

Pi WARS
THE RASPBERRY PI ROBOTICS CHALLENGE COMPETITION



Feed the Fish

<https://piwars.org/2021-vpw/challenges/feed-the-fish/>

Premise:

Your fish are starving! Shoot pellets of food into the bowl or roll balls of food into the base of the bowl to activate the auto-feeding mechanism.

Aim of the Challenge:

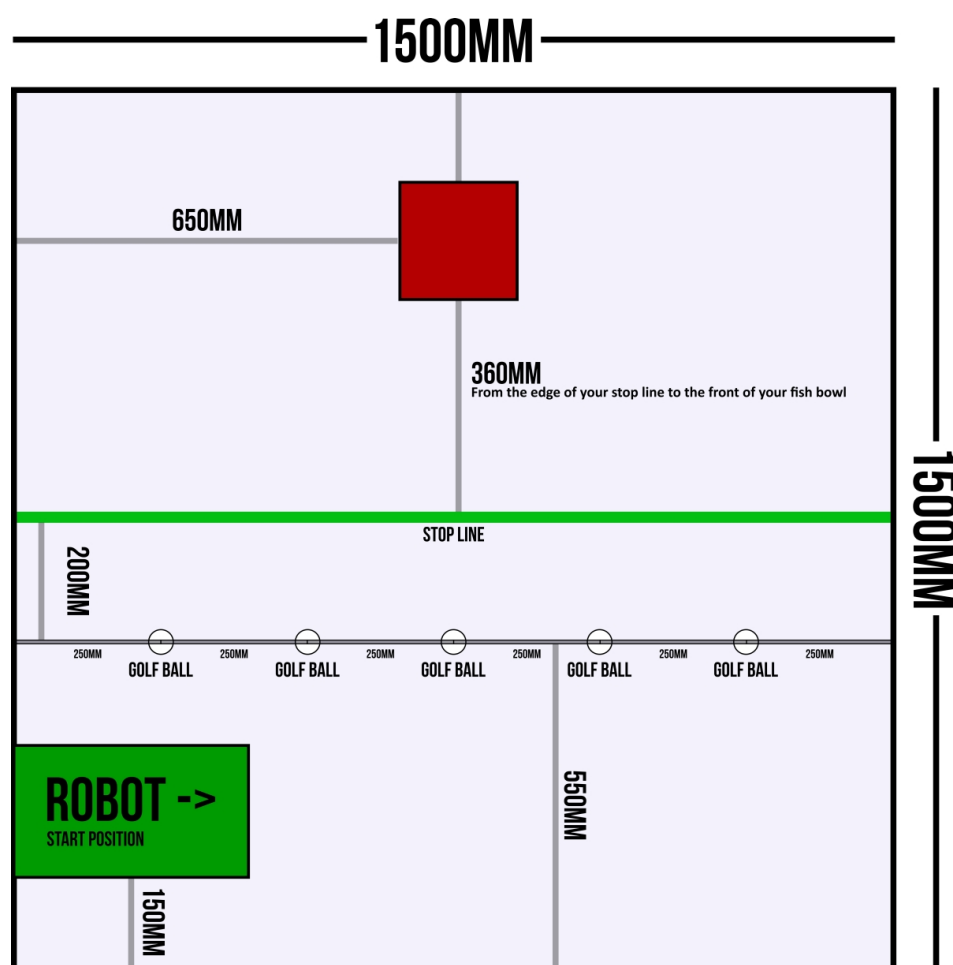
To feed the fish with as much food as you can manage within the time limit.

Control Method:

Remote control or Autonomous.

Time Limit:

5 minutes.



