

# Wonder League Robotics Competition

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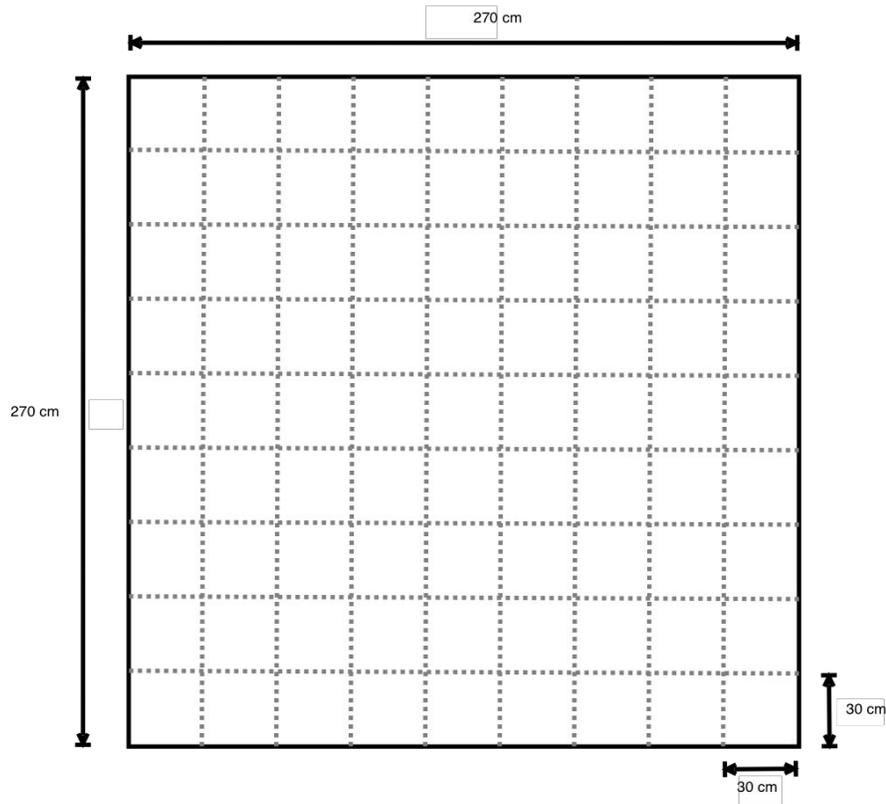
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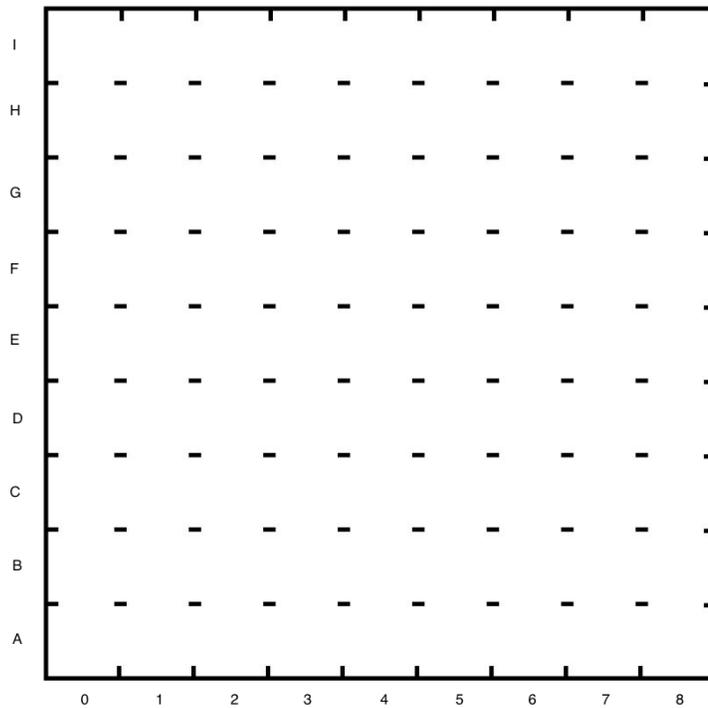
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# Competition Field Setup

1. Use painter's tape to create a 270 cm x 270 cm square.
2. Divide the square into a 9 x 9 grid with cells of 30 cm x 30 cm.



3. Use painter's tape to mark the cells of the grid. (Tip: to conserve tape, use small strips to only mark the corners of each cell.)
4. Use Post-it notes to label each row and column. Use letters A through I for the rows. Use numbers 0 through 8 for the columns.



