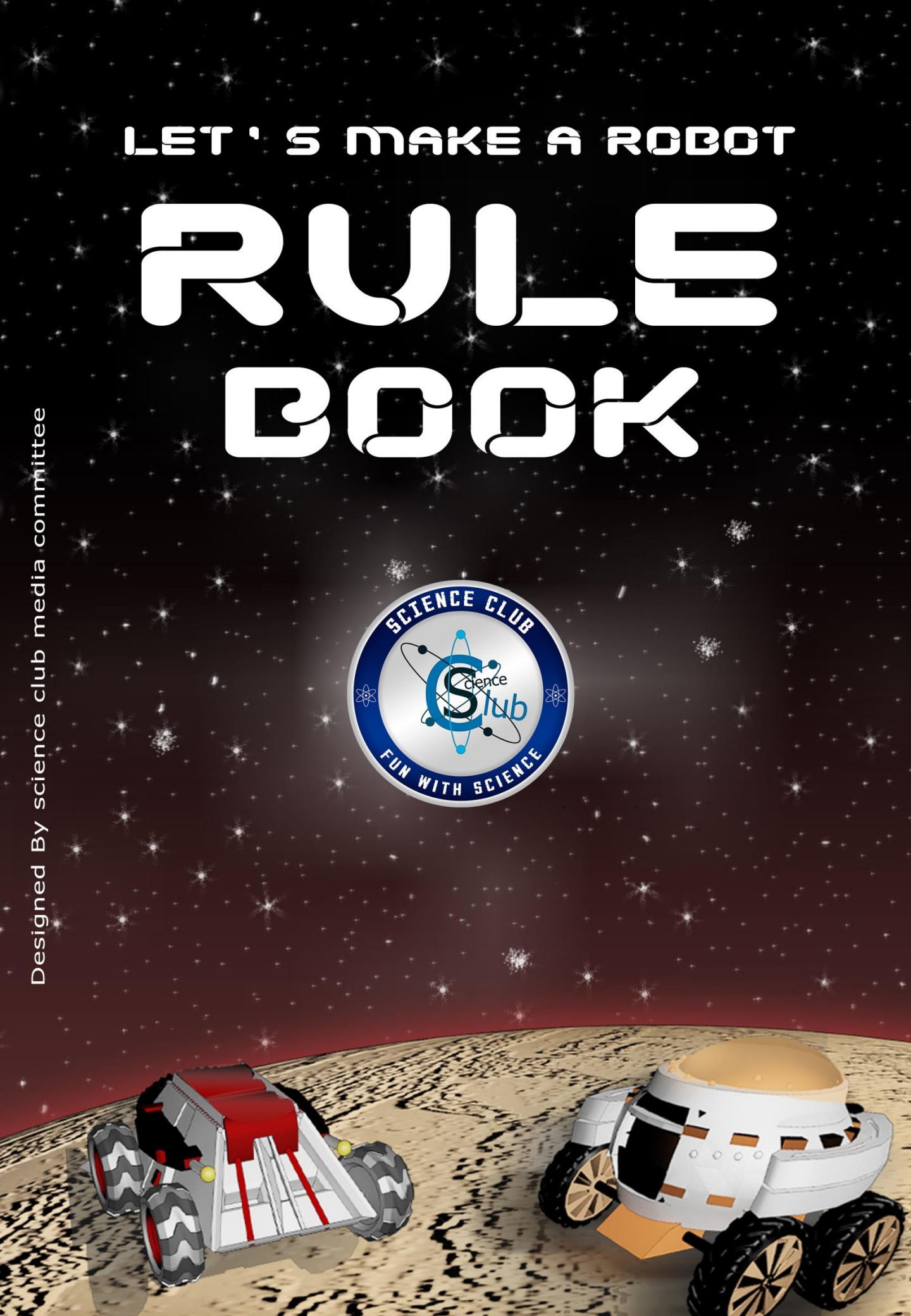
LET'S MAKE A ROBOT

RULE BOOK

Designed By science club media committee



CONTENTS:

INTRODUCTION:

Struggle for existence, that was the primary rule for mankind as they settled for living. They started exploring the earth, been into wars of survival of the fittest, started to look for nutrition, shelter and protection. They built empires and founded nations to manipulate earth's resources to their benefits. By the 18th century it was the beginning of using steam in machines. And all nations headed to the black gold (Oil) to maintain their civilization. But there weren't enough to fulfill all greedy aspirations, which concluded ferocious wars between nations. A lot of destruction was the result of these wars especially when nuclear weapons, EMP and biological weapons were used harshly to invade countries and demolish their cultures. Peace was the last hope to save our world from vanishing, empires were built again and reconstruction took place while slight skirmishes were still existing. Eventually, earth's non-renewable resources tend to vanish and mankind as always known to strive and fight vigorously to their living; were to find a solution. They invaded Mars and started the digging for living one more time. Looking for resources, seeking for power, racing to enforce their domination, controlling whatever they can reach, and manifacture these resources to ease their living. But as expected; it never turns out to a peaceful ending. Wars rose between countries to make our story continue...

GENERAL RULES:

- It is prohibited to use mechanical components that are pre-manufactured by professionals such as rovers, grippers, etc.
- Teams must do safety & Robot inspections before at least 15 min from their trial & must be on the field in their time, there is no replacement in time or change, No Exceptions.
- Robot initial dimensions should fit in a cube of dimensions 35x35x40 cm to get dimension points of (10 points), the maximum limit for robot initial dimensions is to fit in a cube of dimensions 40x40x40 cm.
- Maximum robot weight is 5 kg.
- Robots that will exceed the maximum initial dimensions and weight will not be able to participate the competition.
- The Manual control for the Robots at any time must be a wireless control.
- The allowable margin of error to the objects in this Rulebook wherever not mentioned is ± 5% both in weight and size.
- Any team which will not participate in the pre-contest or will not deliver the video and the technical report before the deadline will not be qualified to participate in any of the competition stages.
- Robots must not damage the game field or the equipment on the field and will get (-5 points) for each damage with maximum (-15 points) then the team will be disqualified.
- Not allowed for a team member to touch their robot intentionally during the game without the judges' permission (-5 points)
- Time bonus is considered only when robot does the full tasks.
- Any complaints should be supplied in a written form to the complaints committee.

PRE-CONTEST:

- Consider 1st presentation including :

"Mechanical"

full design + base with motor completed

"Electrical"

A moving robot and shown with it power distribution system + color sensor Distinguish between colors .

- (40 points) for the Pre-contest included in the final result).
- The team which will not attend the pre-contest won't be able to join the challenges.
- Allowed time is 15 minutes .

TECHNICAL RULES:

STAGE ONE:

Task one (30 points)	- Manual wireless remote operation in the maze using camera (30 points). - Automatically operated using line following system "line follower" (bonus 10 points). - Automatically operated using wall following system (bonus 20 points).
Task two (30 points)	- Holding the liquid cup (5 points). - Climbing, descending and passing the ramp (15 points). - Putting the liquid cup (5 points). - We deduct 1 point for each lost cm of liquid during the stage (Max. 5 points).
Task three (40 points)	- Hold each box (5 points….Max 10 points). - Hold the triangular object (10 points). - Put the objects in the right place of each (15 points). - Exit the room (5 points). - Automatically doing the task (bonus 30 points). - Using your own filtered camera to cast on the screen (bonus 10 points).

