

## 2024 TORONTO CHALLENGE SCENARIO

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### THE CHALLENGE:

Your team will design and build a device operated by fluid power that picks up a wooden cylindrical object from the START position and then places it on one of three destination shelves. The object must be moved and placed in an upright position on your chosen destination shelf. Your task will be to complete as many pick-and-place cycles as possible in a specified time frame (usually two minutes).

### SPECIFICATIONS:

*(Please refer to plan and isometric drawings on pages 3 and 4.)*

The base of your device will sit in the FOOTPRINT AREA, a rectangle 203 X 146mm that is surrounded by a wall approximately 10mm thick and 25mm high. The plane of the START POSITION and the FOOTPRINT AREA is the same. The START POSITION is a small circle 50mm in diameter, where the cylinder will be placed at the start of each pick-and-place cycle. The DESTINATION AREA consists of three (3) shelves, each 19mm high. To place an object on the top shelf it must be lifted 57mm.

The wooden cylindrical objects are 70mm high by 32mm in diameter and each weighs approximately 43g.

Your team will choose the destination shelf for each pick-and-place cycle. A cylinder placed correctly on the bottom shelf is worth 1 point, on the middle shelf 2 points and on the top shelf 3 points. Your team can move the cylinder to any of the destination shelves each time you move it.

*All movements of the device **MUST** be controlled using fluid power.*

Any cylinder dropped in transit will be returned to its starting position. Once a cylinder is moved to its destination shelf it will be returned to its starting position ready to be moved again.

### DEDUCTIONS:

- *If your team manufactures a device that **only works when it is stabilized by hand(s)**, then **only 50% of the “moving object” score will count.***
- *If your **device breaks down** during the allocated demonstration time, your team can repair it during that time, and **subsequent “moving object” scores will only count 50%.***
- *If your device is **touched by hand in any other way**, then **the “moving object” score will be zero for the pick-and-place cycle during which the touching occurs.***

## **BEFORE THE COMPETITION DAY**

On the Workshop Day your team will build two kits that demonstrate movement by pneumatic power and that will introduce you to a variety of tools and materials you can use to build a device that meets the scenario specifications.

Between the Workshop and Competition Day you must design, build and test one or more prototype devices to move the cylinder and record your work in a Design Portfolio. You are encouraged to use drawing software such as TinkerCAD or Sketchup as part of your design process.

In your portfolio, you will have noted how you improved your prototype from your initial design and what you may plan to do differently on the Competition Day. Every member of your team should understand the sections of your portfolio completely so that you can implement those improvements on the Competition Day.

Remember that credit will be given to a well-designed device *particularly* one that is strong and stable (e.g., counter-balanced), makes economical use of the materials available, and uses the piston-syringes effectively.

## **AT THE COMPETITION DAY:**

Your team will bring two copies of your Design Portfolio to the Competition Day. One of these (for the judges) must be a print-out. The second copy – to be used by your team to guide construction of your device – can be a second print-out or in electronic form on a tablet or laptop computer. Upon arrival at the Competition Day, you will be provided a new kit of materials to build your device with. This “Challenge” kit will have the same parts as the “Prototype” kits that you took back to your school after the Workshop Day with the addition of 8 glue sticks, two 20cc syringes, an extra white syringe holder and an extra 1800mm of tubing.