## Mission 1: Rocket Launch

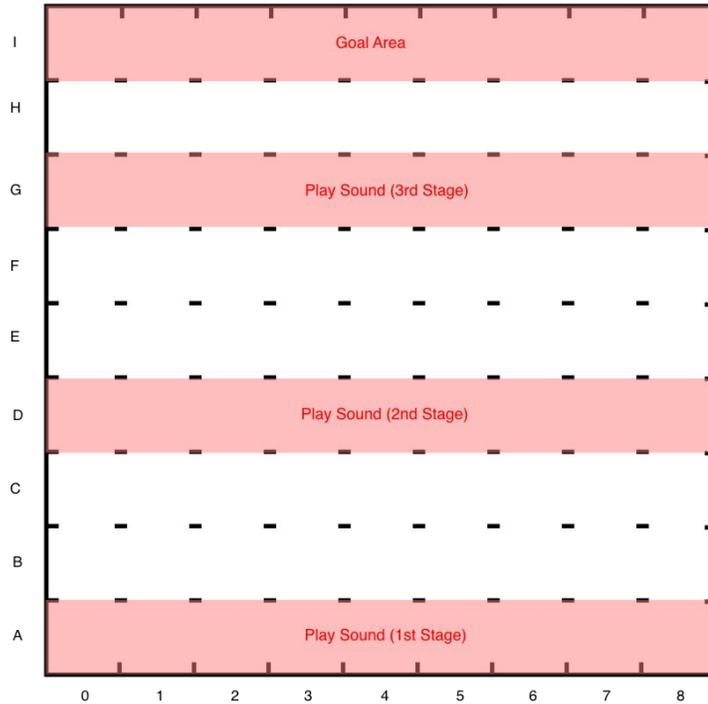
### Summary:

Launch Dash into space using a 3 stage rocket. Each rocket stage must ignite at the correct distance from the launchpad. After igniting all three stages, Dash must travel far enough to escape Earth's gravity!

### Materials Required:

- Dash

## Field Layout:



## Rules:

1. Choose or record a sound for when a rocket stage is ignited.
2. Start with Dash's body within any cell of Row A.
3. Program the robot to move forward from Row A toward Row I.
  - a. *Tip: target rows can be marked with colored construction paper.*
4. Play the sound to ignite each rocket stage when the majority of the robot's body is within the correct row:
  - a. Ignite the first stage in Row A.
  - b. Ignite the second stage in Row D.
  - c. Ignite the third stage in Row G.
5. The majority of Dash's body must fully enter Row I to complete the mission.
6. The mission will fail if Dash exits the grid before successfully entering Row I.

## Scoring (25 points max):

- Correctly ignite the first stage: 5 points
- Correctly ignite the second stage: 5 points
- Correctly ignite the third stage: 5 points
- Successfully enter Row I: 5 points
- Bonus Points for Additional Flair: 1-5 points

# Mission 2: Space Station Dock

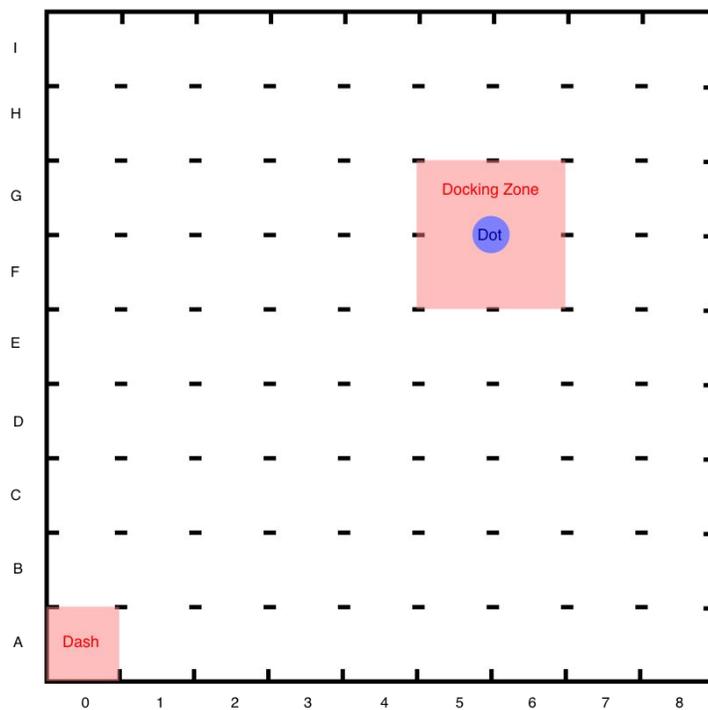
## Summary:

Dock the rocket at the space station to refuel and get supplies.