FEED THE FISH

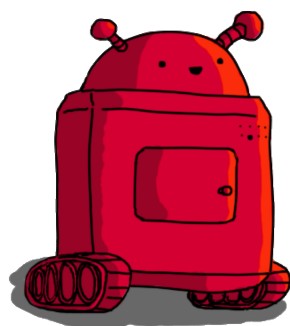
Rules

The “fish bowl” can be imagined as two 200mm-dimension boxes, one on top of the other with two openings. See below for a 3D representation of what you will be constructing. You can construct it in one piece, or create two boxes. If you make the bowl out of multiple parts, please ensure they are glued or taped together for stability. We will provide, in the next week or so, a template for the fish bowl. In the meantime, here is the model shown in the video below (which was created using TinkerCad) in OBJ, STL and GLTF formats. A laser-cuttable version of the fish-bowl/box is available from Open Pi Robotics on GitHub. Thanks to Brian Corteil for supplying it!

The bottom box will be open at the front. The top box will be open at the top but closed on the bottom, forming a 200mm cube with an open top.

The box will be placed in your 1500mm x 1500mm arena. A diagram for placement can be found below. You will want to think about how to fix it to the floor so that the ‘target’ maintains its position.

Your robot will be placed in the bottom left corner, facing the right side wall. You will need to maneuver into place for this challenge. There is a “Stop Line” marked on the diagram. Please use tape to mark it on the floor of your arena.



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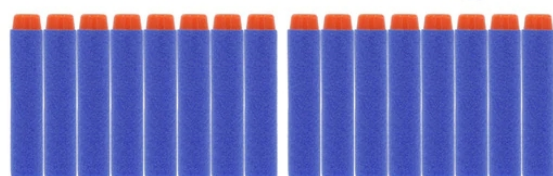
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Control Method:

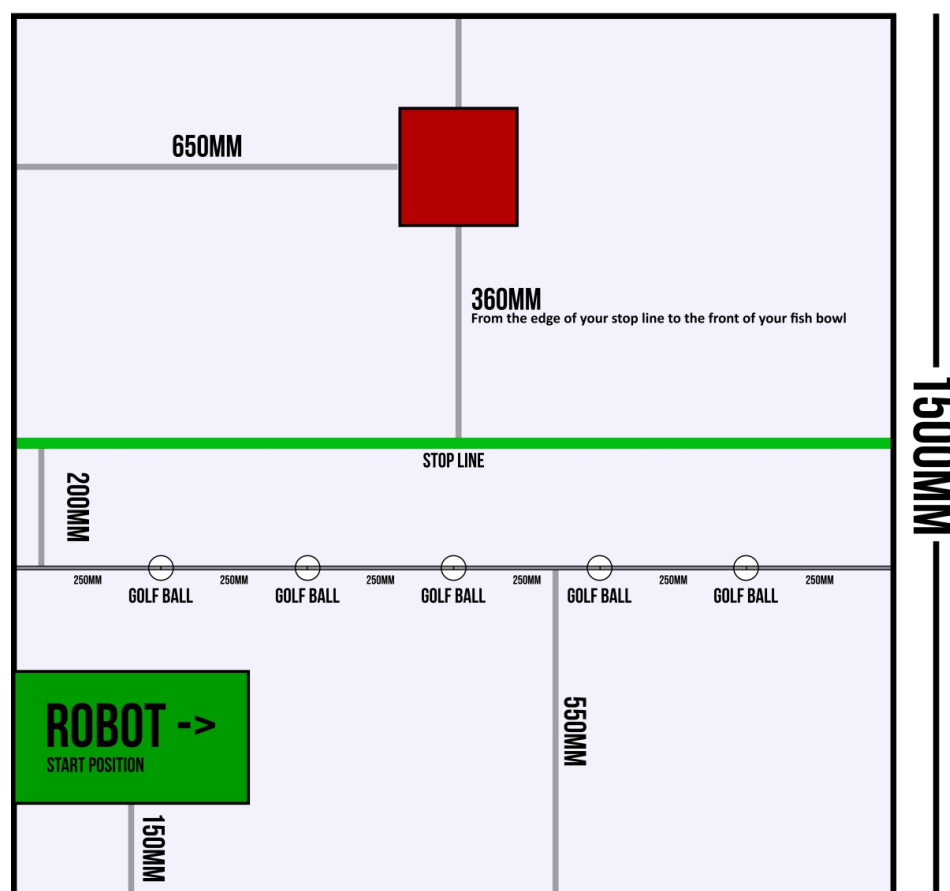
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1500MM



