SLRC 2024 – Team RoboticGen Task Breakdown

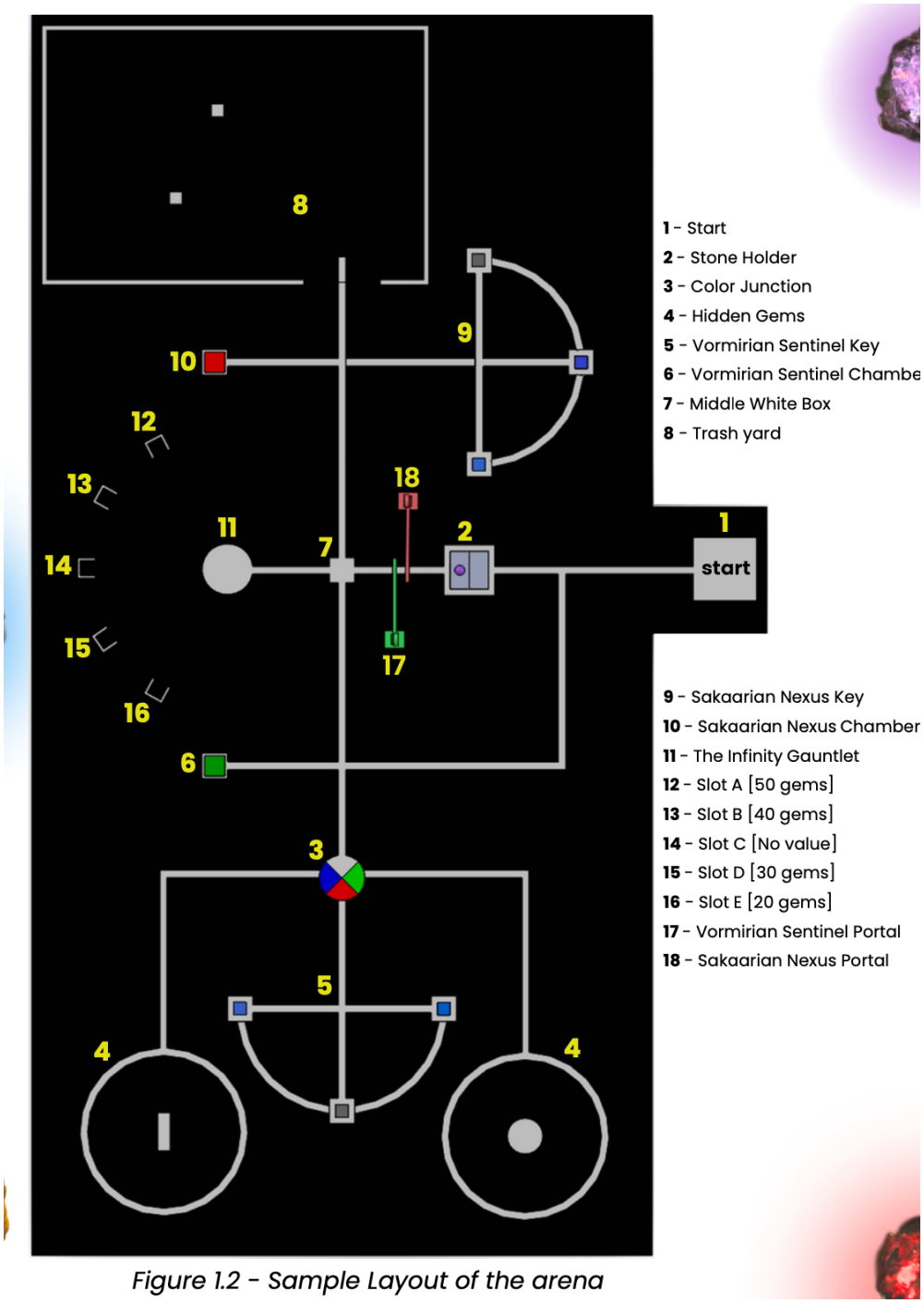
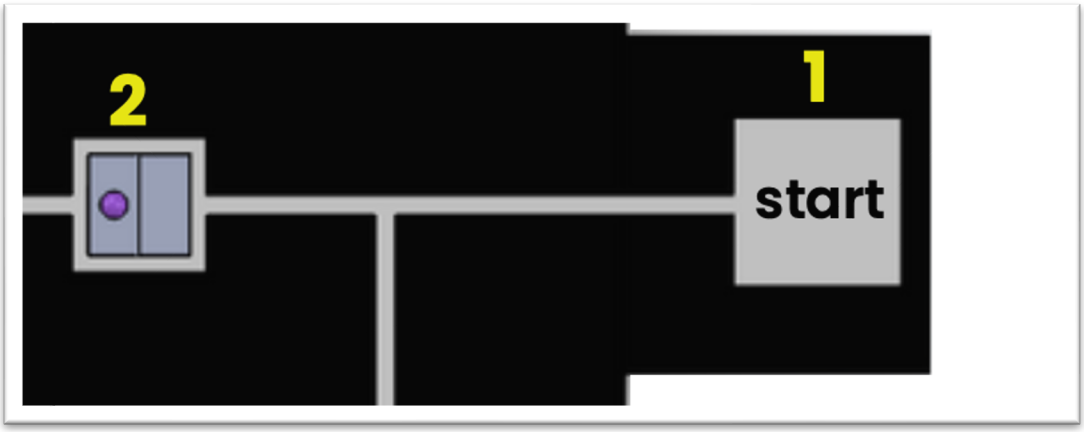


Figure 1.2 - Sample Layout of the arena

1 -

First, the robot should move straight and detect the color on the wall of the **stone holder** (Figure 1.2 - position 2). There can be only two possible colors, **Green** or **Blue** . Then, it should move to Planet A.



