



Rules for qualifying competition 2023

Engineering physics' Robot competition

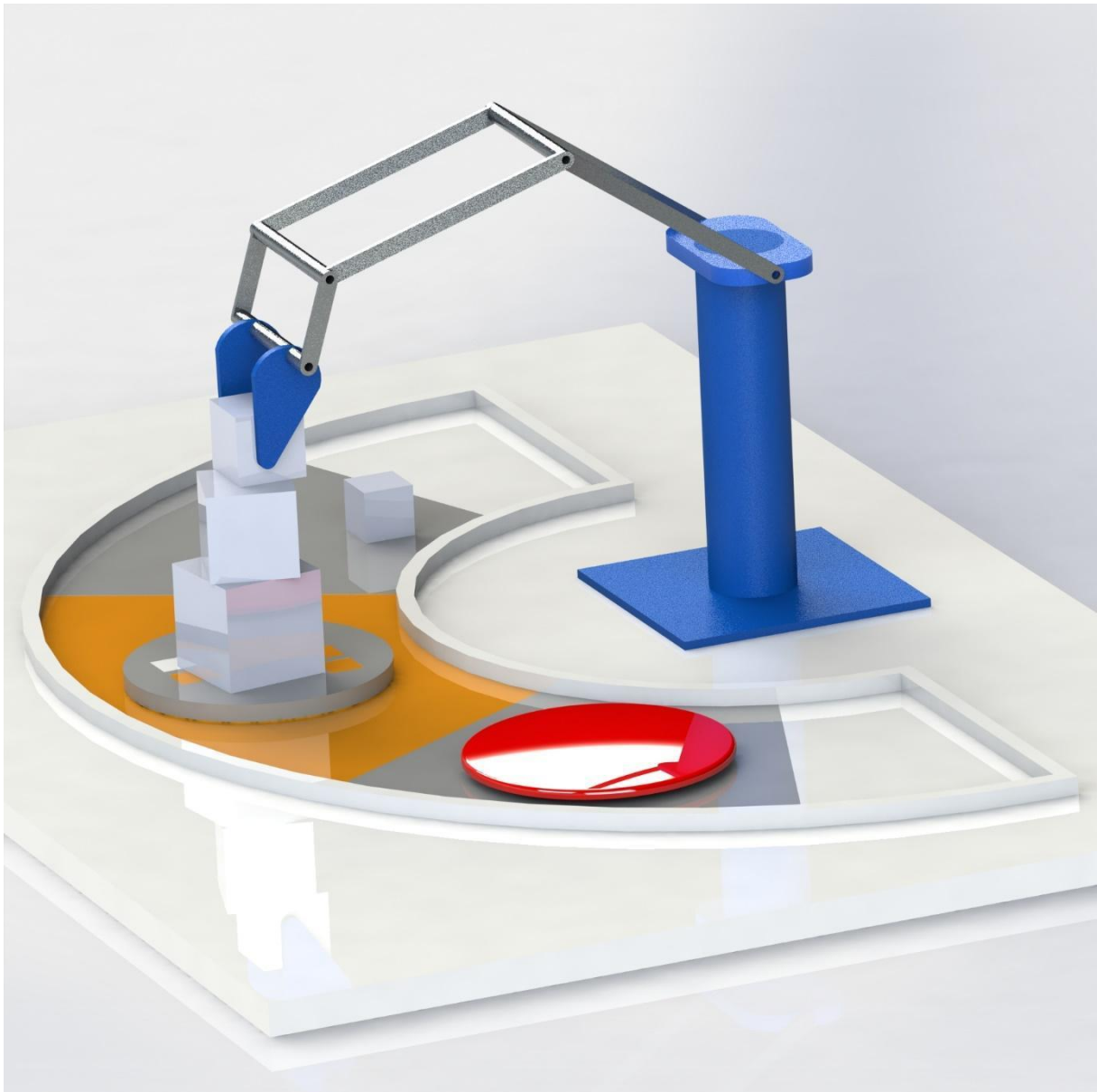




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1 Description of competition

The qualifying competition involves using a robot arm to stack 5 blocks as high as possible in the shortest possible time, plus any bonus block. The blocks will be cubic with different sizes (2-6 cm), this includes the bonus block whose geometry will be within these limits, however it will not be cubic. Between each stacked block, the team must press, with the robot, a button to get a spilt time. One block = 1 point. The team's position is determined first by the number of points then by the fastest time, i.e. the highest tower in the shortest time wins! Contestants have 3 minutes to complete the task. The top 8 teams advance to the main competition.