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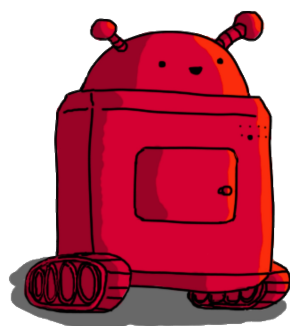
Rules

There are two methods for delivering the food:

The first, easier method, is to place five golf balls on the floor in specific positions (as shown in the diagram to the left) and then nudge or push them forward so that they travel into the bottom box. Once a ball enters the box, it is deemed as 'delivered'. (This is to allow for floors which aren't quite level and might roll the balls back out again!). You may use a mechanism to roll or push the balls forward. **However, once the ball passes the Stop Line (see diagram), it must maintain contact with the floor.**

The second, more difficult, method is to use a shooting mechanism to fire soft or lightweight projectiles into the top box. You will need to calculate the appropriate angle at which to fire the projectiles so that they land in the box. The projectiles must remain in the box (if they bounce out, the fish will go hungry!) but you can fire more than one at once if you feel that will give you greater accuracy.

PLEASE be careful what you use for ammunition and how you fire them – expected volume is shown below but no projectile is safe at high speed!



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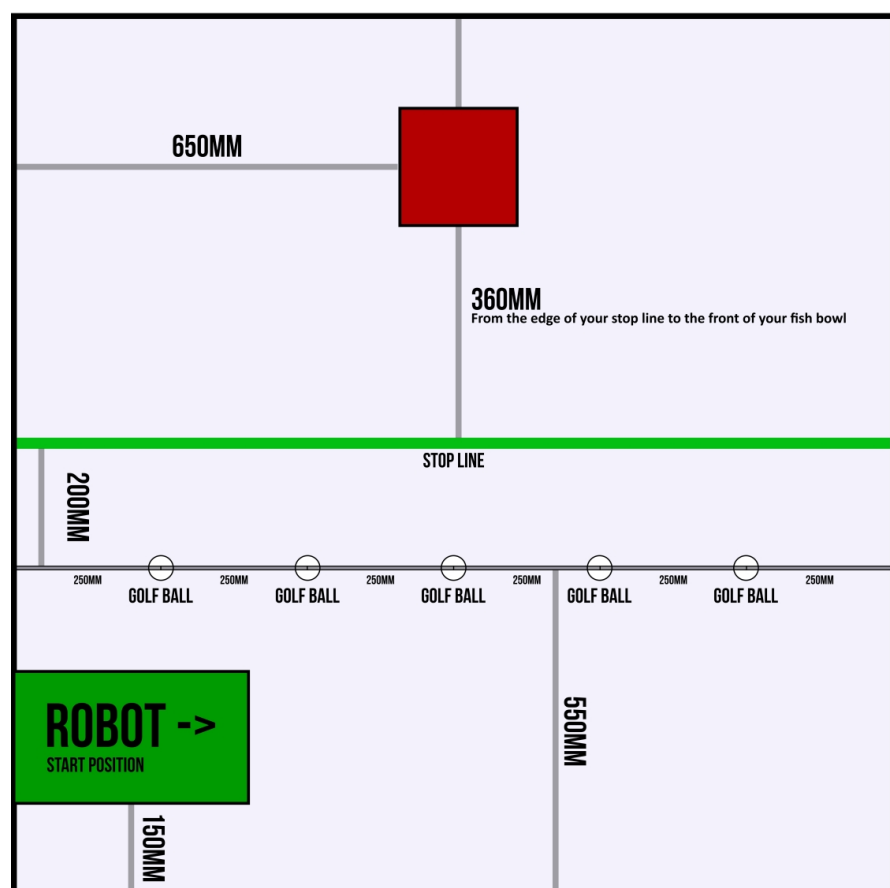
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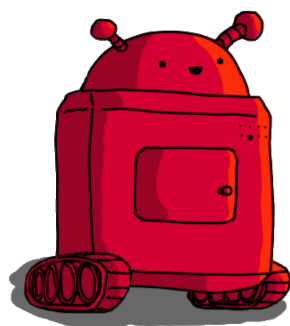
Whether you use the golf balls or the projectile method, you will have “five shots per round” and there will be three rounds.