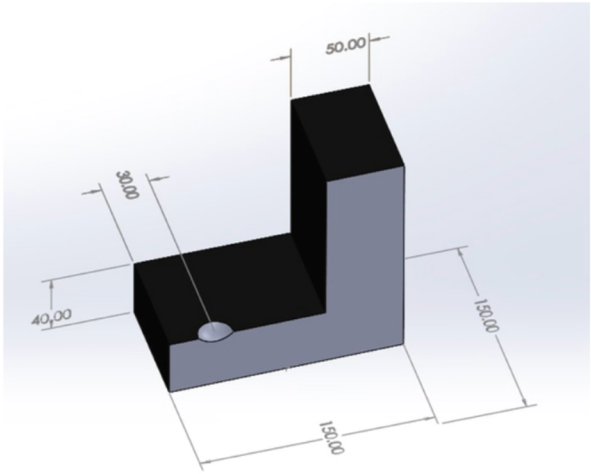


*Figure 1.11 - **Cross section** of Stone holder (dimensions in **mm**)*

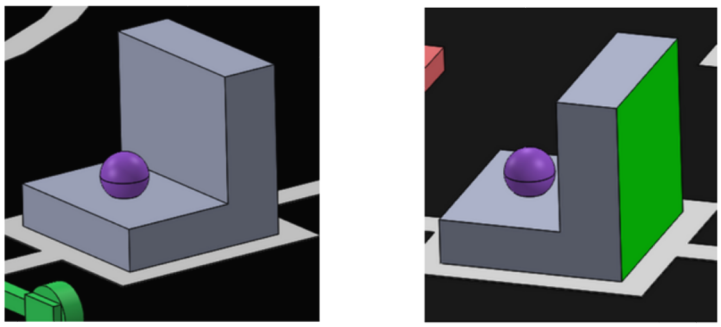
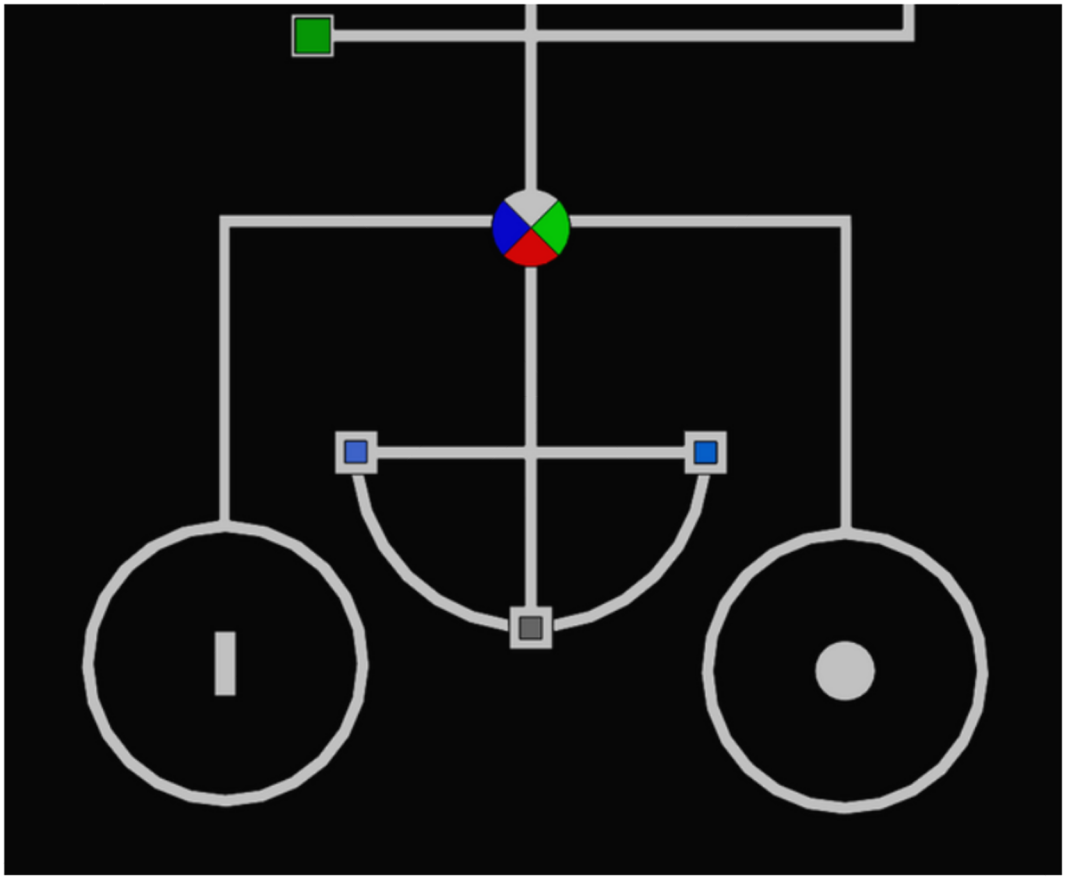