The bonus block will be worth 2 points, and will be of such a shape that it must be placed at the top of the tower.

2 Equipment

To complete the task, each team receives the following equipment from the competition management.

1. 3 servo motors with 15 kg·cm
2. 1 small servo
3. 1 Arduino board (Romeo)
4. 1 handheld controller
5. 1 power supply to the Arduino board
6. 1 USB cable to the Arduino board

New for this year is that each team has the opportunity to pick up a robot arm kit containing parts to start building. There is also example software for controlling the arm.

All teams will also have access to Engineering physics' 3D lab where there are 3D printers, soldering equipment, tools, building materials, servo extension cables, etc...

Apart from the restrictions on electrical components, there are no restrictions on which construction materials the teams may use.





3 Restrictions

3.1 Components

You may only use the electrical components provided by the competition management, with the exception of:

1. Cables
2. LEDs
3. Resistors
4. Power switches

If there are other electrical components that you wish to use, contact the competition management and the list of exceptions may be extended. The list will be continuously updated on the competition page during the course of the competition. If a team uses non-approved components, it may result in point deductions or disqualification.

3.2 Design of the robot

The design of the robot to solve the task must be original. This means that the team cannot take a finished design of, for example, a robot arm and call it their own design of robot. A clear example that is okay is if the team buys Lego, builds and designs their robot from it. But if the team builds the robot with Lego based on a finished drawing, this is not okay. It is okay to use ready-made designs of sub-components such as gears, mechanical joints, etc. If in doubt, contact the competition management. **Exceptions for this year are the robot arms kits obtained from competition management.**