At the end of each round, both the balls (if you’re using them) and your robot must be reset to their start positions.

If you are firing multiple projectiles at the same time, you are limited to a total of five projectiles each round. These projectiles must be separate, distinct shots.

The gun to the left is an example of a shooting mechanism. If you figured out a way to trigger 5 barrels of the gun at the same time, that would be fine (as the projectiles are distinct). However, you would not be permitted to “tape together” the projectiles to make them ‘as one’.

Please contact us if this is at all unclear.



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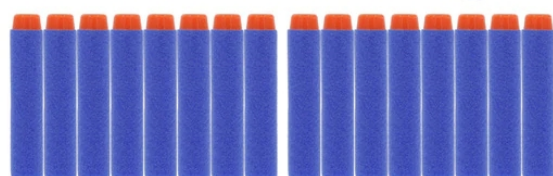
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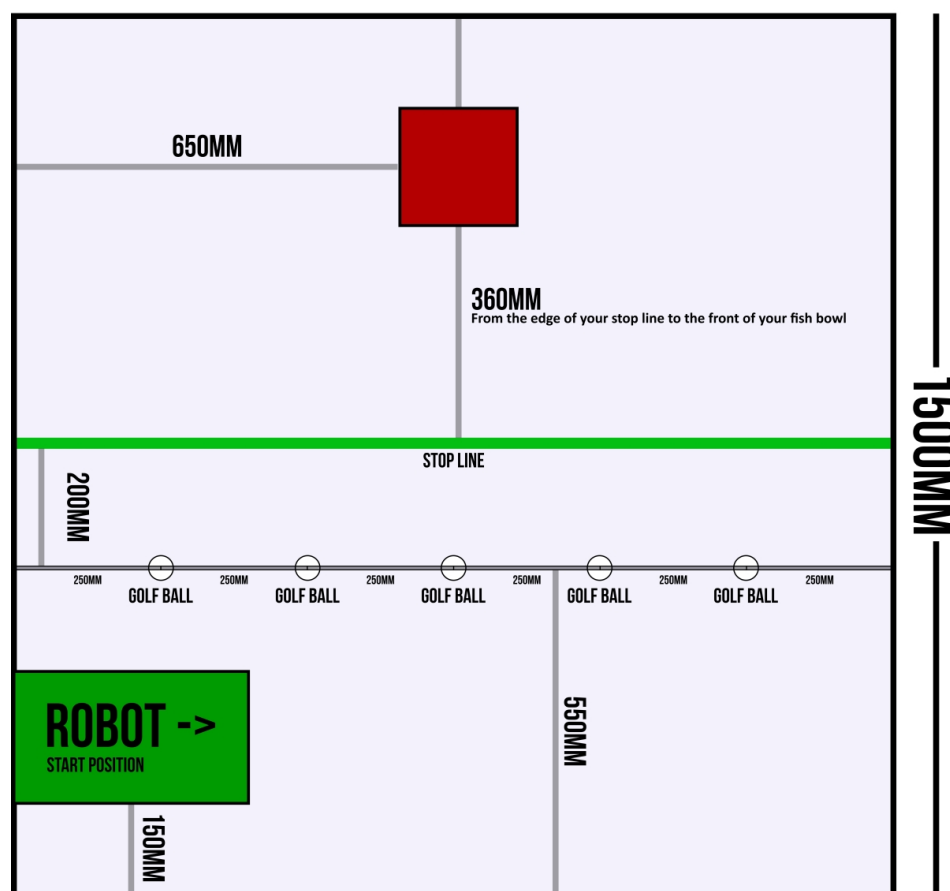
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Rules

Projectiles for the top box must be at least 4cm³ in volume (I think this is right – please contact us if you’re unsure if what you are using is appropriate!). This is to ensure fairness. **Please ensure that the projectiles are visible on your video – even if this means that you do a shot of the box with the projectiles in to let us count them!**

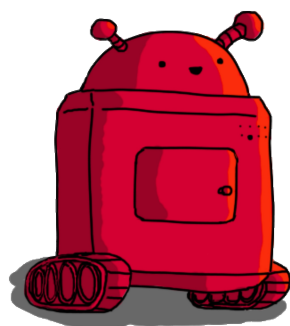
Nerf Rival balls are fine – they are 20mm in diameter.