Figure - side view of stone holder

2 -

Planet A - Mountains in Vormir



Hidden Gems in the Mountain

- First, the robot should reach the junction consisting of 4 color sections (Figure 1.2 - position 3) shown in Figure 1.3, by following the white lines.
    - **Radius of the circle in color junction: 6 cm**

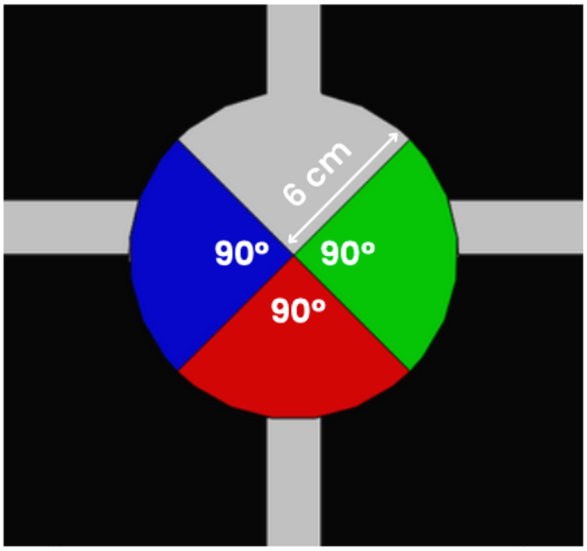


Figure 1.3 - Color junction

3 -

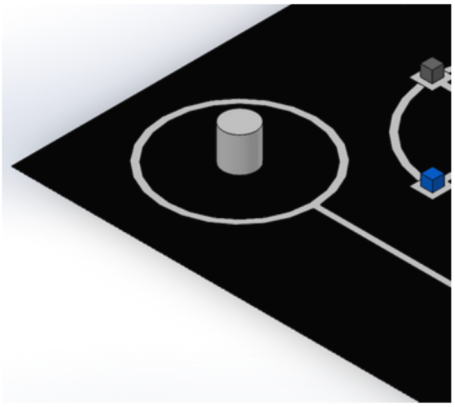
- Then the robot should turn in the correct direction corresponding to the wall color of the stone holder. (**blue or green**) (Figure 1.11).

4 –

- After that, the robot should follow the line to reach a circle (Figure 1.2 - position 4) with an object positioned in the center as in Figure 1.4.
    - **Radius of a circle: 30 cm**

5 –

- Next, the robot should follow the circle and identify the object positioned in the center of the circle.
- A **cuboid** or a **cylinder** with a **height of 15 cm (± 2 cm)** will be positioned at the **center** of the circle. (Figure 1.5)
- Dimensions of the cuboid and cylinder can be **different** except the height.
- The diameter of cylinder or maximum length of one side of cuboid will **not exceed 7cm**.
- Color of the objects will be **white**.



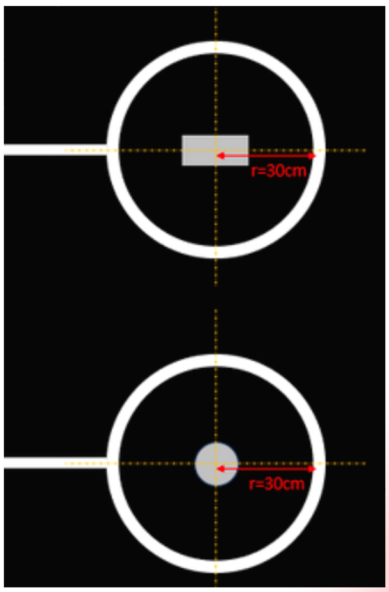


Figure 1.4 - Two circles with objects placed in the middle

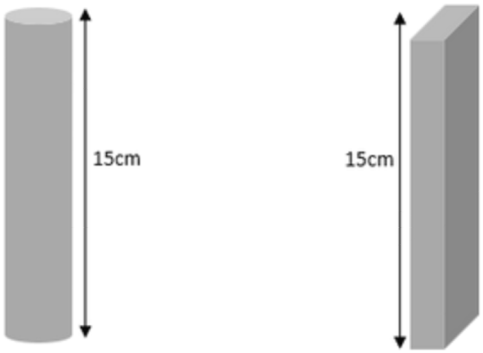


Figure 1.5 - Objects and their respective heights

6 –

Calculation:

- If the object is a **cylinder,** the robot will earn **10 gems** and if the object is a **cuboid,** the robot will earn **20 gems**.
- According to this, the robot should calculate total gems earned in Planet A.

Indication Method:

- For marking purposes, there **must be** an indication method for the detected object in the Planet A. (use LEDs only)
- Use following color LEDs,
  - If the detected object is a **cuboid, a blue** LED should light up.
  - If the detected object is a **cylinder, a green** LED should light up.
- The LED should remain lit until all the tasks are completed.

