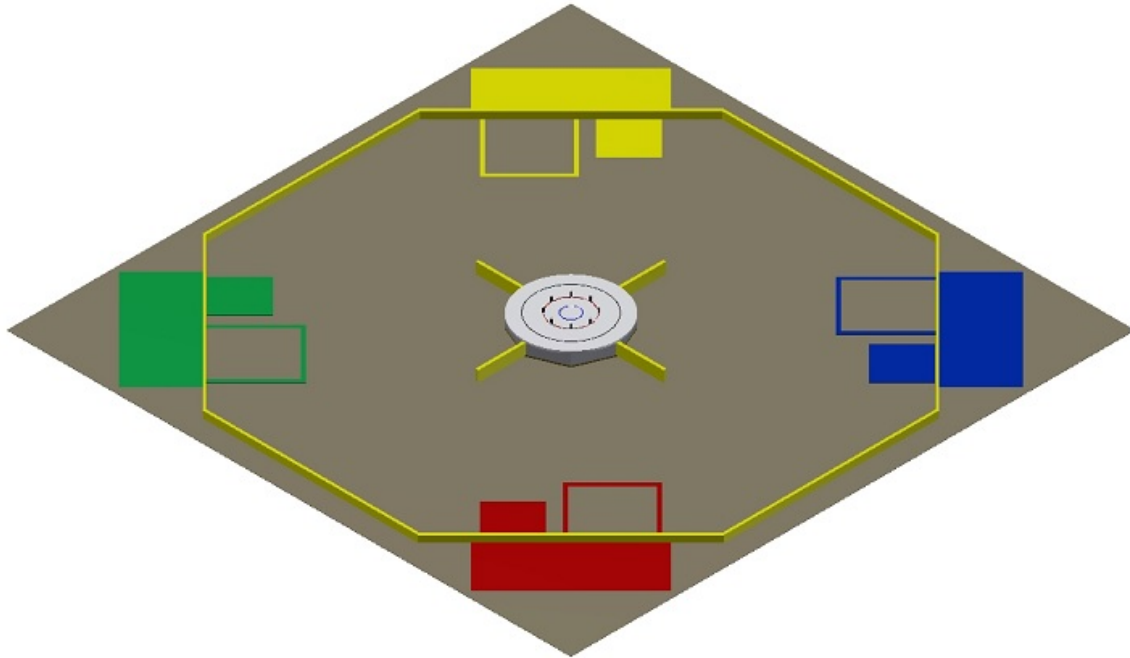


## 2014 - National Robotics Challenge Scope – Competition 93 Crokinole



Date: June 4th to June 6th, 2014, Mississauga, Ontario

**TECHNICAL COMMITTEE CHAIR:**

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**FURTHER COMMUNICATIONS**

Questions for clarification of the rules can be made to the Technical Committee Chair  
[bobtone@rogers.com](mailto:bobtone@rogers.com)

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**Level:** Secondary School **Duration:** 16 Hours

**Purpose of the Challenge:**

To create an engineering project to encourage individuals with different skill sets to form co-operative teams to design, fabricate and operate a robot.

**Mission Statement:**

The intent of the Skills/Compétences Canada National Robotics Challenge is to have teams of students independently Designing / Fabricating / Operating Robots capable of completing the competition tasks in competition with other student-fabricated robots. Teams are not allowed to develop or implement strategies based on interfering with their opponent's ability to complete the competition task set. It is expected and acceptable that teams will use some newly purchased and recycled parts or components (motors, gears, etc.) to fabricate mechanisms, which will complete the Skills/Compétences Canada National Robotics Challenge tasks. Robots will be inspected for adherence to this statement at the Skills/Compétences Canada National Technological Skills Competition.

**The Importance of Essential Skills for Careers in the Skilled Trades and Technology**

SCC is currently working with Employment and Social Development Canada (ESDC) in order to bring awareness to the importance of Essential Skills that are absolutely crucial for success in the workforce. This is part of a new initiative that requires the integration and identification of Essential Skills in contest area descriptions and competition scopes. Essential skills are used in nearly every job and at different levels of complexity. They provide the foundation for learning all other skills and enable people to evolve with their jobs and adapt to workplace change. Good Essential Skills means you will understand and remember concepts introduced in technical training. The level of Essential Skills required for most trades is as high or higher that it is for many office jobs.