## Materials Required:

- Dash
- Dot
- 1 Cup

## Field Layout:



## Rules:

1. Start with Dash within cell A0.
2. Place the cup upside down at the intersection of cells F5, F6, G5, and G6.
3. Remove Dot's stand and place Dot upright on top of the cup.
4. Program Dash to move toward Dot.
5. Dash must come to a complete stop with the majority of Dash's body within the four cell zone defined by cells F5, F6, G5, and G6.
6. Program Dash to play a sound when docking is complete.

**Scoring (25 points max):**

- Successfully dock at Dot: 10 points
- Play docking sound 5 points
- Bonus Points for effective use of beacon: 5 points
- Bonus Points for Additional Flair: 1-5 points
- Knock Dot off cup: -5 points

## Mission 3: Asteroid Avoid

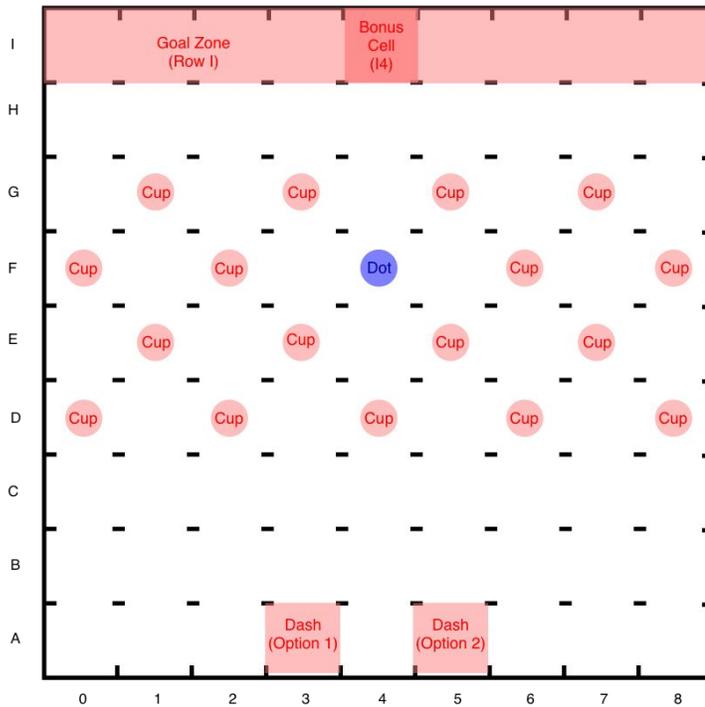
**Summary:**

Navigate through the asteroid belt to get to the outer solar system. Try not to collide with any asteroids!

**Materials Required:**

- Dash
- Dot
- 18 Cups

**Field Layout:**



**Rules:**

1. Place 18 cups upside down in the center of the following cells:

- a. D0, D2, D4, D6, D8
  - b. E1, E3, E5, E7
  - c. F0, F2, F4, F6, F8
  - d. G1, G3, G5, G7
2. Remove Dot's stand and place Dot upright on top of the cup in the center of cell F4.
  3. Start with Dash's body within cell A3 or A5.
  4. Program Dash to move from the starting cell, navigate through the cups, and enter any cell of Row I.
  5. The majority of Dash's body must enter Row I to complete the mission.
  6. The mission will fail if Dash goes outside of the grid at any location other than Row I. (It is okay if Dash exits the grid after successfully entering Row I.)
  7. Bonus points will be awarded if the majority of Dash's body enters cell I4.
  8. Points will be deducted if Dash touches a cup or pushes a cup out of its cell.

**Scoring (25 points max):**

- Successfully enter Row I: 10 points
- Majority of Dash's body enters cell I4: 5 points
- Bonus Points for effective use of beacon: 5 points
- Bonus Points for Additional Flair: 1-5 points
- Dash touches a cup: -1 point per cup
- Dash pushes a cup out of cell: -3 points per cup

