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THE SMALLPEICE TRUST

FORMULA ONE RICIN: RULES

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COMPUTING AND MICROELECTRONICS

1 Game Rules

1. The game, called *Formula One Ricin*, is played in the arena defined in Specification 2. The objective is to collect tokens, and to bring them to one's scoring zone.

2. The arena contains sixteen tokens. The layout is detailed in Specification 2. Each token is worth 2 points.

3. In the centre of the arena, on a raised platform, is a special poison token, which has the effect of nullifying the scores in a zone.

4. At the end of the game, each robot is awarded the sum of the value of all tokens entirely within their scoring zone, unless that scoring zone contains the poison token. If the zone contains the poison token, no points are awarded.

5. An additional bonus point is awarded for any movement from the start position of a robot.[1]

6. A token is in a scoring zone if, and only if, all the following conditions are met:

   (a) At least three of its corners are in contact with the floor in the zone[2],

   (b) It remains on the floor even if any robot touching it is lifted.

7. Participating teams must present their robots to match officials at least one minute before the start of each match. They will be asked to place their robot in the arena, and vacate the arena at least 30 seconds before the official start time of the match.

8. There will be up to 4 robots in each match.

9. The Smallpeice Trust may have any number of match officials within the arena, including during the course of matches.

10. At the start of each match, robots must be entirely within their starting zones.

11. At the start of each match, teams will be permitted to lean into the arena and start their robots.

12. Each match lasts 180 seconds.

13. At the end of each match, teams must wait for instructions to collect their robots or risk disqualification. This is in order to give match officials time to record scores.

14. Teams may be disqualified from one or all matches by match officials, for non-compliance with regulations, lateness to the match, or any other reason at the discretion of the judge. Teams disqualified before the start time of a match will not be permitted to enter a robot.

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[1]This can be awarded regardless of the presence of a poison token.
[2]Note that this means tokens on the central platform are *not* in any zone.

2 Regulations

1. The Judge's decision is final.

2. All robots must be safe.

    (a) This is defined considering safety concerns including, but not limited to:
        i. sharp edges;
        ii. the effects of impact at speed;
        iii. fire risks from the battery (see Regulation 8).

    (b) No robots will be permitted to compete without passing a safety and compliance inspection.

    (c) Smallpeice Trust staff and volunteers may reinspect your robot and invalidate previous inspections at any time.

3. Any assistance from The Smallpeice Trust staff and volunteers is provided without guarantees.

4. Competitors are expected to behave within the spirit of good sportsmanship.

5. Competitors must take reasonable measures to avoid their robot damaging the arena, or anything within it, including other robots. This is a non-contact sport.

6. All robots must be fully autonomous once started. No remote control systems are permitted.

7. At the start of each match, all competing robots must fit within a cube with edges of length $500\,\text{mm}$. Expansion beyond this limit during the course of a match is permitted.

8. The Lithium-Polymer battery is the most dangerous part of the electronics kit and must be treated accordingly. Whenever a robot is in operation its battery must be:

    (a) securely held in place;

    (b) adequately protected from damage even in the presence of damage to the rest of the robot;

    (c) connected only to the main input of the power board.

9. A robot's main power switch must be easily accessible and on the top of the robot whenever the robot is powered.

10. All electronics on a robot must be:

    (a) securely held in place;

    (b) easily removable.

3 Specifications

3.1 Markers

The arena and tokens in the game are labelled with *libkoki* fiducial markers. Each marker number is associated with a particular feature in the arena, and also has an associated size. The marker numbers and sizes are as follows:

Item	Marker Number	Marker Size (mm)
Arena boundary	0 − 27	250
Poison token	32	100
Tokens	33 − 65	100

All markers are oriented vertically such that the principal corner of the marker (which is indicated by a dark grey dot in the black marker border) is on the higher edge.

3.2 Arena

1. The arena floor is an $8\,\text{m} \times 8\,\text{m}$ square. The tolerance of these two dimensions is $\pm\,250\,\text{mm}$.

2. The floor of the arena is carpeted.

3. The layout of the arena is given in Figure 2.

4. The outer walls of the arena are at least $600\,\text{mm}$ high, and the interior surface is white plastic-coated hardboard.

5. Each wall of the arena features seven $250\,\text{mm}$ libkoki markers. The positions of these markers is given in Figure 1. The marker numbering is given in Figure 2.

6. The robot starting zones are squares which share corners with the arena itself. Their sides are of length 1m.

7. In the centre of the arena is a platform raised by $120\,\text{mm}$ (tolerance $\pm\,30\,\text{mm}$) above the arena floor, in the centre of which is a poison token.

8. The scoring zones are isoceles, right-angled triangles with the right angle at the centre of the arena, and the short edges axis-aligned with the arena. The short edges are of length 2m.