- Game time is 20 minutes which starts exactly after 5 minutes of robot setup.
- Three trials are given for the robot to start from the beginning of the current task or the last check point.
- Maze and colored object calibration may be changed every match.
- Robot must not leave Black line (-5 points for leaving every time) if the robot left the maze it will start a new trial "in line follower"
- The robot can hold one or more object at a time.
- The box weight is 70 gm and its material is foam.
- If colored objects are placed in a wrong form, no points will be gained from the 15 points of this task.
- You are allowed to start from any mission.
- You are allowed to skip any mission.
- A bonus of 2 points will be added to the score per each extra minute.

STAGE TWO:

Task one (25 points)	- Hold the stickers (5points). - Get the ramp (10 points). - Hold your flag (5 points). - Put the flag on robot's body (5 points).
Task two (40points)	- Passing the rope (5 points). - Pulling the pin (10 points). - Removing weights (10 points). - Passing the wire mesh (15 points).
Task three (35 points)	- Close the box (25 points). - Put flag in its hole (10 points).

- Game time is 15 minutes and no setup time.
- No trials are given for the robot.
- This stage is considered a race.
- The game starts with two robots together.

- You are allowed to skip **one task** and lose 5 points from your score (without gaining any of the skipped task's points).
- Each robot has the ability to stop his opponent at its position for 1 minute by pressing on a switch that is located in the mission area but it will cost the first robot to lose 10 points from its score. (this option is available for only one time for each robot during the game)
- You must close the box without touching it.

NON-TECHNICAL RULES:

VIDEO:

30 points for the video.

- The video should be delivered before the deadline of 27/8/2017 at 11:59 Cairo time (+2 GMT).
- Video delivery will be on the official competition Facebook page: LINK: https://www.facebook.com/Lets.Make.a.Robot
- Maximum video length is 3 minutes.
- minimum video length is 1 minute.
- The video contents can`t be a simulation but it must be of the real life mechanisms.
- The video should include the robot solving ramp and liquid tasks of first stage.

- ***Initial dimensions in range:*** 35x35x40 cm (10 points)
    - If robot's initial dimensions don`t exceed 35x35x40 cm, the team will gain (10 points) in dimensions.
    - Robot wouldn't be allowed to participate if it exceeds the maximum dimensions (40x40x40 cm).

- ***Maximum total weight:*** 5kg (10 points)

- ***Safety:*** (20 points)

1. No Sharp edges (Bolts, Clips, Design finishing, etc….)
2. Fuse (Main switch, no attaching wires to start or end the system & Calculated-value fuse).
3. Overload protection.
4. Wiring "Wiring is neatly organized and securely attached to the body, breadboard is not allowed under any condition".

5. No liquid batteries should be used.

6. Pneumatic systems if used:

a. Tanks not included in robot dimensions so tanks must be easily detached during dimensions check.

b. 6 bars are the maximum pressure could be used.

c. Robot must be provided with a pressure gauge.

d. All pipes & pneumatic components must be well arranged & safe from moving parts.

Notes:

- Robot wouldn't be able to start the game without passing safety points.
- There are bonus points for caution labels for moving parts, LED indicators, switches, pressure tanks, ... (maximum 5 points).

TECHNICAL REPORT :

70 points for the technical report, the general content for all levels is:

1) Basic Technical Report requirements (5 points)

- Not to exceed 30 pages
- Fonts (Arial, Calibri or Time New Roman)
- Font size 12
- Overall layout design
- Searchable

2) Cover page (4 points)

- University or school logo
- Team Name
- Team members' picture
- Team members' names, roles & academic year

3) Abstract (doesn't exceed one page) (2 point)

- Contains a word about the team
- Reasons of participation
- expected performance in competition

4) Index (2 point)

- All report content and page number

Ex:

2.0 Mechanical design 3

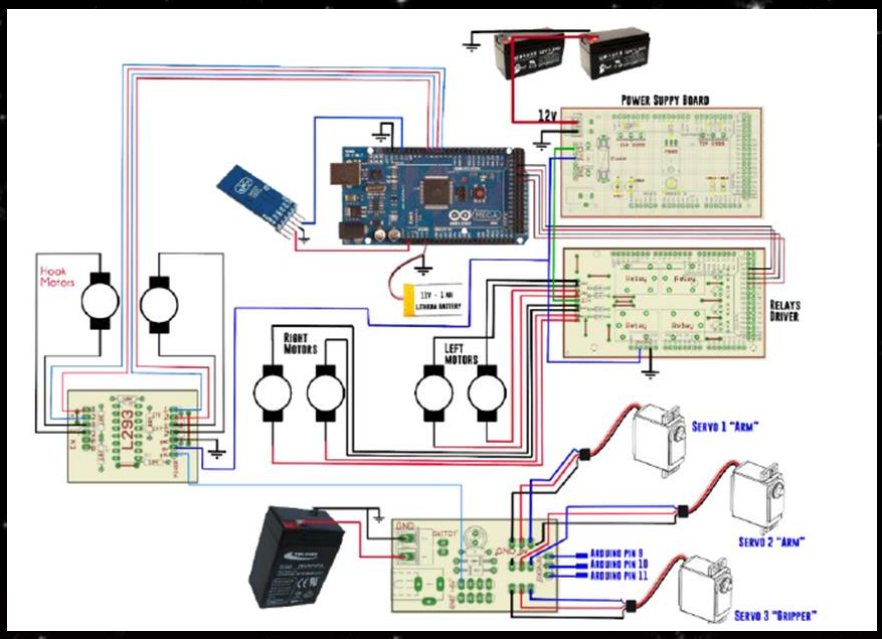
2.1 base design 4

5) Technical content (40 points)

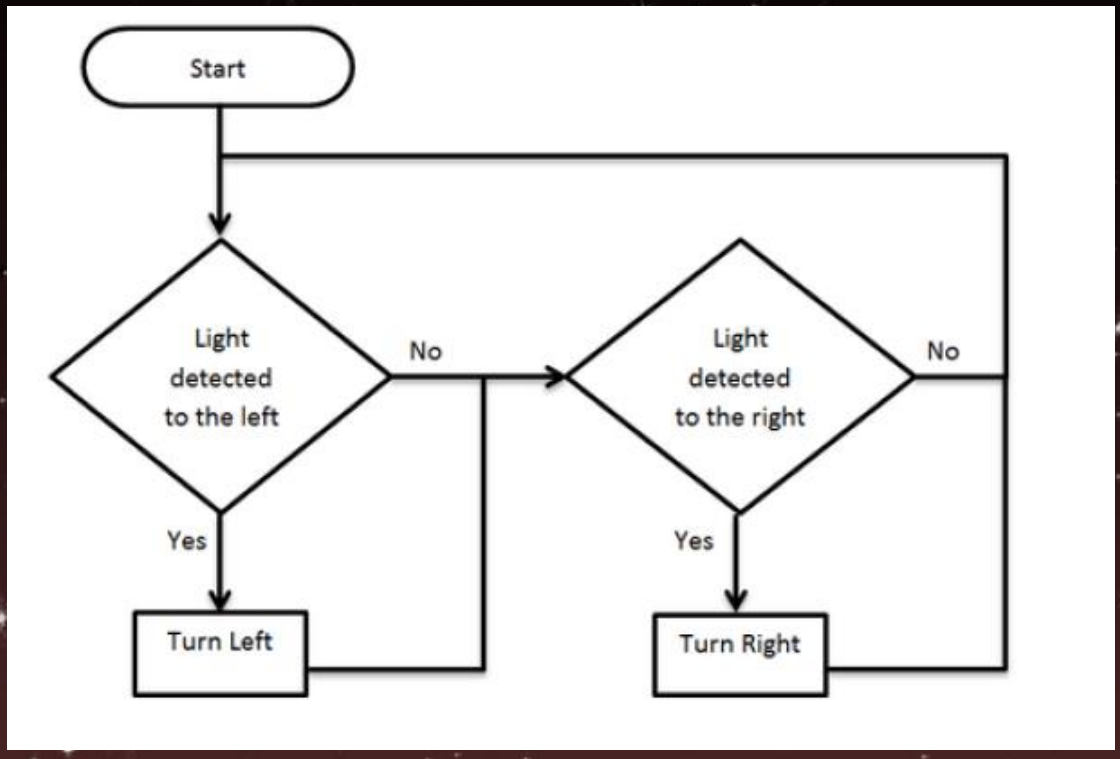
Electrical evaluation: (15 points)

a. System Interconnection Diagram (SID) (3 points)

