

REPUBLIC OF TURKEY
MINISTRY OF NATIONAL EDUCATION
The General Directorate of Technical and
Vocational Education

14. INTERNATIONAL MEB ROBOT
COMPETITION
INDUSTRIAL ROBOTIC ARM
RULES

2020 – ŞANLIURFA

Rules

1. Robotic arm should have minimum 4 degrees of freedom (DoF). The number of DoF can be increased optionally (example figure 1)
2. All equipments (such as actuator, power supply, controller, driver etc.) are provided by competitors. Electric power will be provided in competition area.
3. Electric power is 220V and 50Hz. If competitors need lower voltage, they can bring their own equipments to reduce voltage.
4. Hydraulic ,pneumatic or electrical actuators on robotic arms can be used.
5. Joint axis will be controlled separately. In other words, axis can move independently. It is because DoF of robot will be tested.
6. Opening/closing gripper is not a DoF. It should be considered while calculating robot DoF.
7. Robot can be controlled manual or wireless. Autonomous work won't be accepted.
8. Workspace is maximum 1200 mm. Therefore, robot must not go out of this area when all joint angles are maximum . Robot must be placed in this area.
9. When robot grips the objects , it should inform this action with a light indicator (LED etc.) and audible warning (Buzzer etc.). In another word, light indicator will show and audible warning on , if robot catches any object. Only one indicator and audible warning is enough for all objects. Robots which don't have such functions will be disqualified.
10. Competitor places the robot in workspace. After the competition starts, it is not allowed to change its place or touch to robot.
11. Game starts when robot pushes chronometer button and lasts with same button.
12. After starting game, teams have to finish tasks in 8 minutes. Competitors will stop to operate their robots by instruction of judge which is "Time is up".
13. Each team can request only one technical break. During this break , teams can fix simple and basic problems or damages. Break is limited with 1 hour. End of break, team will continue its game from current task and time.

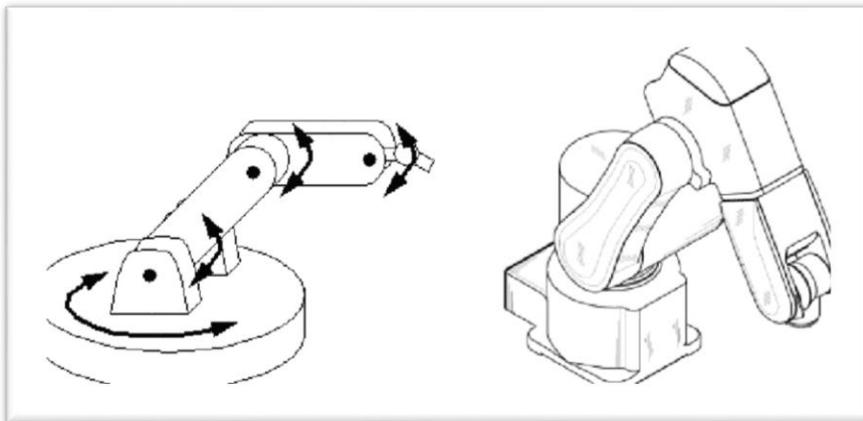


Figure 1- Sample Robot Arm

- 14) Robotic arm picks and places various objects (made by PLA plastic) to the platform which is shown at figure 2. Their dimensions are given at figure 3 and figure 4.