9. The starting and scoring zones is visually delineated on the floor of the arena by coloured tape. The outer edge of the tape indicates the outer edge of the zone. This tape is for visual reference only.
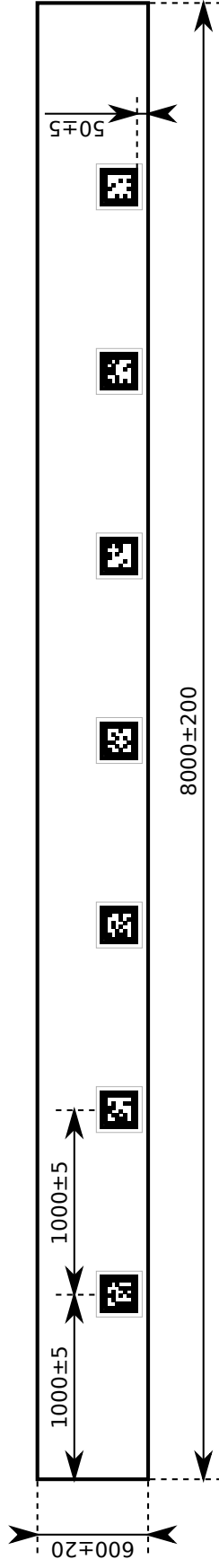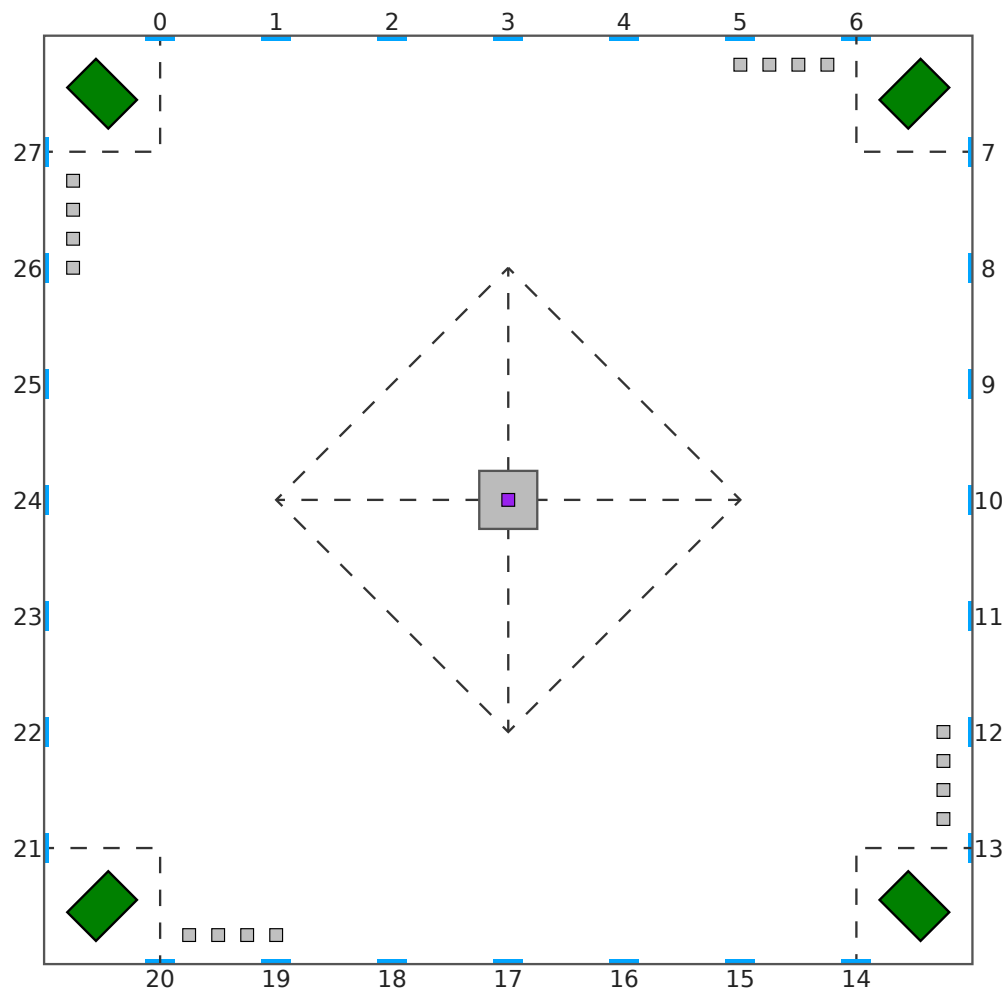
Figure 1: Layout of markers along each arena wall.

Figure 2: Layout zones and tokens in the arena.

3.3 Tokens

1. Tokens are cubic corrugated cardboard boxes, with sides of length 110mm $\pm$ 10mm.

2. Each face of each token has a libkoki marker attached. The marker is identical on all six faces.

3. The poison token will be styled to be visibly distinct from ordinary tokens. The manner of this styling is undefined: robots must rely on the libkoki markers to distinguish the poison token and ordinary tokens.

4. The initial layout of tokens in the arena is given in Figure 2.

4 Tournament Format

The competition takes place in two phases: the league, and the knockouts.

4.1 League

1. In the league stage, teams will face all other teams at least once.

2. At the end of each match, *league points* will be awarded as follows:

   (a) The team with the highest game points is awarded 8 league points;

   (b) The team with the second-highest game points is awarded 6 league points;

   (c) The team with the third-highest game points is awarded 4 league points;

   (d) The team with the fourth-highest game points is awarded 2 league points;

   (e) In case of any ties, the total number of league points spanned is divided by the number of entrants. For instance, if two teams tie for second place in a match, that gives a total of 10 league points between them (6 for second place and 4 for third), which divided equally gives both teams 5 league points.

   (f) After points distribution, any disqualified or non-present teams have their awarded league points nullified for that match.

3. At the end of the league, the total numbers of league points are used as seedings for a knockout structure. Teams that placed higher in the league will have to compete in fewer matches in the knockout – although, all teams will take part in the knockout and thus have a chance of winning.

4.2 Knockouts

The knockouts span five matches, with the format as follows:

Match	Zone 0	Zone 1	Zone 2	Zone 3
QF 1	Seed 3	Seed 5	Seed 8	Seed 10
QF 2	Seed 4	Seed 6	Seed 7	Seed 9
SF 1	Seed 2	1st, QF 1	3rd, QF 1	2nd, QF 2
SF 2	Seed 1	2nd, QF 1	1st, QF 2	3rd, QF 2
GF	1st, SF 1	2nd, SF 1	1st, SF 2	2nd, SF 2

All ties in the knockout stage are resolved by a decision from the Judge, taking league position into consideration.