Example:



b. Flow chart of the code (3 points)
Example:



c. System components with selection reasons (6 points)
i. Microcontroller (1)
ii. Battery (1)
iii. Wireless communication (1)
iv. Motor driver (1)
v. Sensors (1)
vi. PCB design (1)

d. Safety (3 Points)
i. Overload protection (0.5)
ii. Short circuit protection (0.5)
iii. Reverse voltage protection (0.5)
iv. Indication elements (0.5)
v. Wires & tracks size calculations (1)

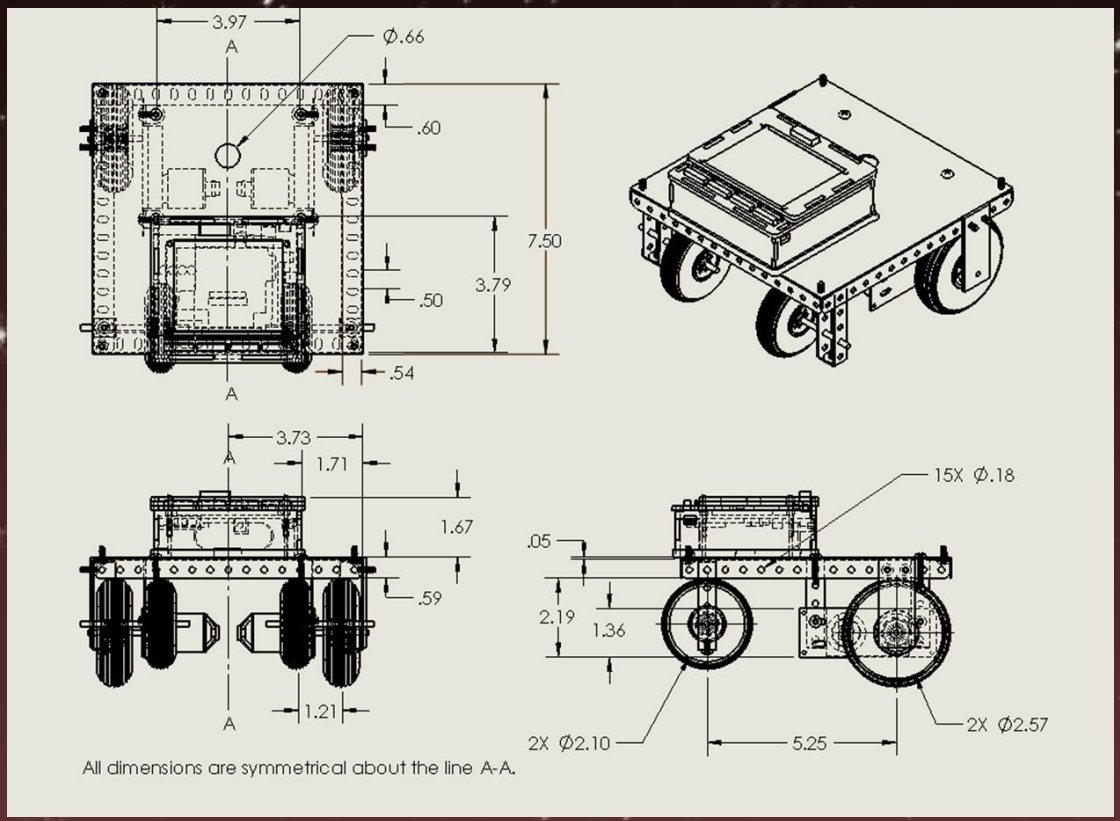
Mechanical evaluation: (25 points)

a. Mechanical design (15 points)

1- CAD design (5 points)

- Full Robots drawings design with basic dimensions (stage 1, stage 2)

Example:



2- **Force & moment calculations & motor selection (2.5)**

3- Base design & suspension system (5)

- CAD design of base

- Suspension system means wheel selection & its fixation system

4- Dimensions & weight (2.5)

b. Mechanisms & understanding of it (4 points)

1- Suction mechanism

2- Gripper

c. Reliability (test time: how many times the robot finishes the final competition full task "not the battery life") (1 point)

d. Manufacturing finishing (2 points)

6) Overall creativity (robot design, style) (2 Point)

• Focus on creative ideas, strength in robot design & parts

7) Lessons learned (3 Points)

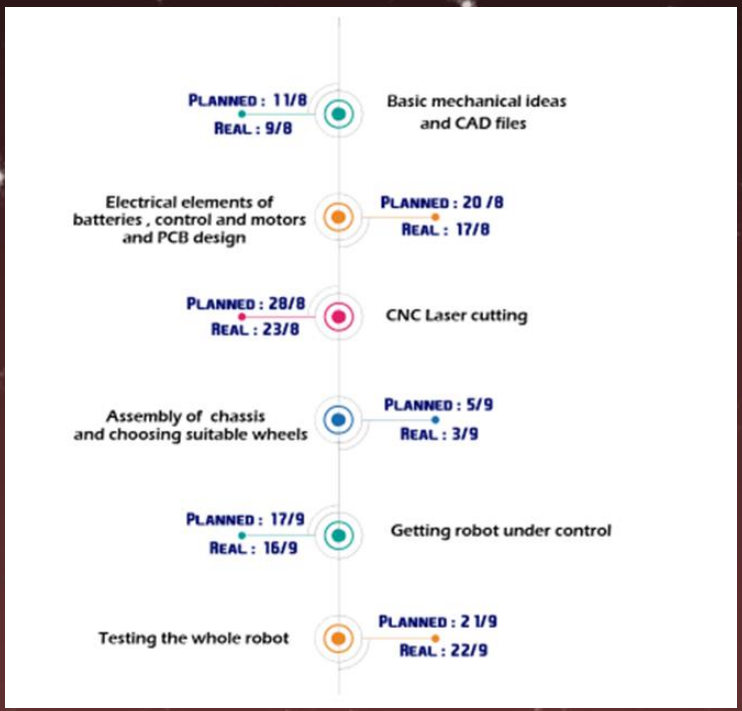
o Technical lessons

o Interpersonal lessons

o Problem solving & troubleshooting

8) Time management (plan, time line & real) (5 Points)

• Example:



9) Budget (plan, real & incomes) (5 Point)

Total Budget 40 L.E

Part name	Unit price	Quantity	Total
Wheels	10 L.E	4	40 L.E

10) Acknowledgements (2 Points)

• For any help (physical as sponsorship or technical support "your coach or anyone helped you" or helpful organizers ….)

