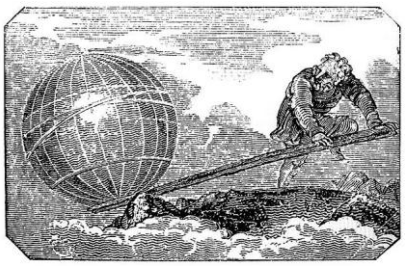
2016
Theme: Move the Earth

Federation of World Educational Robot

Sep. 11, 2015

Contents

Preface



"Give me a place to stand on, and I will move the Earth."

—Archimedes

This is not his ravings, but lever principle in the simple machine.
With the grasp of tools, fire and language, human beings stand out from other living beings on the planet, among which the simple machine is the gems of wisdom gained while human beings are remaking the nature. Contestants in the "WER Move the Earth" will explore the simple machine by operating robots, and apply the learned knowledge to the robot design.
In season 2016, let's move the earth!

1. Arena Introduction

1.1 Preview of Arena

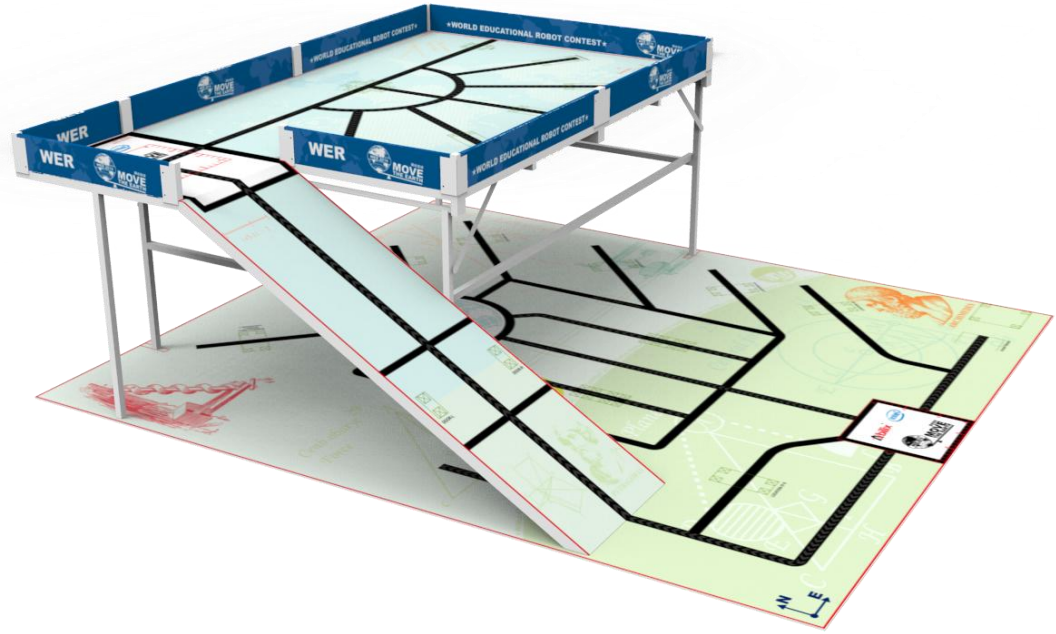


Figure 1 Contest Arena

1.2 Arena Drawing

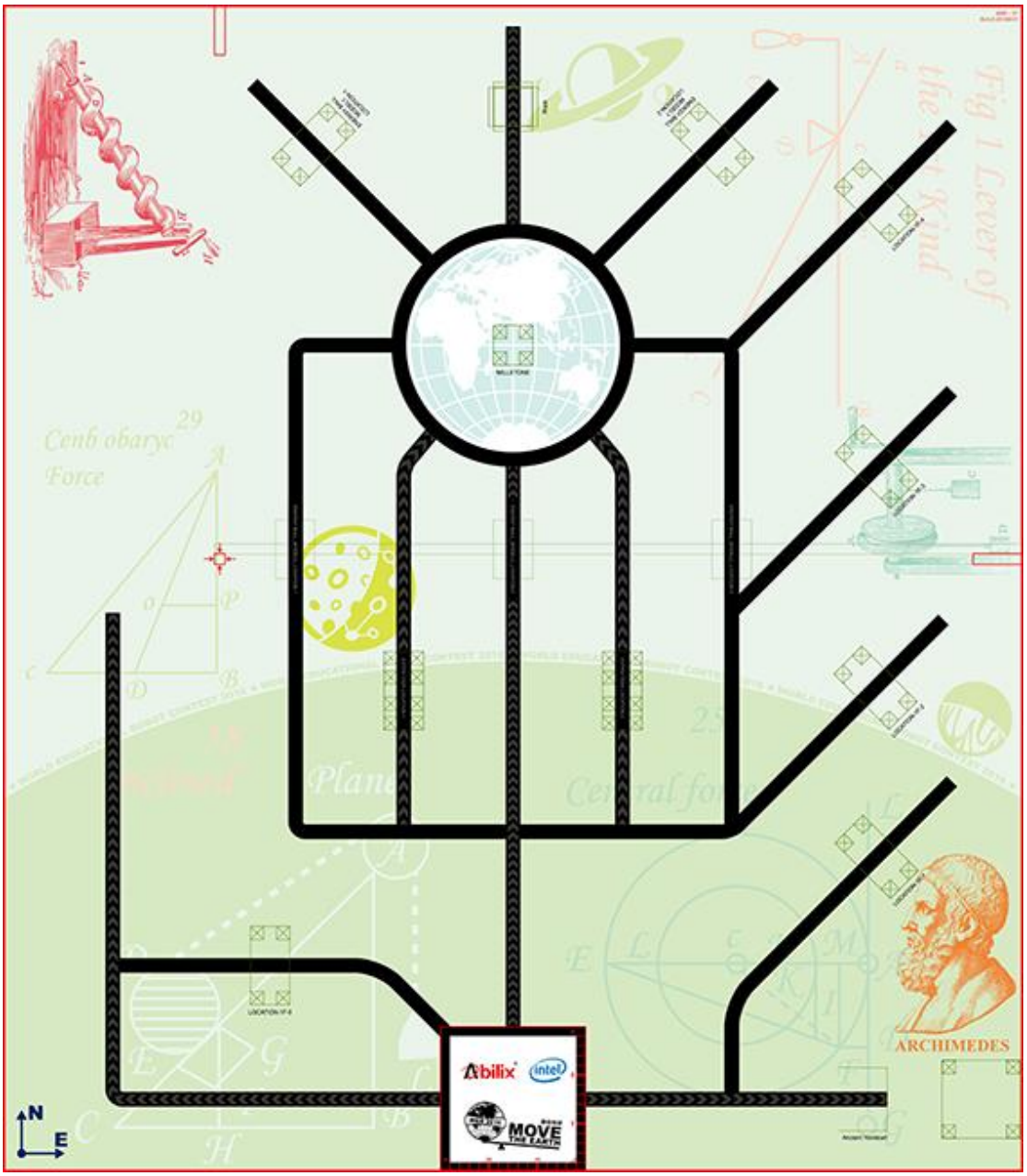


Figure 2 Ground floor base: 210*240cm

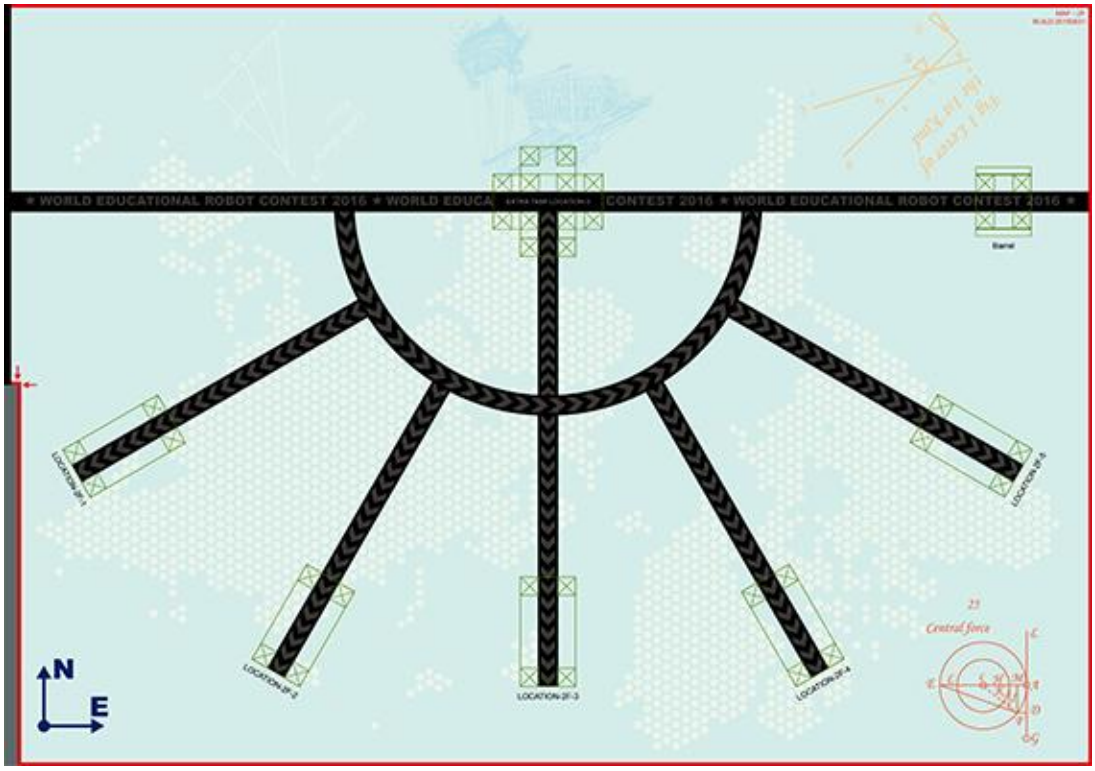


Figure 3 Second floor base: 160*112cm

Figure 4 Slope: 200*42cm

Figure 5 Sticker 1 for second floor fence: 37.6*21cm

Figure 6 Sticker 2 for second floor fence: 53.6*21cm

Figure 7 Sticker 3 for second floor fence: 76.6*21cm

Figure 8 Sticker 4 for second floor fence: 76.6*21cm

Figure 9 Sticker 5 for second floor fence: 109.6*21cm

1.3 Base

There are 2 bases in the arena. The robot can leave or return to any base in any time during the competition.

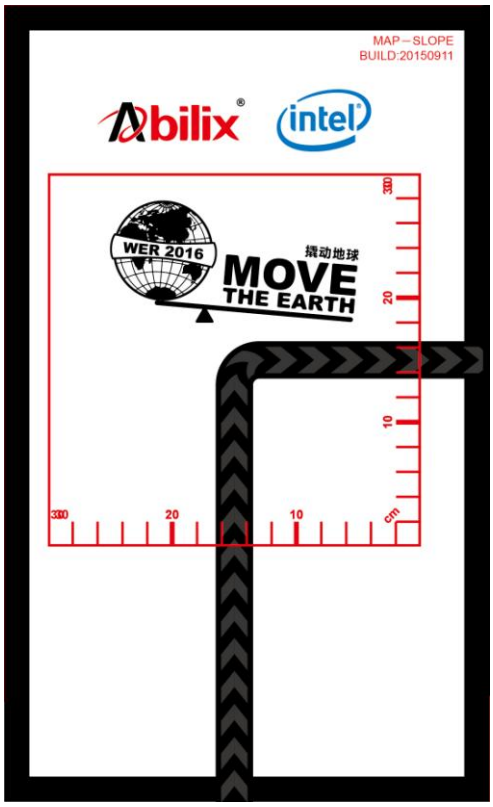


Figure 10 Second floor base

Figure 11 Ground floor base

1.3.1 Leave Base for the First Time

The base type that the robot can leave for the first time is unlimited, and robot's position within the base is also unfixed. However, the robot can't reach outside base

boundary before setting off, otherwise thereferee is entitled to ask contestants to move the robot till they meet the demands.

1.3.2 Return to Base

There is no limit on the base type that the robot is allowed to **return autonomously**. When vertical projection of robot's any part contacts base boundary (including the gained arena task models), it can be concluded that the robot has returned to the base. Timing won't stop afterwards, and referee won't give penalties either. However, if the robot is **moved back to the base by the contestants,** referee will take it as "Contact the robot outside the base". The team will be penalized by "20 points deduction from the finale score", according to the article one "contact the robot outside the base" in 3.3.5 "Penalty".

1.3.3 Leave the Base Again

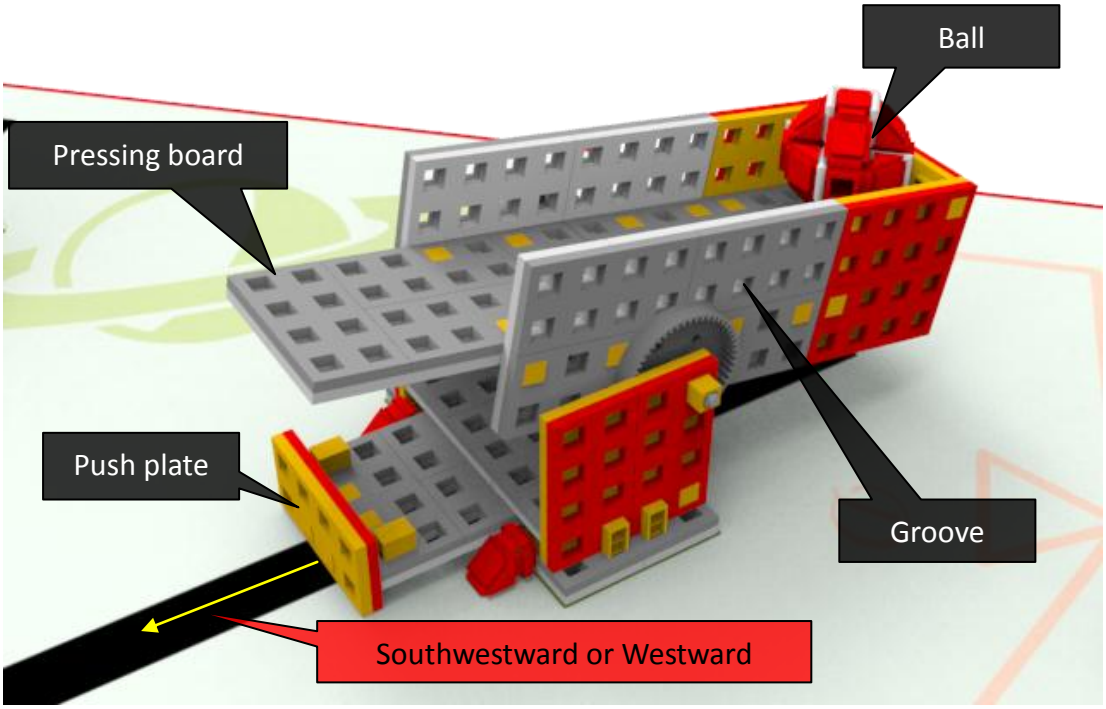
Ditto above"**1.3.1 Leave the base for the first time**"
When contestants set off from another base, the task models they gained aren't allowed to take to the base. Otherwise, those models are invalid, with scores kept, and the later models will be kept by referee till the end of this round ofthe contest.

2. Tasks

There are 16 tasks in total, including one task with “Redemption” (task 1) and three tasks grading by difficulties (task 2, 4 and 5). The highest score is 1000 points.

Task 1: Energy ball

Model 1

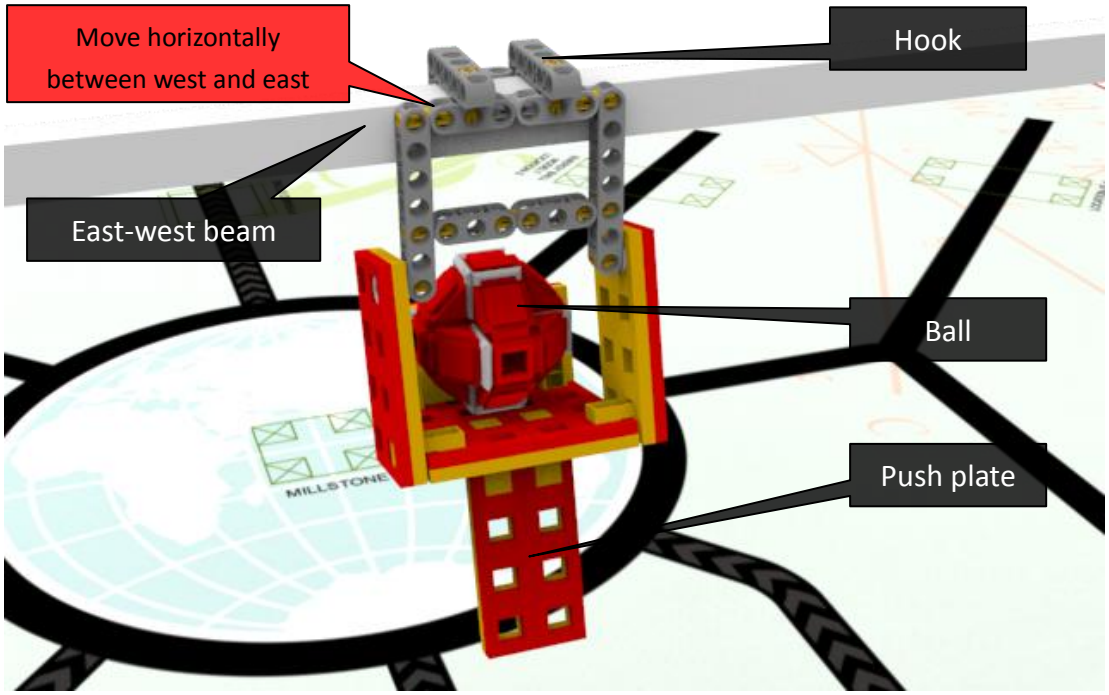


Model Figure 1 Initial Status of Task Model

Initial Status of Task Model

With base slab fixed on the arena, the push plate is drawn to the limit. Lift one end of the pressing board to its maximum, while ball is placed naturally at its lowest position.

Model 2



Model Figure 2 Initial Status of Task Model

Initial Status of Task Model

The hook hooks on the east-west beam, with openingheading southward. The vertical projection of the model in the ground floor casts on one of the three particular locations.

Scoring Criteria and Points of the Task

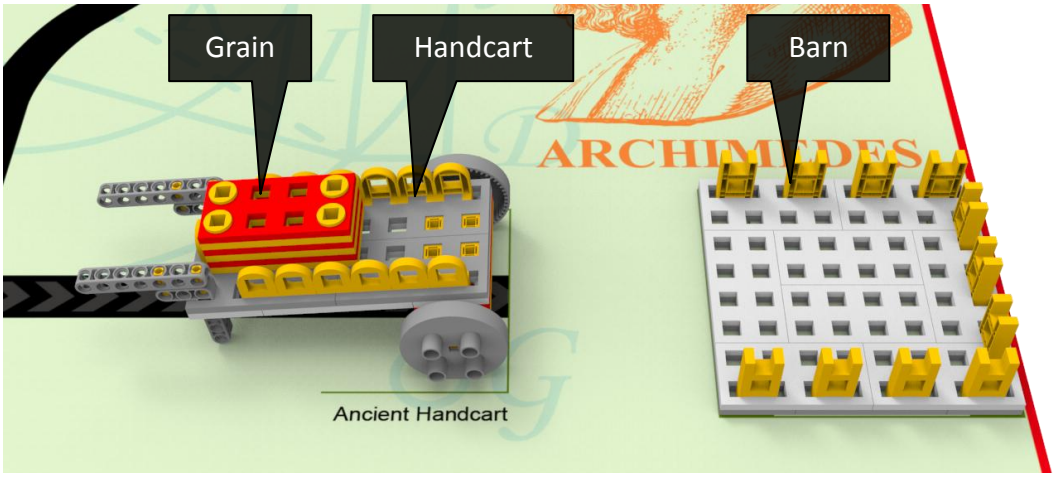
Once the vertical projection of the ball projects to ground floor, the team can get 30 points for each.
At the same time, 20-point deduction triggered by the “Contact robot outside the base” can be offset one time (two times at most). 【Redemption】

Attention:

In the single round competition, if contestants didn’t “contact robot outside the base”, and robot took back two energy balls, the score would be 30+30 points, without points offset or extra points.

However, contestants should give the balls to the referee in the end of competition.

