Asia Pacific Robot Alliance Competition

Game Description, Rules and Scoring

EV3 Guardian of the Galaxy

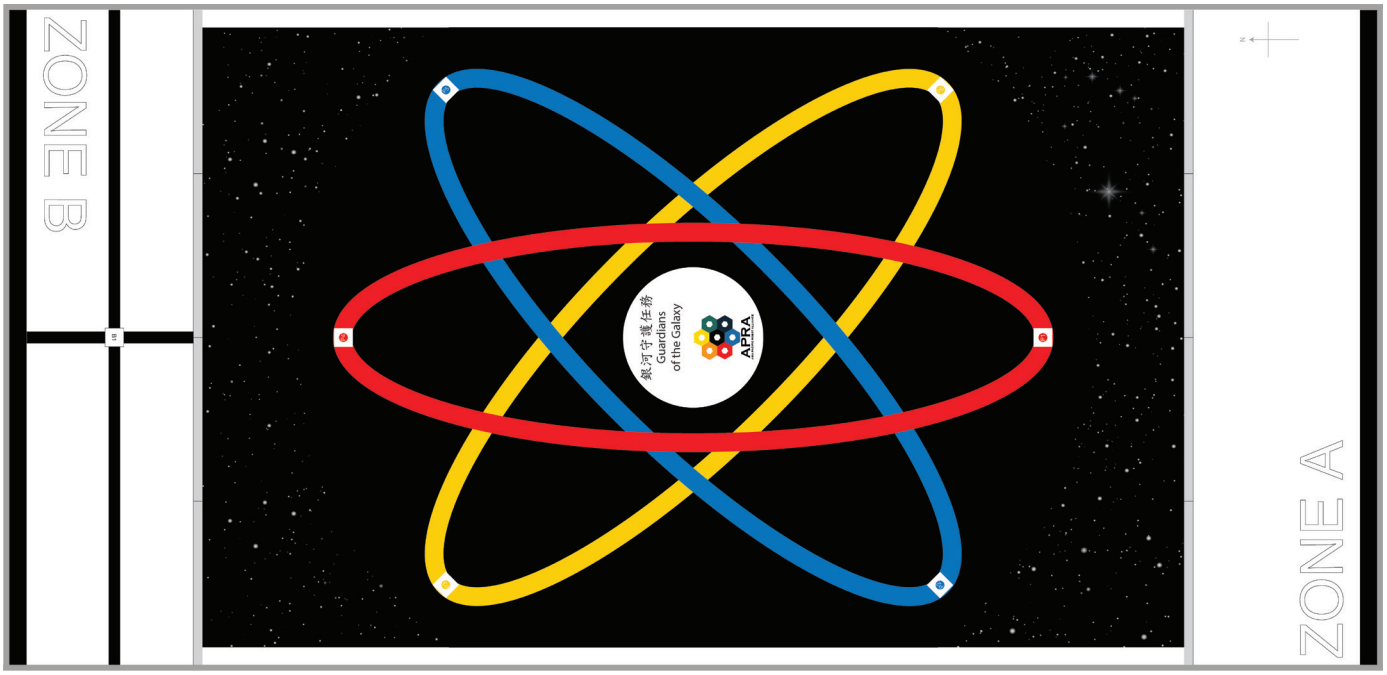
Elementary
(age : up to 12 years old)

version 20191210

APRA
ASIA PACIFIC ROBOT ALLIANCE

Introduction

Participants are to enter as a team of 2 to 3 team members, each team will enter 2 robots. The 2 robots will act as the Guardians of the Galaxy. The first guardian (robot A) will start and complete its mission as fast as possible, once completed, the mission props will be passed to the second guardian (robot B) to complete its mission and finish. The robotic competition will challenge teams on their speed as well as the teamwork between robots.