Standard Nerf bullets are fine – they are 12mm in diameter and 72mm in length.

Golf balls go in the bottom opening, projectiles must go into the top opening.

Your top bowl may contain material to soften the landing of your projectiles. This material may be water, sand or foam, for example, which will provide a “soft landing”. However, the material may not be “attractive”, for example magnets or Velcro would not be allowed.

Please note: you must move your robot fully out of the starting position before you can shoot or move the golf balls.



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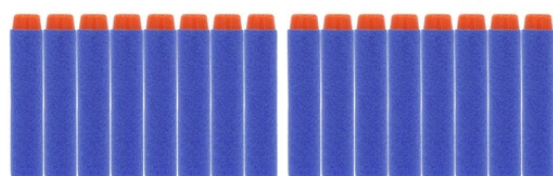
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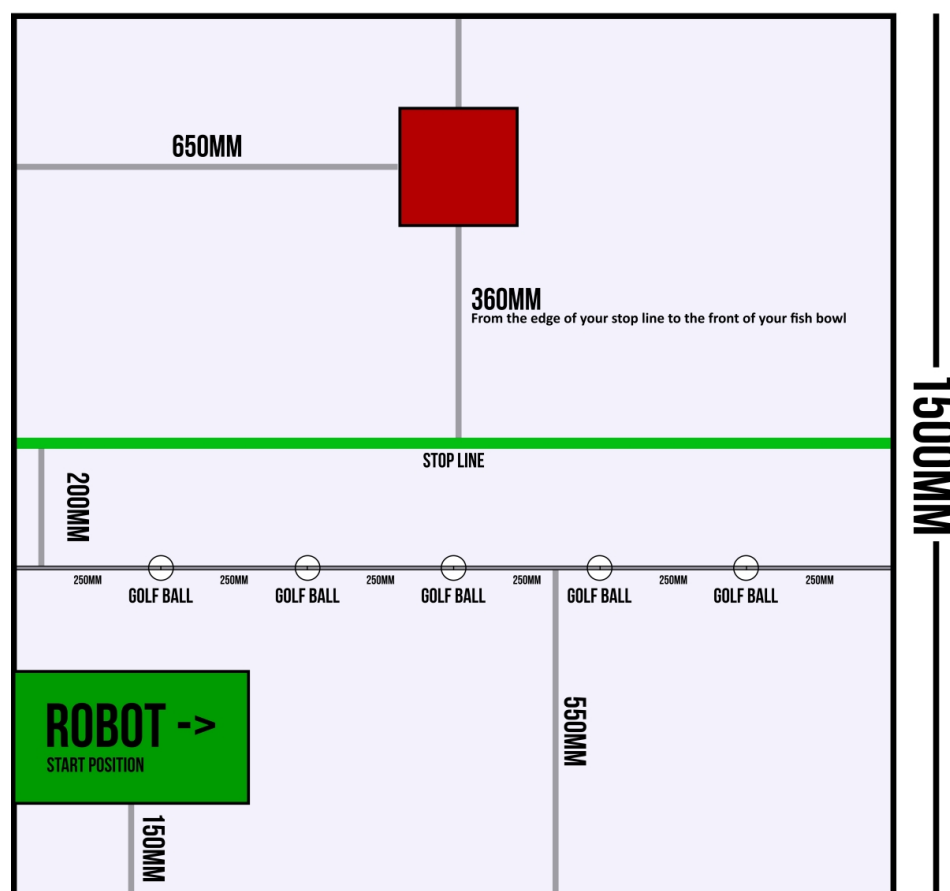
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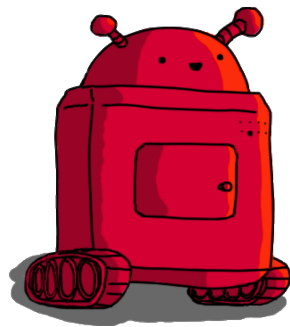
Regardless of which method you use, no part of your robot may travel further forward than the Stop Line marked on the diagram. You should also be mindful of the overall size restrictions in the General Rules found at <https://piwars.org/2021-vpw/general-rules/>