For Advanced Technical Report

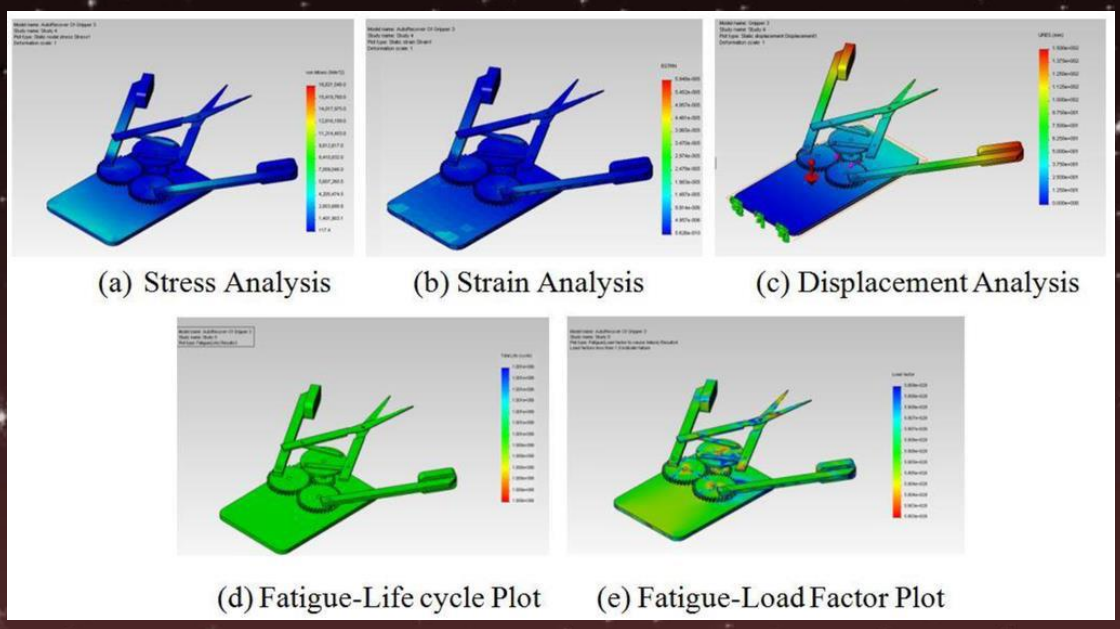
For mechanical evaluation:

a. mechanical design: (6.5)

Report design should be provided with computational analysis "Finite Element analysis" done on design

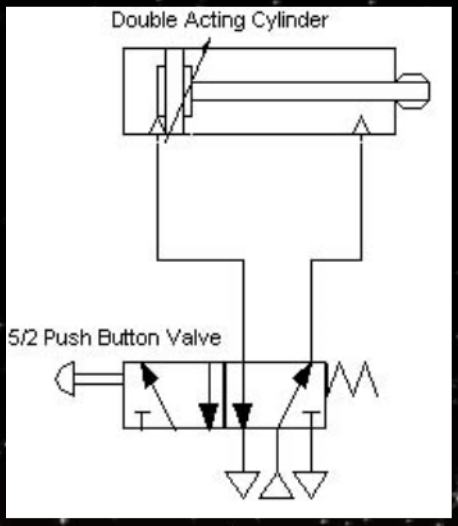
"Structure analysis, dynamic analysis, etc."

Example:



b. Pneumatic design:

if used



1- System Interconnection Diagram (SID) (-3)

Using pneumatic standard symbols

2- System calculations & actuator selection. (-1)

3- Safety: (-1)

o Tanks sealing system

o Max pressure & charging

o Gage pressure position & system arrangement.

Note

(-) sign means if pneumatic system is used in your robot and this data is not provided, negative points will be added to your technical report score.

PRESENTATION:

- 60 points for the presentation and discussion, points will be calculated as the average of three judges.

- The presentation duration is 15 minutes.

- The discussion duration is 15 minutes.

 organizing (15 points)

1. During presentation …… (5 points)

2. Timeline…… (5 points)

3. Team specialization ……. (5 points)

 Presentation Skills (5 points)

 Time management (5 points)

 Teamwork (5 points)

 Symmetricity (from technical report and real output)

 Design understanding (30 points)

1. Scientific background ……. (5 points)

2. Material selection ……. (5 points)

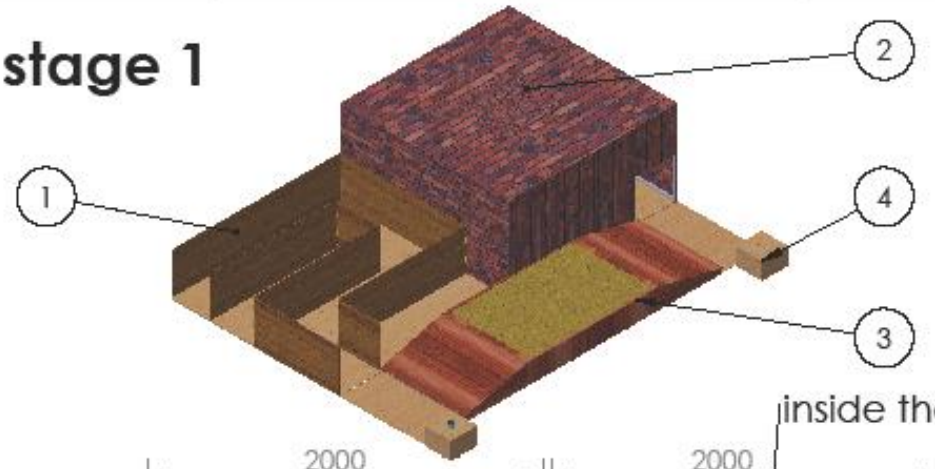
3. Design decision …… (5 points)

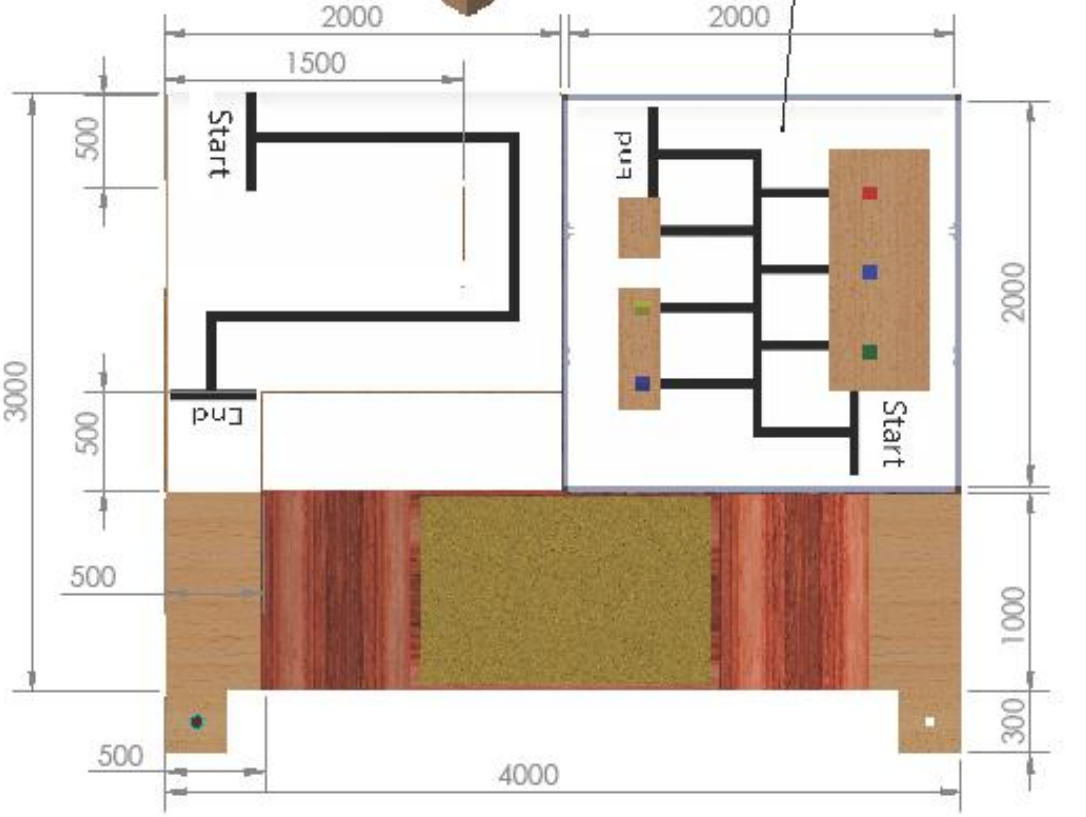
4. Algorithms used ……. (5 points)