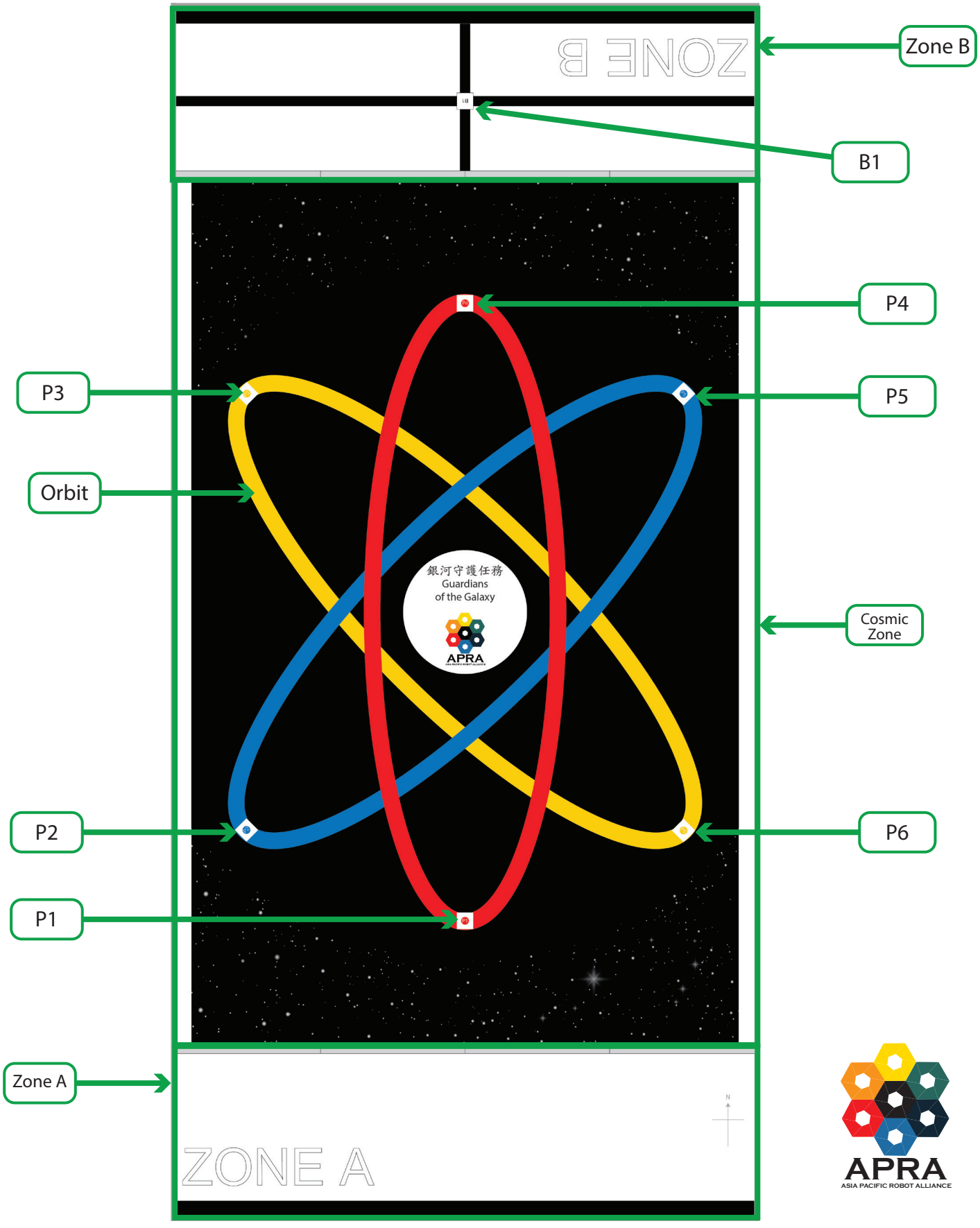
Content

A. Mission Description
B. Scoring
C. Competition Rules
D. Robot Specifications
E. Game Field specifications
F. Game props
G. Scoring Interpretation

APRA
ASIA PACIFIC ROBOT ALLIANCE

A. Mission Description

The six symbols of P1 to P6 will be marked in the "Cosmic Zone" on the field, as shown in the following figure. At the beginning of the competition, obstacles and satellite positions will be marked as follows: yellow satellite will be placed on P3; blue satellite will be placed on P5; obstacles will be placed at P2, P4 and P6; and the red satellite will be placed at B1.