7 –

Vormirian Sentinel Key

- Then the robot should return back to the color junction and move in the direction of the red colored quarter of the circle. (Figure 1.3)

8 –

- According to Figure 1.2, the movement should be directed towards position 5 where there will be a box or boxes placed on the semi-circle.
- There are only three positions for box placement on the semicircle as shown in Figure 1.6.
- The size of white square will be 10 cm x 10 cm x 10 cm
- There will be **1, 2 or 3 boxes**, but only **one metal box**.
    - Size of all boxes: 5 cm x 5 cm x 5 cm
- The robot has to detect and grab the metal box.
- All the boxes are white in color including the metal box. (The metal box may have a different white color from non-metal boxes)

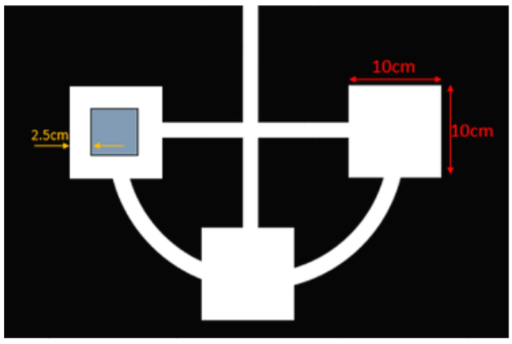
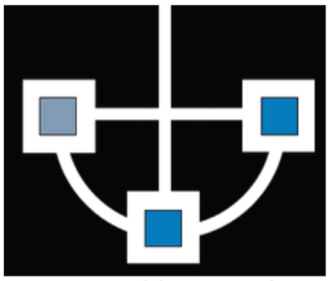
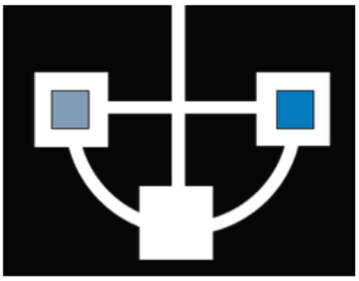


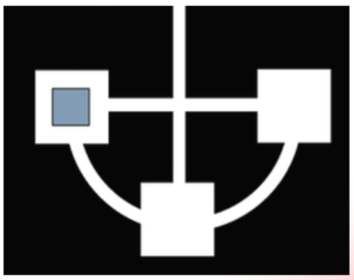
Figure 1.6 - Semicircle and three positions where the boxes will be located



one metal box and two non-metal boxes



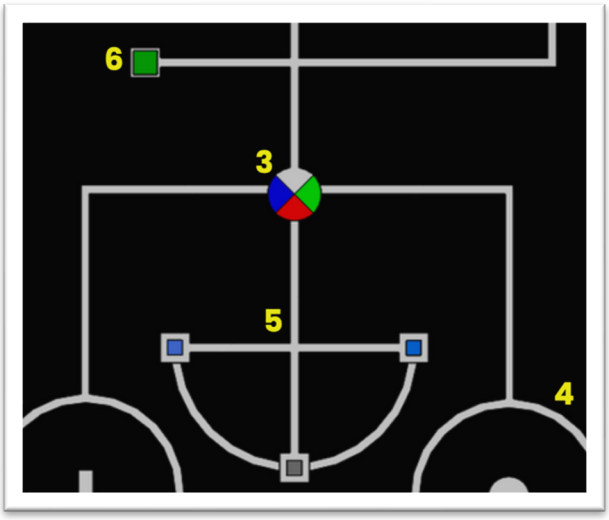
one metal box and one non-metal boxes



only the metal box

9 –

- After that, the robot should go to the position named as Vormirian Sentinel Chamber. (Figure 1.2 - position 6)



10–

- There will be a box with a hole as depicted in Figure 1.8, on the Vormirian Sentinel Chamber position. The box color on the Vormirian Sentinel Chamber position is **green**.

- The robot needs to insert the **metal box** into the hole of the box.
  - **Size of the box: 8 cm x 8 cm x 8 cm**
  - **Size of the hole: 6 cm x 6 cm x 6 cm**

- After inserting the metal box, Vormirian Sentinel Portal (Figure 1.2 - position 17), will open. (As per Figure 1.2, two portals will be located between positions numbered as 2 and 7.)

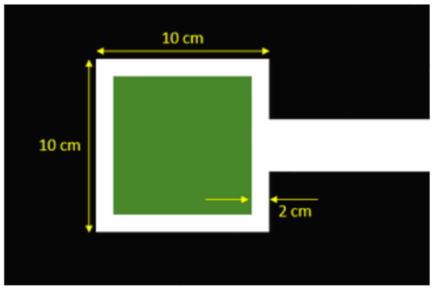


Figure 1.7 - Vormirian Sentinel position

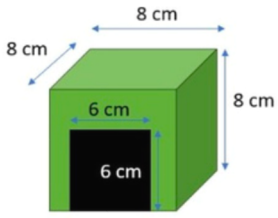
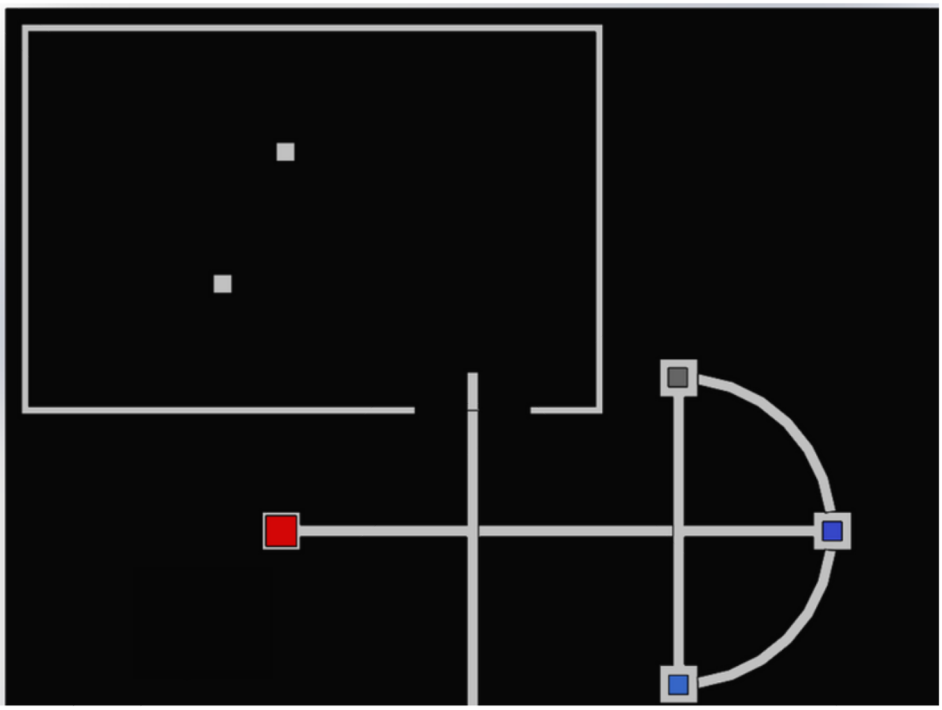