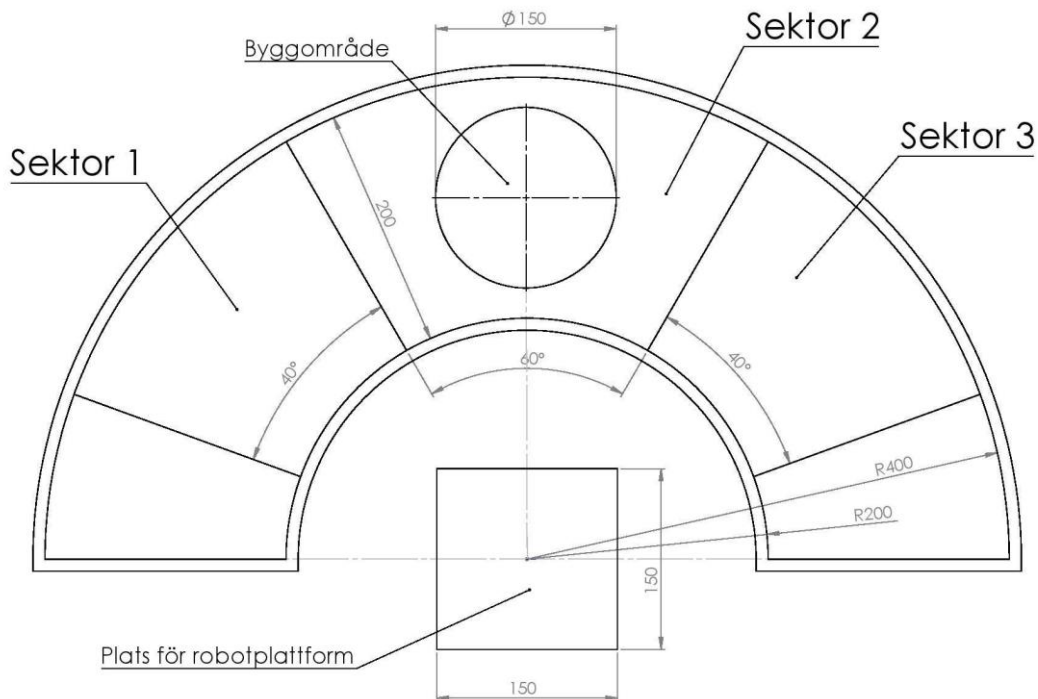




4 Competition course

The competition course as seen from above is depicted in Figure 1 and consists of three different sectors. The robot must be able to reach everything within the given dimensions in sector 1, sector 2 and sector 3. The competing teams will not be told in advance where in sector 1 the button is located, where in sector 2 the construction area is located or how and where the blocks are located in sector 3.

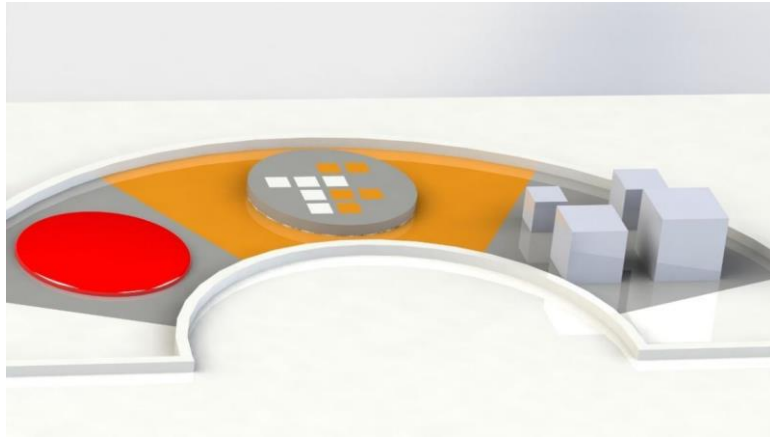
In Figures 1-4, placement of the building area, blocks and button design are only examples; only the sectors are fixed. Therefore, it is important that the robot can reach all parts in the different sectors of the course. Assembly of the robot's platform must be done at the location of the robot platform.



Figur 1. Course seen from above. The button is located in sector 1. The blocks must be stacked in the building area in sector 2. The blocks will be placed in sector 3 at the start of the competition. The base of the robot must be placed in the robot platform location. The lengths in the figure are expressed in millimeters.

Figures 2-4 are renderings of how the course may look. The button is the red round circle in sector 1, the building area is where the circle with the TF logo is seen in sector 2, and the blocks are located in sector 3.





Figur 2. Course seen from the point of view of the robot.



Figur 3. Robot arm on the course.



Figur 4. Robot stacking blocks on the TF-logo in sector 2.





5 Blocks – Size, weight, and placement

The blocks that the teams must stack will have a side length of between 2-6 cm and weigh up to 55 grams. The weight and size of each type of block is specified in the table below. The blocks will be placed somewhere in Sector 3 when the team's turn begins. The distance between the blocks will be at least 2 cm. The placement of the blocks will be the same for all teams, but the teams may not, before their playing time begins, in any way gather information (measure, take photos, etc.) about how the blocks are positioned to gain an advantage.

kloss	Storlek	Vikt
1	2x2x2 cm \pm 0.1 cm	5 g \pm 5 g
2	3x3x3 cm \pm 0.2 cm	10 g \pm 5 g
3	4x4x4 cm \pm 0.2 cm	20 g \pm 5 g
4	5x5x5 cm \pm 0.2 cm	35 g \pm 5 g
5	6x6x6 cm \pm 0.2 cm	50 g \pm 5 g