(A)Mission 1 - Robot A begin：

After Robot A “Fully leaves” Zone A, it may not re-enter or else it will be seen as out of bounds.

(A)Mission 2 – Obstacle clearing:

Obstacles placed at P2, P4 and P6 will need to be relocated to “fully enter” zone B by Robot A.

(A)Mission 3 – Robot A enter Zone B:

Robot A will need to “fully enter” Zone B and come to a complete stop.

(Relay)Mission 4 – Complete satellite connection:

The Red satellite in zone B will receive the Red Battery that is transported by Robot A.

(Relay)Mission 5 – Successful robot handover (given not a manual handover):

Competition Situation: Robot B “fully leaves” zone B only after Robot A “fully entered” Zone B. After Robot B “fully leaves” zone B, it may not re-enter or else it will be seen as out of bounds.

(B)Mission 6 – Transporting Red satellite:

Robot B will transport the red satellite from B1 to P1.

(B)Mission 7 – Robot Arrives zone A:

Robot B must be stationary within 3 seconds after “fully entering” zone A. When stationary, Robot B must have “Fully entered” zone A.

Mission 8 – Avoid working satellites (given that the total score is at least 20 points):

After the competition finished, the markings of P3 and P5 must be fully covered by the yellow and Blue satellites.

Mission 9 – Guarding the satellite (given that the total score is at least 20 points):

After the competition finished, the red, yellow and blue satellites should all contain their corresponding colored batteries (2x2 Bricks).

Mission 10 – Guarding the boundary (given that the total score is at least 20 points):

After the competition finished, the 4 boundaries surrounding Zone A and B should be unmoved. The shadow area underneath the boundary should maintain completely covered.

B. Scoring Details

Robot	Particular		Points
Robot A	Mission 1	Robot A begin	10
	Mission 2	Obstacle clearing	30 (10 each)
	Mission 3	Robot A enter Zone B	10
Robot A & Robot B	Mission 4	Complete satellite connection	10
	Mission 5	Successful robot handover	10
Robot B	Mission 6	Transporting red satellite (points from any 1 out of the 3 senarios) - not touching the red route - touching the red route - the round P1 sign is covered completely	(any 1 out of the 3) 0 10 20
	Mission 7	Robot B arrives zone A	10
Robot A or/and Robot B	Mission 8	Avoid working satellite	20 (10 each)
	Mission 9	Guarding the satellite	30 (10 each)
	Mission 10	Guarding the boundary	40(10 each)

Points deduction	Points
Non-connected part penality	- 10 each
Robot out of bounds	- 10 (count once for each robot)
Manual handover	-20

APRA
ASIA PACIFIC ROBOT ALLIANCE

C. Competition Rules

1. Each round of competitions will have multiple competitions running at the same time, all competition fields will have a consistent setting of objects.

2. Pre-competition preparation time before each competition will be set to 1 minute. Only 2 members of the team are allowed to enter the competition zone. Teams may make adjustments to the robots during this time but may not bring a computer to reprogram the robot.

3. The definition of the robot is the controller (e.g. EV3) and anything that is manually connected to it and cannot be disconnected unless manually from the controller.

4. The definition of Robot A is the robot that begins in zone A; The definition of Robot B is the robot that begins in zone B. Before the competition begins, the robot may be placed in any orientation or location but the vertical projection of the robot should be on or within the boundaries of the marked starting zones.

5. After the competition has begun, any part of the robot that has accidentally or intentionally fallen off may be removed by the judge (will not be counted as part of robot). If field objects have been affected, they will not be restored.

6. Each accidental or intentional fallen part will lead to a penalty of deduction of 10 points.
7. Transported goods are defined as the objects that are moved, relocated or released by the robot.

8. If any part of the robot that is in contact with the ground is out of bounds, the robot will be classified as out of bounds and will receive a penalty of a 10-point score deduction.

9. “fully out of bounds” is defined as all parts of the robot that are in contact of the ground are outside the field. Robots that are “fully out of bounds will be removed from the field and so will the transported goods. The competition will terminate and the scoring calculations will be based on completed missions.

10. “fully entered” is defined as the vertical projection of robot or object is fully within or on the boundary line of a region.