Figure 1.8 - Box on the Vormirian Sentinel position

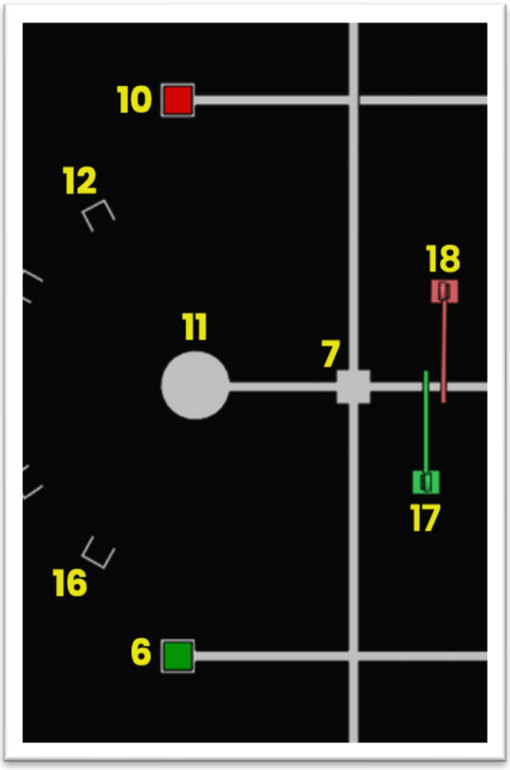
- The metal box should go **at least 3cm** inside the hole in order to open the portal.

11 –

Planet B - Ruins in Sakaar



After completing the sub tasks in Planet A, the robot should go to the junction in Planet B by passing through the white square in the middle of the Planet C (Figure 1.2 - position 7).



Ruins with Gems

- Next, the robot should enter to the Trash yard which is surrounded by walls (Figure 1.2 - position 8) as shown in Figure 1.9. The robot is allowed to move inside the Trash yard.
  - **Height of the walls: 20 cm**
  - **Color of inner side of the walls: White**

- There will be only one opening to enter and exit from the Trash yard, but the position of that opening may not be same as in the figure below. It may vary.

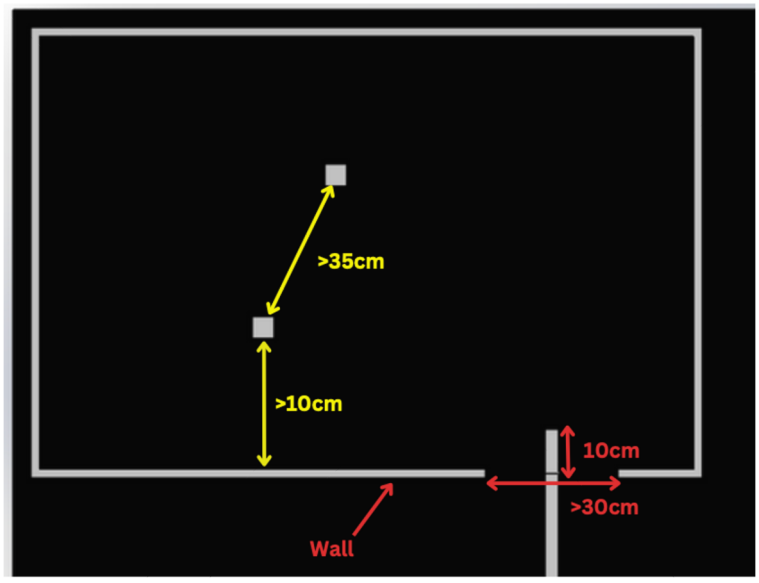


Figure 1.9 - Trash Yard

- There will be 1 or 2 cuboids (maximum 2) of the same or different heights which are fixed on the floor in random positions inside the Trash yard.
- Minimum distance between the wall and a cuboid will be 10 cm.
- All the cuboids are **white** in color.

13 –

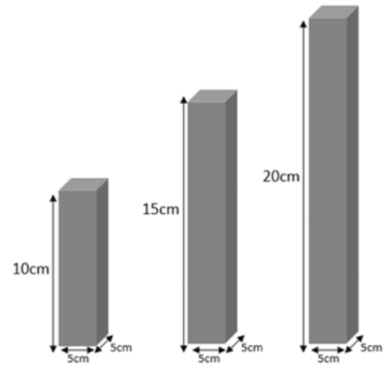


Figure 1.10 - Cuboids with different heights that can be found inside the Trash yard

- The robot should measure the heights of all cuboids. The cuboids should not be damaged when measuring the heights.
- The heights of the cuboids can take any value from the following set of 3 values: **10 cm, 15 cm, 20 cm** as depicted in Figure 1.10.
- After measuring the heights, the robot should record the maximum height among them.