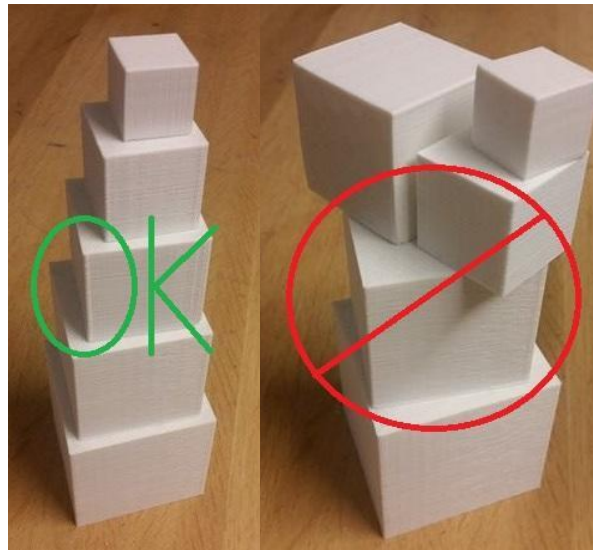
6 Clarification and additions

6.1 Stacking of blocks, split times, and button

The blocks must be stacked one at a time on the construction site. An approved example and a NOT approved example can be seen in Figure 5.

After each block, the team must press the button with the robot arm to get a split time. When the team presses the button, ONLY the blocks may be in the building sector (sector 2). This means that no parts of the robot arm or other objects (e.g. Glue, rubber mats, etc.) may be in that sector for the split time to be valid. Exceptions for parts in the construction sector can be made in the case of a broken robot if the parts do not give an advantage to the team; the competition management assesses whether it gives an advantage. If the team presses the button more than once, then the last time is counted until the robot arm is outside the button sector (sector 1); then the time they got is safe. If the robot happens to double tap the button when the last block (block 5) is stacked, the best time is counted.





Figur 5. Example of an approved example of stacking the blocks on the left and an NOT approved way of stacking the blocks on the right.

6.2 Start

The robot arm should be placed in sector 2 at the start of the game. Time starts once the competition management gives the start signal.

6.3 Mounting of the robot platform on the course

The robot must be built and attached to a platform with the dimensions $150 \times 150 \pm 5$ mm. At the time of the competition, the teams may mount the platform in any way they choose at the location of the construction platform, indicated in figure 1. Remember to mount the platform in a stable manner. NOTE: tape and glue are not permitted. Competition management will provide two clamps for mounting.

6.4 Loose objects and robot parts on the course

The robot may start with loose objects in its gripper and, during the course of the game, leave objects on the course. But there cannot be any objects in the building sector when the button is pressed (see section 6.1).





6.5 Repairs of the robot

Should the robot break during the game, the team may repair the robot during the game. But the playing time is not paused. The repair of the robot must not be planned or improve the function of the robot compared to before the robot broke down. You are therefore not allowed to improve the robot's function during the course of the game.

6.6 Damage on the course

Any damage to the course of the blocks will result in immediate disqualification.

6.7 Blocks outside the course

If you happen to knock a block out of one of the sectors, only the robot can pick up the block if it reaches it. If the robot does not reach, the block is considered out of play.

6.8 Knocking over the tower

If the team knocks their tower over and starts rebuilding it, they don't need to press the button to get a new split time on the blocks they already got a split time on.

6.9 Controlling the robot

It is okay to control the robot in a different way than with the controller provided by the competition management, for example with another controller, keyboard, mouse or joystick. Mechanical steering is not permitted.





6.10 Modifying the hardware

It is NOT permitted to in any way change or rebuild the components (servos, hand controls, Arduino boards, etc.) that the competition management provides.

6.11 Assessment of placement

Example of how the placements might look after the qualifying competition. The 8 teams with the best placement (marked in green) advance to the main competition. The teams that are marked in red do not advance to the main competition.

The placements are thus first and foremost awarded based on the number of points, so a team that has stacked 4 blocks will always have a better placement than a team that has stacked 1 block plus the bonus block, regardless of what time the team has been given

Placering	Lag:	Antal poäng	Tid
1	Team3	4	2:20
2	Team 10	4	2:50
3	Team 1	4	2:55
4	Team 2	3	1:10
5	Team 5	2	2:30
6	Team 7	2	2:45
7	Team 6	1	1:10
8	Team 9	1	1:15
9	Team 8	1	1:30
10	Team 4	1	1:40