Please record an uninterrupted video of your entire three sets of five shots to show that you have completed the challenge within the time limit and also to confirm any penalties incurred.

Ranking and Points

Points will be awarded for each “piece of food” successfully delivered. (These may be different depending on whether you are completing the task autonomously or with remote control).

Rankings, which will be according to the Formula Scoring System, will be awarded according to the number of points scored on the food targeting challenge. In the event of a tie-break, the robot who manages to complete their 3 x 5 shots in the shorter time will rank higher. In the event of a time-and-points tie-break, the tie will be settled by artistic merit points (see below).



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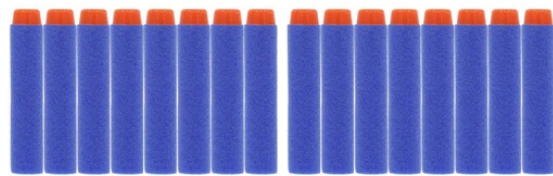
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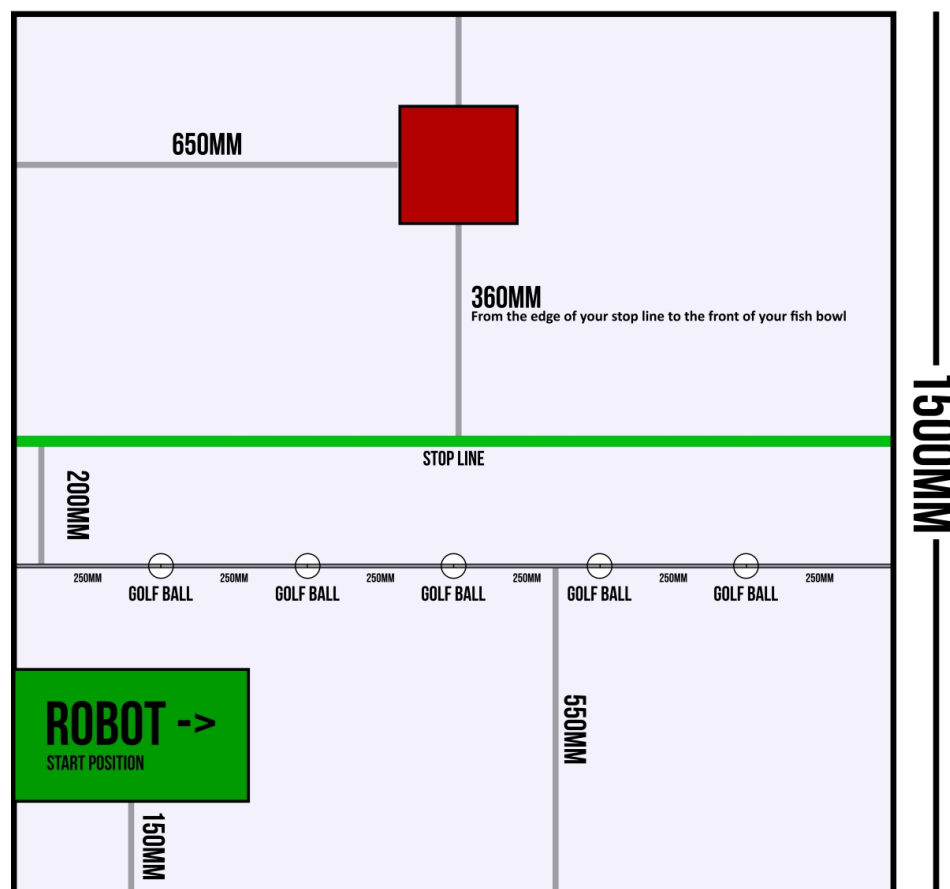
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Additional Points

Additional “Artistic Merit” points will be available for decoration of your Fish Bowl!