Calculation:

- If the maximum height of the cuboids is,
  - **10 cm** - 10 gems
  - **15 cm** - 20 gems
  - **20 cm** - 30 gems

- According to the cuboid configuration of the Trash yard, the robot can calculate its total earned gems in Planet B.

14 –

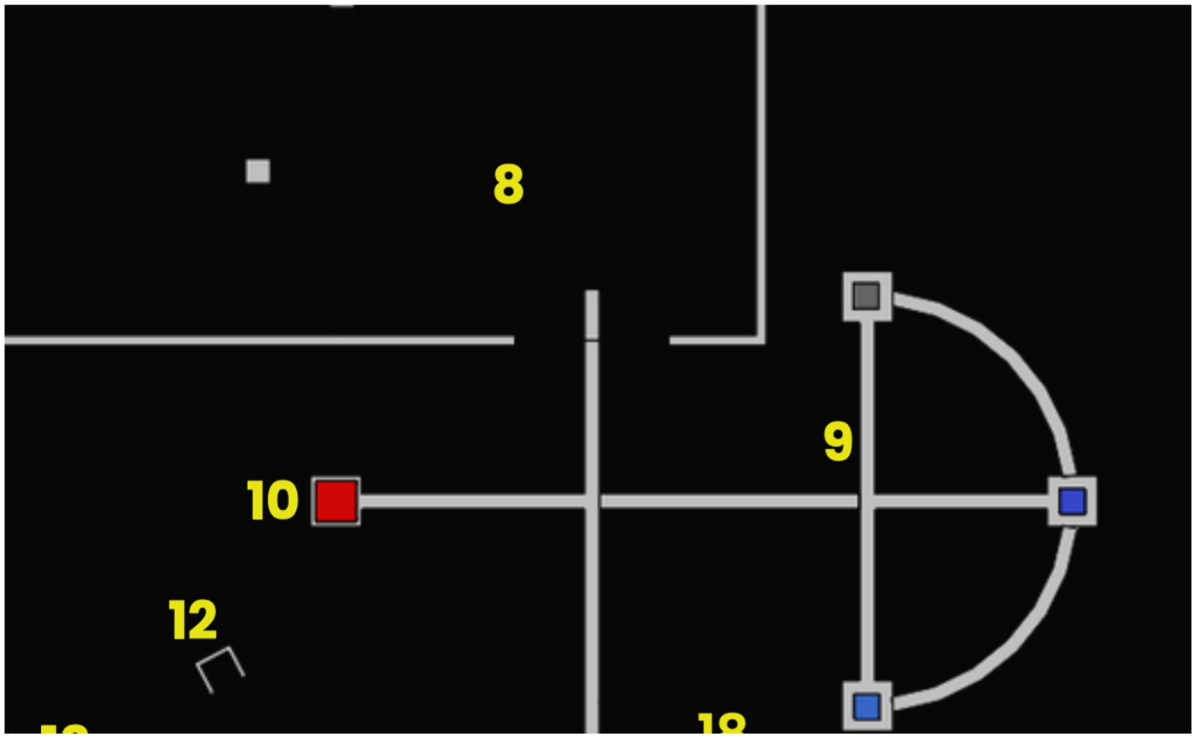
Indication Method

- For marking purposes, there **must be** an indication method for detected maximum height in the Planet B. (use a separate LED for this task, **don't** use the same LED used in the task in Planet A)
- Use following colors for gems earned in Planet B,
  - 10 gems - **red**
  - 20 gems - **green**
  - 30 gems - **blue**
- The LED should remain lit until all the tasks are completed.

15 –

Sakaarian Nexus Key

- Next, the robot should exit the Trash yard and go to the junction in planet B and then, the robot should turn to the direction of the semicircle which is shown as position 9 in Figure 1.2.