5. Circuit design …… (5 points)

6. Pneumatic design if used ..... (5 points)

stage 1



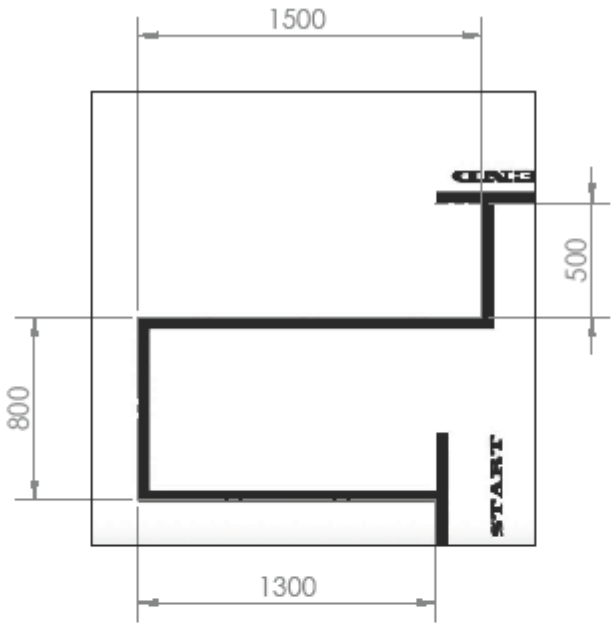


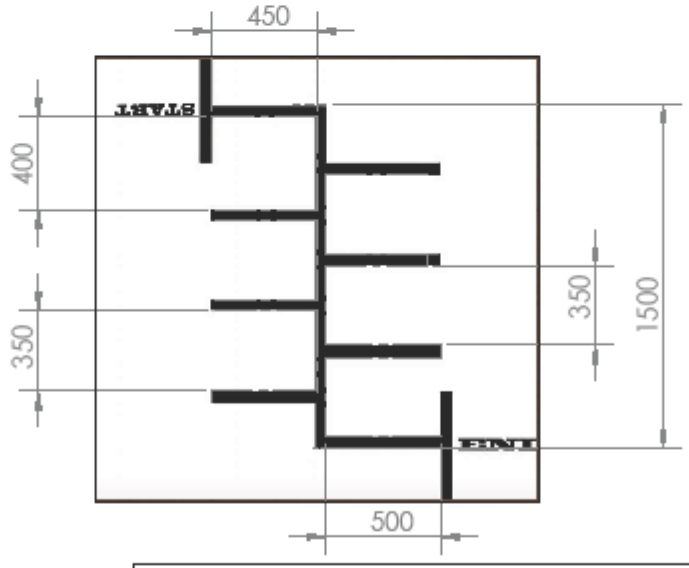
LMR 2017	
DATE :	22/7/2017
PROVIDED BY :	SCIENCE CLUB : TECHNICAL COMMITTEE

Item no.	PART NAME	MATERIAL
1	wall maze	wood
2	room	wood
3	ramp	wood
4	table	wood

NOTES:
1) ALL DIMENSIONS IN MM.