11. “fully left” is defined as the vertical projection of the robot or object is fully outside the boundary line of a region.

12. Robot B may only leave Zone B after Robot A “fully enters” zone B or a “manual handover” has taken place. If not, Robot B and its transported goods will be removed from the competition field.

13. “Manual handover” is defined as: participants have the ability to manually start robot B 1 minute after the competition has begun but robot A must be stationary and will be removed by the judge.

14. “Manual handover” will be effective once the judge has been notified. After the “manual handover” is effective, the team will receive a penalty of 20-points deduc tion.

15. Mission Models:
    - Mission models are defined as objects that are already on the competition field when the participant enters the competition area.
    - If the robot has similar looking parts to the competition models, the judge may request the relevant parts to be removed to avoid confusion.
    - Disassembling mission models is not allowed (regardless temporarily or not) and violators will receive a 10-point penalty.
    - Before the competition begins, the vertical projection of Robot B must not overlap with the red satellite on B1.
    - The mission models may not be modified and participants may not add or change any part of it.
    - If the mission models are put within the robot, it must pass the gravity test to be qualified to compete.

16. To pass the gravity test, the robot containing the mission object (placed manually) must be able to separated from the model using gravity while the robot is rotated.

17. The duration of the competition is 2 minutes (120 seconds). When the judge signals that the competition has begun, the timer will start. The timer will not stop until the competition ends.

18. When the judge signals the beginning of the competition, participants may start the robot (though confirmation button or other sensors).

19. If participants interfere with the robots, transported goods, mission models, field or other items on the field without confirmation from the judge after the competition begins, the competition will finish immediately and the judge will start calculating the scores for already completed missions.

20. After the competition begins, robot B is permitted to move freely within zone B (not including any manual or remote control).

21. Missions, Mission models, model positions and field settings can vary yearly and may subject to change for different events.

22. Missions are divided into 4 categories
    - A: May only be completed entirely by robot A or else no score is awarded.
    - B: May only be completed entirely by robot B or else no score is awarded.
    - A&B: To be completed by both robot A and robot B or else no score is awarded.
    - A/B: To be completed by robot A and/or robot B or else no score is awarded.

23. The end of a competition is defined as: the vertical projection of Robot B has “fully entered” zone A. (N.B. when Robot B “fully enters” zone A, the timer with stop.)

24. If either of the following events occur during the competition, the competition will end immediately:
    - Competition completed.
    - The competition time has been reached (2minutes).
    - If any participants interfere with the robot.
    - If competition rules have been violated.

25. After the competition has ended, judges will calculate the scores for the competition. Teams will need to sign and confirm the results. If any issues are raised, they should be resolved immediately, appeals will not be accepted afterwards.

26. All teams must not bring their own competition fields to the venue on the competition day for testing. Testing time will be provided along with the competition field by the organizers. Teams should follow the schedule of the day and go to the dedicated fields for testing. The number of times for testing is not limited but each time is restricted to 2 minutes. When lining up, participants without a robot will be requested to leave the line and queue at the end. (N.B. all robot Bluetooth functionality should be switched off during the event)

27. Each competition event will have at least 2 rounds of competition, the order of results will be based on the best result achieved. For teams with the same score, the team completed with the shorter completion time will be ranked higher. If the completion is also the same, the result of the second-best round of competition will be consid ered.