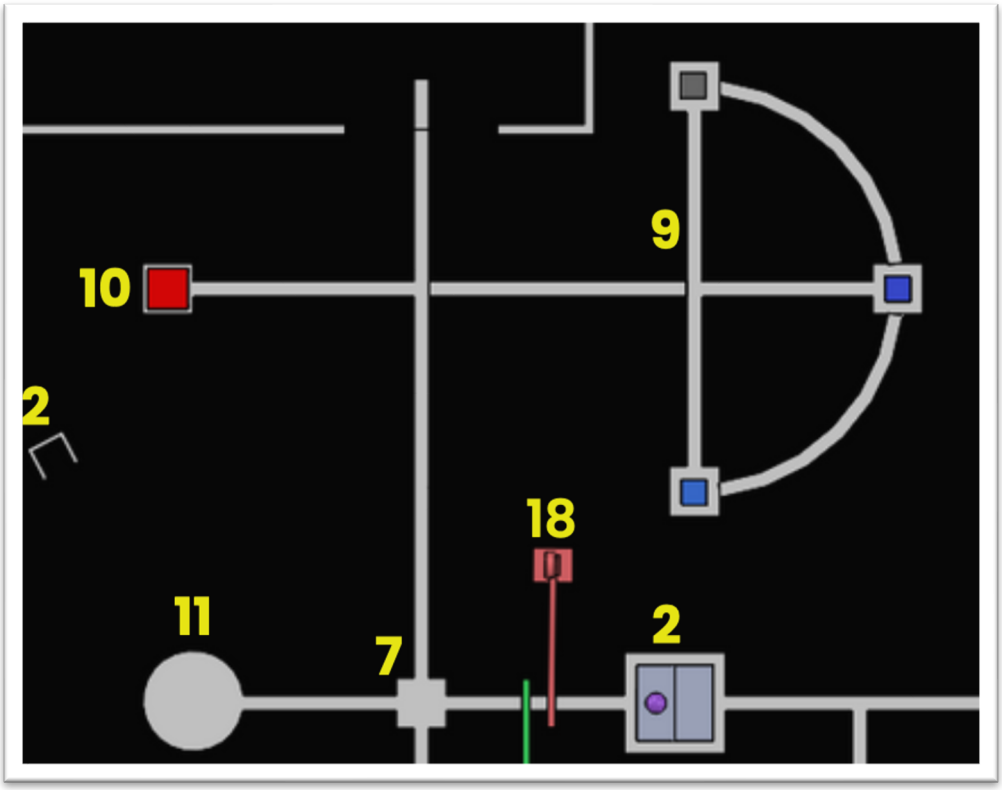


16 –

- Following the approach from the task in Planet A, the robot should detect and grab the metal box.

17 –

- After that, the metal box should correctly be inserted into the box (similar in shape to Figure 1.8) on the Sakaarian Nexus Chamber (Figure 1.2 - position 10).
- The box color on the Sakaarian Nexus Chamber position is **red**. (Figure 1.2 - position 10)
- Then, the Sakaarian Nexus Portal (Figure 1.2 - position 18) will open.



18–

Planet C - Thanos's home

After completing the task in Planet B, the robot should go to the white square in the middle. (Figure 1.2 - position 7).

The task in Planet C consists of the following sub tasks.

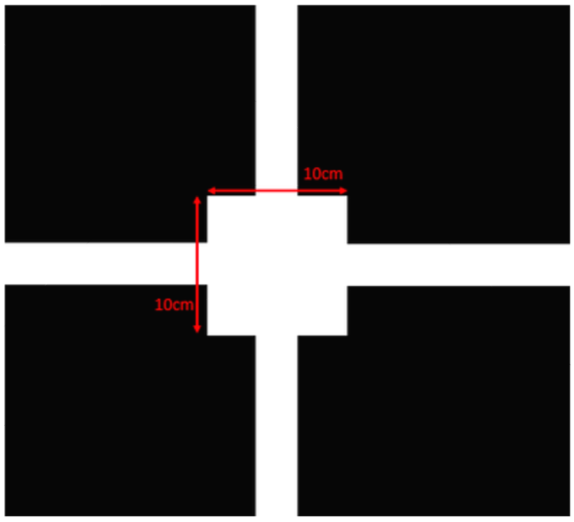


Figure - middle box

19–

The Final Stone

- After coming to the middle box, the robot should turn to the direction of the stone holder.
- Since both portals are open now, the robot can move closer to the stone holder.

20–

- Next, the robot should grab the stone. The dimensions of the stone are mentioned below. (similar to a table tennis ball)
  - **Radius: 2 cm ± 0.5cm**
  - **Weight: 3 g ± 1g**
- The stone holder will be placed on a 20 cm x 20 cm white square.

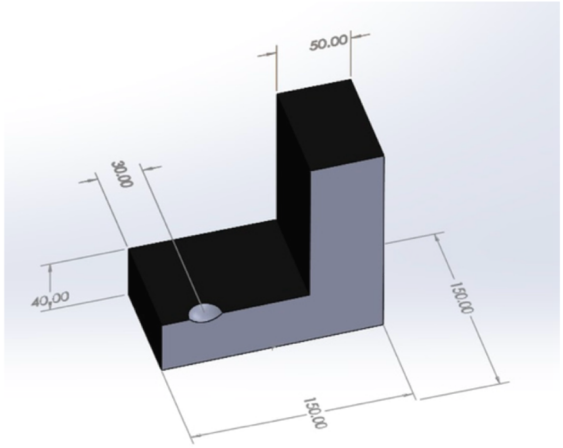
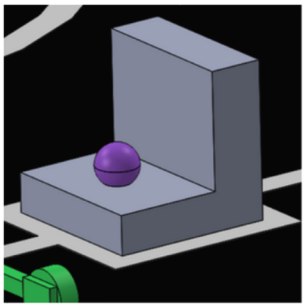
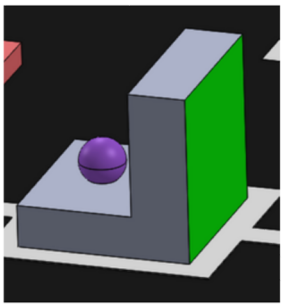