Task 2: Ancient Handcart

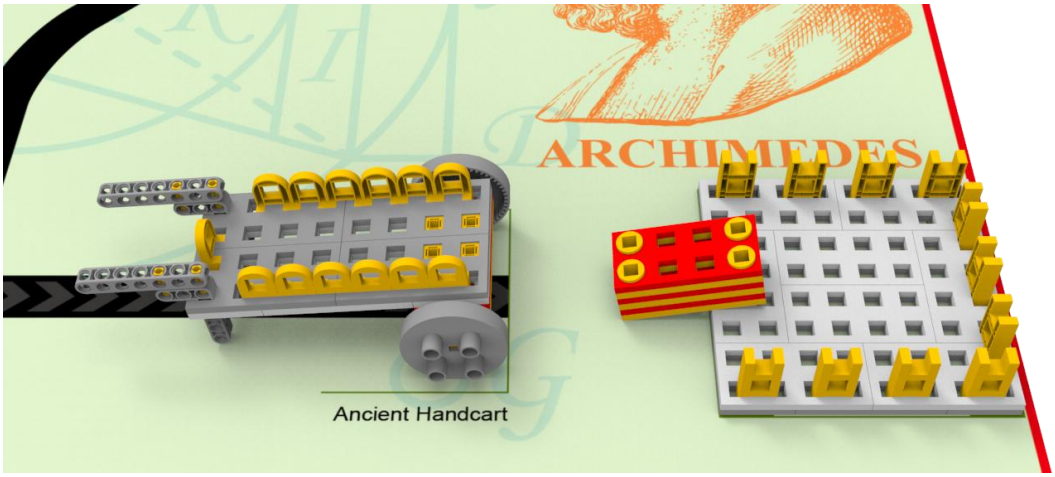


Model Figure 3 Initial Status of Task Model

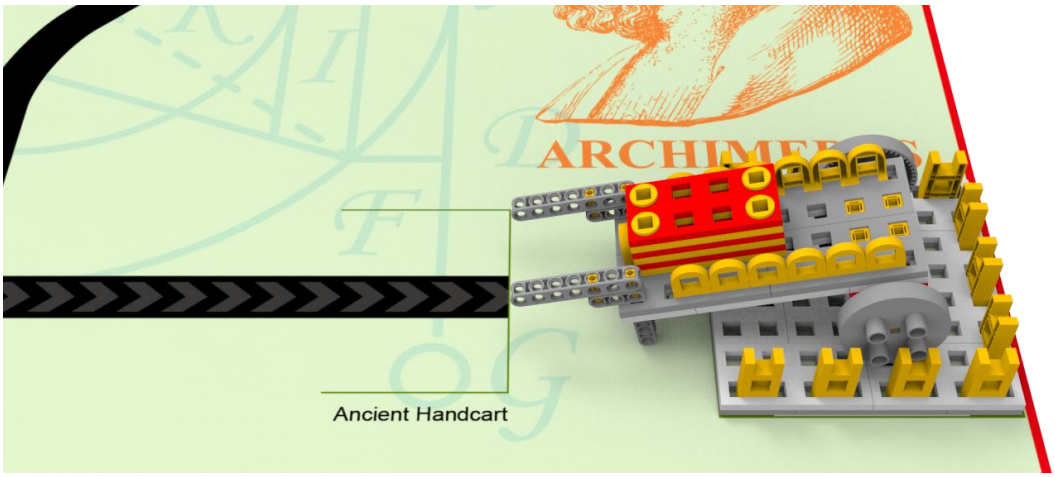
Initial Status of Task Model

With base slab of the barn fixed on the arena, wheels of the handcart faces toward the barn and are placed in the middle. Its vertical projection shouldn't exceed the marker line. The grain is put on the handcart, clinging to handle and centered.

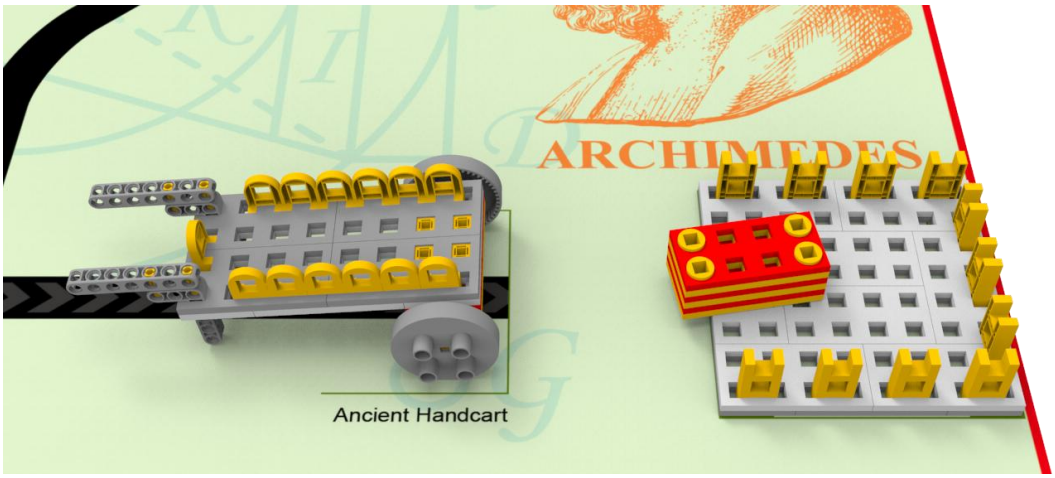
Scoring Criteria and Points of the Task

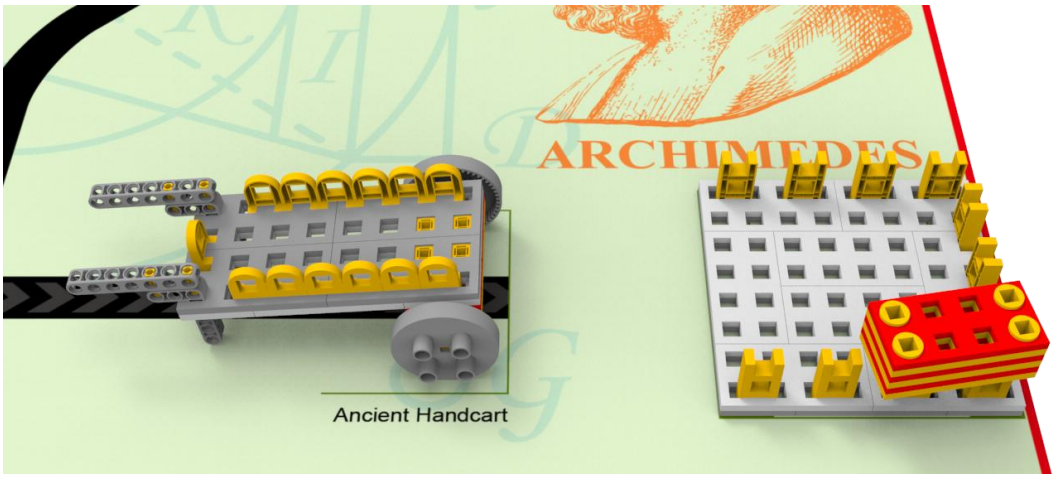


Once the grain touches arena, the score will be 0.

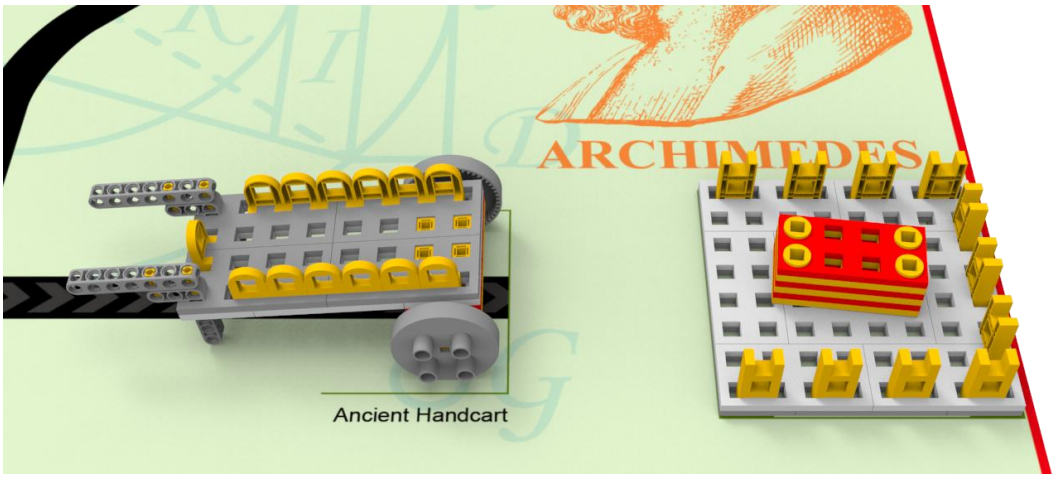


The score is 0 if the grain didn’t touch the barn.



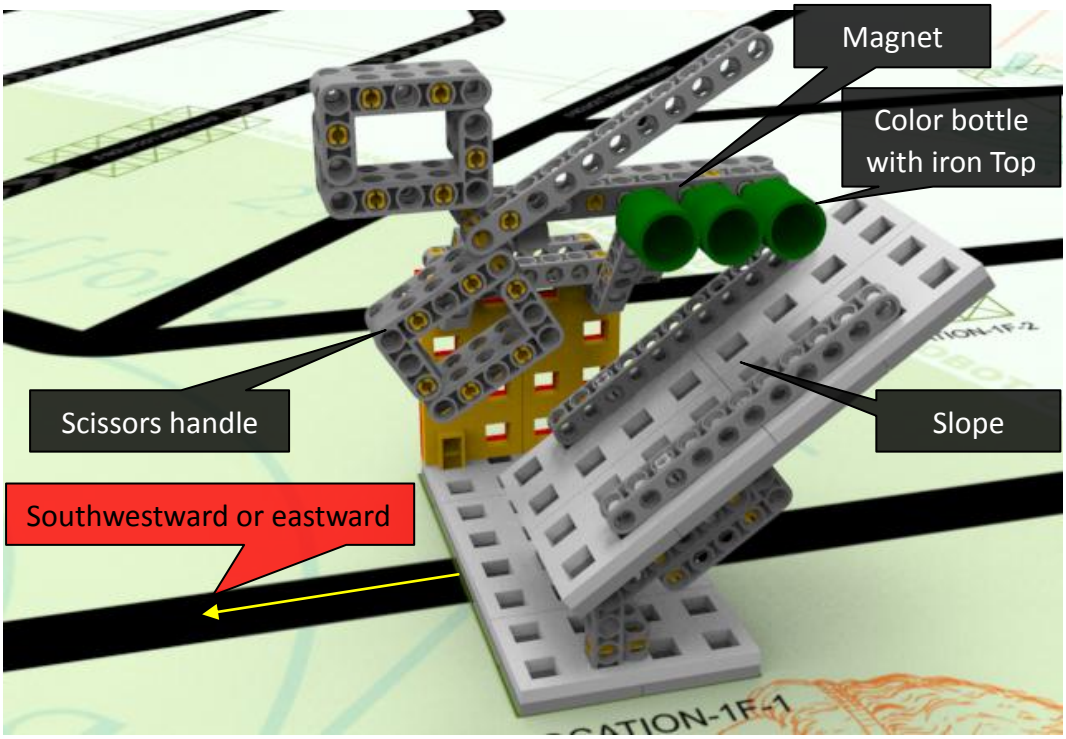


The grain touches the barn (base slab and fence included), with arena not touched by any part of the grain, while part vertical projection falls on the arena; then the score is 30 points. 【Points for low difficulty】



If the grain touches the barn, and all its vertical projection entirely falls on it (base slab and fence included), score is 50 points. 【Points for high difficulty】

Task 3: Scissors

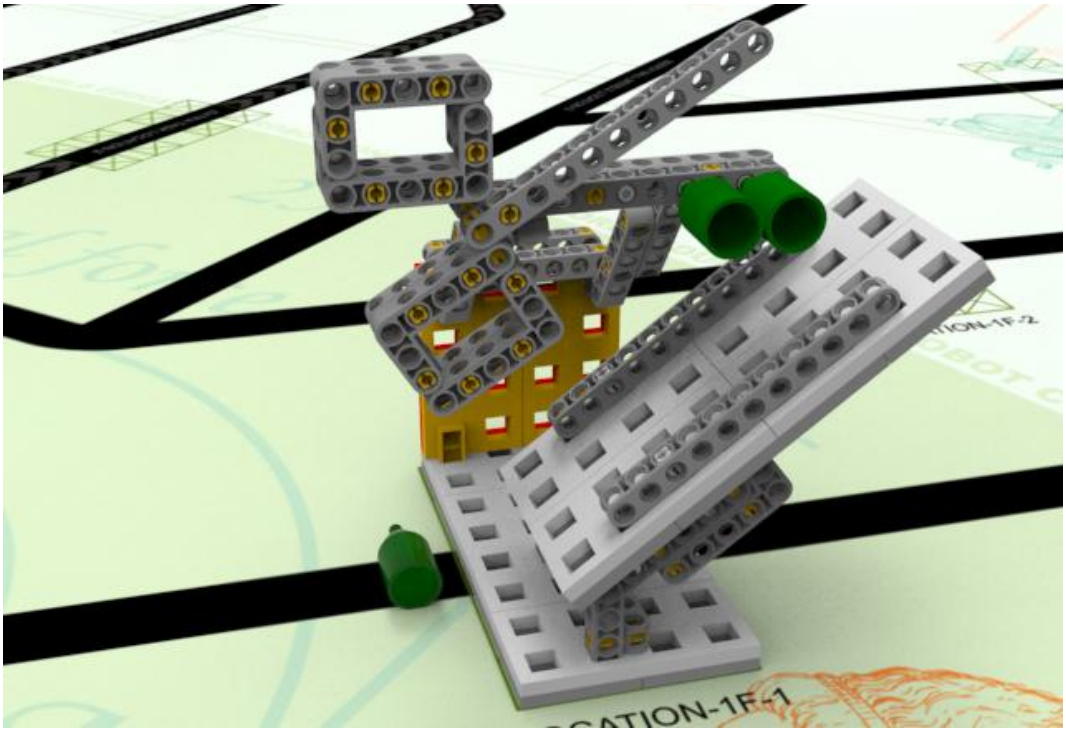


Model Figure 4 Initial Status of Task Model

Initial Status of Task Model

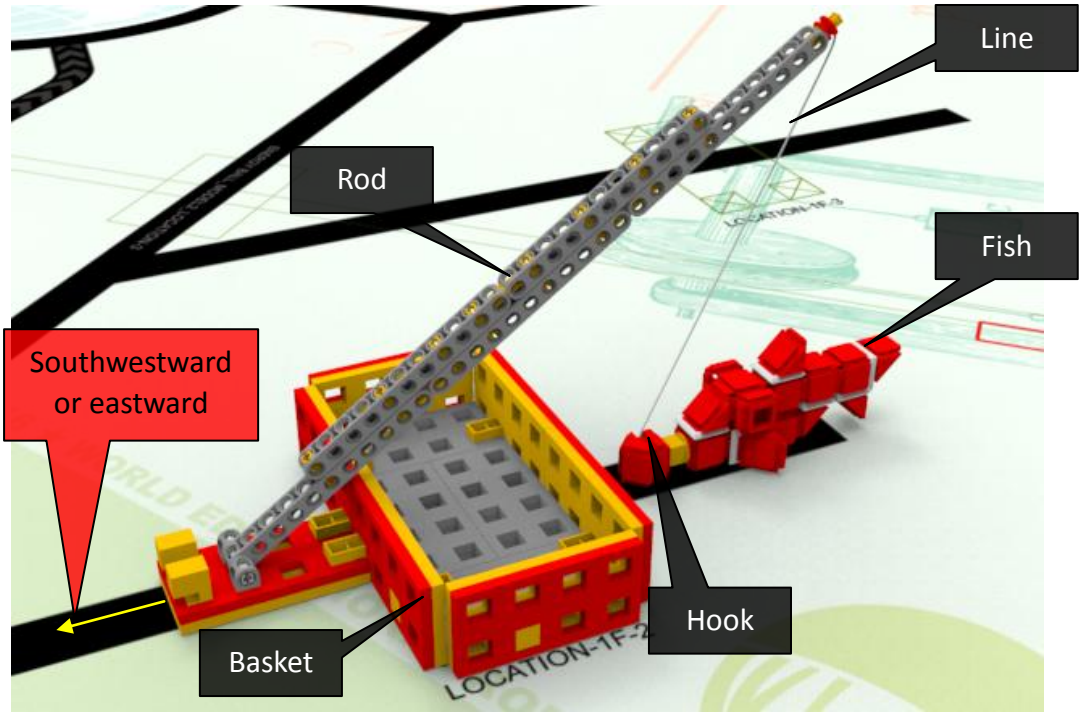
The base slab is fixed on the arena. With three color bottles (random colors) attached on the magnet of the scissors, the opening of bottles can be placed as the figure 4, and also can face downward, while the iron tops and magnet should be surely connected. The movable handle droops naturally, leaving scissors open.

Scoring Criteria and Points of the Task



If the color bottles are completely detached from the magnet, score is 10 points/each.

Task 4: Grand Duke Jiang Fishes



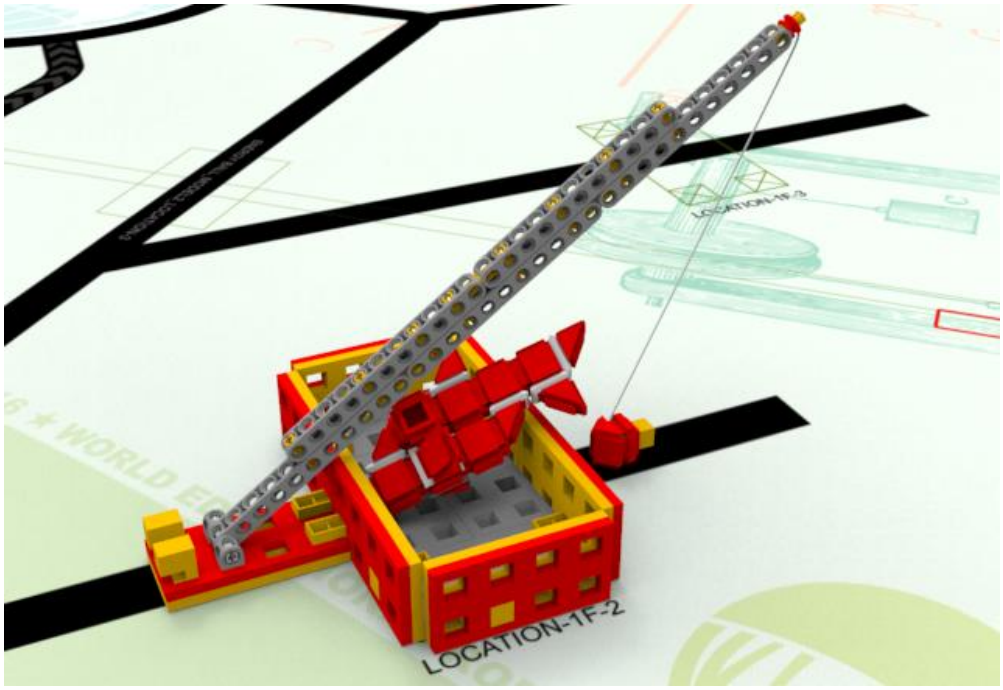
Model Figure 5 Initial Status of Task Model

Initial Status of Task Model

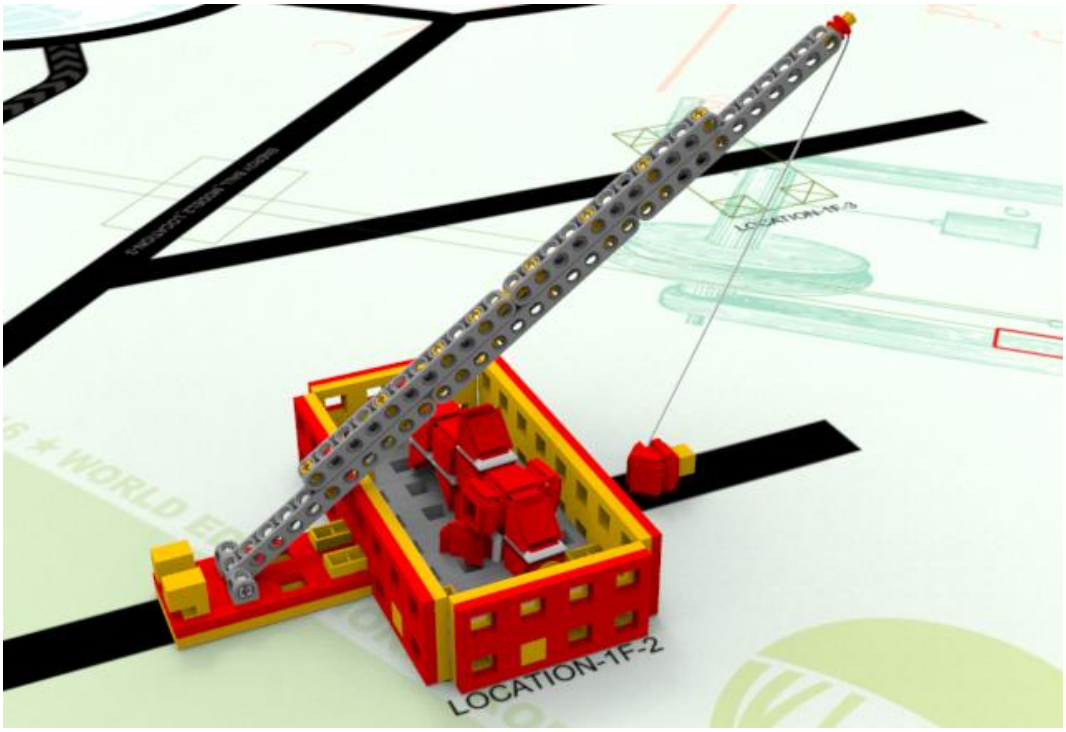
The basket is fixed on the arena, with fishing rod placed above the basket, fish hit the hook. The length of the line is 18 (±0.5)cm. The location of the fish is shown as the figure.

