

## Competition Tasks Details

(\* All rules and objects are subject to change due to availability, space limitation, time constraints, etc.)

- \* The competition will be scored through a video conference
- \* The items described here may not be the items in the competition due to availability.
- \* No hardware or software changes are allowed once the competition has started.
- \* No hardware or software changes are allowed once we start the initial setup.
- \* Robots are allowed to automatically use predefined tools.
- \* The competition tasks should be performed in the specified order.

### Initial Setup

Based on the work area specified by the contestants, the following objects are randomly placed in the workspace defined by the team before the beginning of the competition.

1. A stack of five dinner plates, a stack of five salad plates, a stack of five soup bowls, a stack of five cloth napkins
2. A silverware tray with five sets of silverware including salad forks, diner forks, soup spoons, table knives, and tablespoons. and 1 pair of ice cube tongs
3. Five wine glasses, five water glasses, five teacups, and five saucers for the teacups
4. A pitcher (1 liter), a wine bottle (750 ml), and a coffee Carafe (1 liter)
5. An ice cube bucket with about 30 ice cubes
6. A cup of 10 salt/sugar packets
7. A measuring cup

Before start, the team will specify a dinner set area.

### Task

1. (120 pts) Set down a dinner plate at the center (left/right) of the defined dinner set area and one inch from the table edge. Place a salad plate inside the middle of the dinner plate, then place a soup bowl inside the middle of the salad plate.

- 40 Points for placing the dinner plate: 20 points for picking up the plate; 20 points for placing the plate.
- 40 Points for placing the salad plate in the middle of the dinner plate: 20 points for picking the plate; 20 points for placing it in the middle of the dinner plate. -10 points If the salad plate is on the dinner plate, but not properly placed.
- 40 Points for placing the bowl in the middle of the salad plate: 20 points for picking the bowl; 20 points for placing it in the middle of the salad plate. -10 points If the bowl is on the salad plate, but not properly placed.

2. (180 pts) Place dinner fork on the left of the dinner plate. Place the dinner knife on the right side of the dinner plate and have its blade facing the plate. Place the salad fork on the left of the dinner fork and the tablespoon on the right side of the dinner knife. Place the napkin in a rectangle on the left-hand side of the plates and outside of the forks. Place a teaspoon right above the dinner plate with the handle pointing to the right.

The forks and knives should be also vertical to the table edge, and one inch from the table edge. Keep an even distance between the two forks as there is between the dinner fork and the dinner plate, not too much and not too little, but there is not a specific amount. Just make sure you can see the whole utensil and that none of it is hiding under the dinner plate.

- 60 Points for placing the dinner fork: 30 points for picking up the fork; 30 points for placing the fork properly. -10 points If the fork is on the wrong side of the plate. -10 points If the fork is too far away from the plate or if its center location is too much above or below the proper locations. -10 points if it is touching the plates.
- 60 Points for placing the dinner knife: 30 points for picking up the knife; 30 points for placing the knife properly. -10 points if the knife is on the wrong side of the plate. -10 points If the knife is too far away from the plate or if its center location is too much above or below the proper location. -10 points if it is touching the plates or other utensils. -5 points if the knife blade is not facing the plate.
- 60 Points for placing the napkin in a rectangle on the left-hand side of the plates and outside of the forks: 30 points for picking the napkin; 30 points for placing it in a rectangle on the left-hand side of the plates and outside of the forks. -10 points If the napkin is on the plates or the utensils. -10 points, If the napkin is not in the right location. -5 points If the napkin is not in a proper shape.

3. (100 pts) Place a water glass straight above the table knife. Place a wine glass up and to the left of the water glass. Place cup and saucer to the right of the spoon directly out from the middle of the dinner plate. The base of the cup will sit in the inner ring of the saucer. Place the cup of salt/pepper/sugar above the teaspoon.

The team will win:

-20 points for placing the water glass above the table knife. If the glass is tipped over when placing it at the intended location, the team receives 10 points.

-20 points for placing the wine glass to the left of the water glass. If the glass is tipped over when placing it at the intended location, the team receives 10 points.

-10 points for placing the saucer to the right of the spoon.

-20 points for placing the cup on top of the saucer. If the cup does not sit in the inner ring of the saucer, the team receives 10 points.

-30 points for placing the cup of salt/pepper/sugar above the teaspoon (10 points for each item). If the item is tipped over, the team loses the corresponding 10 points.

4. (150 pts) Pick and place three ice cubes and drop them into the water glass

The team will win 30 points if the robot picks up the tongs from the tray and holds it ready for the next step. The team will forfeit the 30 points if the tongs position is manually adjusted in the robotic hand or if the team manually hand the tongs over to the robot.

The team will win 40 points per ice cube when the robot picks up the ice cube from the bucket and puts it into the water glass. The team will lose 20 points out of the 40 points if an ice cube is dropped out of the glass. For example, if the team puts two ice cubes into the glass, but during the demo the robot drops the other cube on the table, the team will gain  $40+40-20=60$  points. The team will lose all points if the glass is tipped over.

5. (150 pts) Pour water into the water glass from the pitcher, pour wine from the wine bottle, pour coffee from the coffee Carafe.

Before pouring, the participant will be asked to pour a certain amount of liquid into the measurement cup.

The team will win 50 points per task (water, wine and coffee) if the robot pours the required amount onto the glass/cup, with a margin of  $\pm 20\%$ . If the poured amount differs by more than 20% from the required one, the team gains 25 points per task.

The team will lose 25 points if liquid is spilled out of the glass/cup. The team will lose all points if the liquid container (pitcher, wine bottle, Carafe) is dropped.

Due to regulations and restrictions, the teams can replace wine with water or colored water.

6. (100 pts) Pick up a packet of sugar, tear it open, pour a half packet of sugar into the tea cup.

The team will receive  
20 points for picking the packet of sugar  
30 points for tearing it open

50 points for pouring half of the packet (+-25%) into the tea cup. If the team pours a different amount of sugar, it receives 20 points.

### **Final evaluation**

Each team would need to repeat the tasks five times in one hour. At the end of each round, the teams should stop the clock, remove all used plates, bowl, silverware, measure the liquid using the measuring cup.