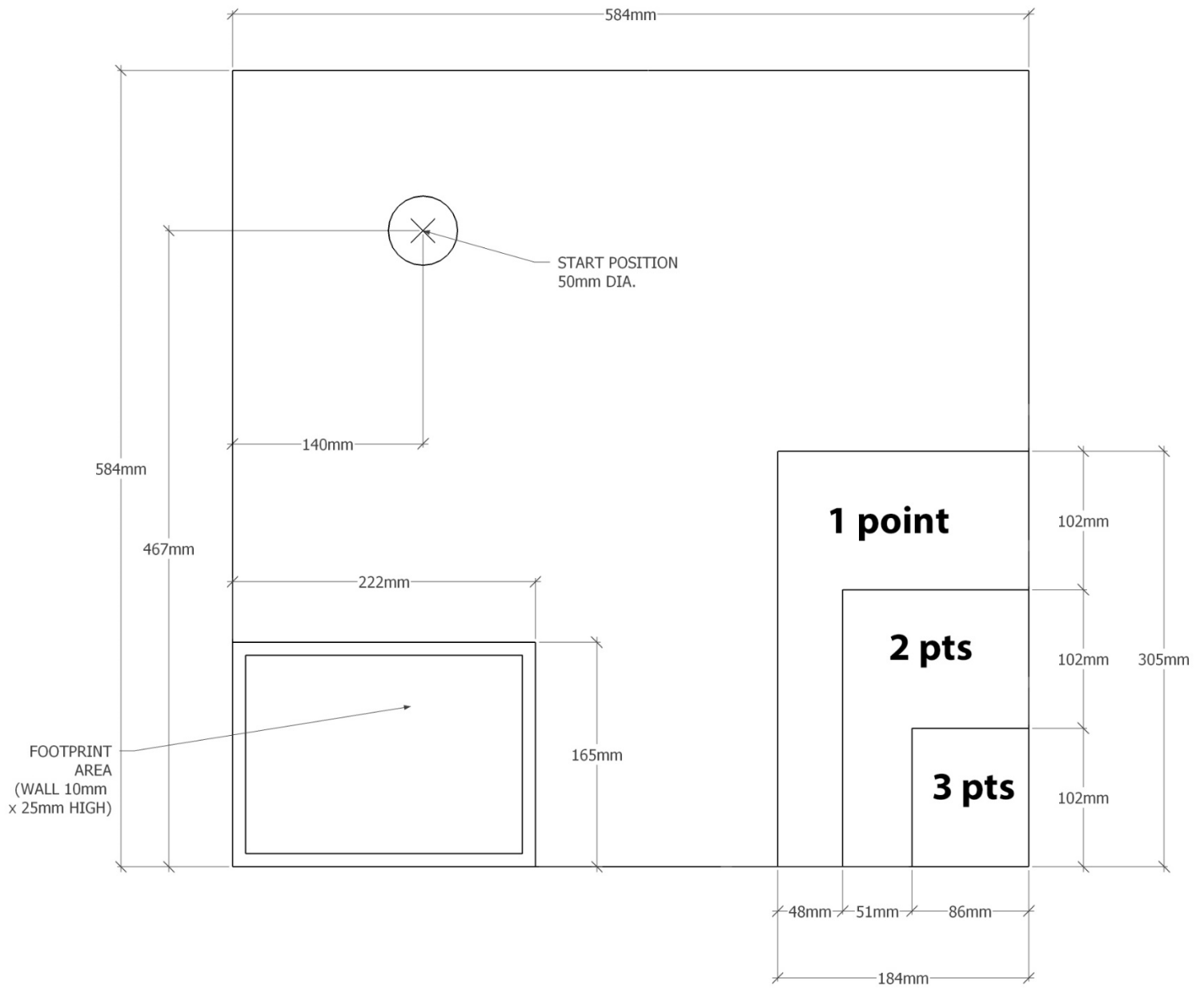
Referring to your portfolio and working co-operatively and within strict time limits, your team will build the device you have previously designed to meet the Challenge Scenario.

Glue guns will be available at dedicated workstations but only after lunch on the Competition Day. You are encouraged NOT to use hot glue unless it is an emergency. Wood glue and cardboard gussets are much stronger and less likely to come loose if in contact with water.

Using the *Local Challenge Rubric*, The Challenge Judges will evaluate your Design Portfolio, Teamwork & Work Habits and the Design, Construction and Performance of your device as well as asking you four questions specified on the rubric.

Prizes will be awarded for the best *Overall Score* and the best *Design Portfolio Score*.

# 2024 TORONTO CHALLENGE SCENARIO LAYOUT PLAN VIEW



# 2024 TORONTO CHALLENGE SCENARIO LAYOUT ISOMETRIC VIEW

