

Competition Tasks Details

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

- * The items described here may not be the items in the competition due to availability.
- * The contestants should provide their workspace for setup before the competition.
- * No hardware or software changes are allowed once the competition has started.
- * Robots are allowed to automatically use predefined tools.

1. Transfer a cup on its saucer (Level 1, 10 pts)

Items:

A set of plastic cup and saucer

https://www.amazon.com/Aspire-Break-resistant-Plastic-Cappuccino-Espresso/dp/B01MRC6I4U/ref=sr_1_3?s=home-garden&ie=UTF8&qid=1504224878&sr=1-3&keywords=Cappuccino%2BCups%2Band%2BSaucers%2Bplastic&th=1



Setup:

One target location on the table is defined and marked in the robot's workspace
A cup and a saucer are paced randomly in the robot's workspace. Their locations are unknown.

Rules:

- The robot should first grasp and place the cup on the saucer (5 pts)
- The robot grasps the saucer with the cup on it, lifts, transfers and places them on the defined target location. (5 pts)
- Dropping the cup will terminate the task.

2. Pick up a fork, a knife, and a spoon from a silverware tray (Level 1, 15 pts)

Items:

A silverware tray containing 2 sets of fork, knife, spoon.

<https://www.amazon.com/Rubbermaid-Silverware-Cutlery-Tray-White/dp/B000QONEHQ/>



https://www.amazon.com/dp/B007WLXUA2/ref=pd_luc_rh_spmrai?th=1



Two plastic plates

<https://www.amazon.com/Nicole-Home-Collection-Everyday-Dinnerware/dp/B00P2XTTS4/>

Setup:

One plates is placed at a defined location.

The silverware tray with two sets of forks, knives, and spoons is placed at a defined location.

Competition:

- Grasp a spoon, a knife, and a fork from the draw and place them on a table so that the knife and a spoon on the right, and a fork on the left with the correct vertical orientation.



- Three points for each correct placement of the utensil.

- Collect the utensils back into the tray and place the same kind in the same slot of the tray.
- Two points for each correct placement of the utensil back into the slot

3. Use a spoon to stir water in a cup (Level 1, 10 pts)

Items:

Spoon and cups are the the same as used in Tasks 1 and 2.

Setup:

A spoon is placed in a cup with the spoon's handle out. The location of the cup holding the spoon can be defined by the contestants.

Competition:

1. The robot picks up the spoon in the empty cup
2. Submerge the bowl of the spoon in the other cup half-full of water
3. Stir water using the spoon for two cycles. Completing each cycle gains 5 pts.
4. The competition is terminated if the cup is tipped over.
5. 3 pts will be reduced if any water is spilled

4. Pour water into a cup (Level 2, 30 pts)

Items:

One YCB pitcher or other pitcher

<https://www.amazon.com/Rubbermaid-Pitcher-2-25-quart-FG3062PRPERI/dp/B0014CTFPY/>

One cup (without the saucer)

https://www.amazon.com/Aspire-Break-resistant-Plastic-Cappuccino-Espresso/dp/B01MRC6I4U/ref=sr_1_3?s=home-garden&ie=UTF8&qid=1504224878&sr=1-3&keywords=Cappuccino%2BCups%2Band%2BSaucers%2Bplastic&th=1



Setup:

The pitcher is placed at a defined location

Uncertain amount of water is in the pitcher. But it is more than enough to fill three cups.

Three cups are placed at random locations

Rules:

- The robot grasps and picks up the pitcher and then pours water into the cup to 90% full (the target water line is marked in the cup, along with 80% full line)

- Pouring is considered successful if the final water line is between the 80% line and completely full
- Over spill is a failure
- Under 80% is a failure
- Ten points for each successful pouring
- The water level in the pitcher is not observable

5. Grasp a plug and insert it into a socket (level 2, 20 pts)

Grasp a plug and insert it into a socket

Items:

1. Power Strip (w/ 2-AC outlets and 4 USB charging ports)
https://www.amazon.com/gp/product/B016OVD668/ref=ox_sc_act_title_1?ie=UTF8&psc=1&smid=A2VRWFTK1O6VGO
2. Industrial VELCRO – adhesive backed
https://www.amazon.com/gp/product/B00006RSP1/ref=ox_sc_act_title_3?ie=UTF8&psc=1&smid=ATVPDKIKX0DER
3. One AC night light
https://www.amazon.com/gp/product/B010ON1XPI/ref=ox_sc_act_title_2?smid=A3CB9WM8DJ65SR&psc=1
4. One USB night light
https://www.amazon.com/gp/product/B0191S9I4K/ref=ox_sc_act_title_2?ie=UTF8&psc=1&smid=A1KKVWVWYDW8DT

Competition Set-Up:

1. Mount the power strip to a surface using the VELCRO tape and plug into an AC power source.
2. Plug one AC night light into one outlet of the power strip.
3. Manually plug one USB light into one USB port of the power strip.

Competition:

1. Extract the both lights completely from the outlet. (If plug cannot be removed, consider loosening them in order to proceed to the next step)
2. Grasp and plug one light at a time into the sockets to minimum depth for electrical contact.
3. Scoring is based on the following for each plug:
 - a. Light removal - 5 points per light
 - b. Light insertion (light on) - 5 points per light

6. Grasp and cleanly tear away one piece of paper towel (Level 2, 20 pts)

Items:

1. Paper towel roll holder similar to

https://www.amazon.com/gp/product/B003VJPMBY/ref=ox_sc_act_title_1?smid=ATVPDKIKX0DER&psc=1

2. Paper towel

Setup:

1. The paper towel and its holder is placed on the table
2. The roll is vertical to the table
3. Leave a small amount of paper hanging down

Competition:

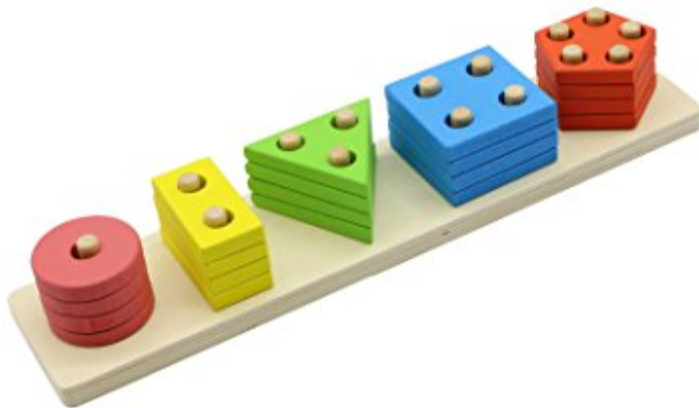
1. The robot holds on the loose paper towel
2. The robot tears off a sheet of paper in perforated squares – 10 pts
3. The robot tears off the second sheet of paper in perforated squares – 10 pts
4. The robot is allowed to try five times (total).
5. Knocking down the holder will terminate the task.

7. Peg in hole insertion tasks (Level 3, 30 pts)

Items:

One wood sorting board

https://www.amazon.com/MoTrent-Recognition-Colorful-Geometric-Sorting/dp/B01CPAWLEA/ref=sr_1_28?s=toys-and-games&ie=UTF8&qid=1504222817&sr=1-28-spons&keywords=Creative+Wooden+Color+and+Shape+Geometric+Sorting+Board&psc=1



Setup:

The main board is attached with Velcro to the table.

Six puzzle pieces are placed besides the board randomly.

Rule:

- Locate one of the wood puzzles
- Recognize where should it go within the wood board (depending on the number of holes)
- Put the puzzle on the board.
- Repeat until all puzzles are used.
- Five points for putting one puzzle piece on the board

7. Hammer a nail (Level 3, 30 pts)

Items:

1. Smooth Foam 2" x 4" x 12"
https://www.amazon.com/gp/product/B00A2GIV80/ref=ox_sc_act_title_7?ie=UTF8&psc=1&smid=ATVPDKIKX0DER
2. 10D 3-Inch Common Nails – 1 pound
https://www.amazon.com/gp/product/B000BQUGBG/ref=ox_sc_act_title_5?ie=UTF8&psc=1&smid=A1NAIB2K0ZQEK
3. YCB hammer
<http://www.harborfreight.com/16-oz-claw-hammer-66862.html>

Competition Set-Up:

1. Set hammer at predefined table location with handle overhanging table (figure 1)
2. Fix smooth foam to table top at defined location with 2"x 12" surface on table (figure 1) – can be flipped for additional tests.
3. Mark nail locations on foam per (figure 1).
4. Mark 3" nails with a 1" and 2" depth
5. Set nail in next location per test push to 1" depth.