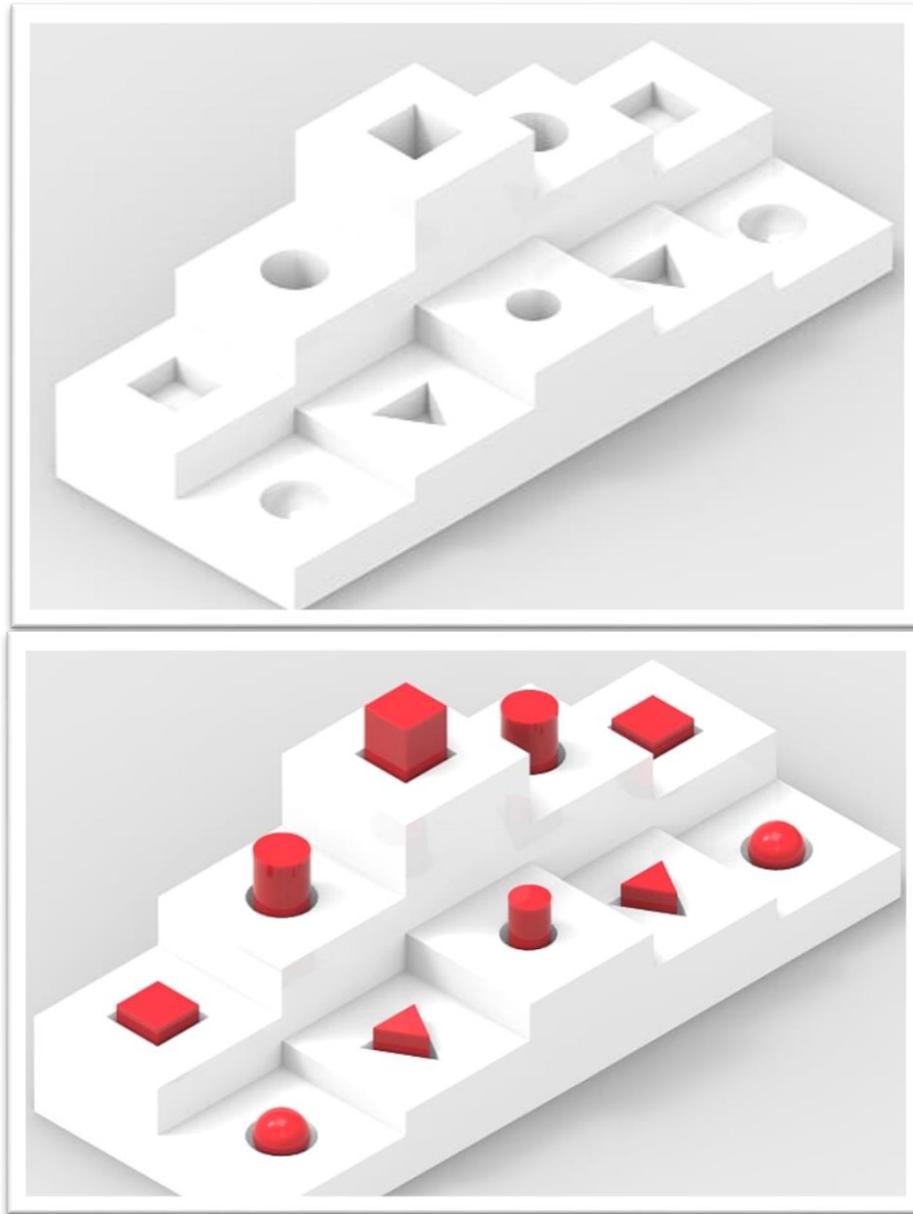


Figure 2- Platform and objects

Scoring

- 1) Ranking list is announced after all teams played. Top 16 teams on the ranking list will get chance to go final games. Teams will be sorted from best score in ranking list. In case of equal scores, their times will be taken into consideration. In final games, team which gets best score will be winner. Scoring table is explained at below
- 2) Winner is determined by calculating total scores considering two different criterions.
- 3) Each object is 10 points. Competitor gets 100 points totally if all objects are placed correctly.
- 4) Placement order is not important . The important one is to put the objects in correct places.
- 5) While robot is moving, If it causes to fall objects which were already placed, penalty (-5 points) is given to team. It is not allowed to take this object again.
- 6) While robot is carrying an object, If it drops this object down the workplace, it gets -5 points as a penalty. Competitor can take the object again and carry to platform. It is not allowed to take object if it is dropped second time.
- 7) Any damage to the platform made by robot or its operator will be disqualified.