*Figure 1.11 - **Cross section** of Stone holder (dimensions in **mm**)*





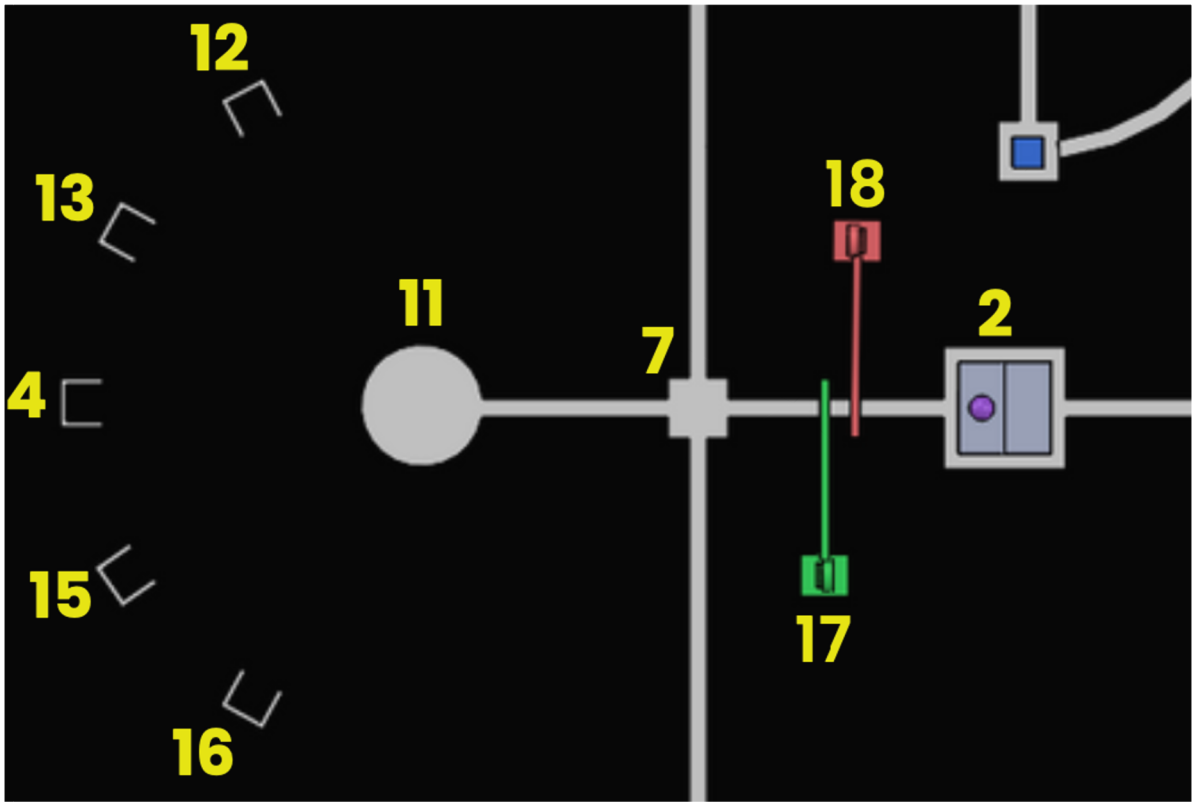
21 –

- After that the robot should return to the white square in the middle. (Figure 1.2 - position 7).

22 –

The Infinity Gauntlet

- Next the robot should go to the shooting position. (Figure 1.2 - position 11)



23 –

- There will be five target positions numbered as **20, 30, NO value, 40, 50** (Figure 1.2 - positions 12, 13, 14, 15 and 16 respectively) in front of the shooting position. (Figure 1.12)
    - **Angle between two target positions: 30 degrees**
    - **Distance between one target position and the shooting position: 50cm ± 5cm**
    - **Radius of the shooting position: 10 cm**

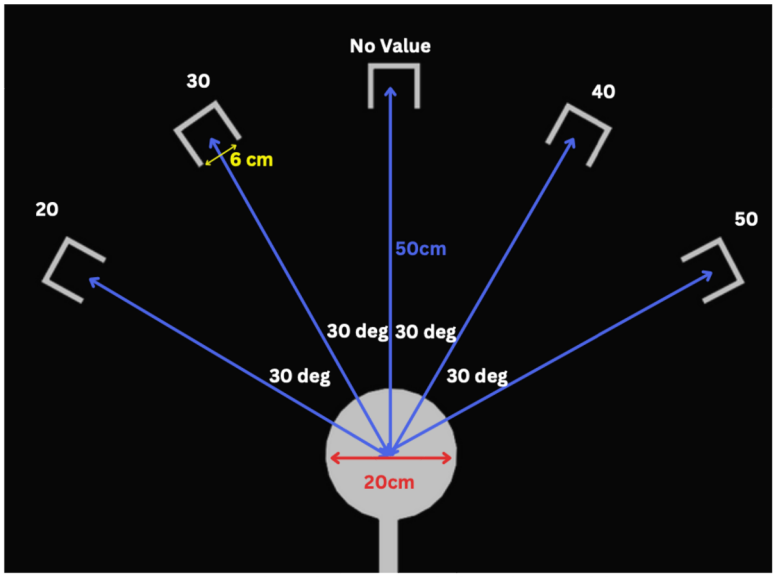


Figure 1.12 - Shooting pot and shooting positions

- The robot has to shoot the stone retrieved from the stone holder to one of the five target positions along the floor.
- The robot should **not leave** the shooting position before or while shooting the stone.
- There will be five boxes with a hole at these five designated target positions.
    - **Size of hole: 6 cm**
    - **depth and height: 8 cm**
- To determine the correct target position, the robot should use the previously obtained gems from the tasks in Planet A & B.

Target Position Value = **Total gems earned in Planet A** + **Total gems earned in Planet B**

- The sum of gems will correspond to the number assigned to the correct target position where the stone should be shot.

24–

- There should be a way to indicate that the robot has completed its task. This will be considered to measure the time.