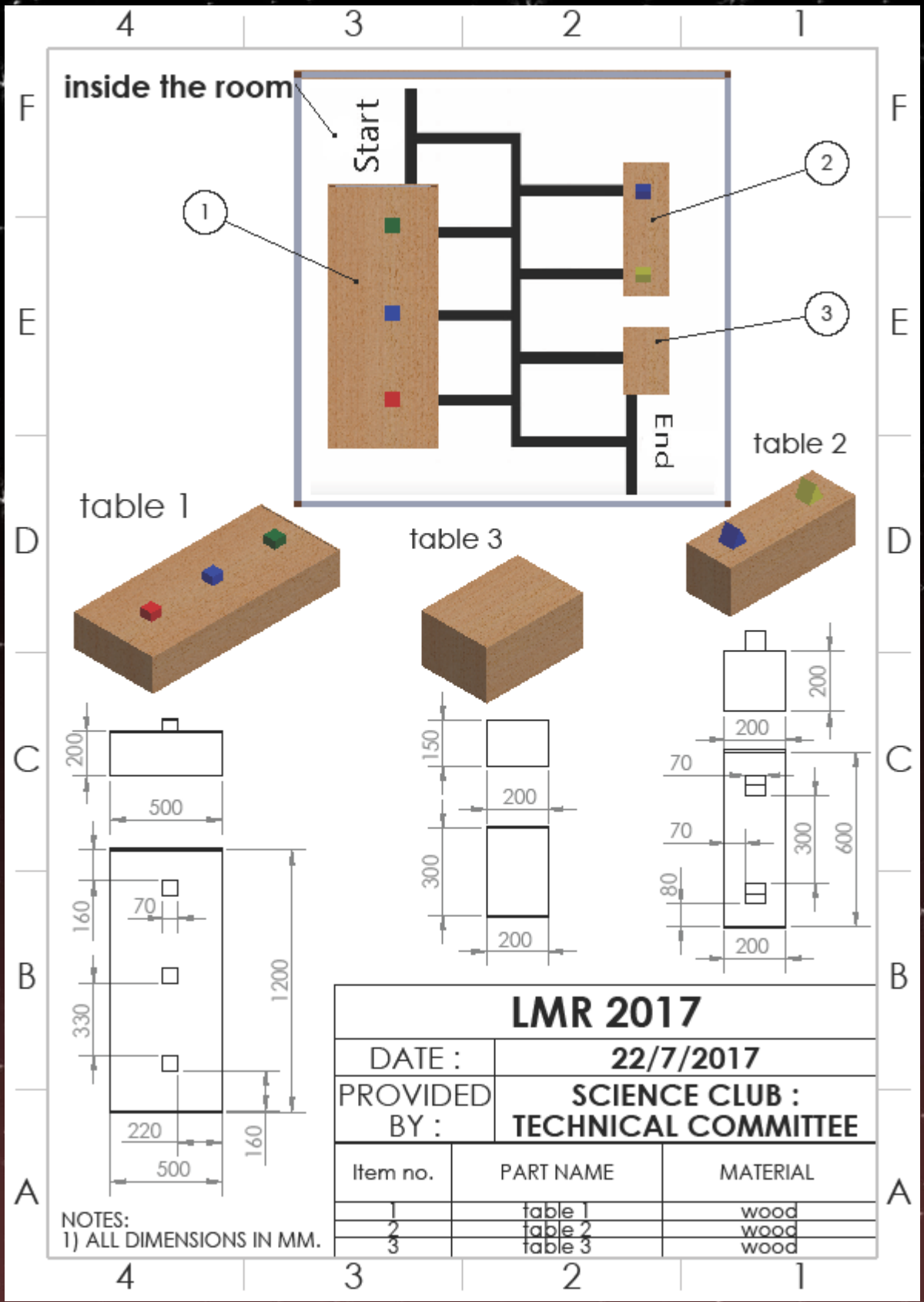
stage 1 line follower



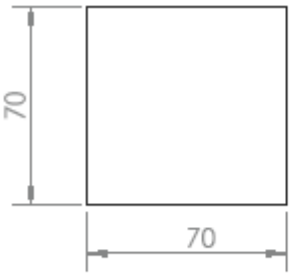


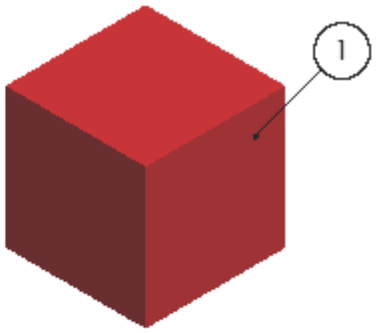
LMR 2017	
DATE :	22/7/2017
PROVIDED BY :	SCIENCE CLUB : TECHNICAL COMMITTEE

NOTES:
1) ALL DIMENSIONS IN MM.

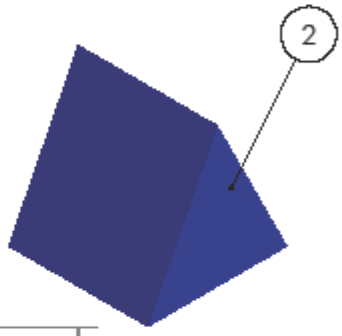

inside the room
Start
End
1
2
3
table 1
table 2
table 3
200
500
160
70
330
1200
220
160
150
200
300
70
70
80
600
LMR 2017
DATE :
22/7/2017
PROVIDED BY :
SCIENCE CLUB : TECHNICAL COMMITTEE
Item no.
PART NAME
MATERIAL
1
table 1
wood
2
table 2
wood
3
table 3
wood
NOTES:
1) ALL DIMENSIONS IN MM.

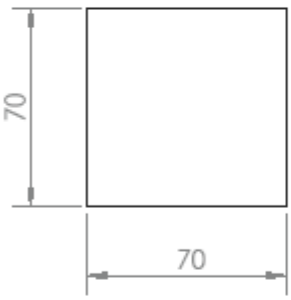
cubic box

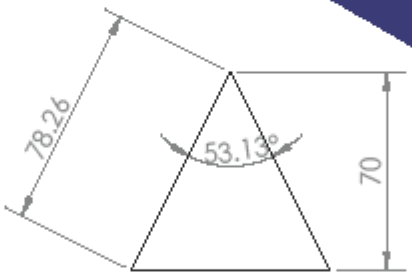




triangle box

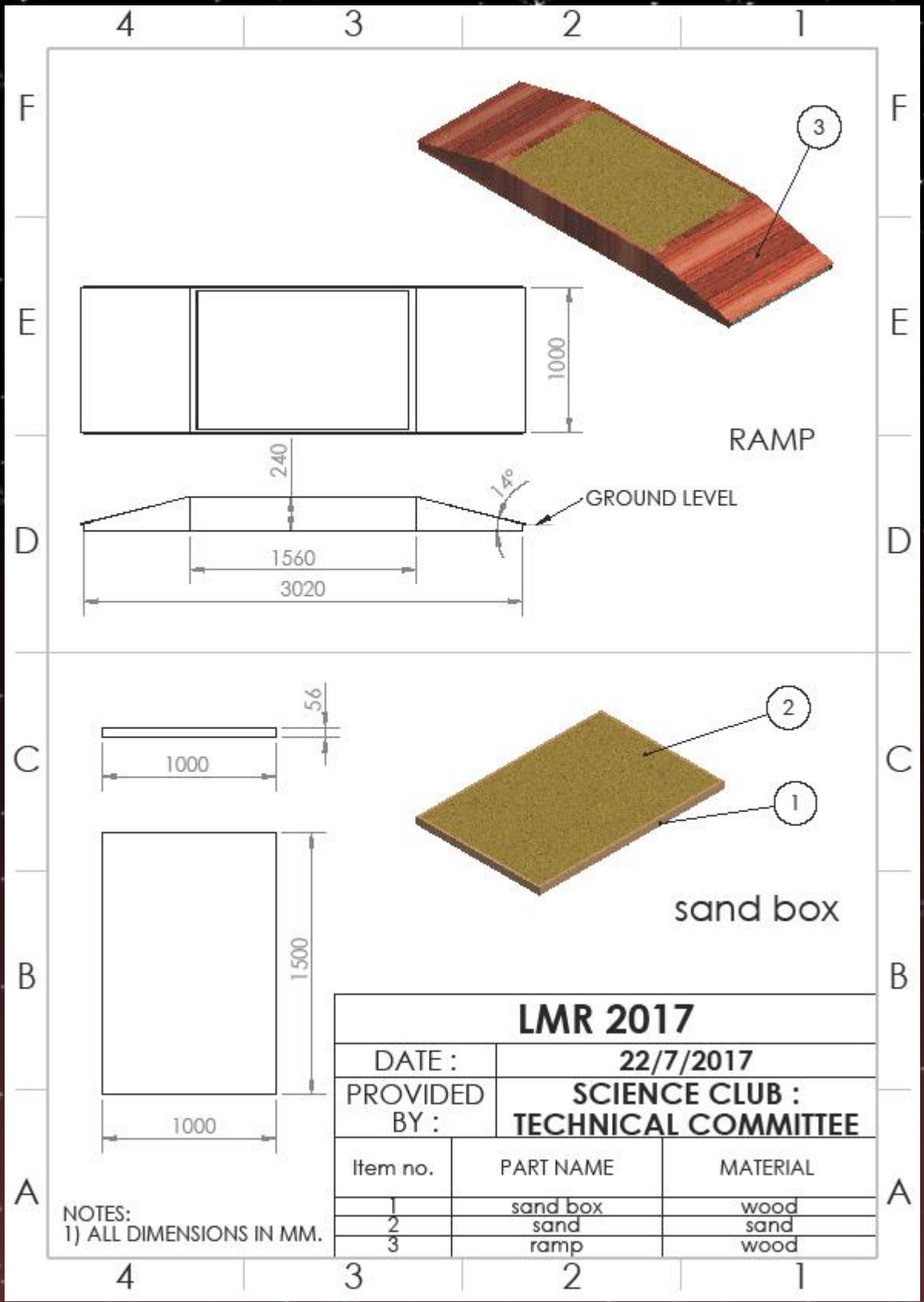


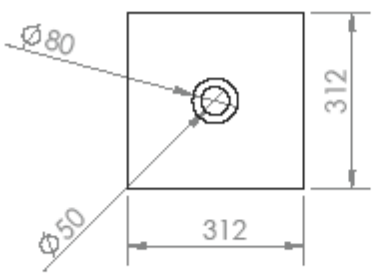


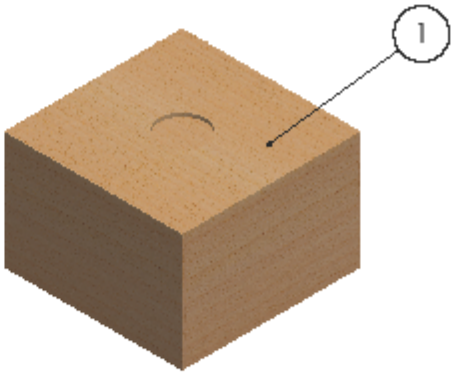


LMR 2017		
DATE :	22/7/2017	
PROVIDED BY :	SCIENCE CLUB : TECHNICAL COMMITTEE	
Item no.	PART NAME	MATERIAL
1	cubic box	foam
2	triangle box	foam

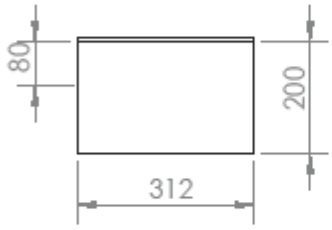
NOTES:
1) ALL DIMENSIONS IN MM.