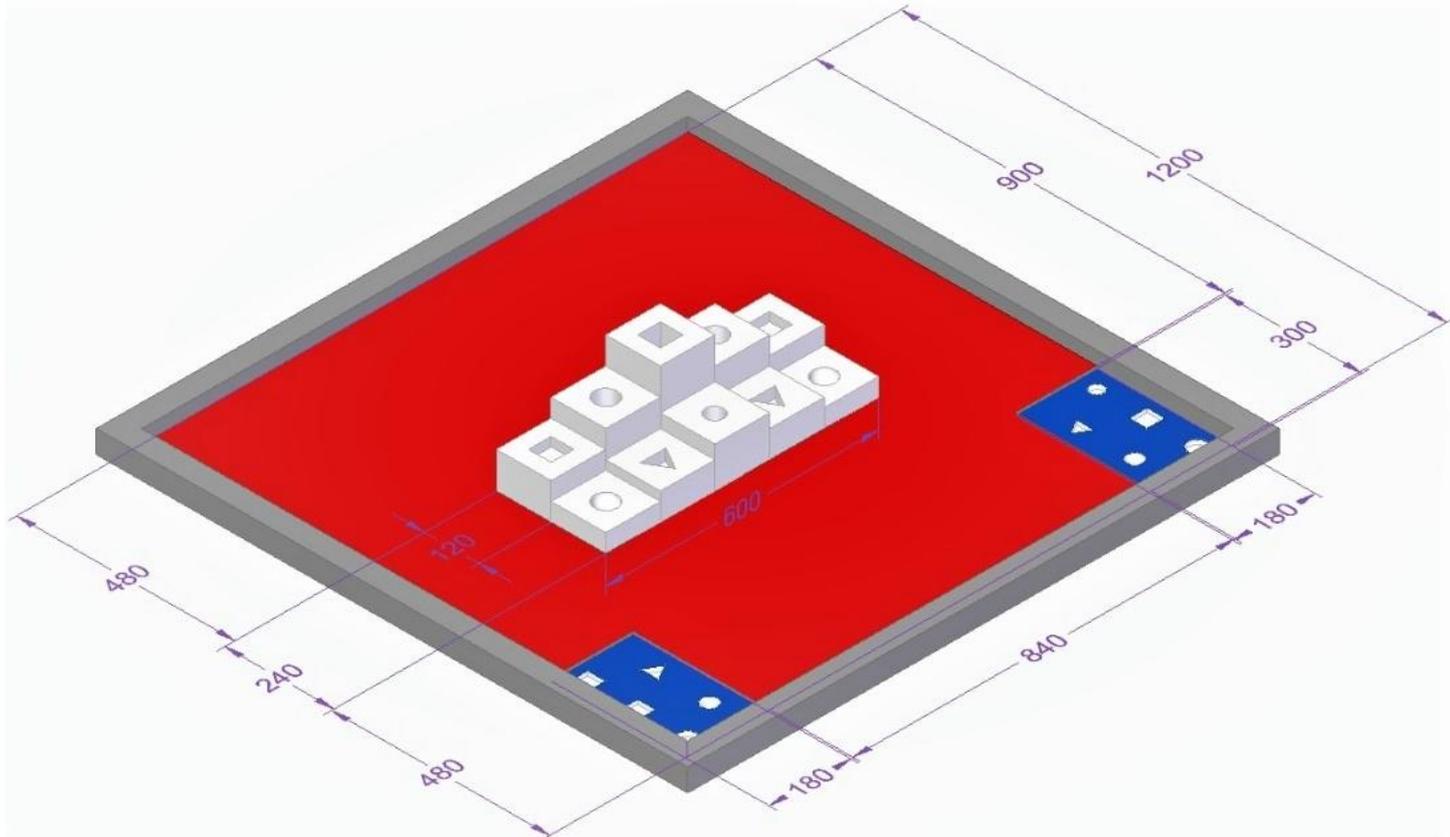
Total score will be calculated according to the following table.

Criterion	Percentage (%)	Calculation
Object placement score	85	0-100
Robot time	15	$\frac{\text{Best time in the contest}}{\text{Robot time}} \times 100$

Score: (%85 x object placement score)+(%15 x Robot time)

It is given dimension of ground,platform and objects at below.

- 1) Location of platform on red ground is given in figure-3. It is placed according to these given dimensions..
- 2) Red zone is working area, blue zones are first locations of objects to be placed. Any of these blue zones will be determined by drawing lots. Competitors can place their robots any where in red zone.