Scoring Criteria and Points of the Task

Once the fish touches arena, the score is 0 point.



Part vertical projection of the fish falls inside the basket (Area inside the outer contour is seen as part of the basket; the base slab for fixing fishing rod doesn't belong to the basket), while any part of the fish hasn't touched the arena; then the score is 40 points. 【Points for low difficulty】



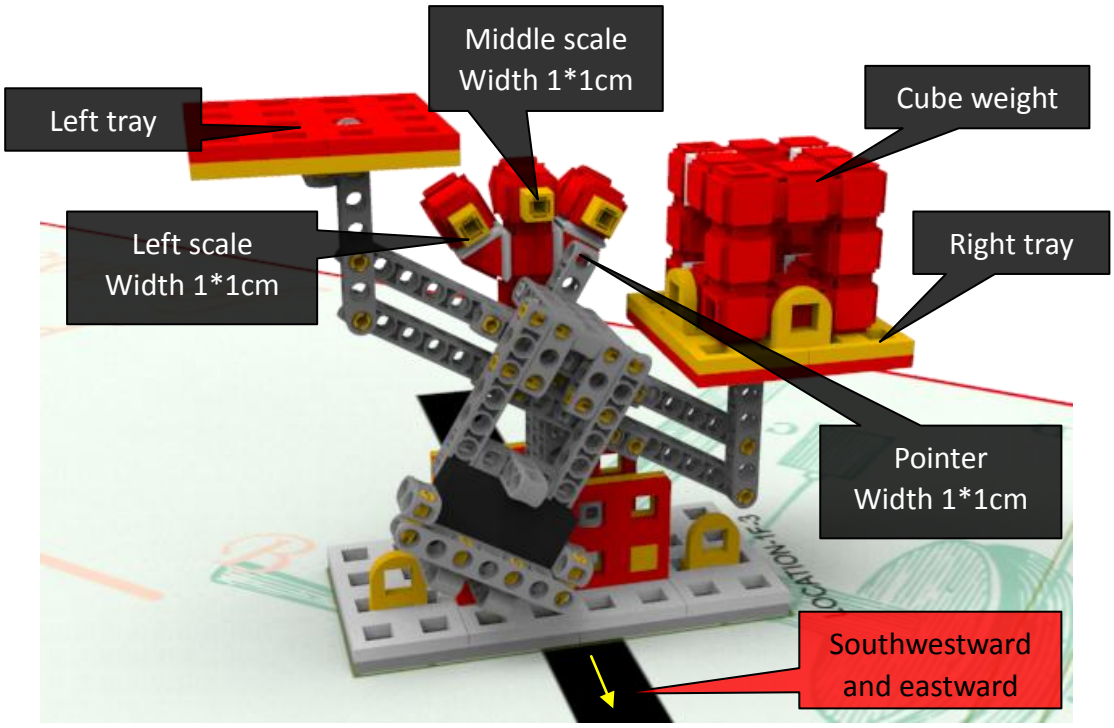
All the vertical projection of the fish casts inside the basket (Area inside the outer contour is seen as part of the basket; the base slab for fixing fishing rod doesn't belong to the basket), the score is 60 points. 【Points for high difficulty】

Note:

Grand Duke Jiang goes fishing (those who are willing put themselves onto the fishhook).

Grand Duke Jiang was an ancient Chinese military strategist who helped King Wen and King Wu of Zhou overthrow the Shang dynasty. After King Wu established the Zhou dynasty, Lv Shang was enfeoffed at Qi, which later developed into a powerful state in the Spring and Autum and Warring States periods. As the founder of the state of Qi, his posthumous title is Grand Duke of Qi.

Task 5: Weight Control



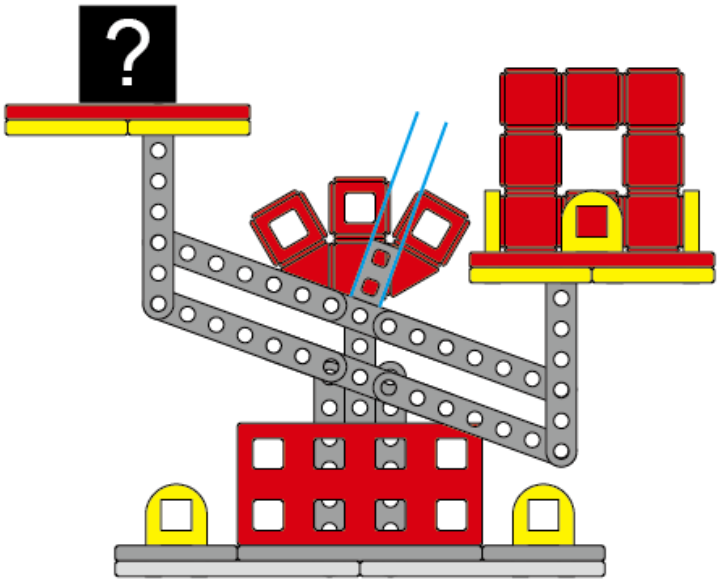
Model Figure 6 Initial Status of the Task Model

Initial Status of Task Model

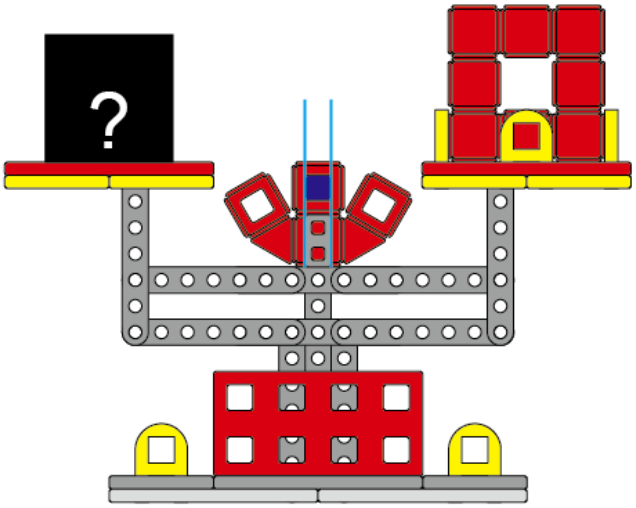
Base slab is fixed on the arena. A cube weight is placed on the right of the balance, with the pointer pointing to the right sclae.

Scoring Criteria and Points of the Task

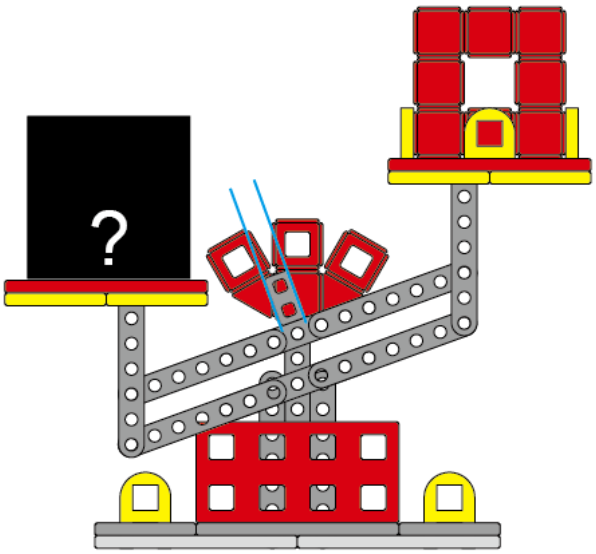
The scale is a cube with section at 1*1cm, width of the pointer at 1cm. The standard for pointing to the certain scale is that the vertical projection of pointer's extending line casts on the dial scale. When it's obvious that the pointer points in the middle of the left middle or right middle of the scales, it can be concluded that the pointer points to the left or right.

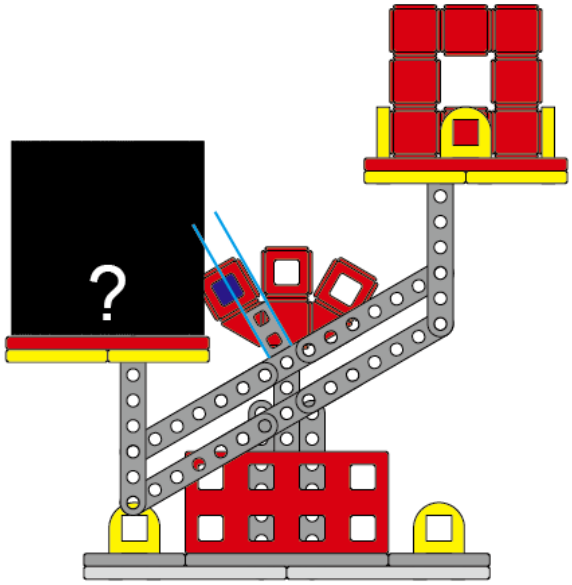


The score is 0 point when the pointer points to the right middle of the scale.



When the pointer points to the middle scale, the score is 30 points. 【Points for low difficulty】



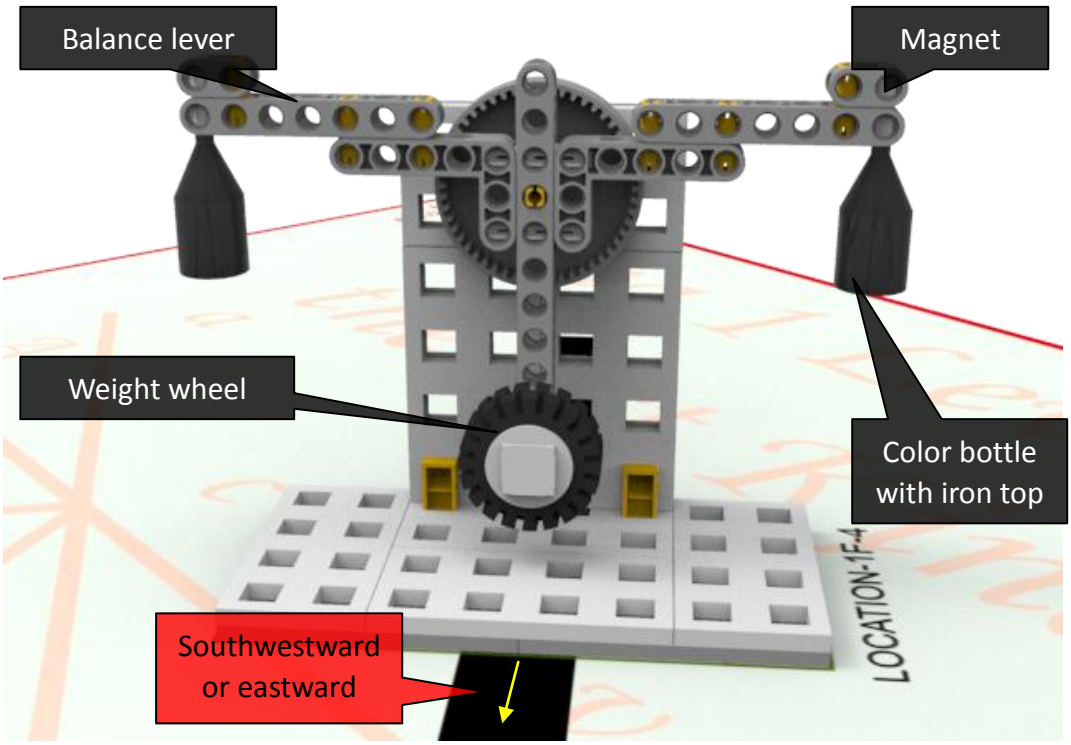


When the pointer points to the left or left middle, the score is 60 points. 【Points for high difficulty】

Attention:

Contestants must build an object (material and structure conforming to standard for robot in the "*General Rules*") and put it on the left tray by the robot (adhesive as glue and tape is not allowed here); the right cube weight shouldn't be detached from the right tray. Otherwise, the score is invalid.

Task 6: Game of Balance

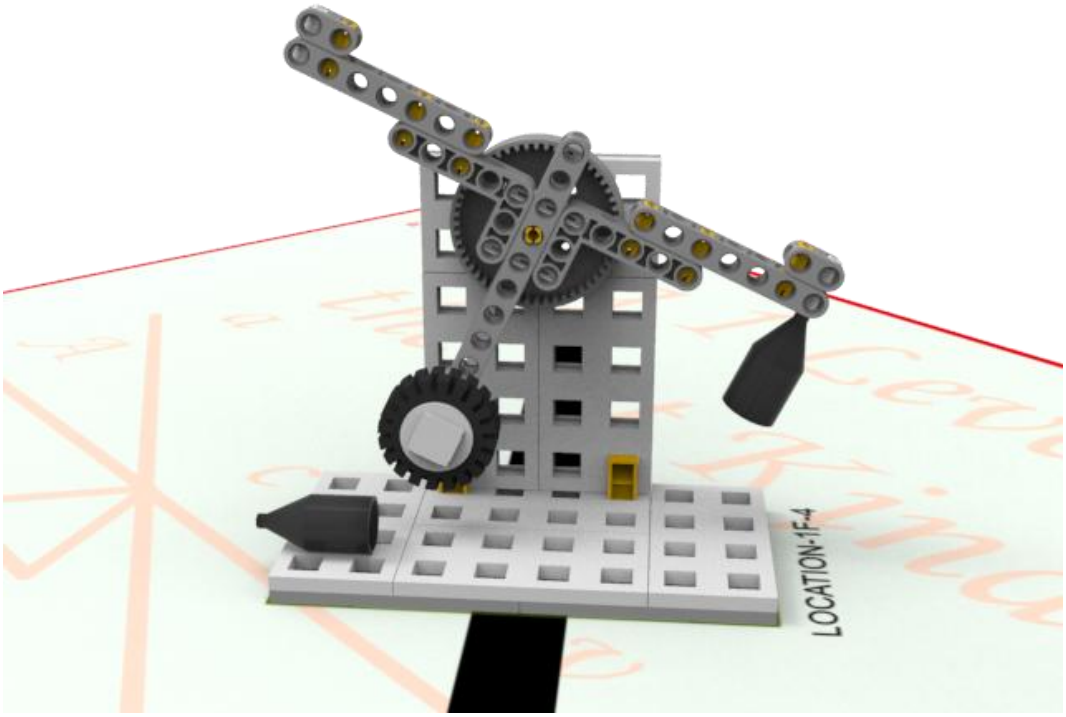


Model Figure 7 Initial Status of the Task Model

Initial Status of the Task Model

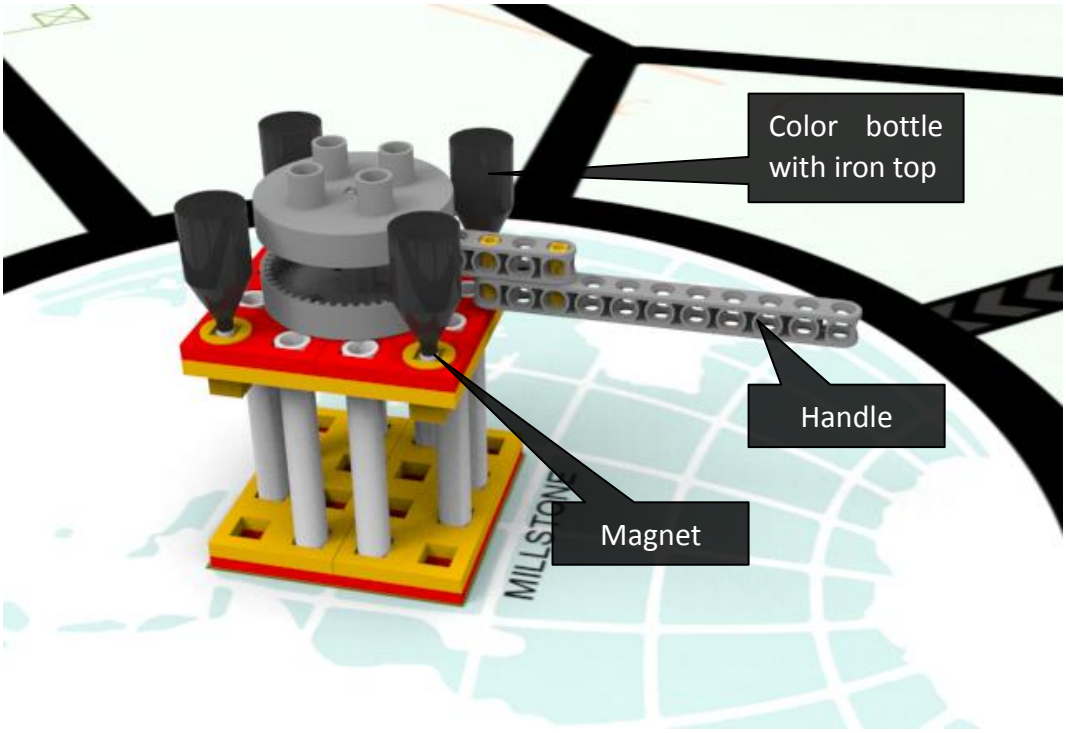
The base slab of the balance lever is fixed on the arena. Two magnets are installed on the two sides of the balance lever, with two color bottles attaching to the magnet respectively (random colors). The opening of the color bottle is downward. Weight wheel droops naturally so that the balance lever can keep balance.

Scoring Criteria and Points of the Task



If the color bottle is completely detached from the magnet, the score is 20 points/each.

Task 7: Millstone

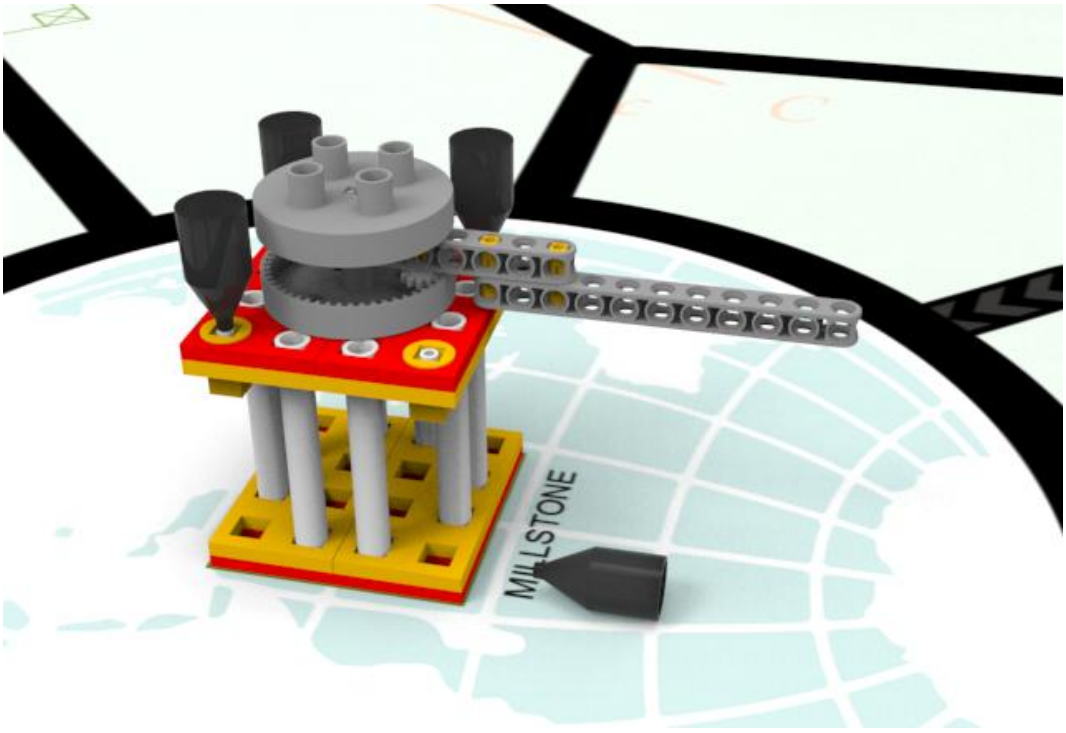


Model Figure 8 Initial Status of the Task Model

Initial Status of the Task Model

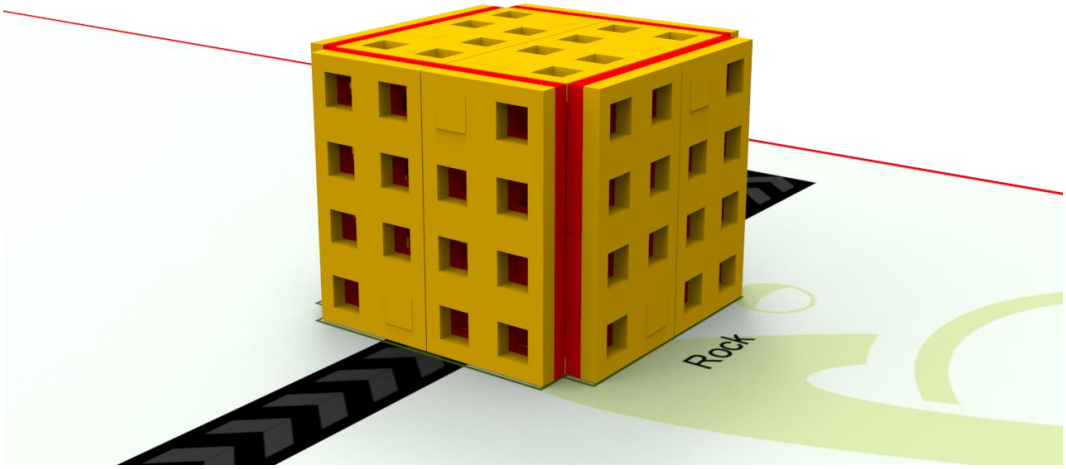
With base slab fixed on the arena, the handle points to due east, due south, due east or due north, keeping 4 color bottles (random colors) upturned and attracted by the magnet on the top.