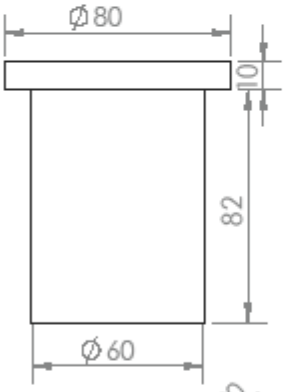

4
3
2
1
F
E
D
C
B
A
3
1000
RAMP
240
14°
GROUND LEVEL
1560
3020
56
1000
2
1
sand box
1500
1000
NOTES:
1) ALL DIMENSIONS IN MM.
LMR 2017
DATE :
22/7/2017
PROVIDED BY :
SCIENCE CLUB : TECHNICAL COMMITTEE
Item no.
PART NAME
MATERIAL
1
sand box
wood
2
sand
sand
3
ramp
wood

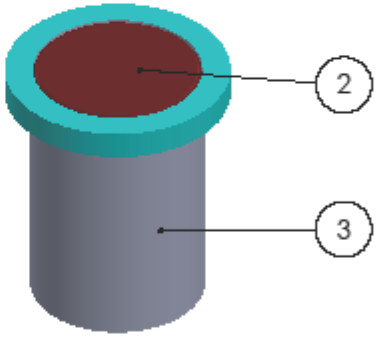




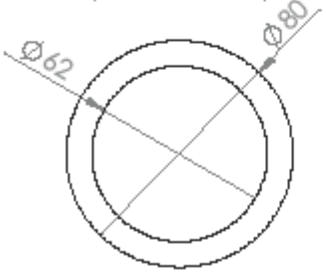
table







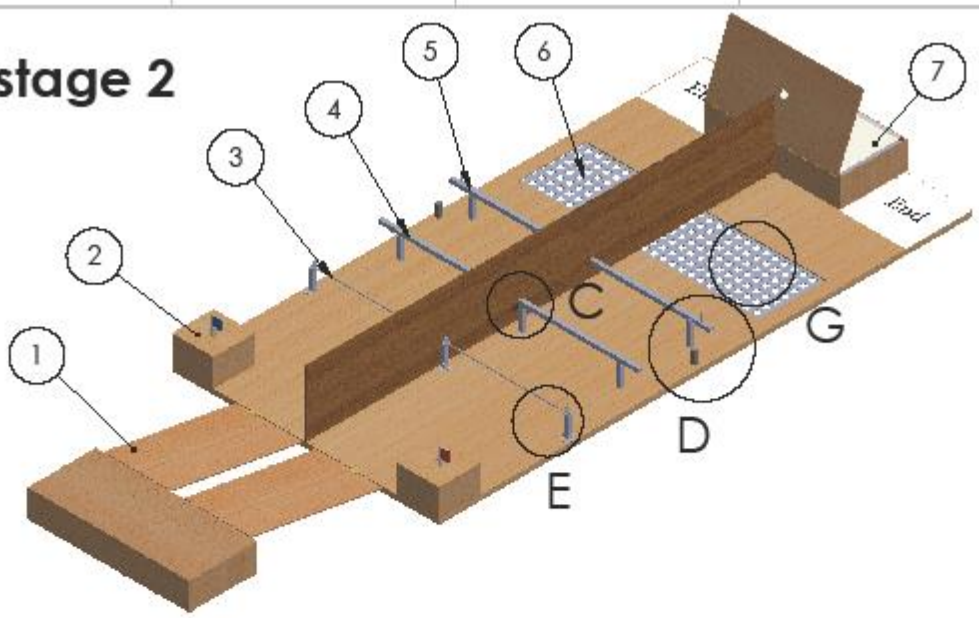
metal cup



NOTES:
1) ALL DIMENSIONS IN MM.

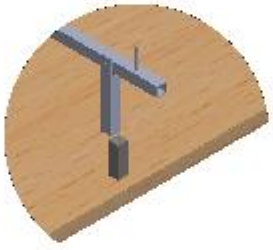
LMR 2017		
DATE :	22/7/2017	
PROVIDED BY :	SCIENCE CLUB : TECHNICAL COMMITTEE	
Item no.	PART NAME	MATERIAL
1	table	wood
2	liquid metal	metal
3	metal cup	stainless steel