28. If there are any special cases, the final decision will be subject to the main judge with no objection.

D. Robot Specification

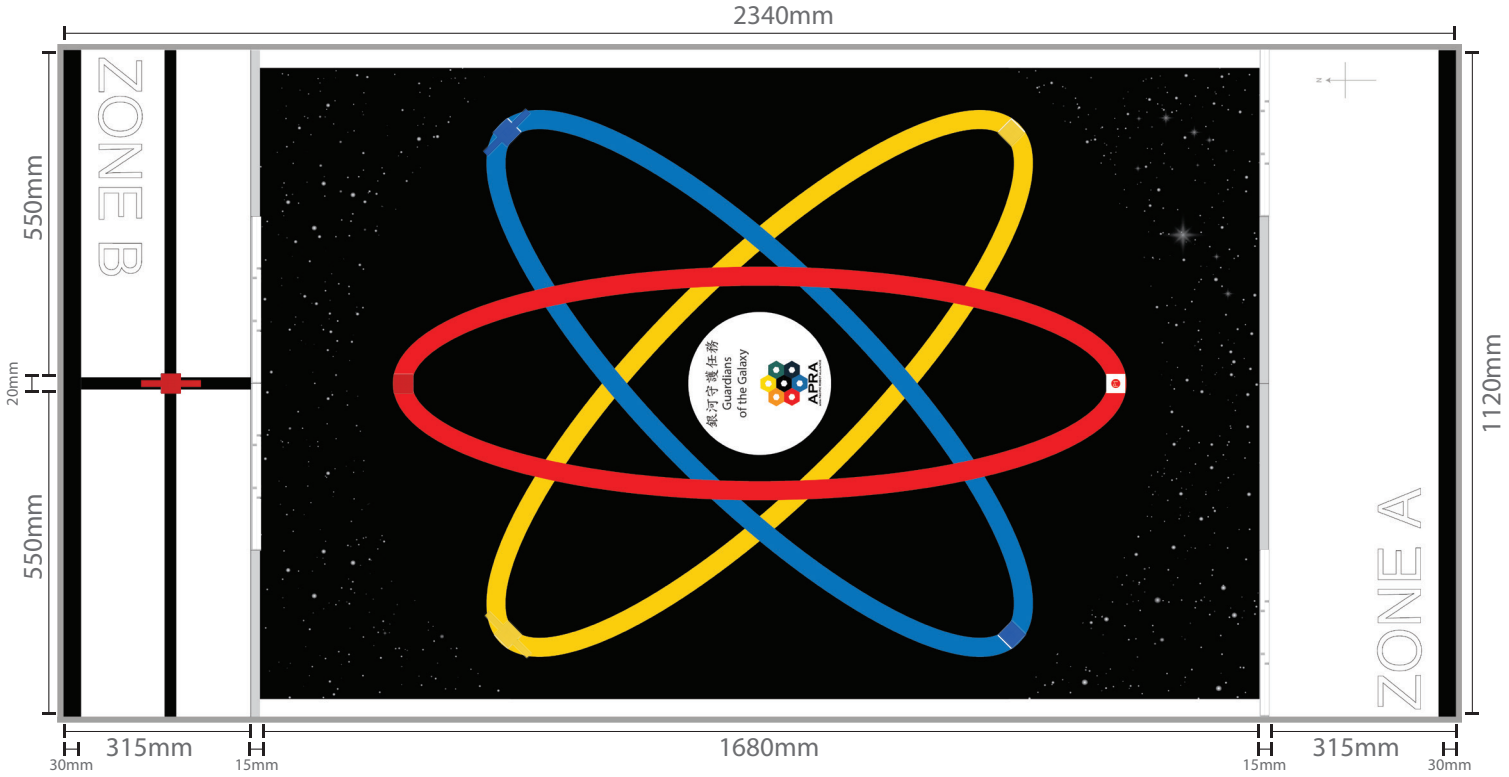
1. Dimensions: when the robot is fully extended, the dimension should be within H: 25cm x W:25cm x L:25cm.
2. Robot electronics (controllers, motors, sensors) must be from LEGO® MINDSTORMS™ or HiTechnic.
3. Each robot is limited to 1 controller (EV3 or NXT).
4. Number of motors and sensors are not restricted. The following may be used.

9842-NXT motor	9843-NXT touch sensor	9844-NXT light sensor	9845-NXT sound sensor	9846-NXT ultra-sonic sensor
9694-NXT color sensor	45502 large motor	45503 medium motor	45504 ultra-sonic sensor	45505 gyro sensor
45506 color sensor	45507 touch sensor	HiTechnic NXT color sensor V2		