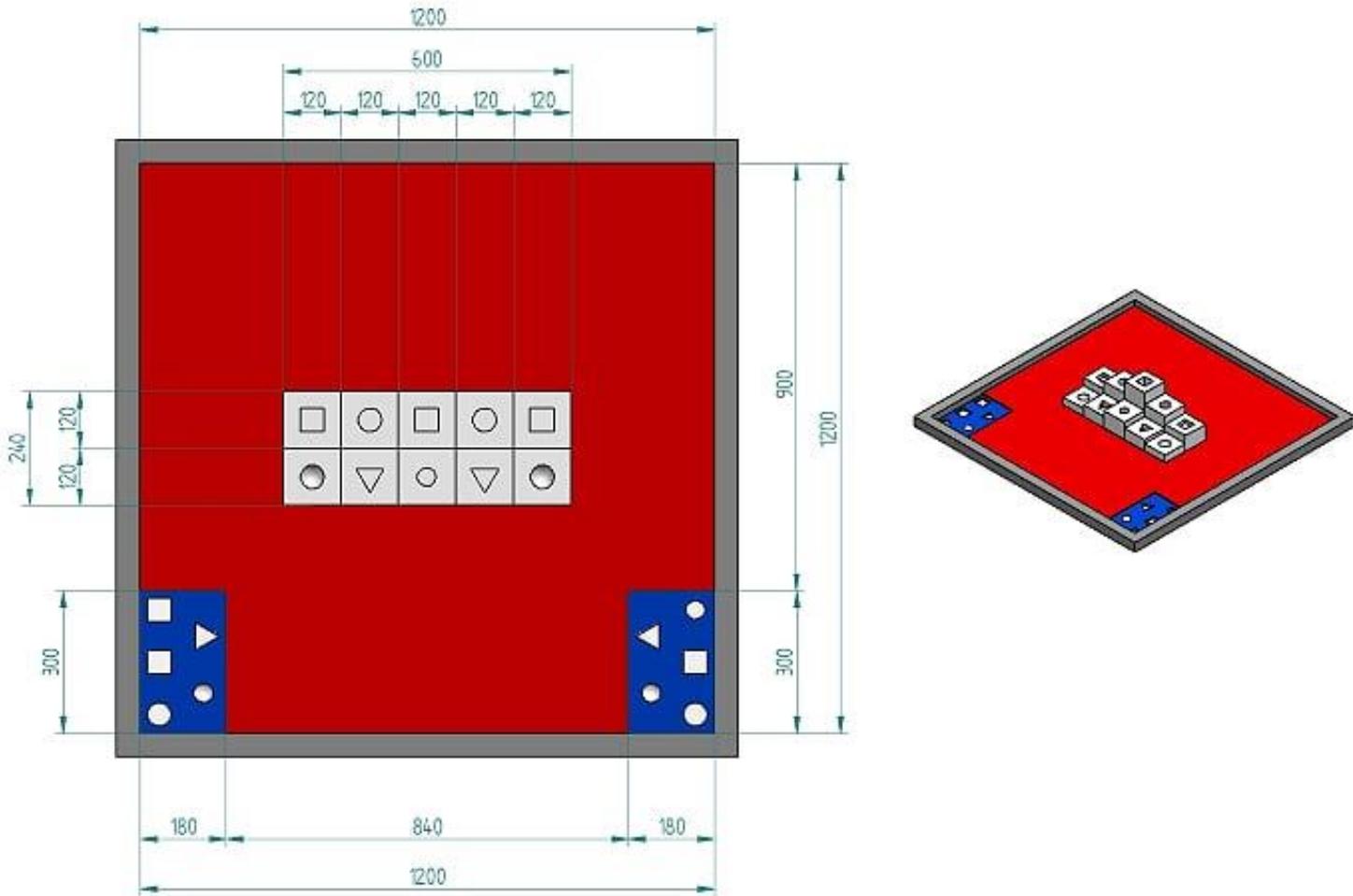


Figure 3- Location of Platform

3) Dimensions of blue zones given at figure 4a and figure 4b.