Competition:

1. Grasp hammer at predefined location.
2. Position hammer at nail location and drive nail to full depth.
3. Repeat for 5 nails
4. Scoring based on the following:
 - a. Drive nail with hammer face (see figure 1) to within 1" of nail protruding out of foam – 2 points per nail **-or-**
 - b. Drive nail to full depth (head flush with foam) – 6 points per nail

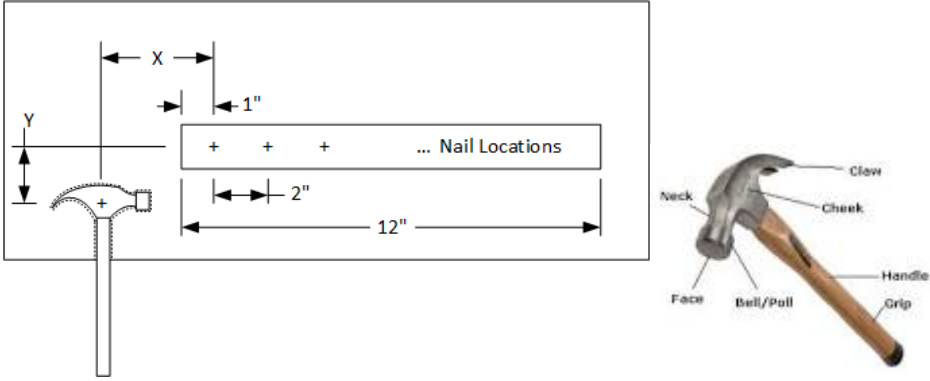


Figure: Hammer A Nail Setup

9. Transfer straw into a to-go cup with lid (Level 3, 30 pts)

Items:

1. Straws

https://www.amazon.com/Smoothie-Straws-Extra-Assorted-Colors/dp/B001R3JL5C/ref=pd_sim_sbs_79_3?ie=UTF8&dpID=510YB6zbJhL&dpSrc=sims&preST=AC_UL160_SR160%2C160_&psc=1&refRID=A8DKCNHNP_T9KB99X8F5A

2. Cup with lid

https://www.amazon.com/World-Deals-Plastic-Clear-Flat/dp/B010JQLKSA/ref=pd_sim_79_5?ie=UTF8&dpID=41DcNm7awGL&dpSrc=sims&preST=AC_UL320_SR238%2C320_&psc=1&refRID=WBMB9GZTH6XY_RV2FJKRG

Setup:

1. The straws are packed fairly tightly in one upright cup.
2. Another cup has a lid on it, placed upright and 30 cm to the side of the cup holding straws.
3. The cup with lid is full of water

Competition:

1. The robot picks up one straw from the cup
2. Place it into the straw hole while keeping the cup upright to earn full points
3. The location of the cup can be defined by the contestant.
4. The competition is terminated when the cup with lid is tipped over.
5. Dropping straw is allowed.

10. Open a bottle with a locking safety cap (Push Down & Turn Caps) (Level 4, 40 pts)

Item:

Pharmacy Vials 40 Dram - Snap Caps Vials with Safety Push and Turn Cap (40 DRAM)

https://www.amazon.com/Pharmacy-Vials-Snap-Caps-Amber/dp/B01GILGN3C/ref=sr_1_1?ie=UTF8&qid=1504224229&sr=8-1&keywords=Pharmacy+Vials+40+Dram+-+Snap+Caps



Competition Set-Up:

1. Attach bottle securely to the table so that the attachment can withstand substantial twisting forces. (A person may allowed to hold the bottle, not the cap, and the person cannot apply twisting motion)
2. Place cap on bottle and twist to lock.

Competition:

1. Push and turn the cap of the bottle to unlock it. (20 pts)
2. Remove cap from bottle (20 pts)
3. Scoring based on the following:
 - c. Cap is unlocked but not removed – half points
 - d. Cap is separated from the bottle completely – full points