Scoring Criteria and Points of the Task



The score is 10 points/each if the color bottles are completely separated from the magnets.

Task 8: Moving Rock

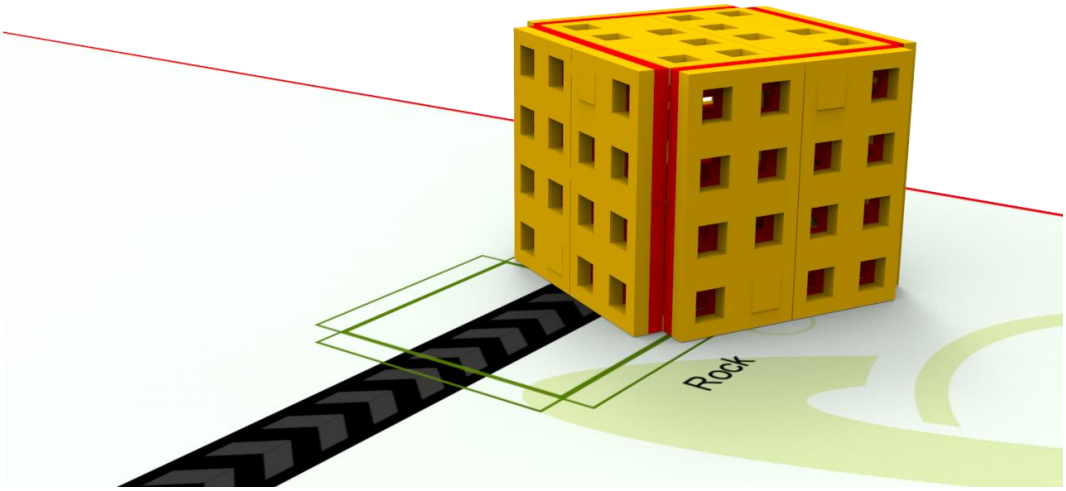


Model Figure 9 Initial Status of the Task Model

Initial Status of the Task Model

There is outline drawing of the rock in the east by south of the ground floor drawing. Rock's orientation can be seen in the figure.

Scoring Criteria and Points of the Task



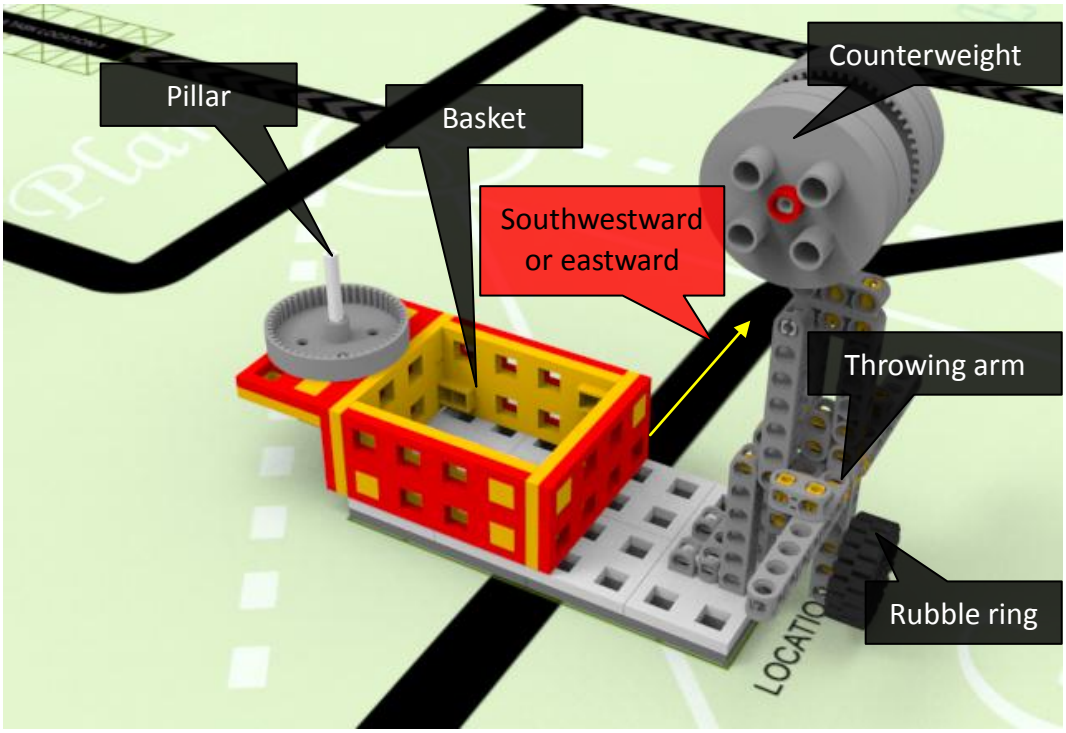
The score is 0 point if the vertical projection of the rock doesn't touch any base.

The score is 50 points if the vertical projection of the rock touches the ground floor base.

Attention:

In any case, contestants must hand the rock models that they've gained over to the referee at the end of each round of the competition.

Task 9: Catapult

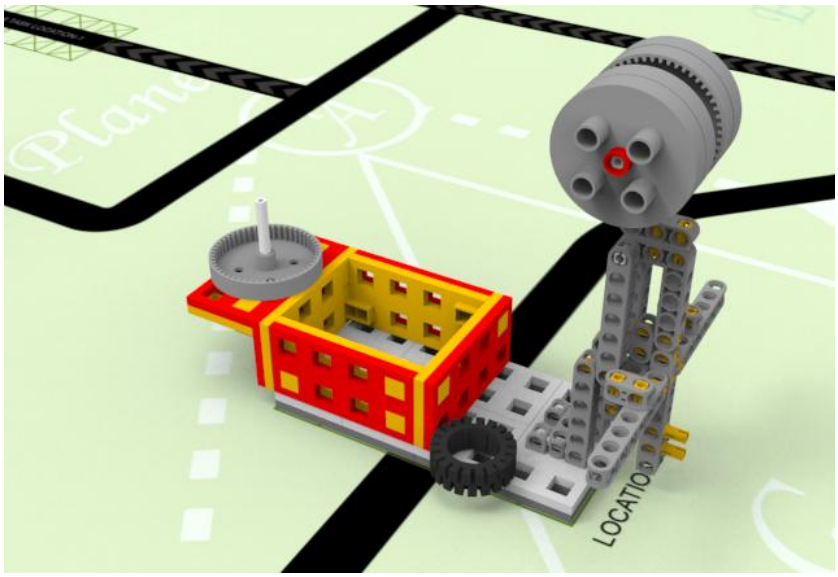


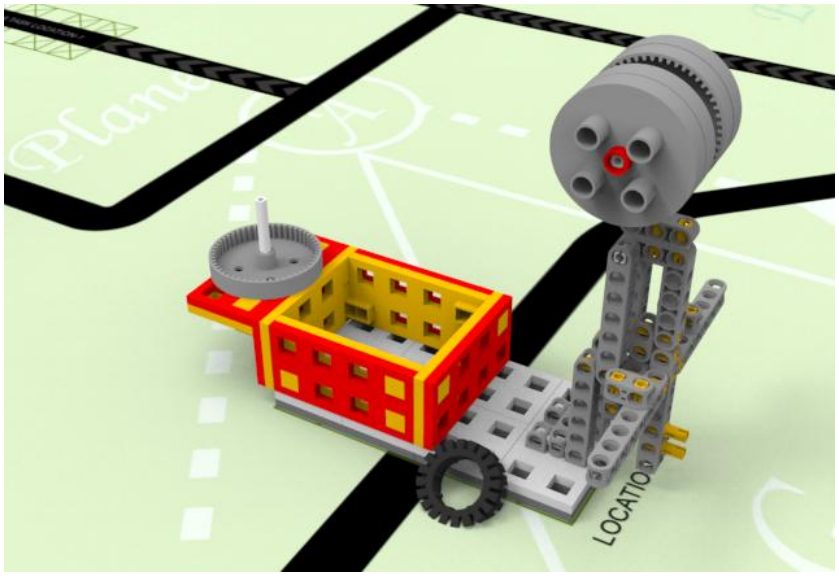
Model Figure 10 Initial Status of the Task Model

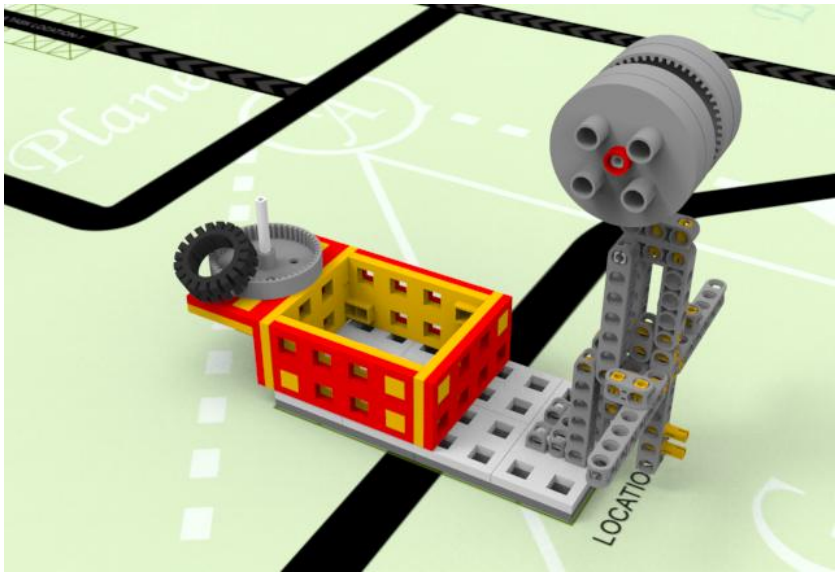
Initial Status of Task Model

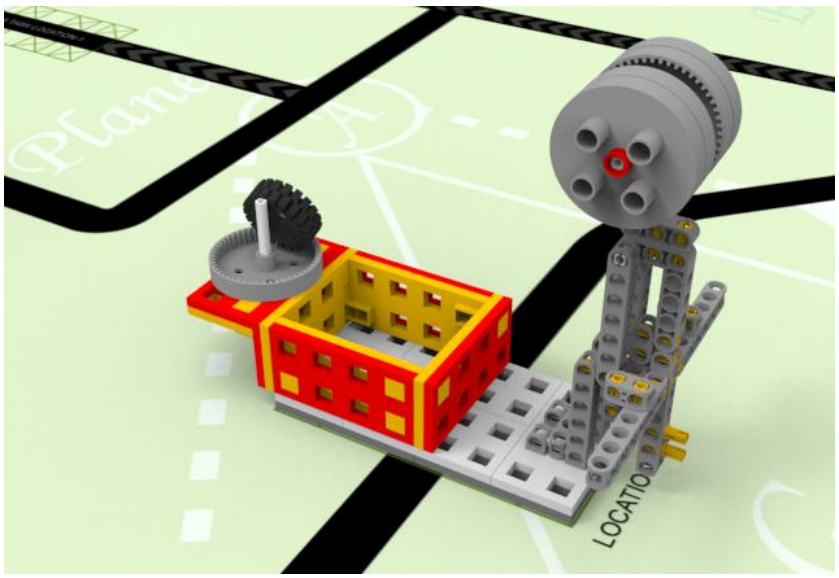
The base slab is fixed on the arena. Counterweight reaches the highest position, with rubber ring closely hanging on the hook of the throwing arm.

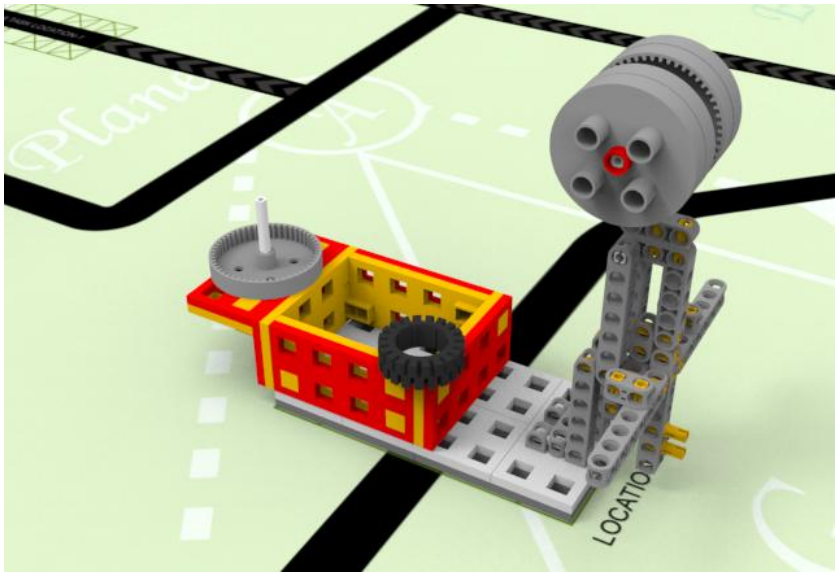
Scoring Criteria and Points of the Task



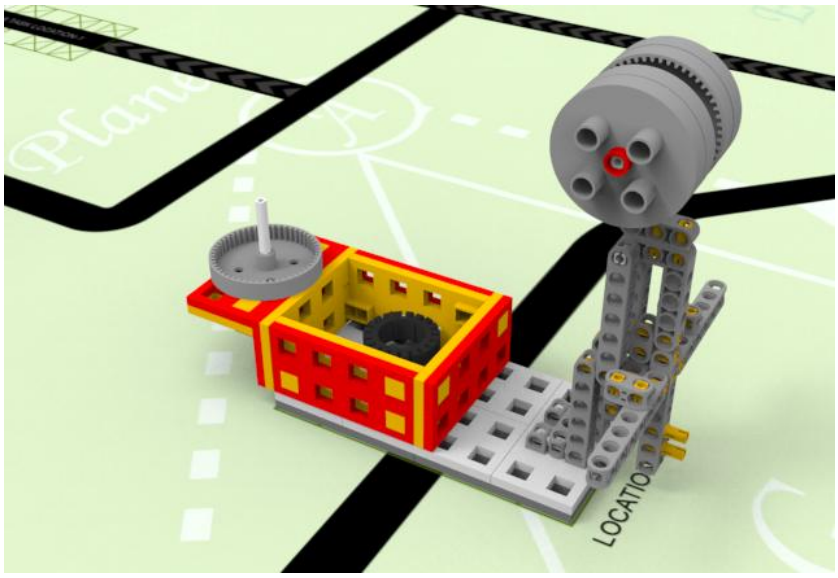




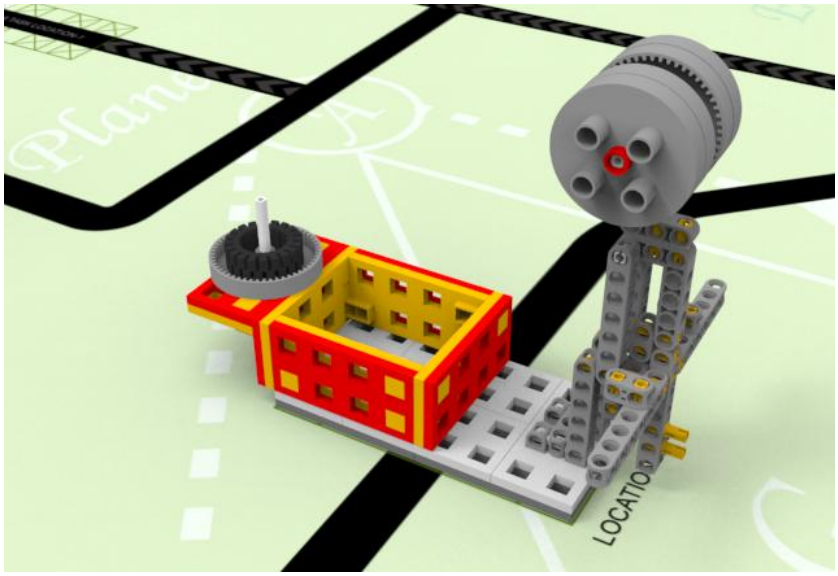


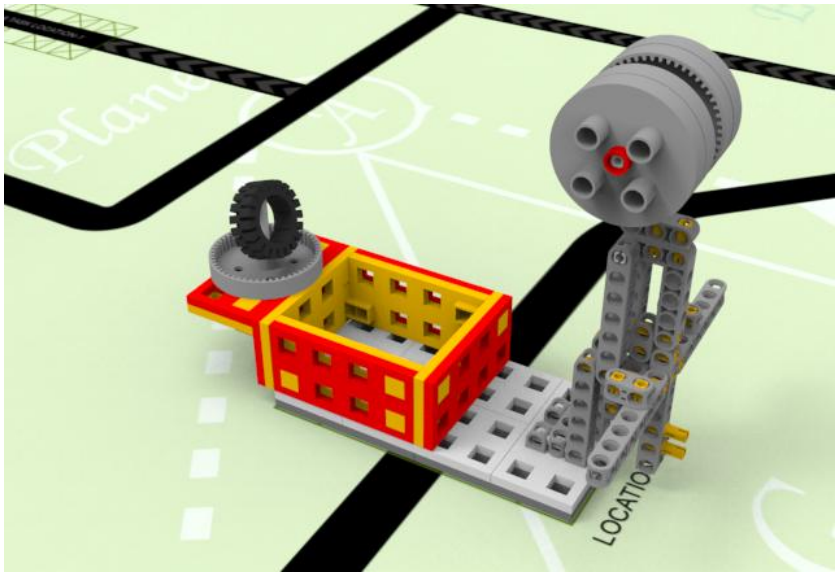


The score is 0 point if the rubber ring isn't inside the basket and doesn't encircle the pillar.



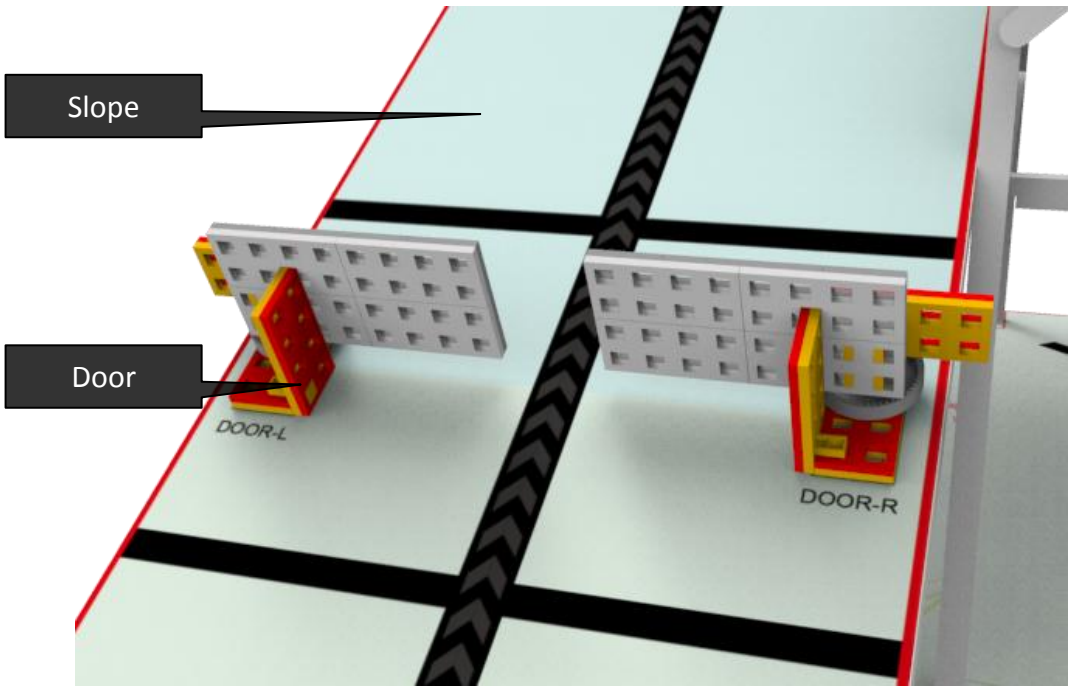
The score is 40 points if the rubber ring falls inside the basket.