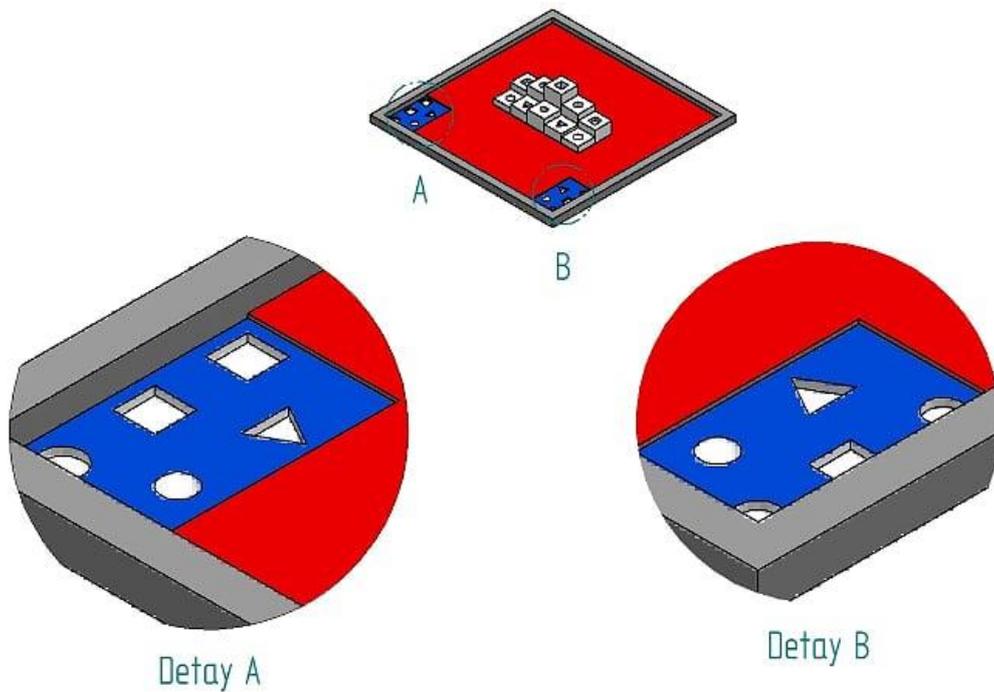
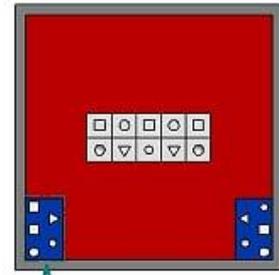
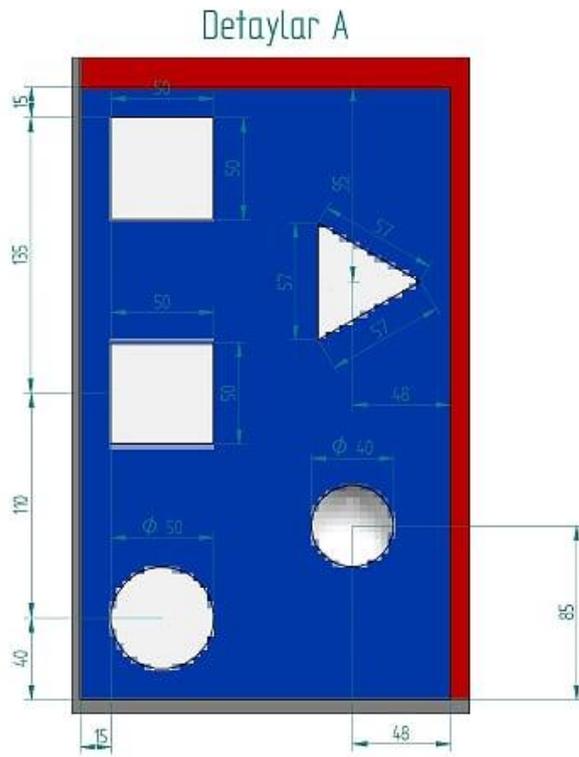
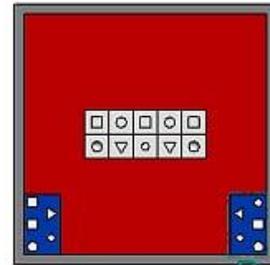
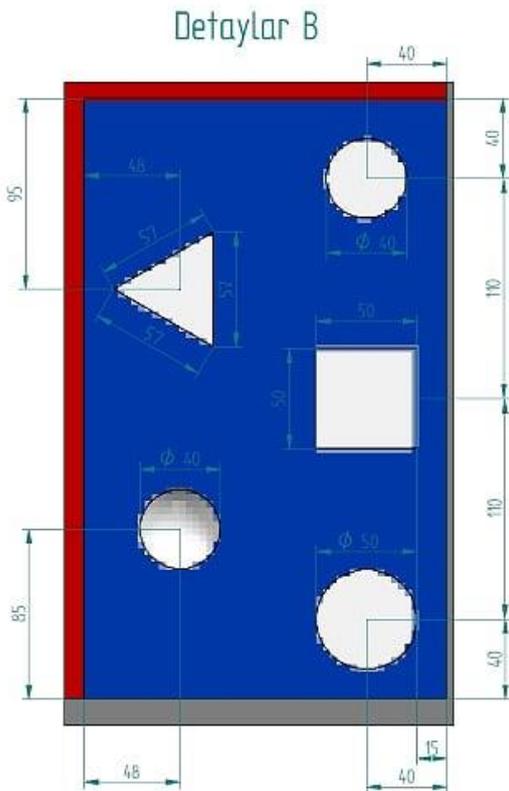