## Mission 4: Fly By

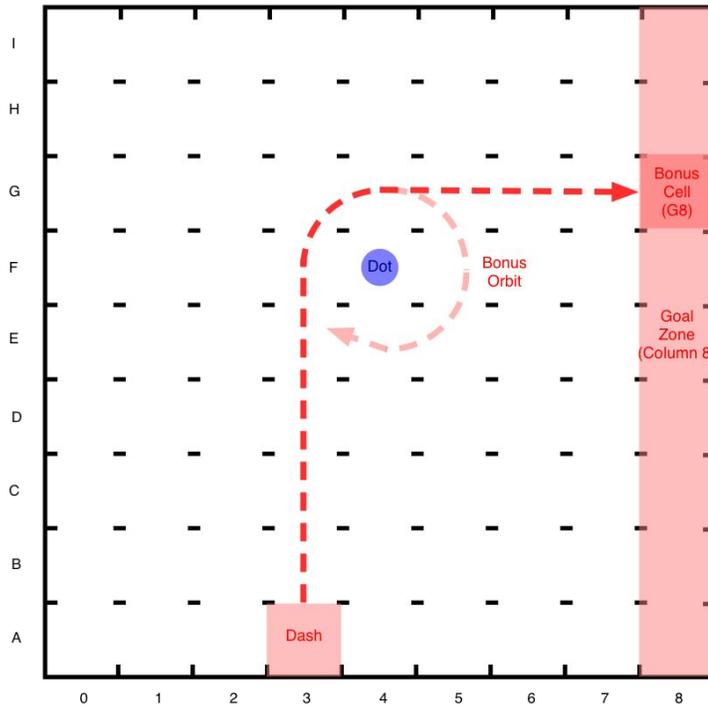
**Summary:**

Scan a nearby planet before using its gravitational pull to slingshot your rocket toward its destination.

**Materials Required:**

- Dash
- Dot
- 1 Cup

## Field Layout:



## Rules:

1. Place 1 cup upside down in the center of cell F4. Remove Dot's stand and place Dot upright on top of this cup.
2. Start with Dash's body within cell A3.
3. Program Dash to move from Row A towards Row G.
4. Dash must pass by Dot on the left side (anywhere within Columns 0 to 3) and some portion of Dash's body must enter Row G.
5. After successfully entering Row G, Dash must turn right and move towards Column 8.
6. The majority of Dash's body must enter Column 8 to complete the mission.
7. Bonus points will be awarded if some portion of Dash's body passes through cell G8.
8. Bonus points will be awarded if the robot makes 1 or more full orbits around Dot.
9. The mission will fail if Dash exits the grid before successfully entering Column 8.
10. Points will be deducted if Dot is knocked off the cup.

## Scoring (25 points max):

- Successfully pass Dot and enter Column 8: 5 points
- Majority of Dash's body enters cell I4: 5 points
- Bonus Points for full orbit around Dot: 2 points per orbit (max 5)
- Bonus Points for Additional Flair: 1-5 points
- Knock Dot off cup: -5 points

# Mission 5: Surface Landing

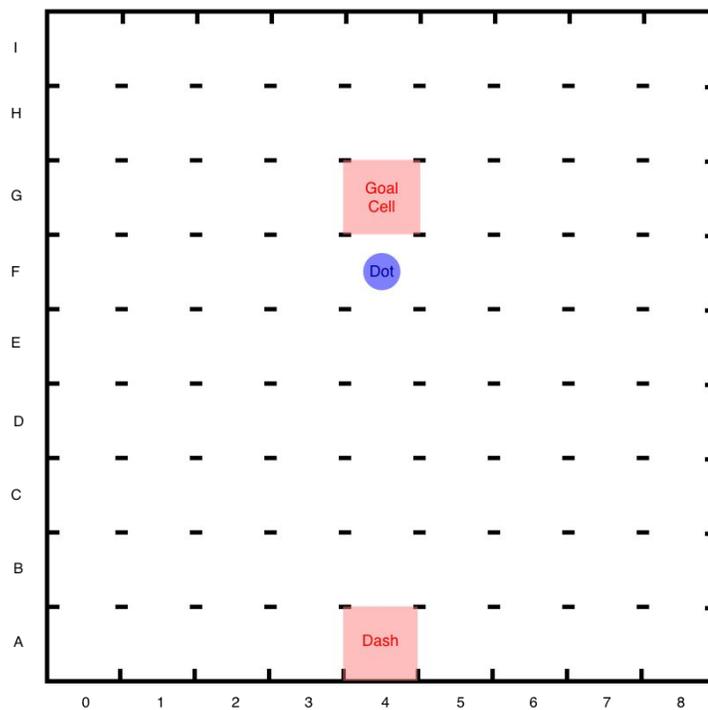
## Summary:

You've reached the destination planet! Maneuver your rocket to the landing site on the far side of the planet. Perform a reverse entry for a smooth landing.