The score is 60 points if the rubber ring encircles the pillar (hanging on the top is also included).

Task 10: Door Kicker

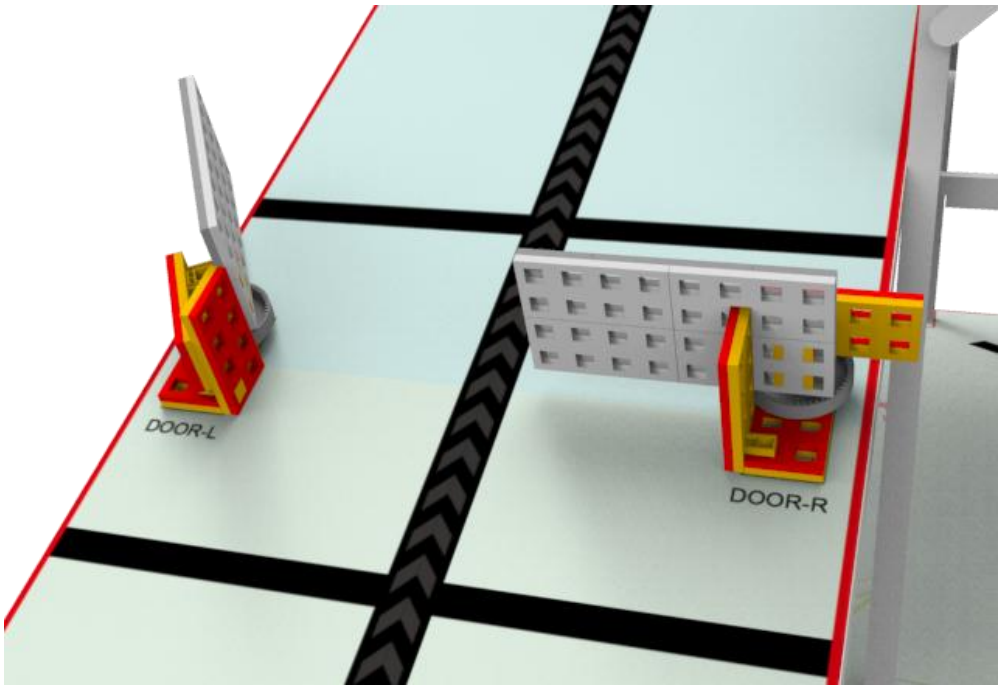


Model Figure 11 Initial Status of the Task Model

Initial Status of the Task Model

The base slab is fixed on the arena. There is a double door in the designated position of the slope. The door is closed when the competition begins, by this time the robot can only pass the slope by moving up.

Scoring Criteria and Points of the Task

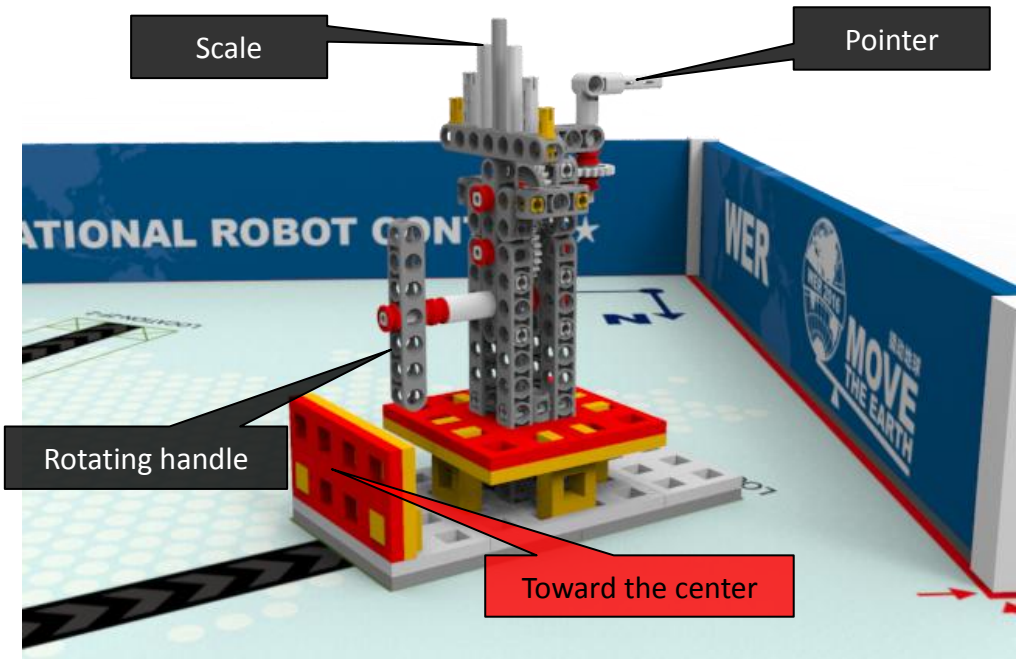


If the door can be opened large enough and kept opened, the score is 30 points/ door.

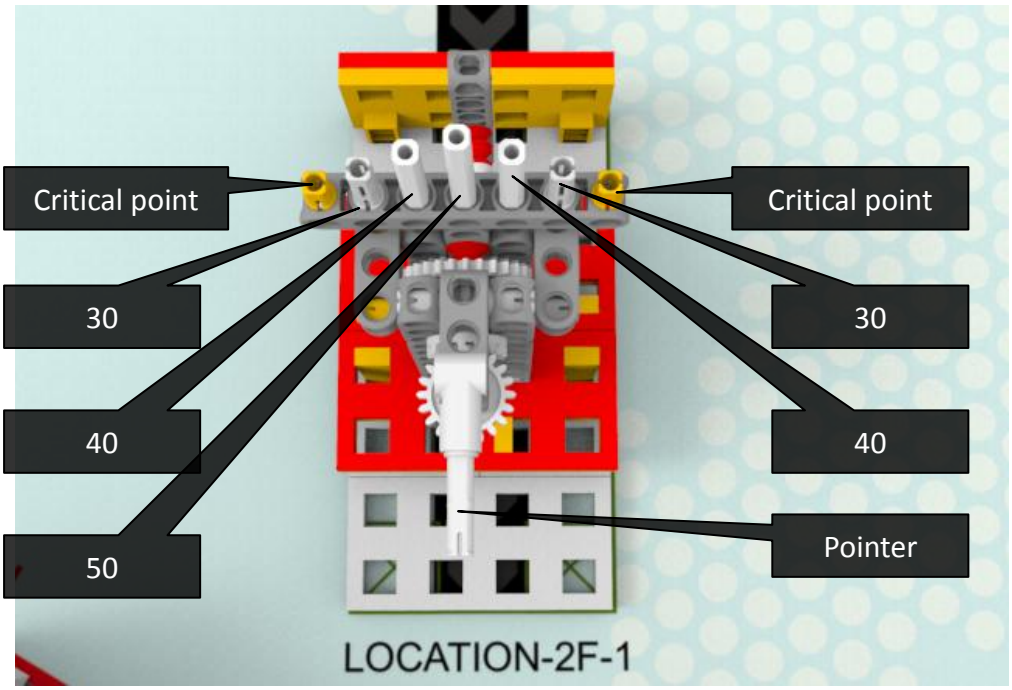
Attention:

During the competition, if the door is apparently damaged or its position is moved because of robot running or being touched by the contestants, either case happening to either door, the points of this door is invalid. If the door or part door structure still connects the arena, the score maintains the status quo; if the door or part of it falls on the arena, it will be kept by the referee until the end of this round.

Task 11: Gear Transmission



Model Figure 12 Initial Status of Task Model Effect Picture 1



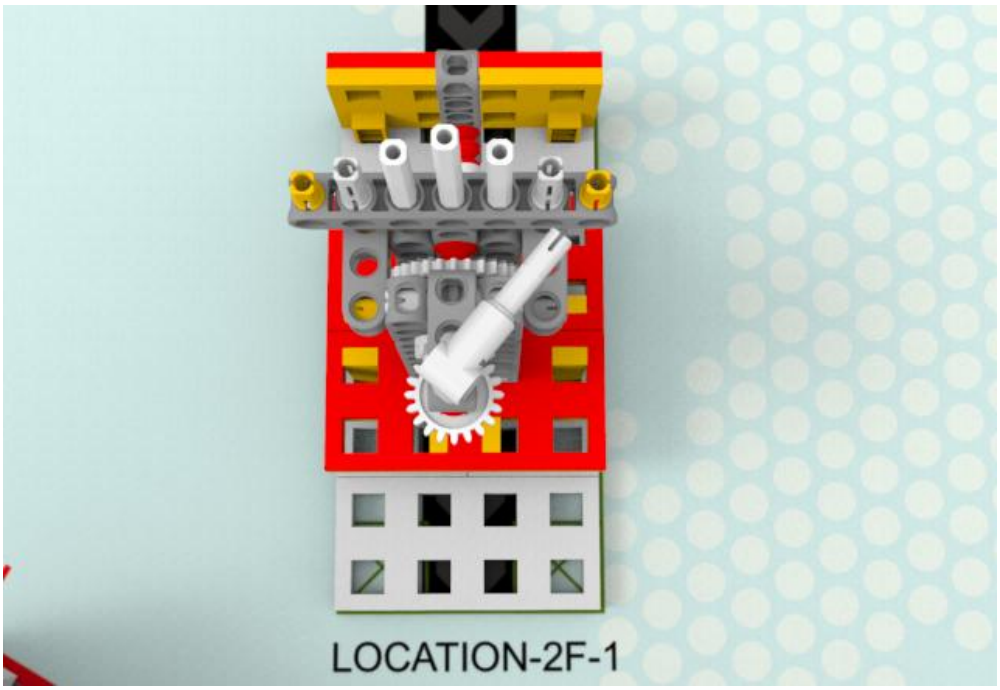
Model Figure 13 Initial Status of Task Model Effect Picture 2

Initial Status of the Task Model

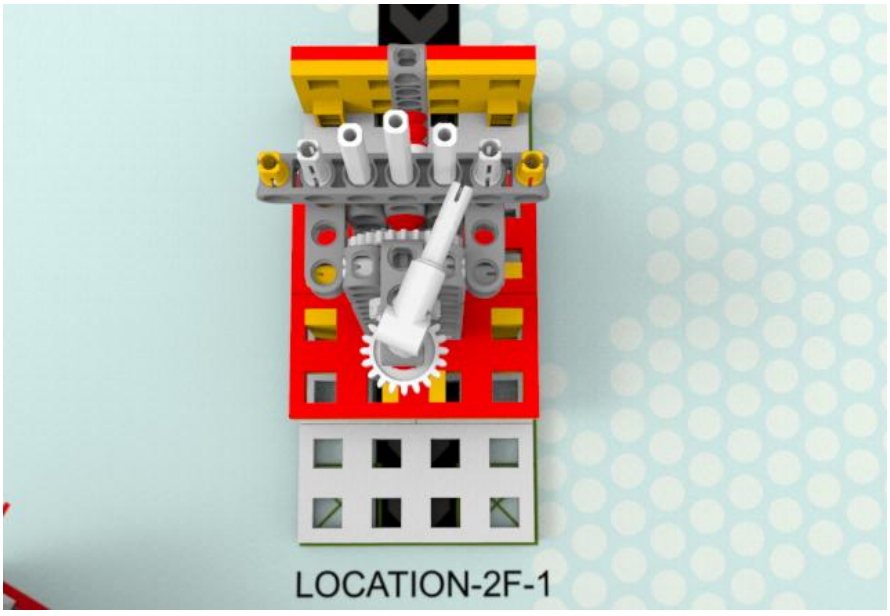
With base slab fixed on the arena, the direction of the pointer is shown as the effect picture 2, leaving the handle at random angle.

The standard for pointing to the certain scale is based on where the pointer's extended line points to on the dial scale.

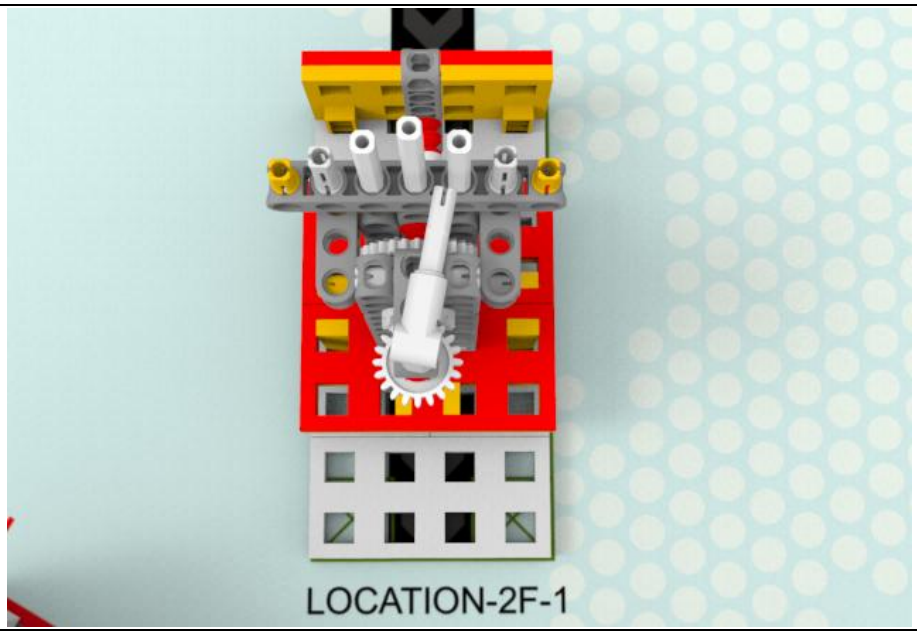
Scoring Criteria and Points of the Task



The score is 30 points if the pointer points to critical point or between critical point and 30 points scale.



The score is 40 points if the pointer points to 30 points scale or between 30 and 40 points scale.



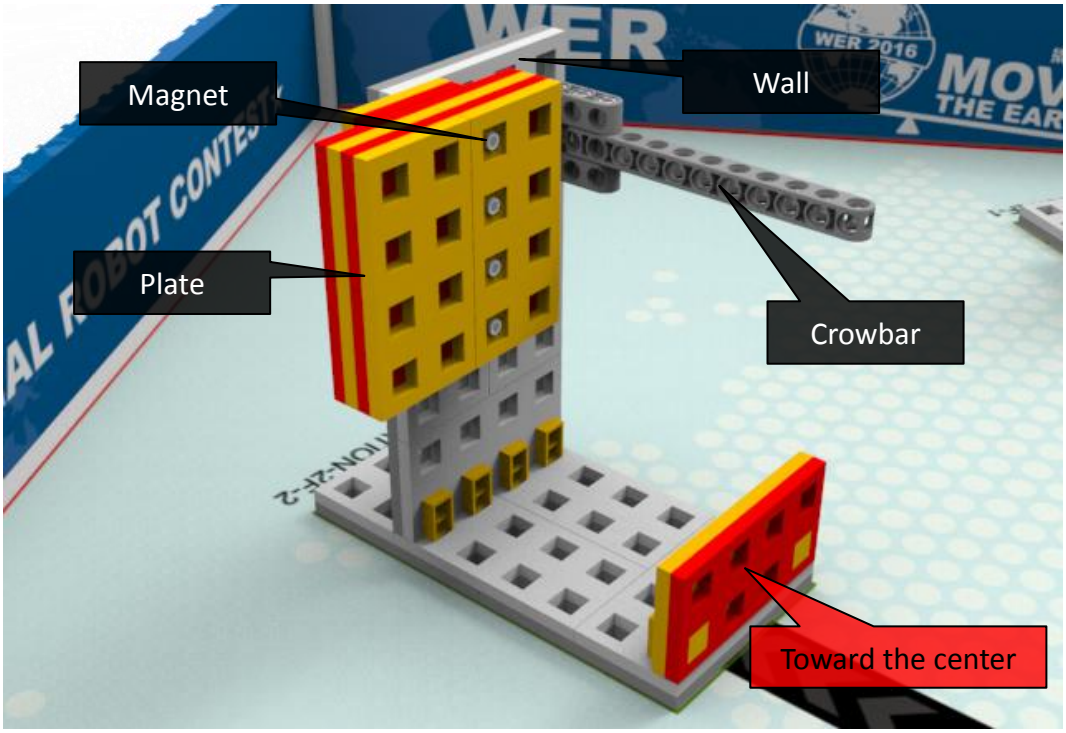
The score is 50 points if the pointer points to 40 points scale or between 40 and 50 points scale.

Attention:

Only when the pointer stops pointing will the referee scores.

The higher points will be recorded if the pointer points to the middle of two points.