stage 2



DETAIL C

SCALE 1 : 8



DETAIL D

SCALE 1 : 12

DETAIL G

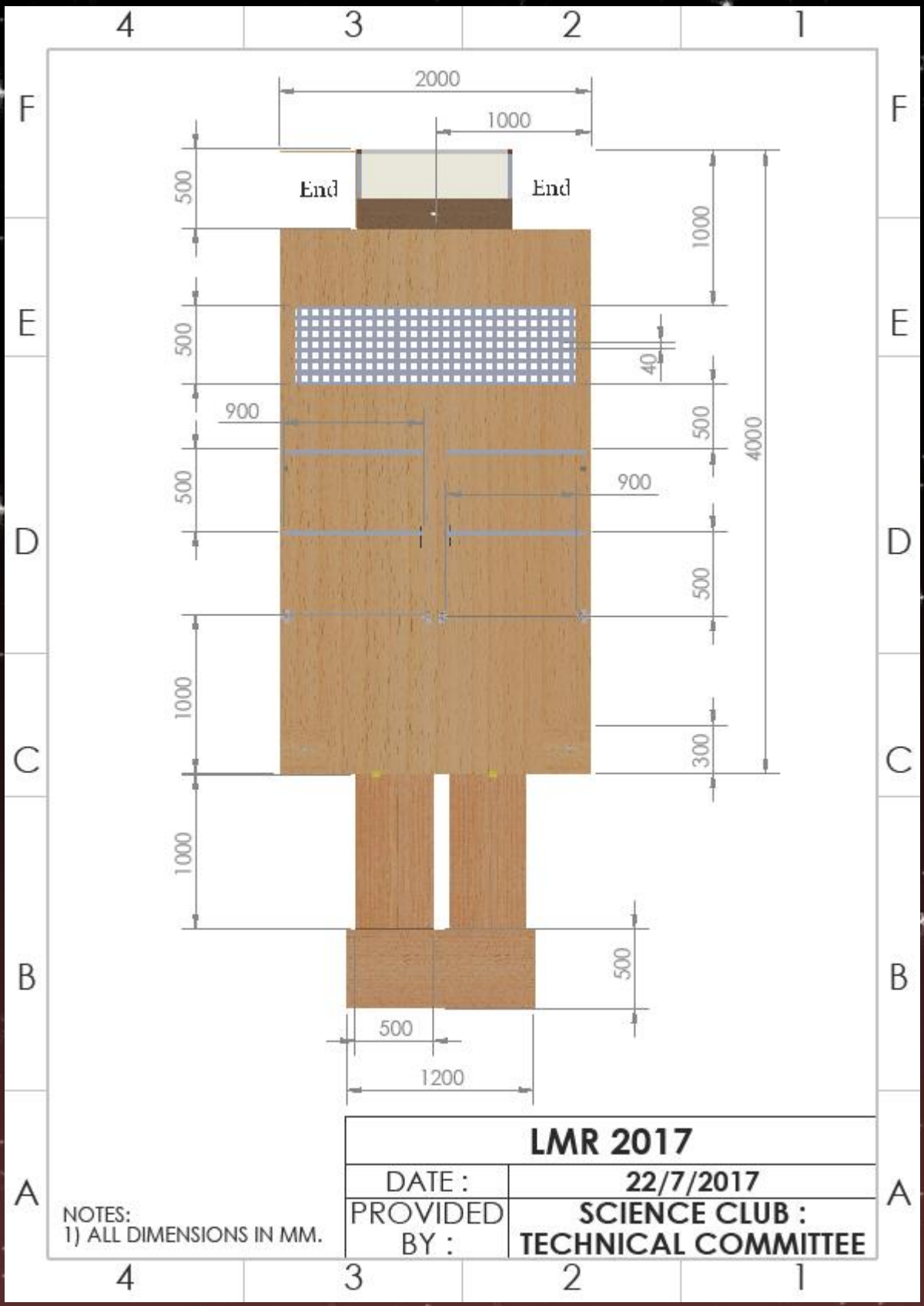
SCALE 1 : 10

DETAIL E

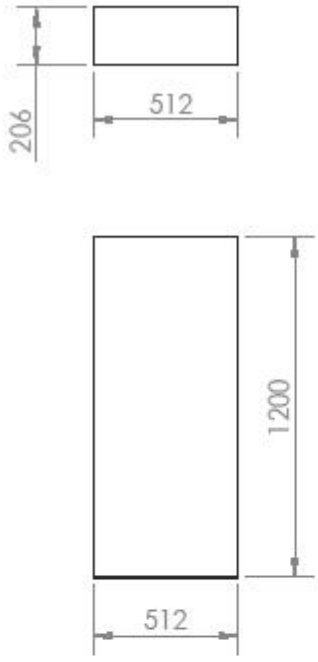
SCALE 1 : 8

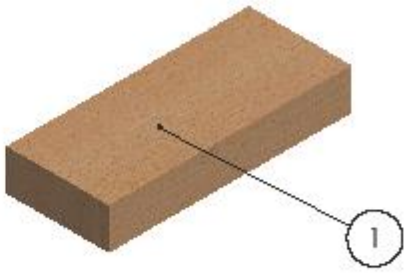
NOTES:
1) ALL DIMENSIONS IN MM.

LMR 2017		
DATE :	22/7/2017	
PROVIDED BY :	SCIENCE CLUB : TECHNICAL COMMITTEE	
Item no.	PART NAME	MATERIAL
1	bridge	wood
2	box	wood
3	wire	fibre
4	gate with a pin	metal
5	gate with a weight	metal
6	net	metal
7	foam	foam

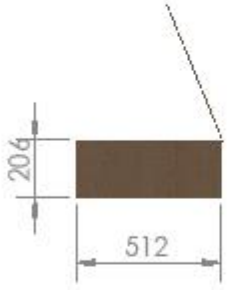

4
3
2
1
F
E
D
C
B
A
2000
1000
End
End
500
500
500
500
1000
1000
1000
40
900
900
500
500
500
4000
300
500
500
1200
LMR 2017
DATE :
22/7/2017
PROVIDED BY :
SCIENCE CLUB : TECHNICAL COMMITTEE
NOTES:
1) ALL DIMENSIONS IN MM.

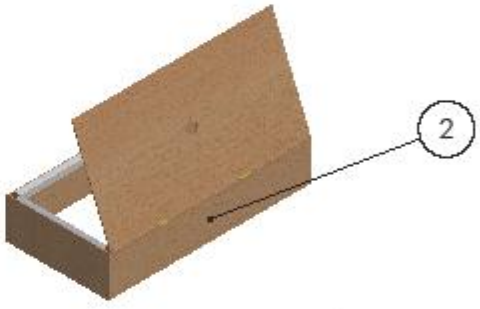
stage 2





start table



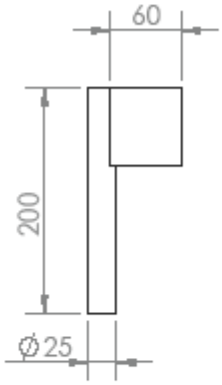


box

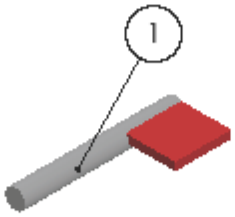
NOTES:
1) ALL DIMENSIONS IN MM.

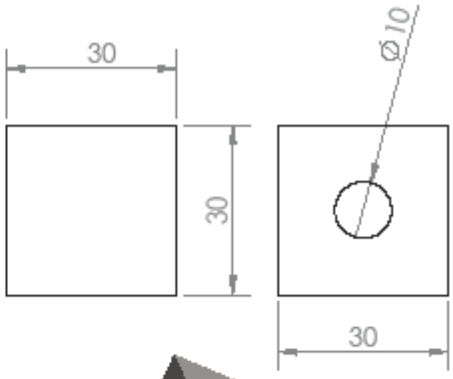
LMR 2017		
DATE :	22/7/2017	
PROVIDED BY :	SCIENCE CLUB : TECHNICAL COMMITTEE	
Item no.	PART NAME	MATERIAL
1	table	wood
2	box	wood

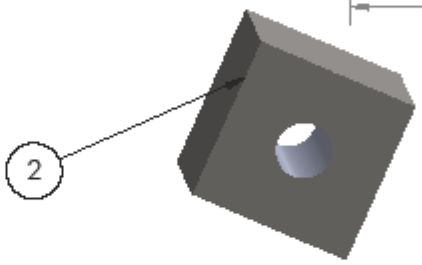
equipment for stage 2



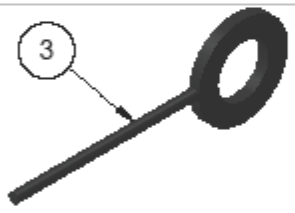
flag



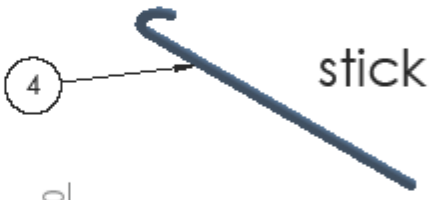




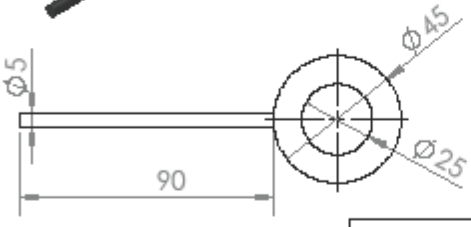
weights

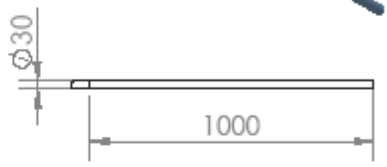


pin



stick





LMR 2017		
DATE :	22/7/2017	
PROVIDED BY :	SCIENCE CLUB : TECHNICAL COMMITTEE	
Item no.	PART NAME	MATERIAL
1	flag	wood
2	weights	lead
3	pin	artelon
4	stick	cartoon

NOTES:
1) ALL DIMENSIONS IN MM.

PRIZES

And our prizes this year are:
LE 4000 for the first place
LE 2500 for the second place
And finally LE 1000 for the third place.

FOR MORE INFORMATION

@ lets.make.A.robot
@ ScienceClub4Alex