5. Only the official rechargeable battery or 1.5V lithium batteries may be used. The judge reserves the right to open the controller and inspect the used batteries. If teams are found to violate this, they will have 1 minute to correct the problem or else they will not be able to participate in that round of competition.
6. Robots are to be constructed using strictly LEGO® brand pieces. No other building mate rial can be used, including glue, tape, screws etc.
7. Robots must be programmed using ROBOLAB, LEGO® MINDSTORMS NXT or EV3 soft ware.
8. Robots must be autonomous and not be remotely controlled.
9. Participants may bring prebuilt robots to the competition venue.
10. At any time if the judge finds robots that are not to specification requirements, the team will have 1 minute to correct the problem or else they will not be able to participate in that round of competition.
11. Teams are only allowed to use 2 robots (2 controllers) to compete in each round of competitions, corresponding to Robot A and Robot B. It is a violation to use more than 2 robots in each round of competitions. Teams may decide to switch to different robots for another round of the competition but they may not exchange parts or robots with other teams. If teams are found to be colluding, the teams may be subject to disqualification.

APRA
ASIA PACIFIC ROBOT ALLIANCE

E. Game Field Specification

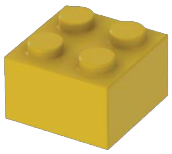
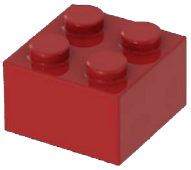


1. The competition field is L:2340mm x W:1120mm (The total size of the field mat is 2360mm x 1140mm).
2. The competition area is surrounded by a 10mm wide grey outline which serves as a tape region to secure the field mat to the ground. The field may be placed on the ground or a platform within 30mm from the ground. All settings are subject to the venue setting on the day of the competition.
3. The rectangle on the right indicated by “Zone A” will be where robot A begins.
4. The rectangle on the left indicated by “Zone B” will be where robot B begins.
5. Position B1 (within zone B) locates where the red satellite will be positioned at the beginning.
6. The orbits within the cosmic zone are 31mm wide.
7. Position markers will have a 15mm diameter circle.
8. Positions for “obstacles” are marked using the circle position markers.

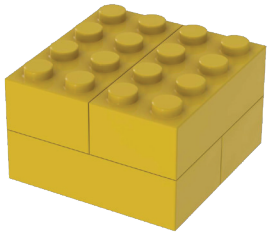
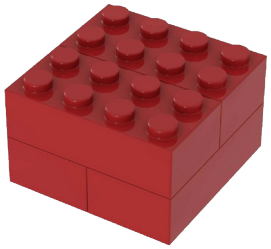
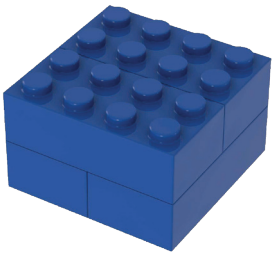
APRA
ASIA PACIFIC ROBOT ALLIANCE

F. Game Props

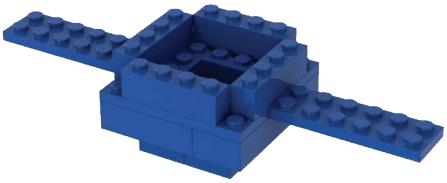
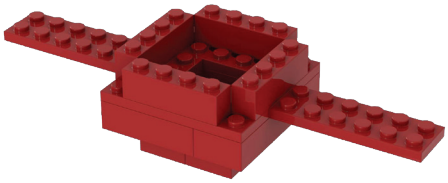
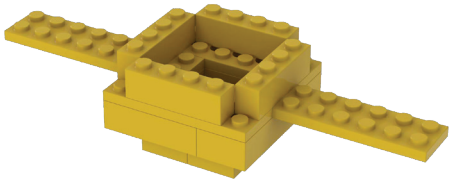
Batteries are represented by 2x2 LEGO® Bricks.

Obstacles are constructed with 4 2x4 LEGO® Bricks.

Satellite construction please refer to appendix 1.