Task 12: A Labor-saving Crowbar

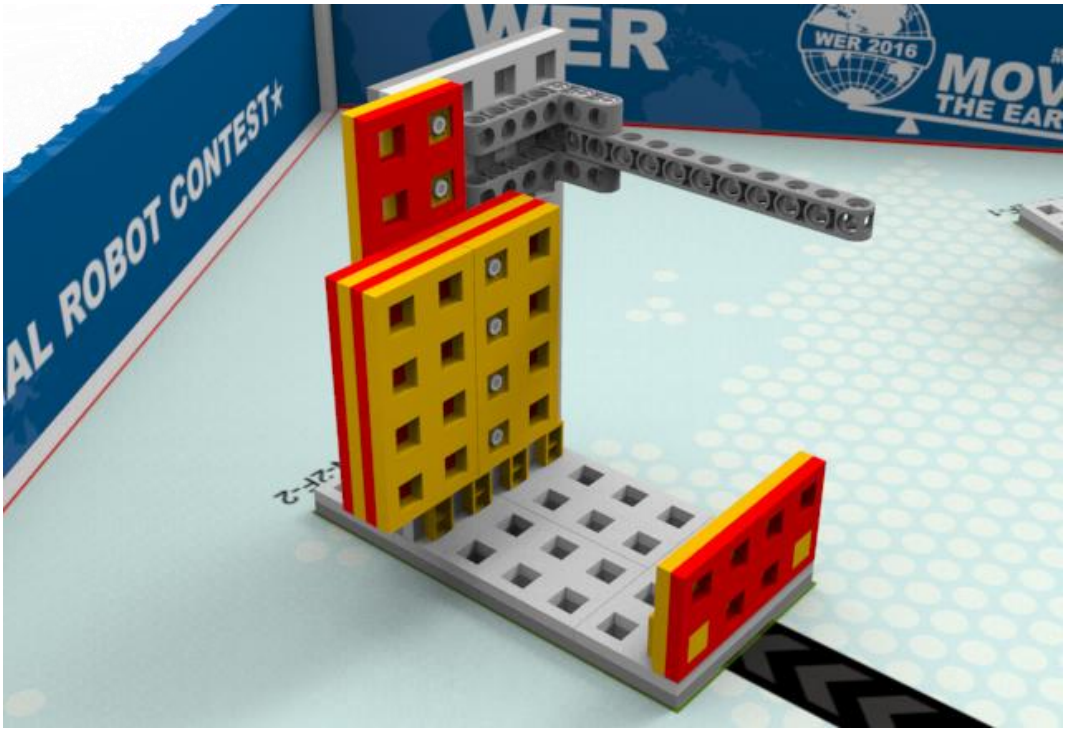


Model Figure 14 Initial Status of Task Model

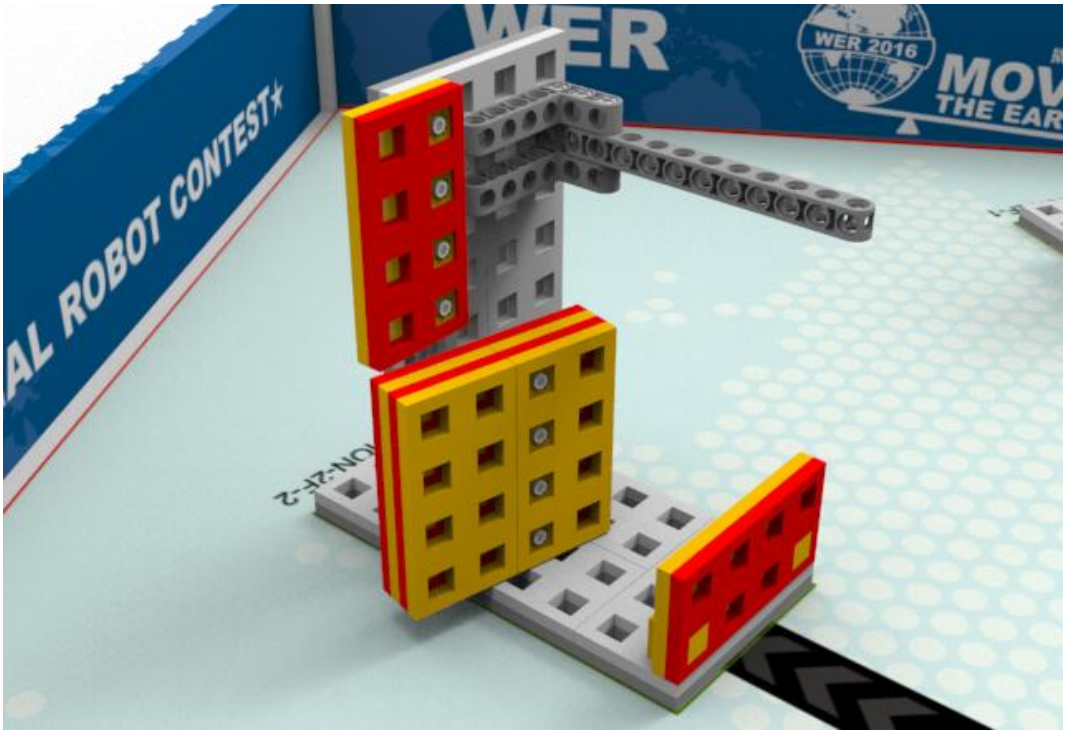
Initial Status of the Task Model

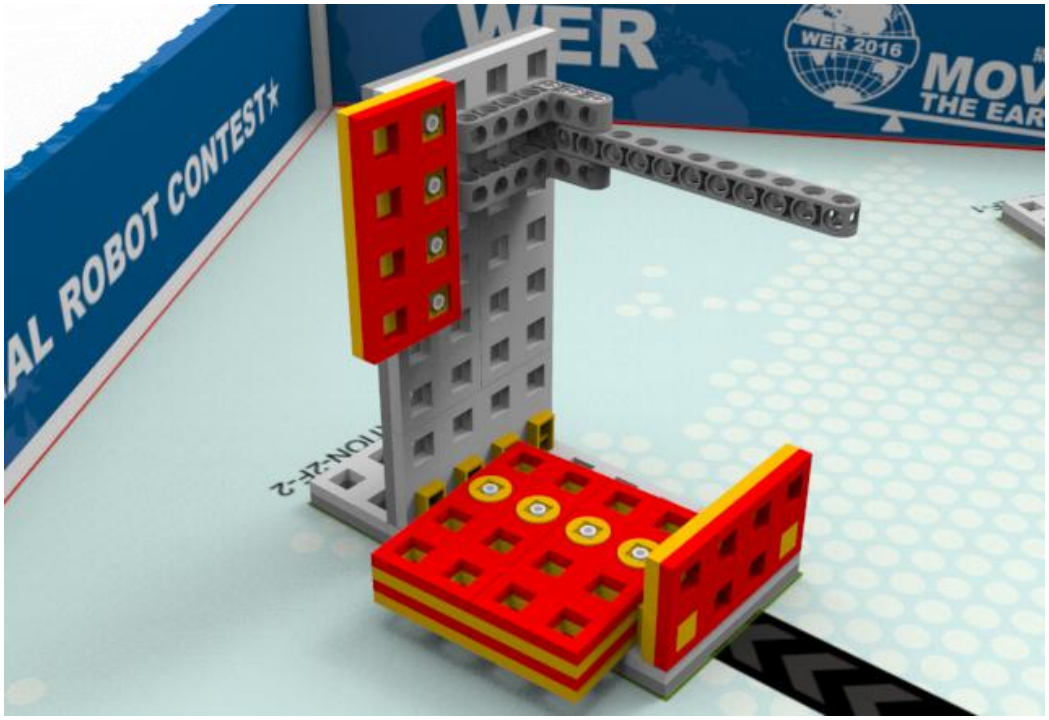
The base slab is fixed on the arena. The slab that needs to be drawn away is attracted to the wall by magnet, with one side of the slab abutting on the front end of crowbar, whose handle is vertical to the wall.

Scoring Criteria and Points of the Task



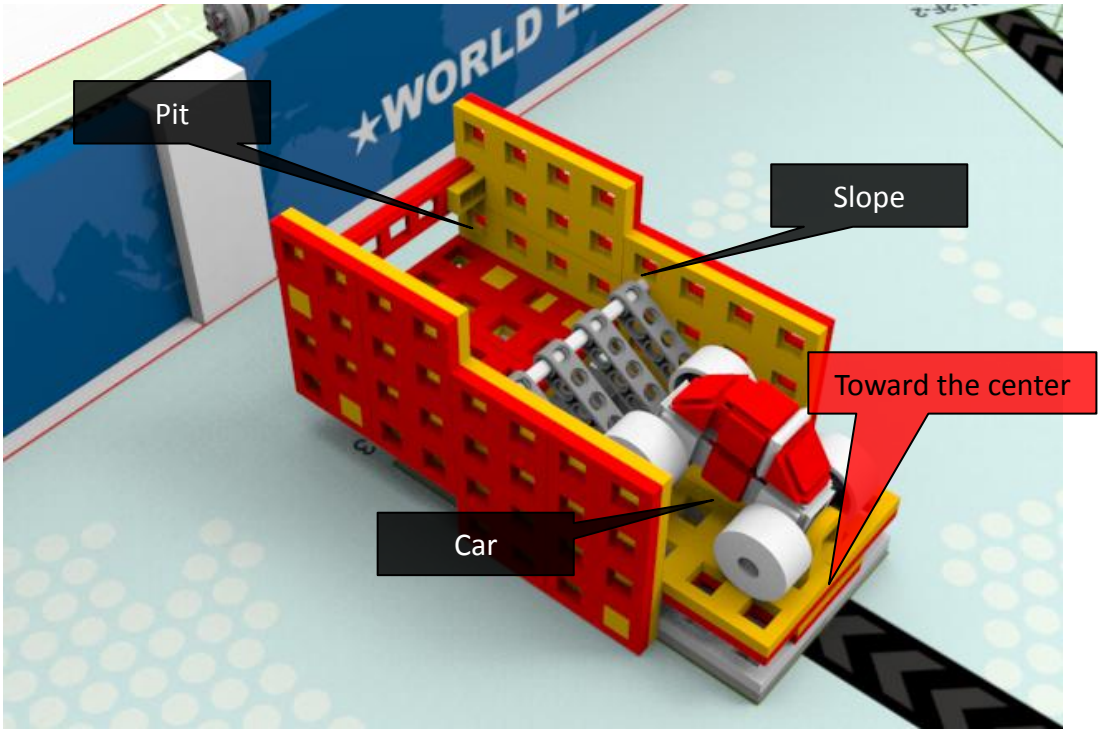
The score is 0 point if the slab is still attracted to the wall.





The score is 30 points if the slab is completely divorced from the wall (base slab not included).

Task 13: Mountain Climbing

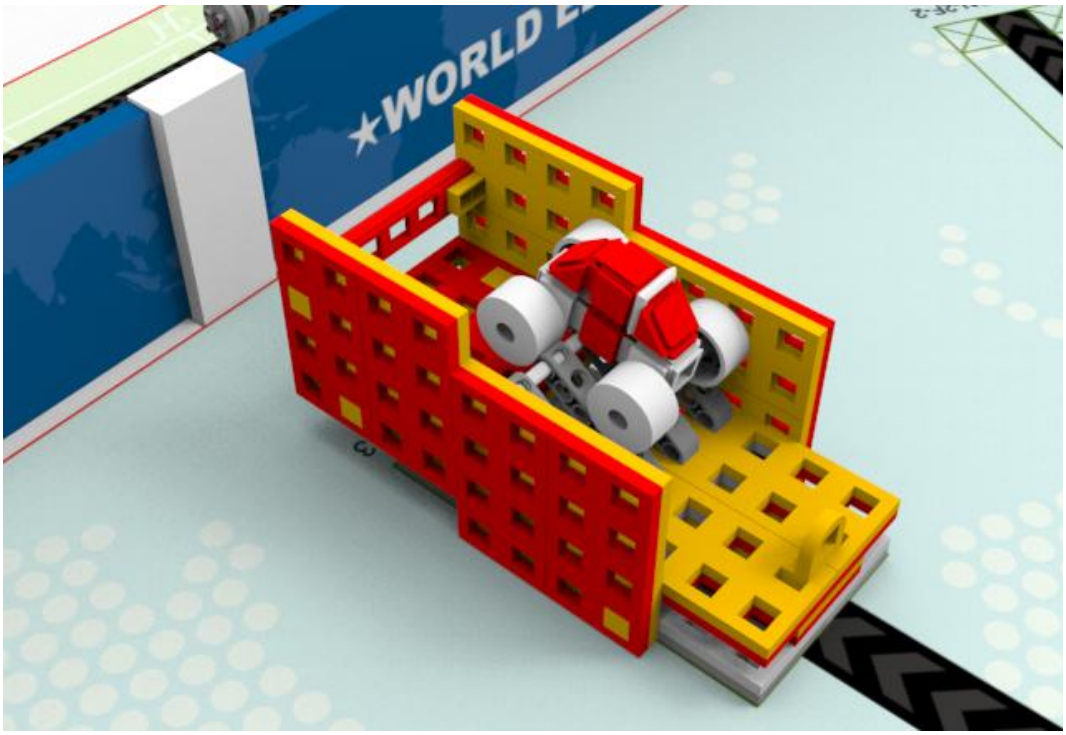


Model Figure 15 Initial Status of Task Model

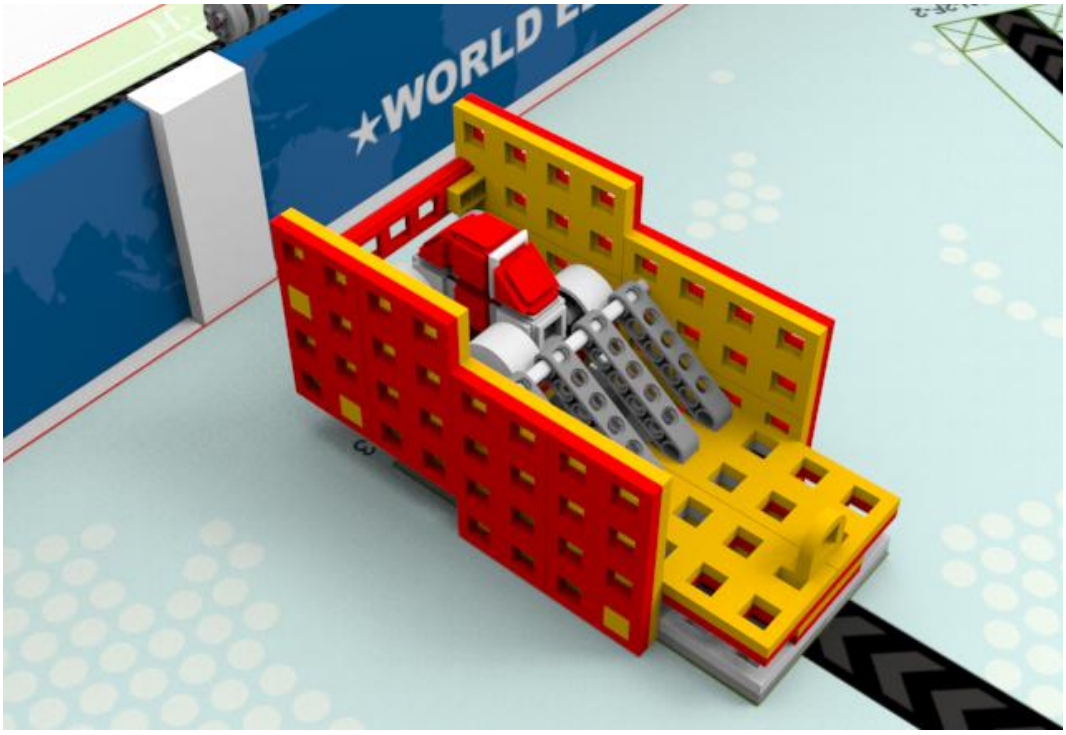
Initial Status of the Task Model

The base slab is fixed on the arena. The moving direction of the car is the same with slope's orientation. One end of the car adjoins to A connector, with the other end at the bottom of the slope, as shown in the effect picture.

Scoring Criteria and Points of the Task

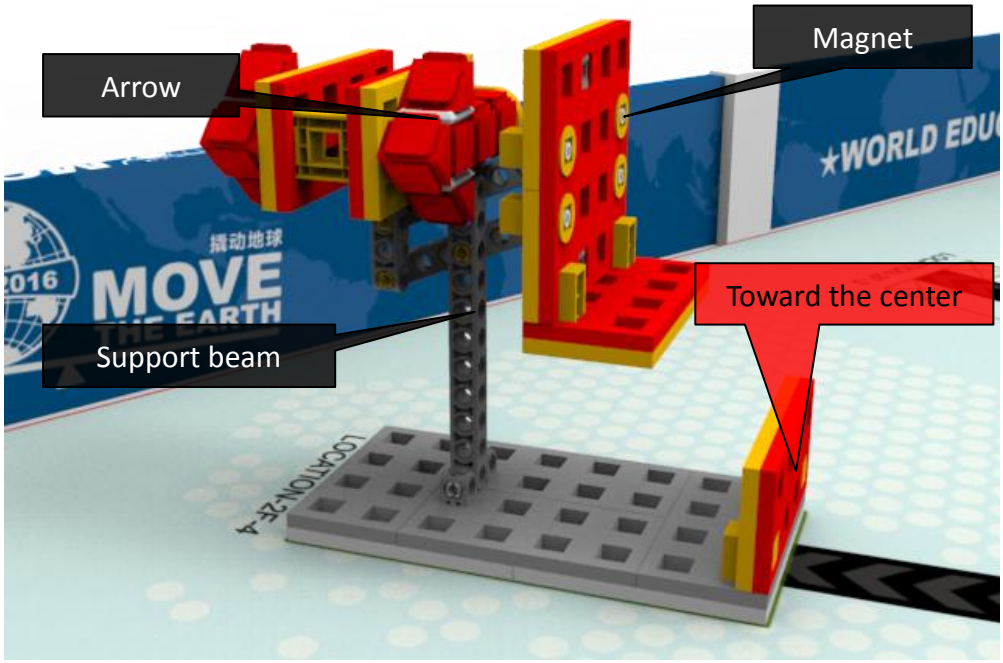


The score is 0 point if four wheels haven't touched pit's bottom at the same time.



The score is 40 points if four wheels hit the bottom of the pit at the same time.

Task 14: Emergence

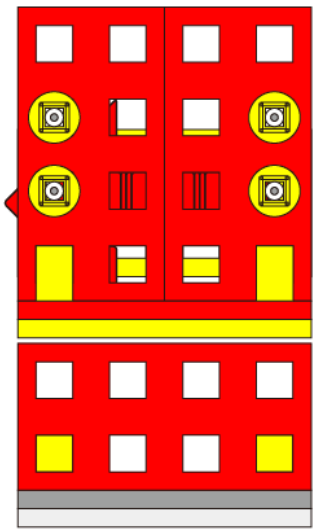


Model Figure 16 Initial Status of the Task Model

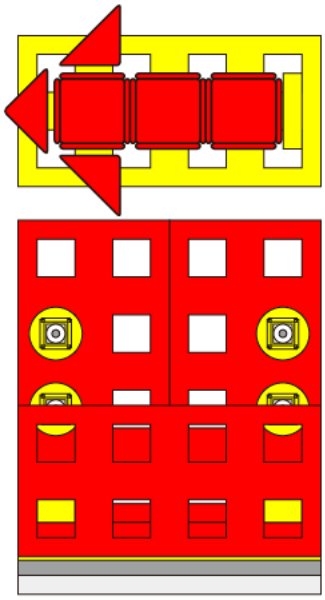
Initial Status of the Task Model

The base slab is fixed on the arena. Adjust the square slab to its highest position, and the backboard of the arrow to its lowest position.

Scoring Criteria and Points of the Task



The score is 0 point if the arrow is clearly blocked by the square slab.

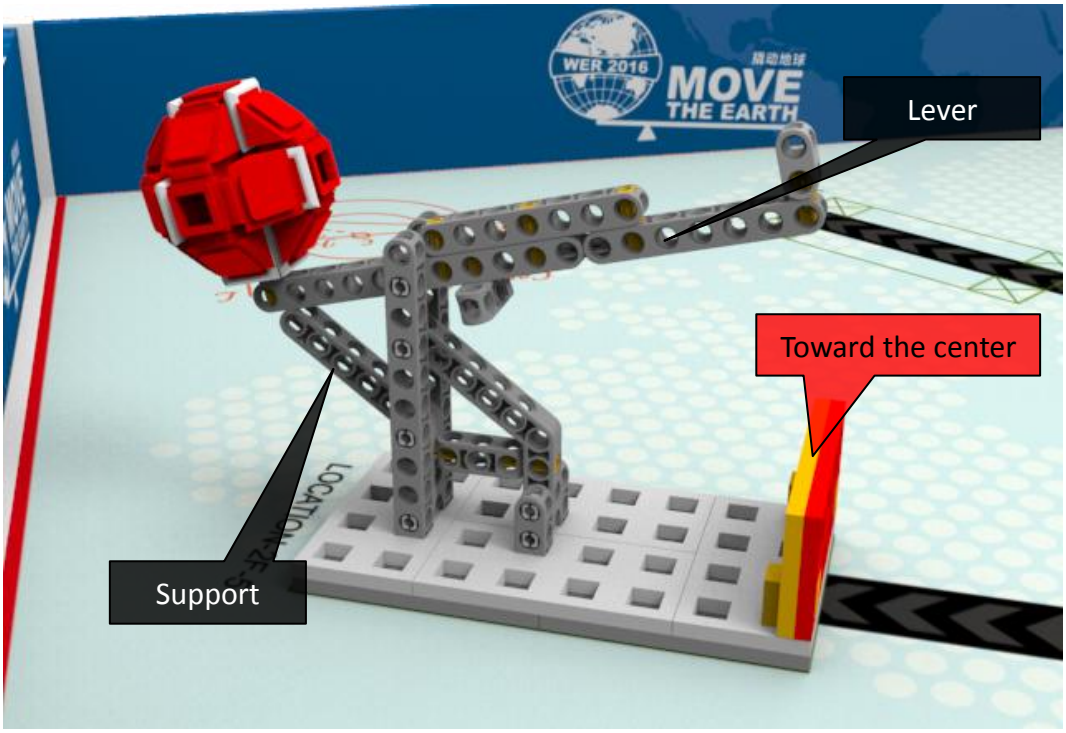


The score is 50 points if the arrow is overtly exposed.

Attention:

Contestants must build a new model （material and structure conforming to standard for robot in the "*General Rules*", with weight and design unlimited) and put it on the model by the robot (adhesive as glue and tape is not allowed here). Otherwise, the score is invalid.

Task 15: Move the Earth

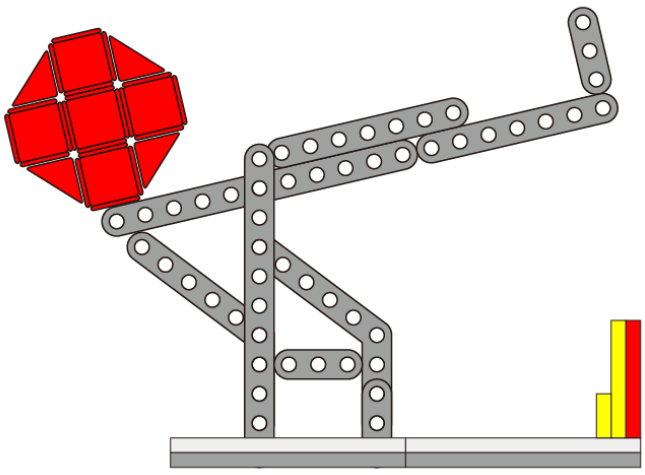


Model Figure 17 Initial Status of the Task Model

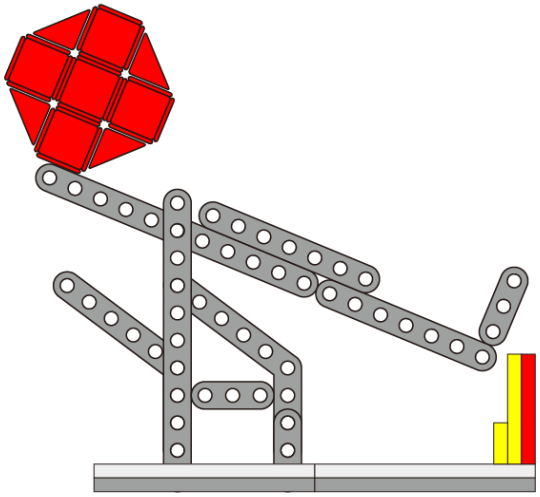
Initial Status of the Task Model

The base slab is fixed on the arena. The lever tilts to its lowest position toward the “earth” (the ball).