## Materials Required:

- Dash
- Dot
- 1 Solo Cup

## Field Layout:



## Rules:

1. Start with Dash's body within cell A4.
2. Place 1 cup upside down in the center of cell F4. Remove Dot's stand and place Dot upright on top of this cup.
3. Program Dash to move from cell A4 to cell G4.
4. Dash must come to a complete stop within cell G4.
5. The majority of Dash's body must be within cell G4 in order to earn maximum points.
6. Bonus points will be awarded if Dash's rear is aimed towards Dot (reverse landing).

- The mission will fail if Dash goes outside of the grid at any time.
- Points will be deducted if Dot is knocked off the cup.

**Scoring (25 points max):**

- Majority of Dash's body within cell G4: 10 points
- Portion of Dash's body within cell G4: 5 points
- Bonus Points for reverse landing: 5 points
- Bonus Points for Additional Flair: 1-5 points
- Knock Dot off cup: -5 points

## Mission 6: Sample Collection

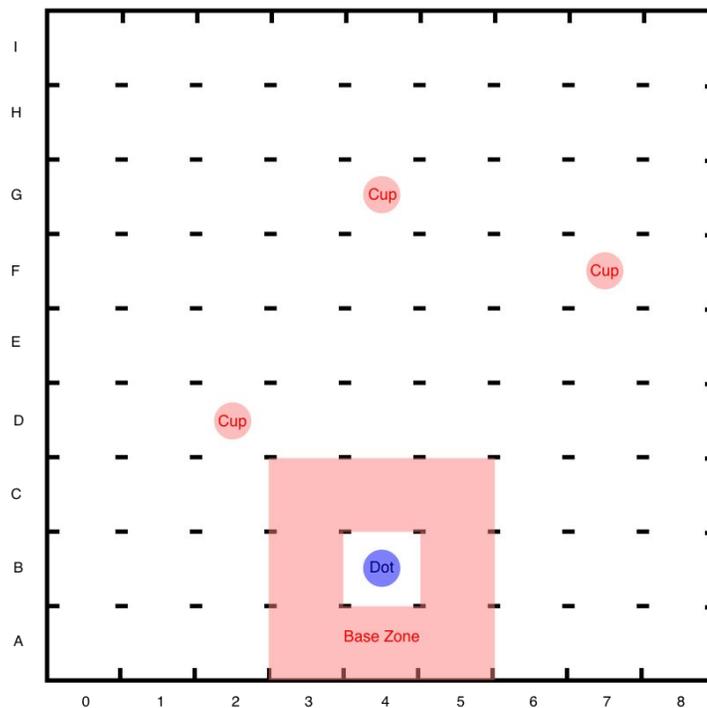
**Summary:**

Scan the planet surface for mineral deposits. If possible, bring samples back to the base.

**Materials Required:**

- Dash
- Dot
- 4 Solo Cups

**Field Layout:**



**Rules:**

1. Choose or record a sound for when Dash detects a cup.
2. Place 3 cups upside down in the center of the following cells:
  - a. D2, F7, G4
3. Place 1 cup upside down in the center of cell B4. Remove Dot's stand and place Dot upright on top of this cup.
4. The Base Zone is an area made of the following cells:
  - a. A3, A4, A5
  - b. B3, B5
  - c. C3, C4, C5
5. Start with Dash's body within any cell of the Base Zone.
6. Dash cannot start within the same cell as Dot (B4).
7. Program Dash to move from the Base Zone toward the cups.
8. Earn points by "tagging" each cup by playing a sound when the cup is detected.
9. Bonus points will be awarded if Dash can push a cup into the Base Zone.
  - a. Once a cup has been pushed into the base zone, the program can be stopped.
  - b. The majority of the cup must enter the Base Zone to qualify for bonus points.
  - c. Any cups that were successfully tagged or pushed into the Base Zone can be removed from the grid.
  - d. The robot can be manually repositioned to any cell within the Base Zone (except cell B4).
  - e. The program can be restarted to make Dash find and collect another cup.
  - f. NOTE: Competitors can choose to:
    - i. use the same program for all cups
    - ii. use the same program and modify it for each cup
    - iii. use separate programs for each cup.
10. If a cup is pushed outside of the grid before entering the Base Zone, it is no longer valid for bonus points. If the cup was tagged before being pushed outside the grid, the points for tagging the cup will still be awarded.

**Scoring (50 points max):**

- Playing sound to tag a detected cup: 5 points (Awarded once per cup)
- Successfully pushing cup back to base: 10 points (Awarded once per cup)
- Bonus Points for collecting all cups: 5 points
- Bonus Points for Additional Flair: 1-5 points