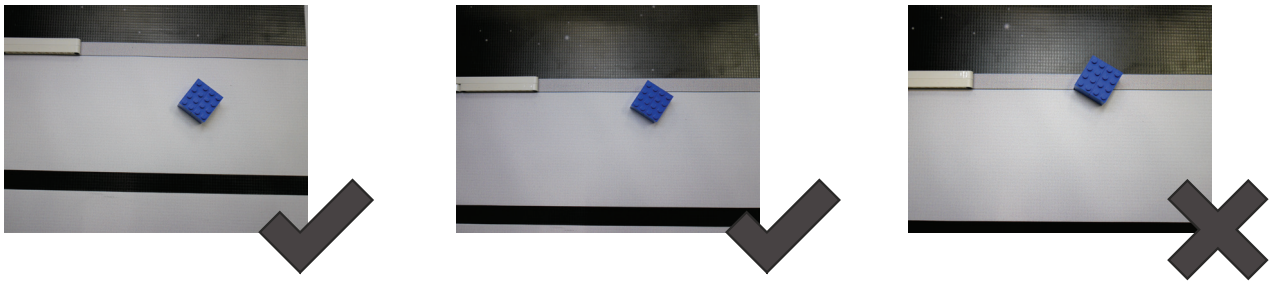




Boundary construction please refer to appendix 2.

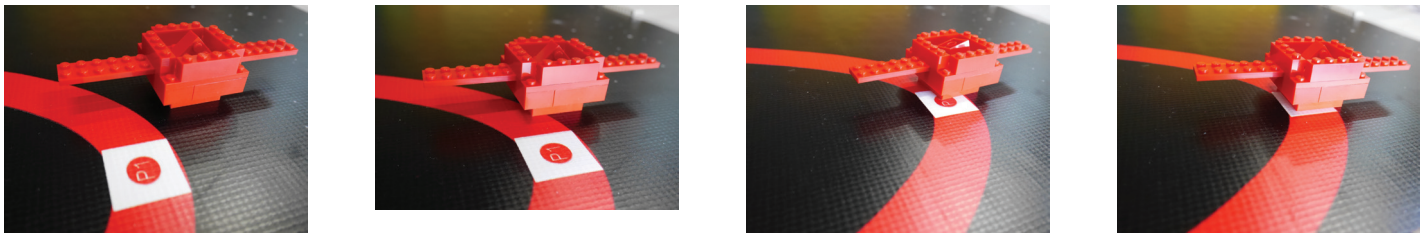
APRA
ASIA PACIFIC ROBOT ALLIANCE

G. Scoring Interpretation

(A)mission 2 - Obstacle clearing: obstacle “Fully entered” zone B.

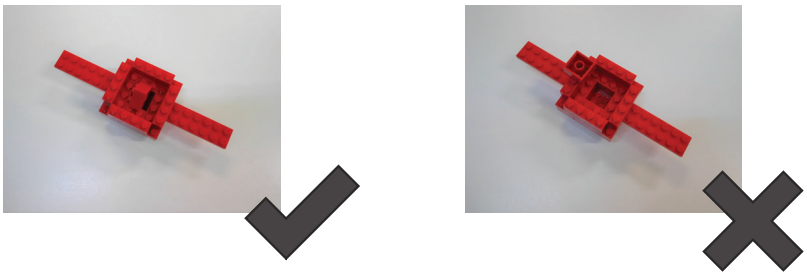


B)mission 6 - Transporting Red satellite: scoring method shown below.



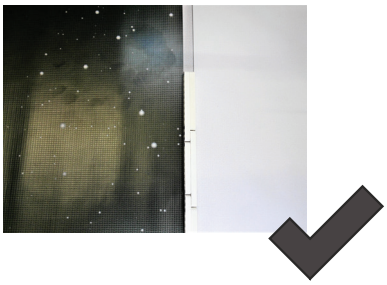
0 pt **10 pt** **10 pt** **20 pt**

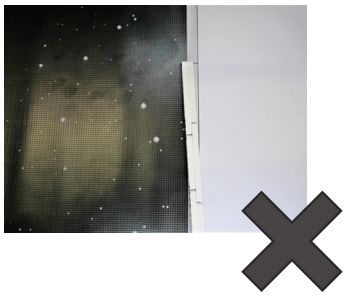
Mission 9 – Guarding the satellite: At the end of the competition, the satellite should contain a battery with the corresponding color.