Scoring Criteria and Points of the Task



The score is 0 point if the end of lever on which the earth is put touches support.



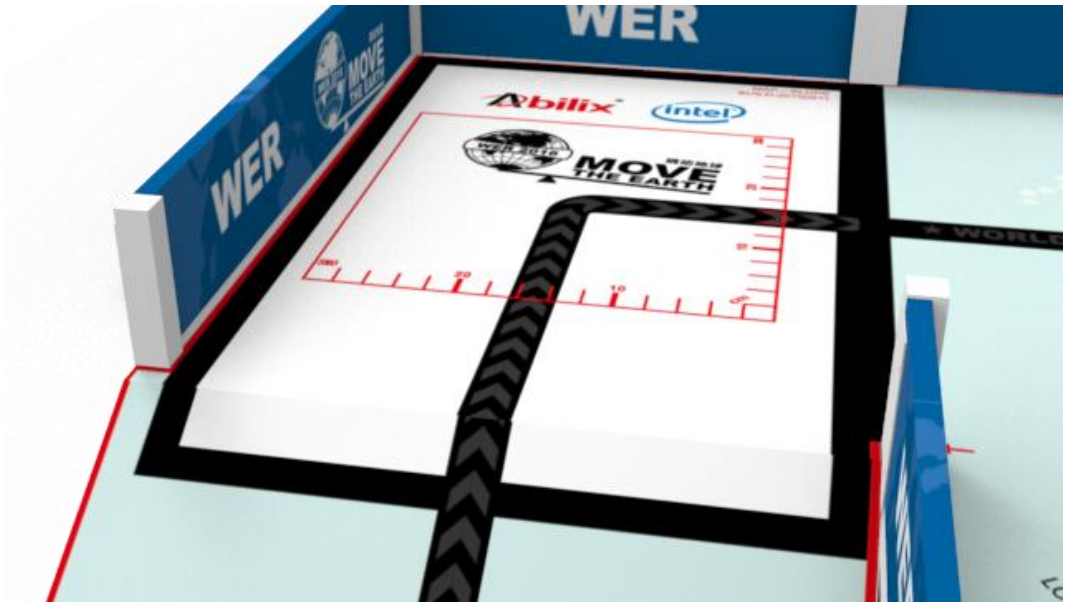
The score is 50 points if the end of the lever where the earth is located is separated from the support.

Attention:

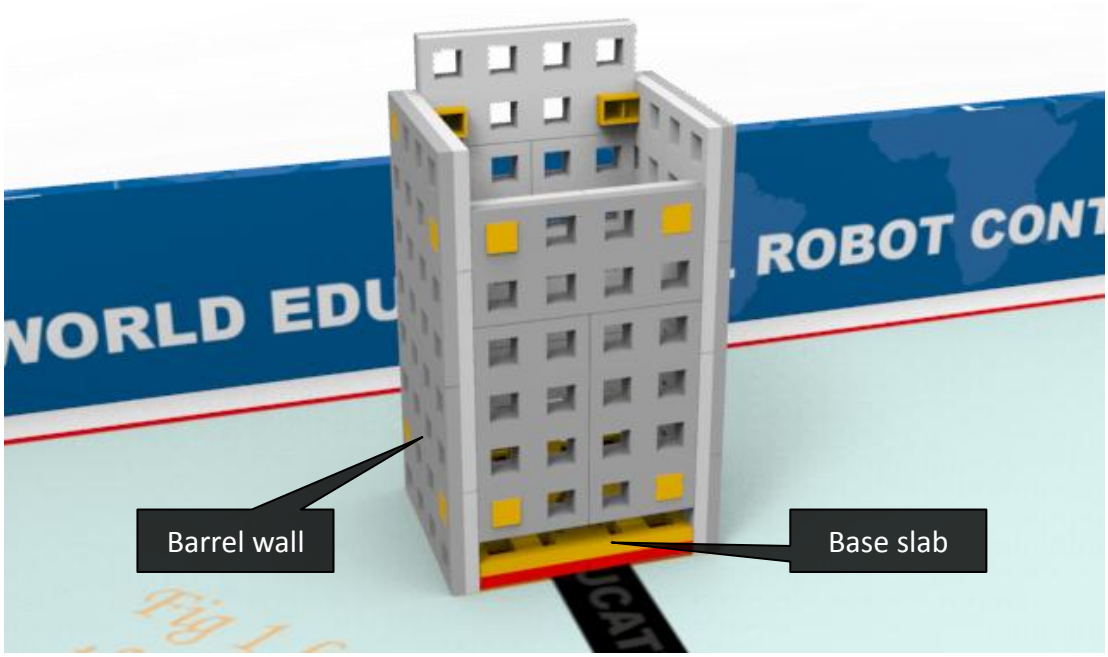
Contestants must build a new model (material and structure conforming to standard for robot in the "*General Rules*", with weight and design unlimited) and put it on the model by the robot (adhesive as glue and tape is not allowed here). Otherwise, the score is invalid. It is also allowed that the static robot mechanism touches the model to get points. Otherwise, the score is invalid.

Task 16: Treasure Hunt

Model Figure 18 The Location of the Ground Floor Base



Model Figure 19 Location of the Second Floor Base



Model Figure 20 Task Model

Initial Status of the Task Model

The base of the barrel is fixed on the arena. The barrel wall and base can be separated manually so that referee can rebuild the model easily.

Scoring Criteria and Points of the Task

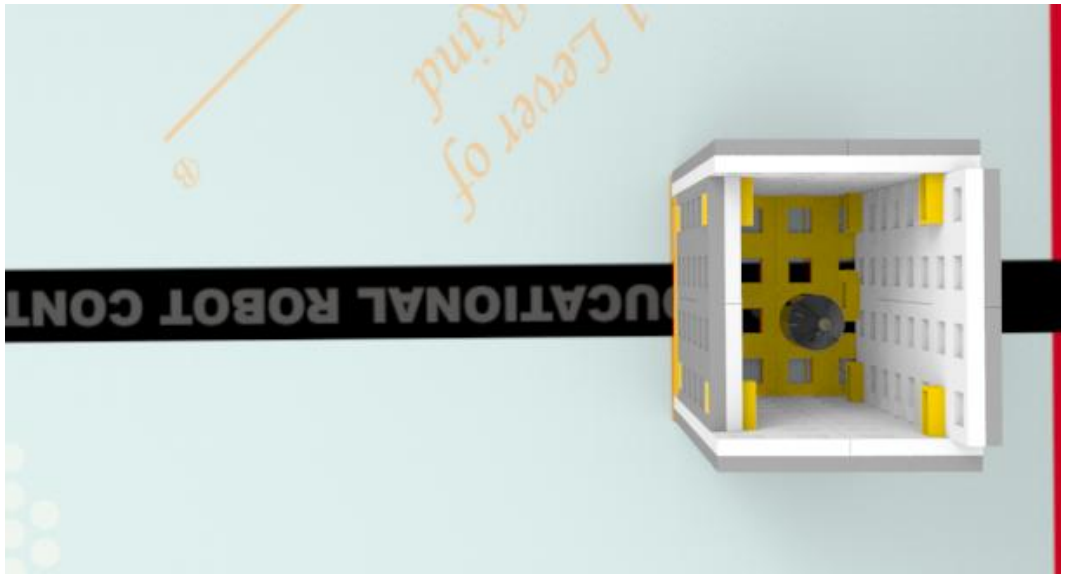
Treasure Hunt Stage Ⅰ ： Collection

The score is 10 points/each if the robot collects color bottle (random colors) to the ground floor base.

Treasure Hunt Stage Ⅱ ： Carry

The score is 20 points/each if the robot collects color bottles (random colors) to the second floor base.

Treasure Hunt Stage Ⅲ ： Placement



The score is 30 points/each if the robot collects color bottles (random colors) to the barrel.

Attention:

Task in the single round competition can be divided into three scoring stages:

Stage Ⅰ (Collection): The robot returns to ground floor base with color bottles, which can be seen as getting the color bottles and winning 10 points/each. However, if contestants contact the robot with color bottles outside base in this process; then

task is considered as failed. It follows corresponding point penalty and the color bottles will be kept by referee.

Stage Ⅱ (Carry): After robot leaves ground floor base with color bottles, if contestants contact robot outside base, aparting from penalty points, contestants can make the robot return to ground floor base with color bottles and leave again at any time. In this case, the points they've got is still valid.

StageⅢ(Placement): If contestants contact robot outside base after robot leaves second floor base with color bottles, there will be corresponding penalty points, beyond that, contestants can make the robot return to second floor base and leave again at any time; then the points they've got is still valid. The score of this stage is invalid if the barrel is separated from its base slab.

Anyway, contestants must hand color bottles they have got over to referee when the competition comes to end.

3. Coordinate of Task Model

3.1 Location of Task Models

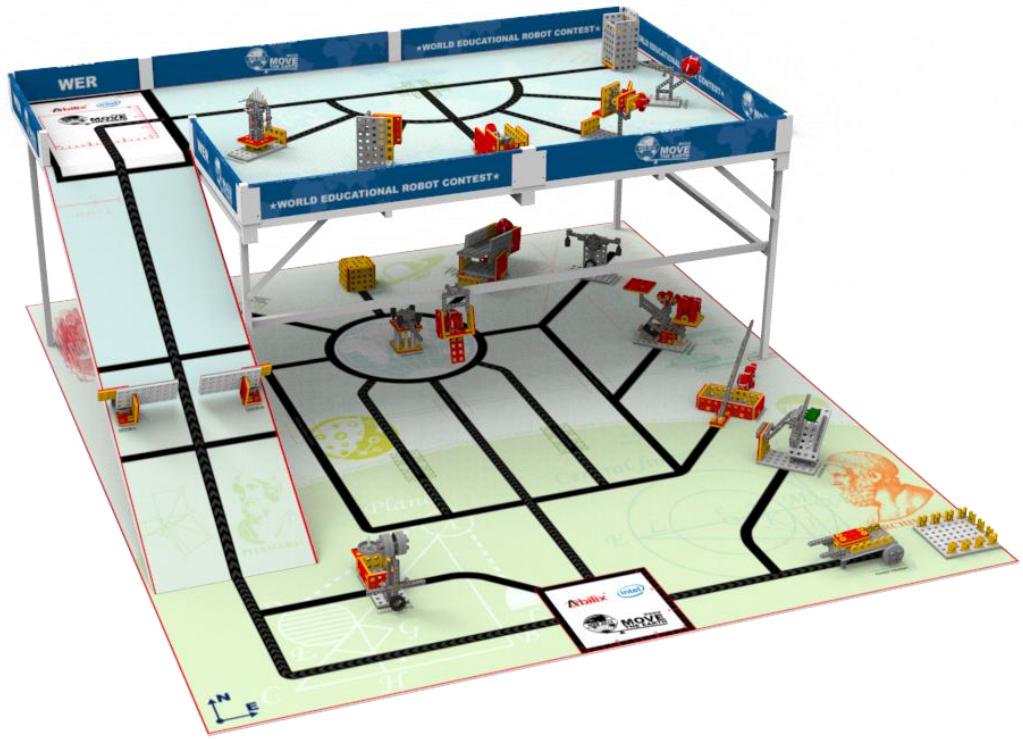


Figure 12 Effect Picture of Arena (Task model included)

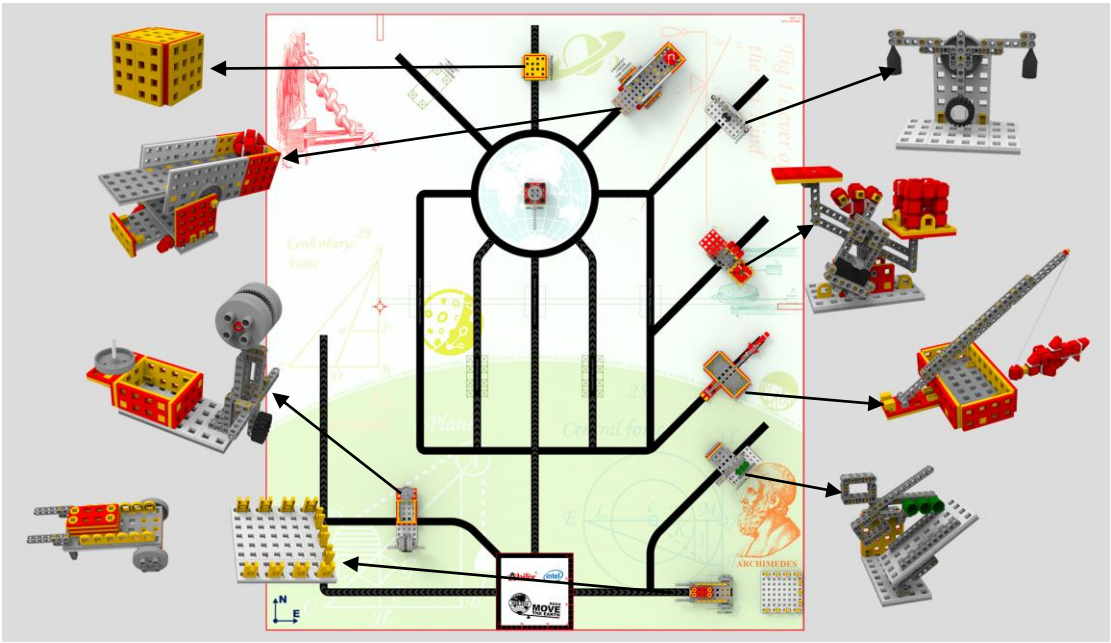


Figure 13 Location of Task Model in ground floor

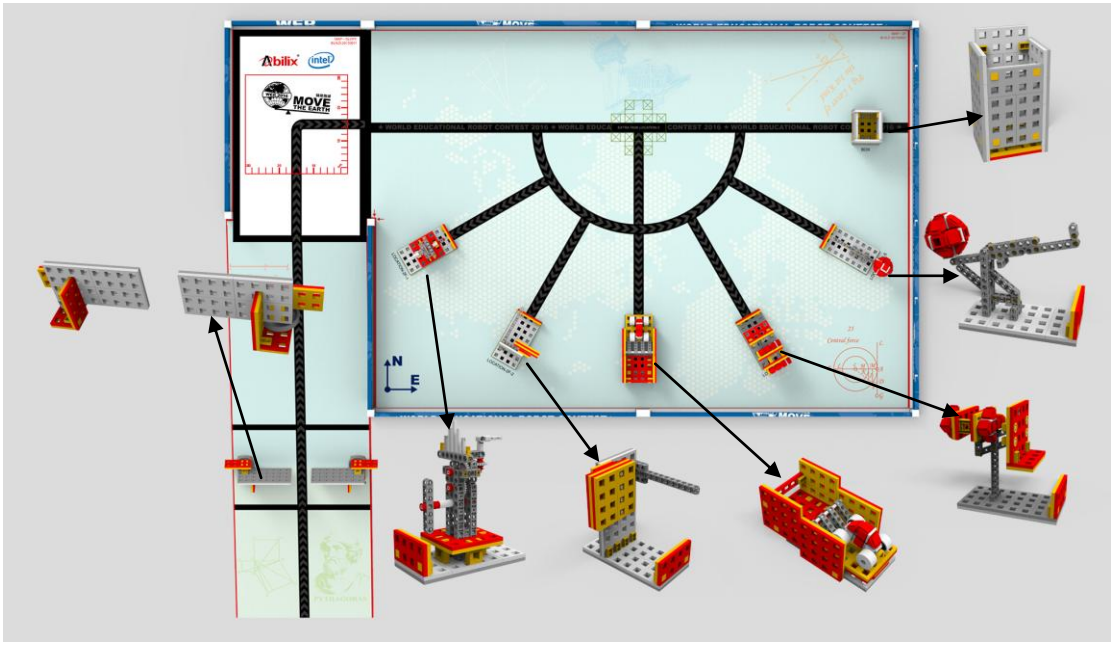


Figure 14 Location of Task Model in Second Floor and Slope

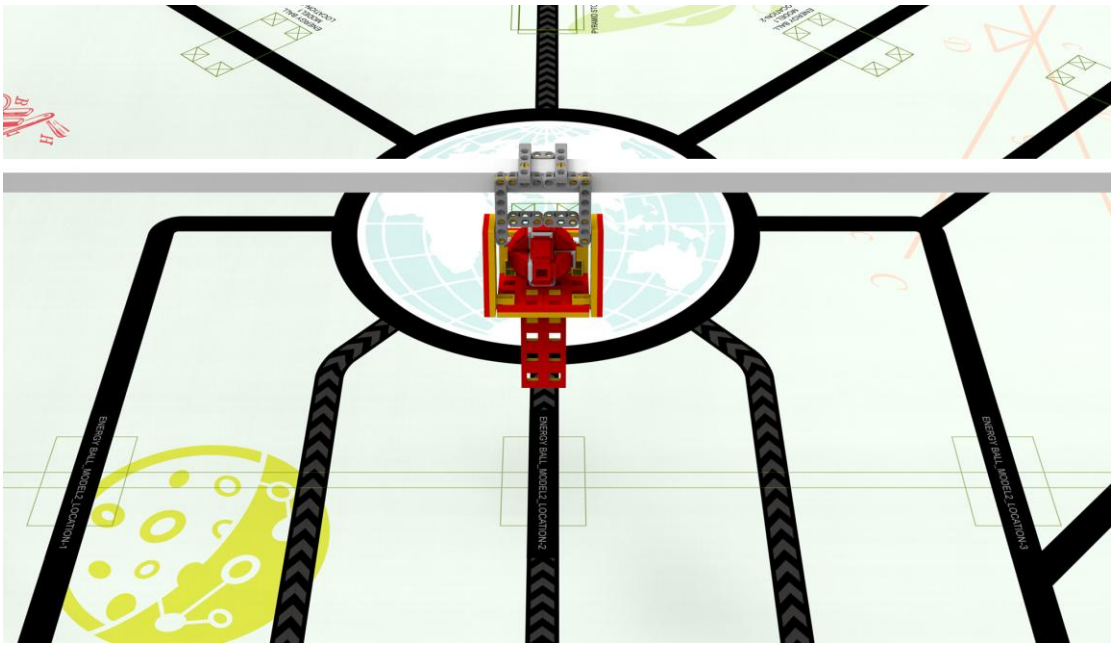
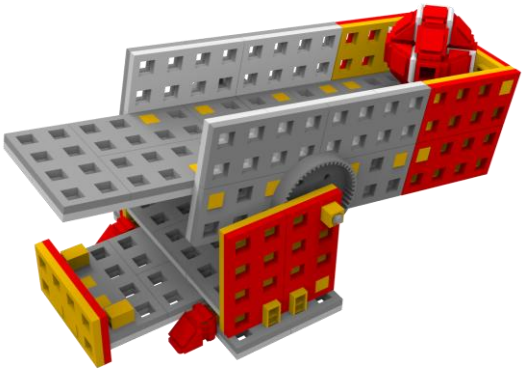
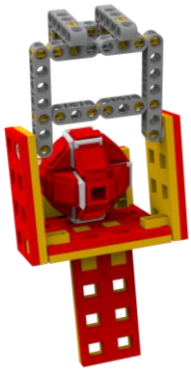
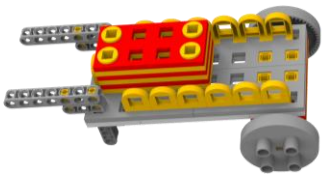
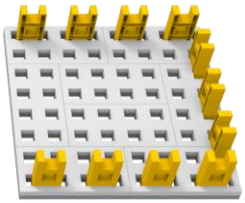
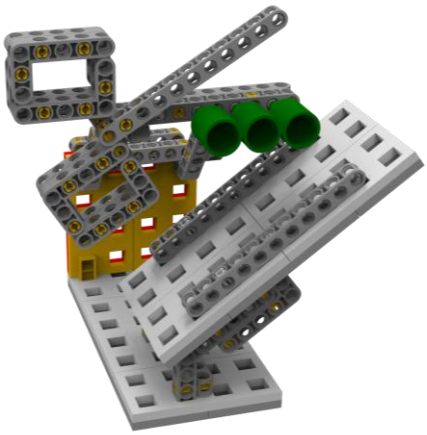