Figure 4a- Object placement zones (blue zones)



A

Derinlikler bütün yuvalar için 10mm



B

Derinlikler bütün yuvalar için 10mm

Figure 4b- Location of blue zones

4) There is only one platform to use in this competition and its dimensions are given at figure 5. Platform parts will be produced with 3D printer by using PLA material.

5) Platform consists of 10 parts. Dimensions given at figure 5.

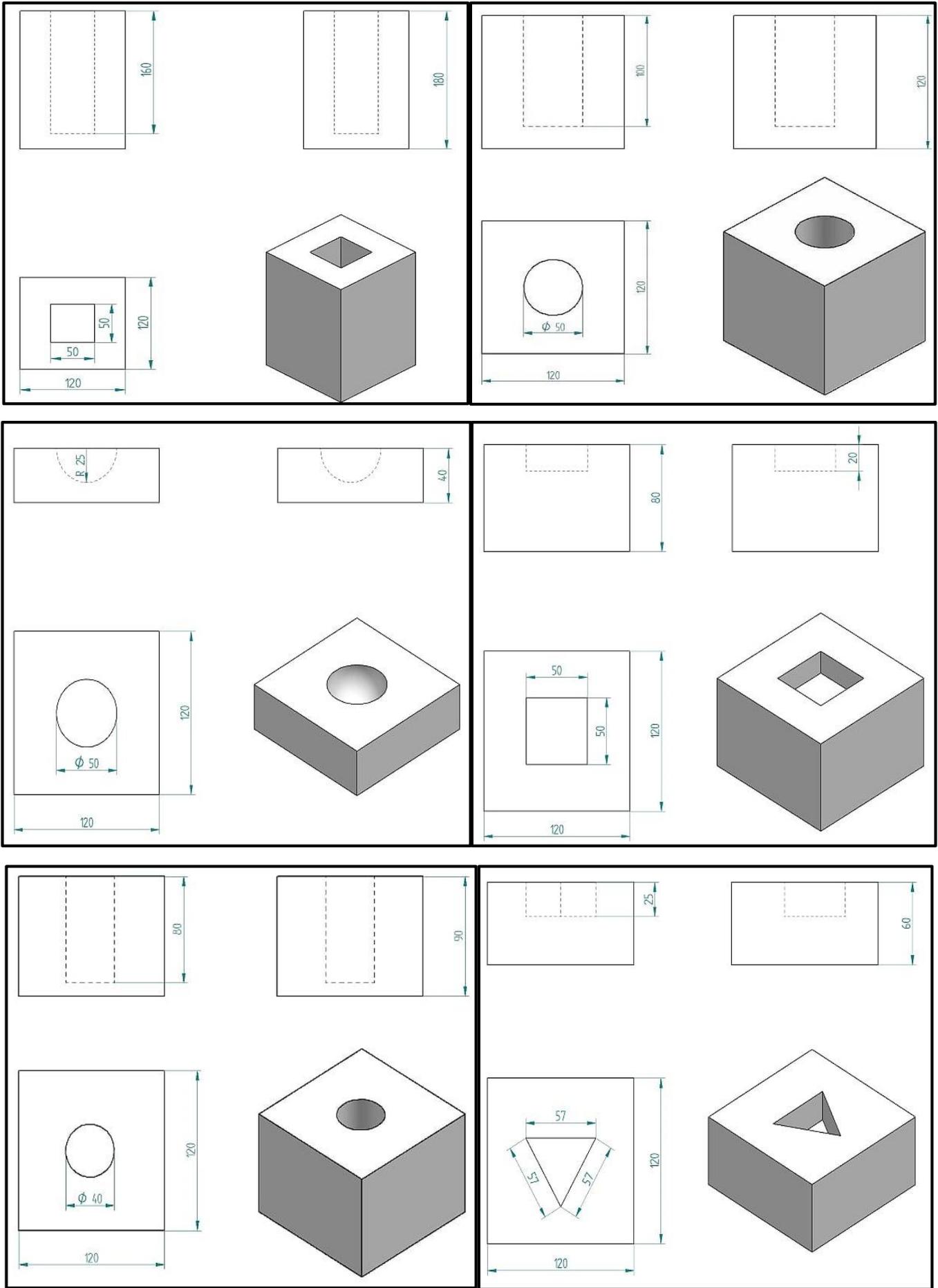


Figure 5- Platform dimensions

6) There are 6 objects to be placed on the platform. Dimensions are shown at figure 6.

7) Information about the weights of objects will not be given. As an additional information: Objects will be produced by using 3D printer with PLA material and %20 infill density.

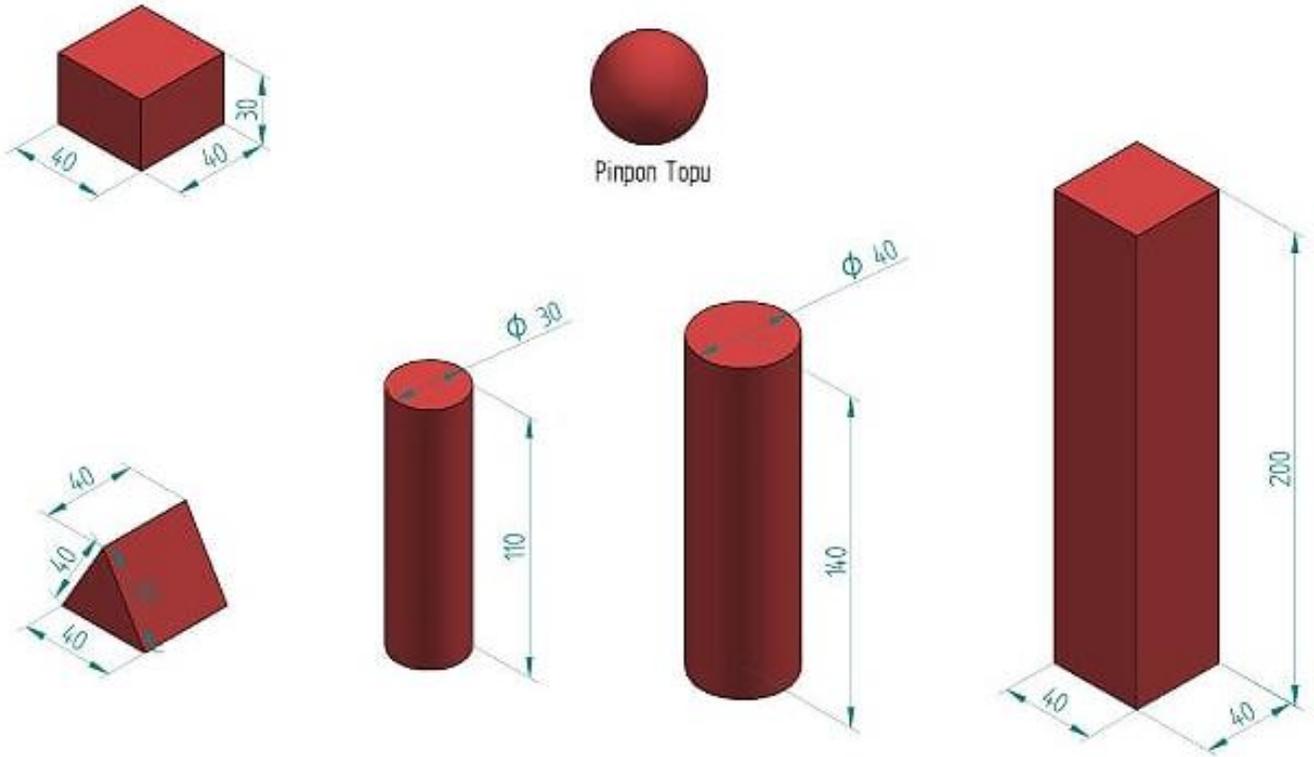


Figure 6- Objects