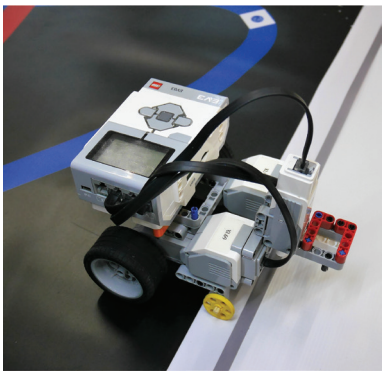
APRA
ASIA PACIFIC ROBOT ALLIANCE

Mission 10 – Guarding the boundaries: At the end of the competition, the grey section should remain fully covered by the boundaries.

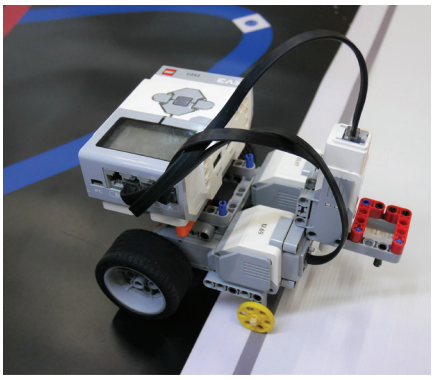




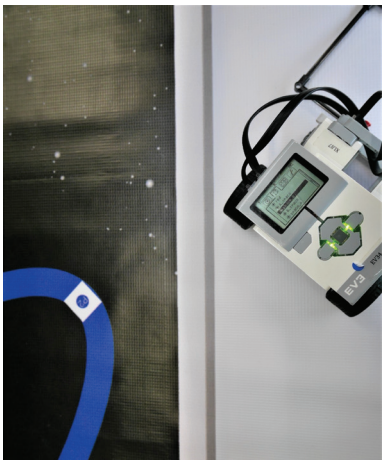
Out of bounds definition



Not out of bounds



Out of bounds: deduct 10 pt

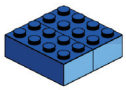


Out of bounds completely: deduct 10 pt and robot will be remove from the field

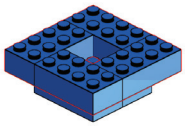
APRA
ASIA PACIFIC ROBOT ALLIANCE

APPENDIX 1

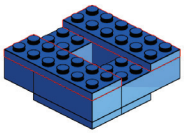
1



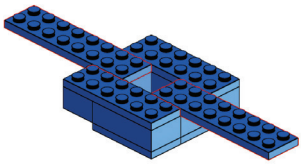
2



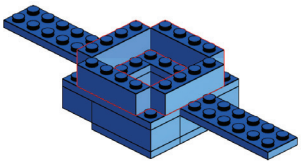
3



4



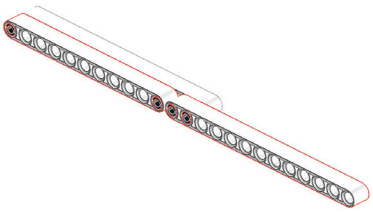
5



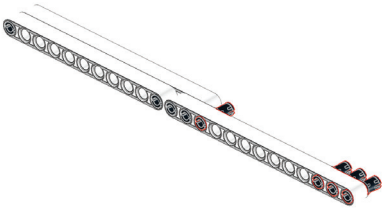
APPENDIX 2

1

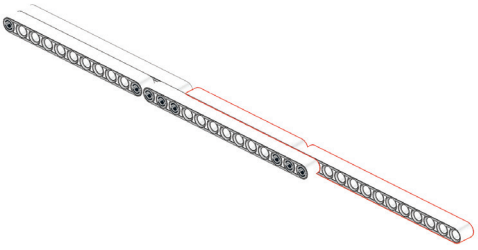
2



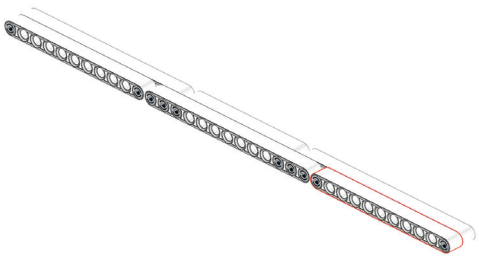
3



4



5



APRA
ASIA PACIFIC ROBOT ALLIANCE