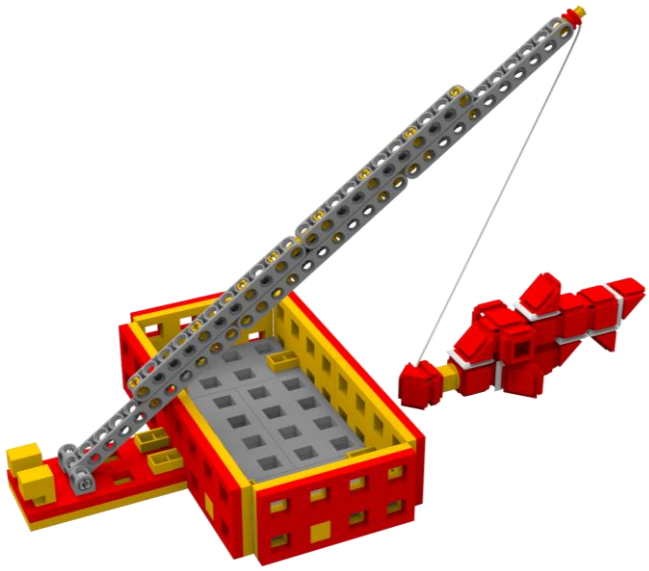
Figure 15 Location of Task Model in Beam

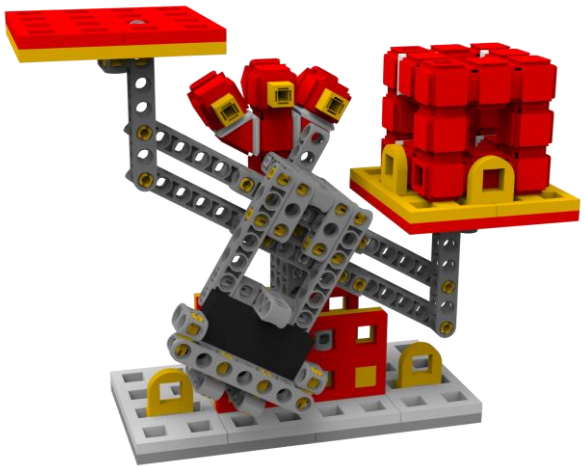
3.2 Location Label of Task Model-General Table

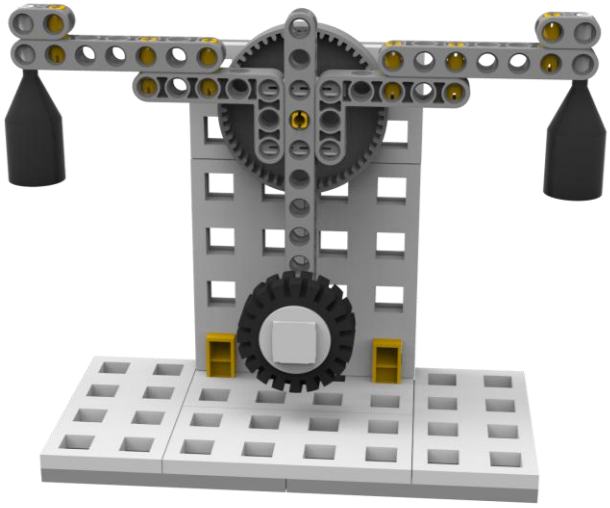
Task 1-Model 1	
Location Label ENERGY BALL MODEL1 LOCATION-1 ENERGY BALL MODEL1 LOCATION-2	
Task 1-Model 2	
Location Label ENERGY BALL_MODEL2_LOCATION-1 ENERGY BALL_MODEL2_LOCATION-2 ENERGY BALL_MODEL2_LOCATION-3	

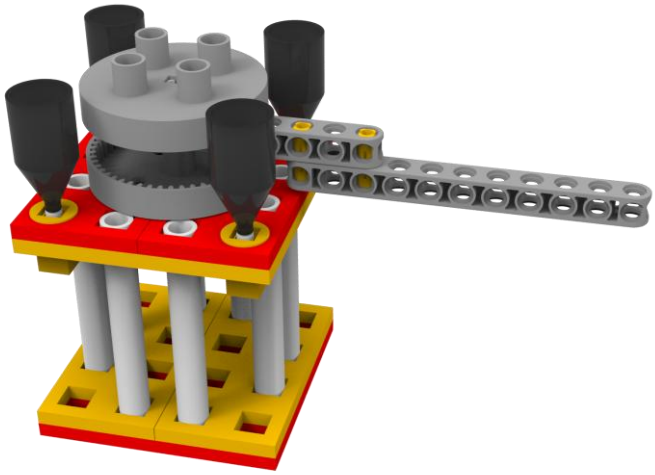
Task 2	
Location Label Ancient Handcart	 

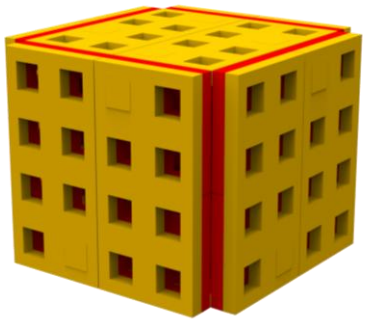
Task 3	
Location Label LOCATION-1F-1 LOCATION-1F-2 LOCATION-1F-3 LOCATION-1F-4 LOCATION-1F-5	

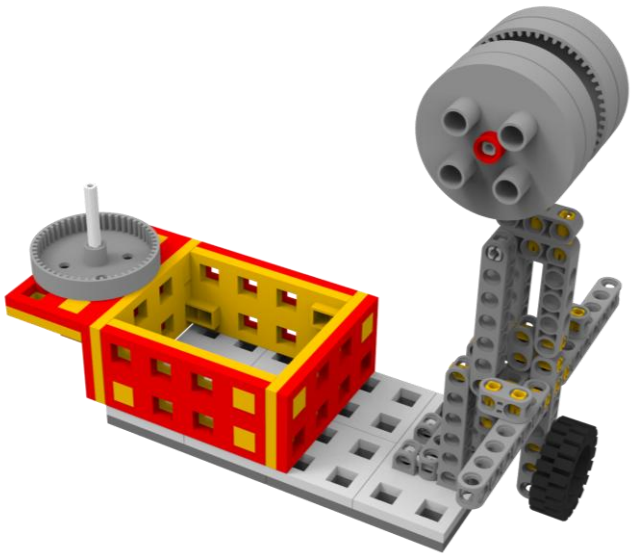
Task 4	
Location Label LOCATION-1F-1 LOCATION-1F-2 LOCATION-1F-3 LOCATION-1F-4 LOCATION-1F-5	

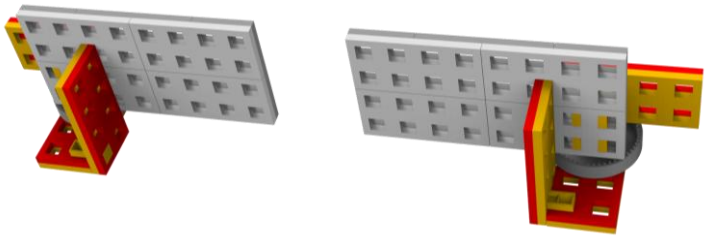
Task 5	
Location Label LOCATION-1F-1 LOCATION-1F-2 LOCATION-1F-3 LOCATION-1F-4 LOCATION-1F-5	

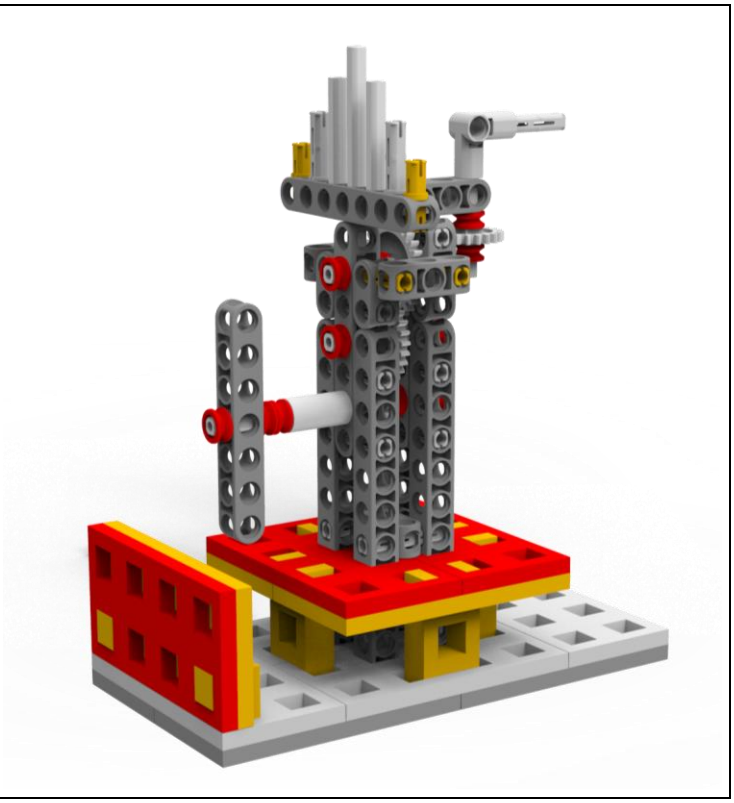
Task 6	
Location Label LOCATION-1F-1 LOCATION-1F-2 LOCATION-1F-3 LOCATION-1F-4 LOCATION-1F-5	

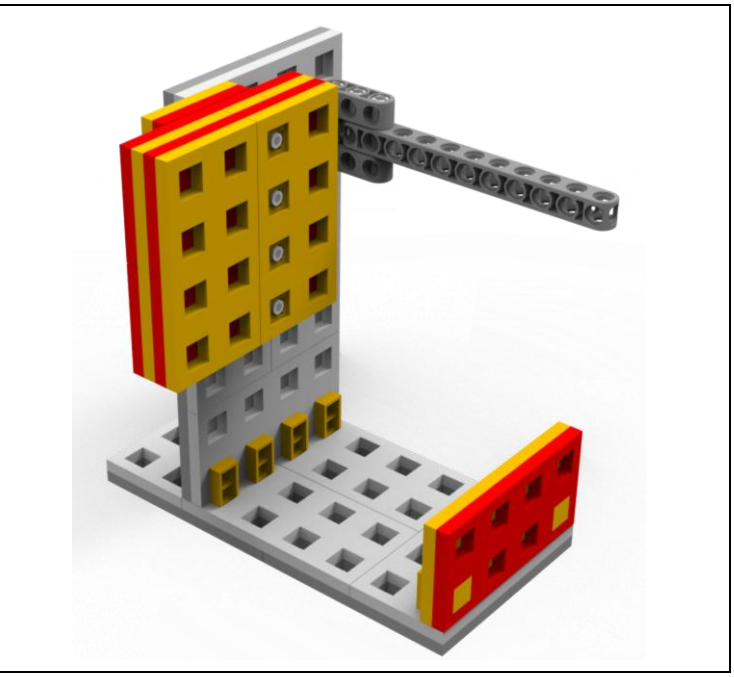
Task 7	
Location Label MILLSTONE	

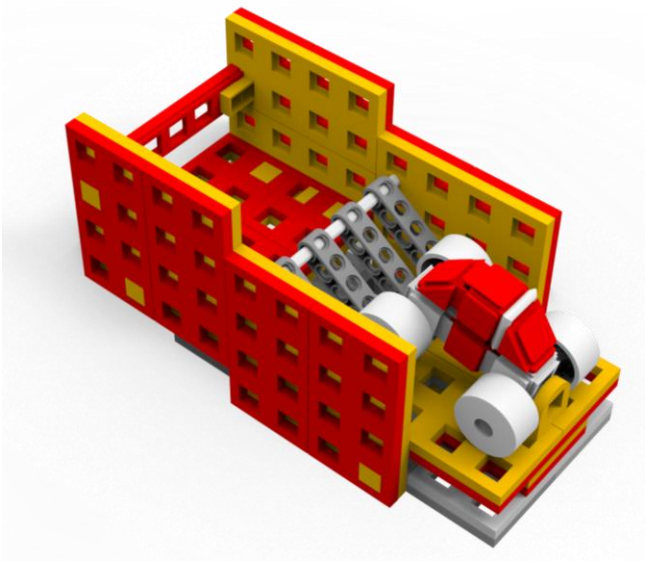
Task 8	
Location Label Rock	

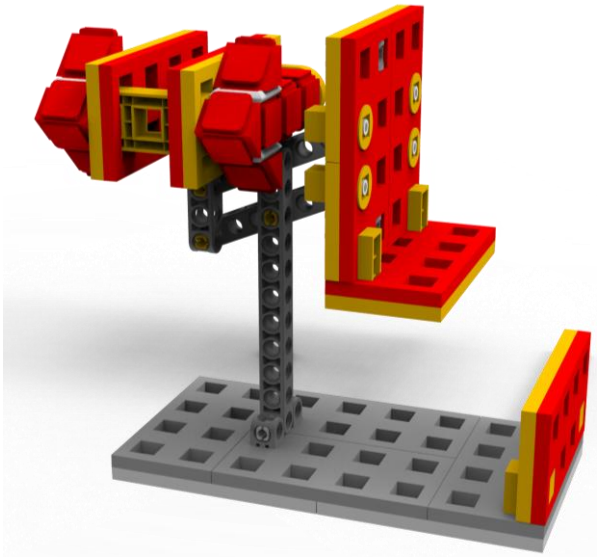
Task 9	
Location Label LOCATION-1F-1 LOCATION-1F-2 LOCATION-1F-3 LOCATION-1F-4 LOCATION-1F-5	

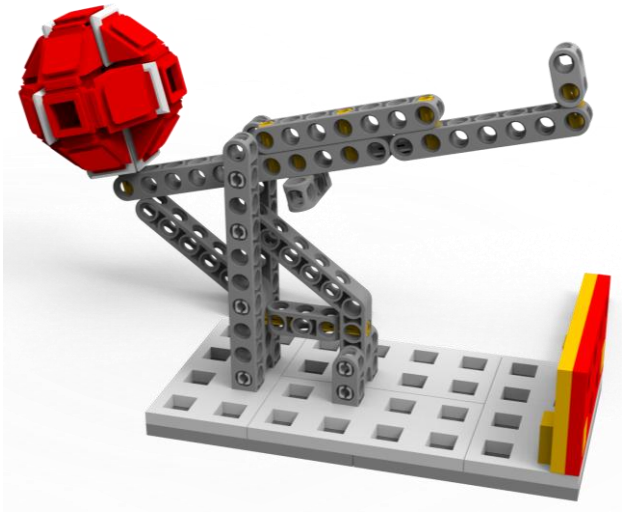
Task 10	
Location Label DOOR-L&DOOR-R	

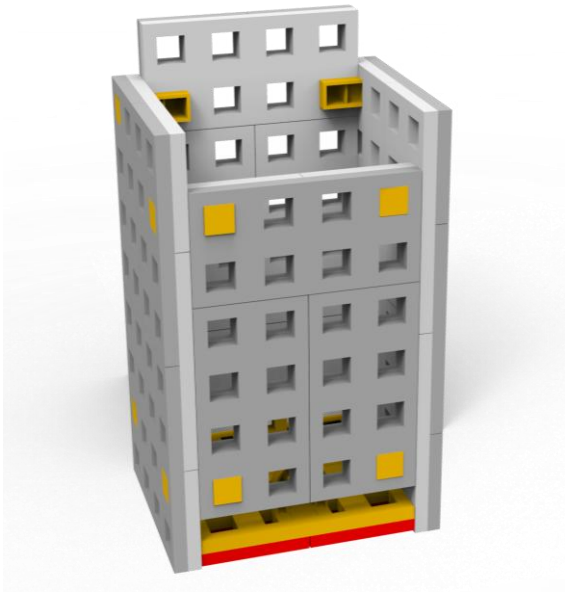
Task 11	
Location Label LOCATION-2F-1 LOCATION-2F-2 LOCATION-2F-3 LOCATION-2F-4 LOCATION-2F-5	

Task 12	
Location Label LOCATION-2F-1 LOCATION-2F-2 LOCATION-2F-3 LOCATION-2F-4 LOCATION-2F-5	

Task 13	
Location Label LOCATION-2F-1 LOCATION-2F-2 LOCATION-2F-3 LOCATION-2F-4 LOCATION-2F-5	

Task 14	
Location Label LOCATION-2F-1 LOCATION-2F-2 LOCATION-2F-3 LOCATION-2F-4 LOCATION-2F-5	

Task 15	
Location Label LOCATION-2F-1 LOCATION-2F-2 LOCATION-2F-3 LOCATION-2F-4 LOCATION-2F-5	

Task 16	
Location Label Barrel	

Attention:

The location label with blue background is the initial position of the task model. In some region contests, model may appear in the location label of the same type.

3.3 Location Label of Task Model-Drawing Lots

Technical ground from organizer draws lots with the following four labels. When it's done, models will be fixed, with their orientation referring to "Orientation Mark" (Black on red) in "Model Fig" in " 2. Task.

ENERGY BALL MODEL1 LOCATION-1
ENERGY BALL MODEL1 LOCATION-2

ENERGY BALL MODEL2 LOCATION-1
ENERGY BALL MODEL2 LOCATION-2
ENERGY BALL MODEL2 LOCATION-3

LOCATION-1F-1
LOCATION-1F-2
LOCATION-1F-3
LOCATION-1F-4
LOCATION-1F-5

LOCATION-2F-1
LOCATION-2F-2
LOCATION-2F-3
LOCATION-2F-4
LOCATION-2F-5

World Educational Robot Contest(WER) Innovation Contest Arena Task-Model Location-Drawing Lots Recording Sheet(2016)			
Label Type	Task No		Result
ENERGY BALL MODEL1 LOCATION	Task 1	Model 1	
ENERGY BALL MODEL2 LOCATION		Model 2	
LOCATION-1F	Task3		
	Task4		
	Task5		
	Task6		
	Task9		
LOCATION-2F	Task11		
	Task12		
	Task13		
	Task14		
	Task15		

4. Location of Extra Task Models

EXTRA TASK LOCATION-1
EXTRA TASK LOCATION-2
EXTRA TASK LOCATION-3

Attention:
Extra task may not be set in some regions tasks. If there is, the model location adopts the above three types.

5. Score Sheet

World Educational Robot Contest(WER) Innovation Contest Arena Task-Score Sheet(2016)				
Serial Number		Primary Division □ Junior High Division □ Senior High Division □		
Team Name/Organization Name				
Energy Ball	30*___(1-2)	The vertical projection of the ball projects to ground floor.		
Ancient Handcart	30 □	The grain touches the barn (base slab and fence included), with arena not touched by any part of the grain, while part vertical projection falls on the arena.		
	50 □	The grain touches the barn, and all its vertical projection entirely falls on the warehouse (base slab and fence included).		
Scissors	10*___(1-3)	The color bottles are completely detached from the magnet.		
Grand Duke Jiang Fishes	40 □	Part vertical projection of the fish falls inside the basket (Area inside the outer contour is seen as part of the basket; the base slab for fixing fishing rod doesn't belong to the basket), while any part of the fish hasn't touched the arena.		
	60 □	All the vertical projection of the fish casts inside the basket (Area inside the outer contour is seen as part of the basket; the base slab for fixing fishing rod doesn't belong to the basket).		
Weight Control	30 □	The pointer points to the middle scale.		
	60 □	The pointer points to the left or left middle.		
Game of Balance	20*___(1-2)	Color bottle is completely separated from the magnet.		
Millstone	10*___(1-4)	Color bottle is completely separated from the magnet.		
Moving Rock	50 □	The vertical projection of rock touches ground floor.		
Catapult	40 □	The rubber ring falls inside the basket.		
	60 □	The rubber ring hitches the pillar (hanging on the top is also included).		
Door Kicker	30*___(1-2)	The door is opened large enough and kept opened.		
Gear Transmission	30 □	The pointer points to critical point or between critical point and 30 points.		
	40 □	The pointer points to 30 points or between 30 and 40 points.		
	50 □	The pointer points to 40 points or between 40 and 50 points.		
A Labor-saving Crowbar	30 □	The slab is completely divorced from the wall (base slab not included).		
Mountain Climbing	40 □	Four wheels hit the bottom of the pit at the same time.		
Emergence	50 □	The arrow is overtly exposed.		
Move the Earth	50 □	The end of the lever where the earth is located is separated from the support.		
Treasure Hunt	10*___(1-9)	Robot collects the color bottles (random colors) to the ground floor.		
	20*___(1-9)	Robot collects the color bottles (random colors) to the second floor.		
	30*___(1-9)	Robot collects the color bottles (random colors) to the barrel.		
Extra Tasks	_____	See Arena Notice for more		
Marked with the strokes of character "正"			-20 points/each	Robot returns to base and sets off again.
Time used for completing tasks (Extra task included)			Single round score	
Sign by the referee			**Sign by the contestant**	

6. Contacts and Interpretation

Please contact Federation of World Educational Robot (FWER) if you have any doubt or suggestion to this rule.
Email: rules@wercontest.org
Federation of WER reserves all the right for final explanation.