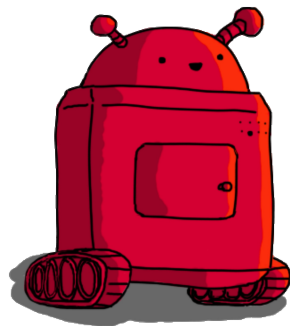
Penalties

Fish do not like you tapping on the side of their bowl! Any shot that hits the outside surfaces of the boxes loses you X points.

Hints

Practice, practice, practice.

If using soft projectiles, it may be sensible to mark out a specific place in your arena that you will fire from – that way when you move from practicing to “real” operation, you will have a near-identical position.



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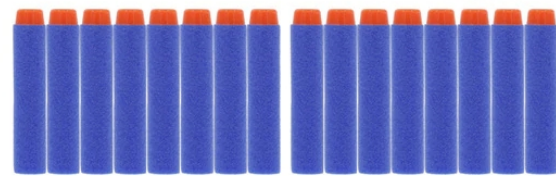
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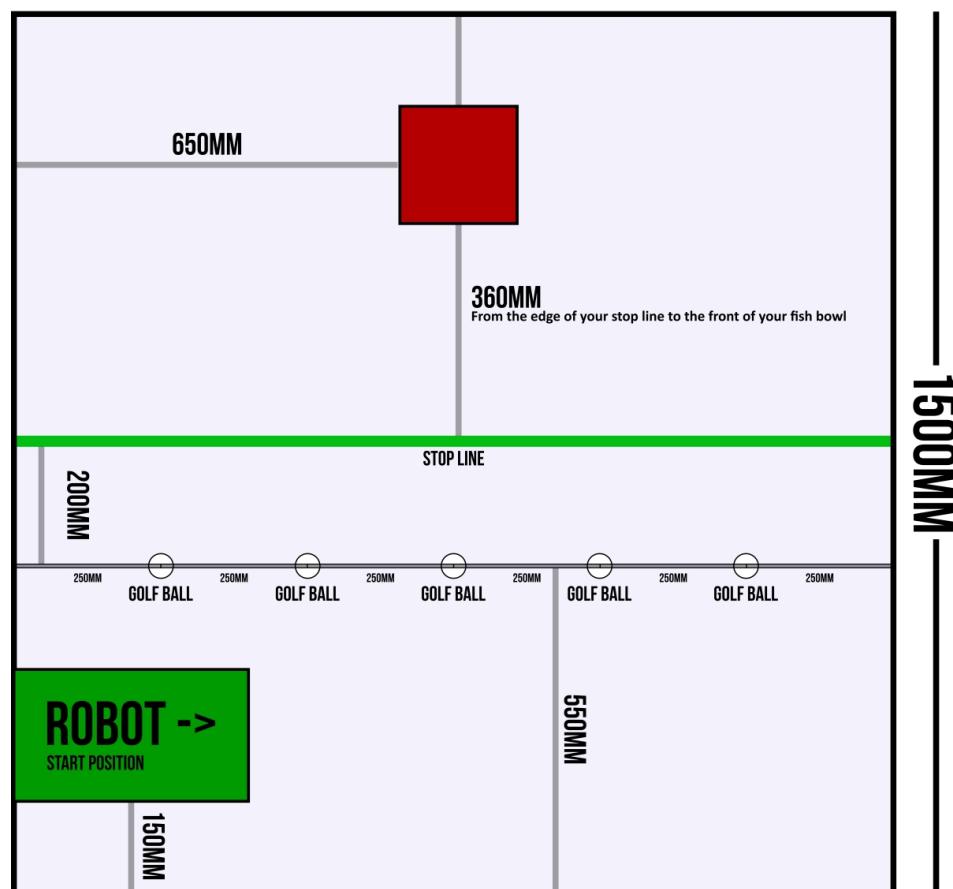
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Notes:



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