The following 9 skills have been identified and validated as key essential skills for the workplace:

<sup>1</sup>Numeracy, <sup>2</sup>Oral Communication, <sup>3</sup>Working with Others, <sup>4</sup>Continuous Learning, <sup>5</sup>Reading Text, <sup>6</sup>Writing, <sup>7</sup>Thinking, <sup>8</sup>Document Use, <sup>9</sup>Digital

**Skills and Knowledge Applied:**

- Drafting
- Mechanics
- Electronics
- Metalwork
- Woodworking
- Communications
- Woodworking
- Communications

*Essential Skills – <sup>1</sup>Numeracy <sup>7</sup>Thinking (Problem Solving) <sup>8</sup>Document Use*

## Equipment and Materials

### Supplied by the Competitors:

- Robots - Robot accessories (including batteries, battery charger, spare parts)
- Various tools required to modify and repair robots onsite
- Safety equipment including mandatory eye protection
- Extension cord and power cord

### Supplied by the Committee:

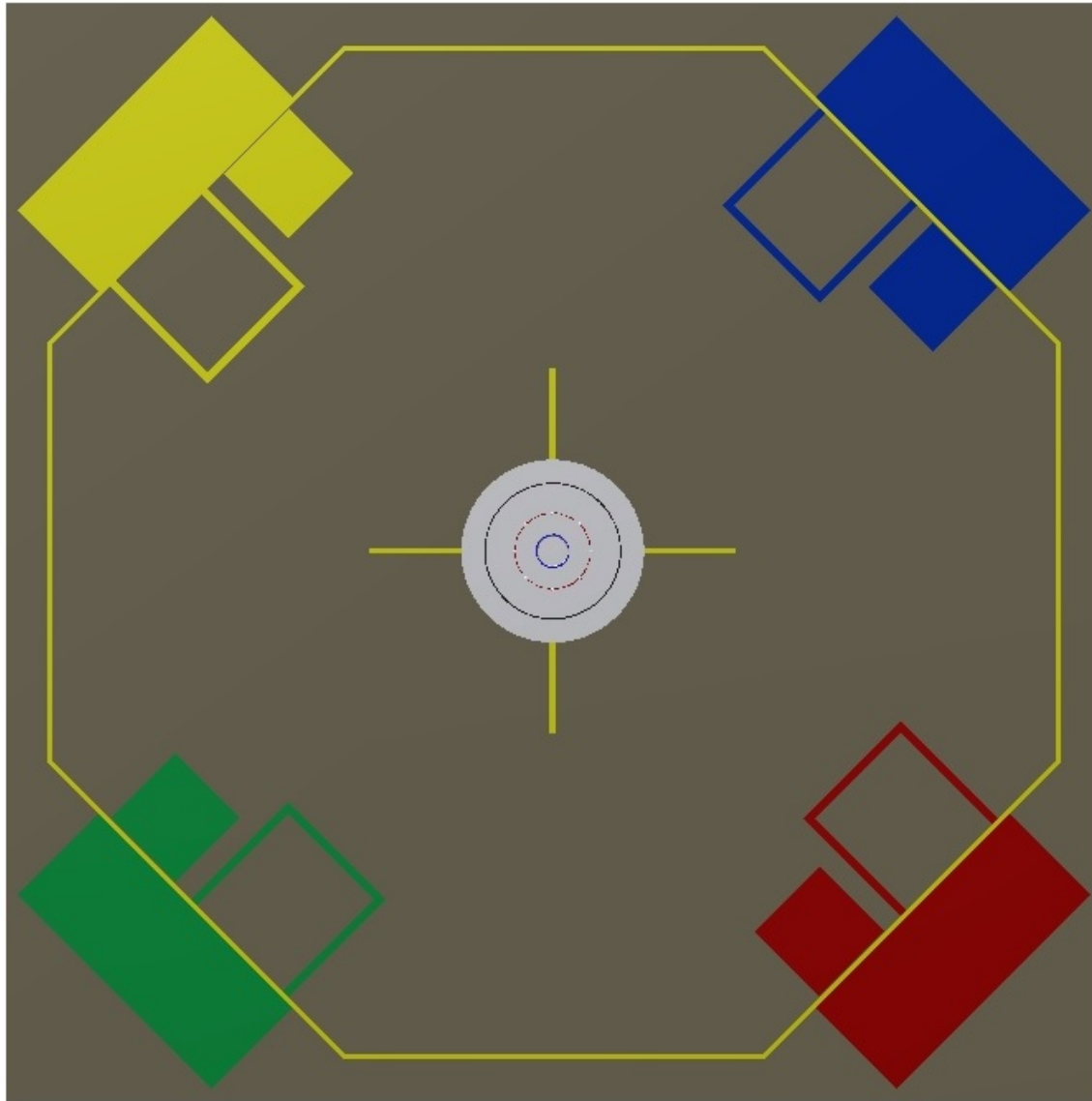
- Playing Field including Team Home Area
- One worktable with access to a 120 V power outlet (minimum 100W) per team

**Judging Criteria:** On the court performance of the robot in the set task.

**Team Size:** Four Students maximum

**Number of Teams:** One team per province or territory

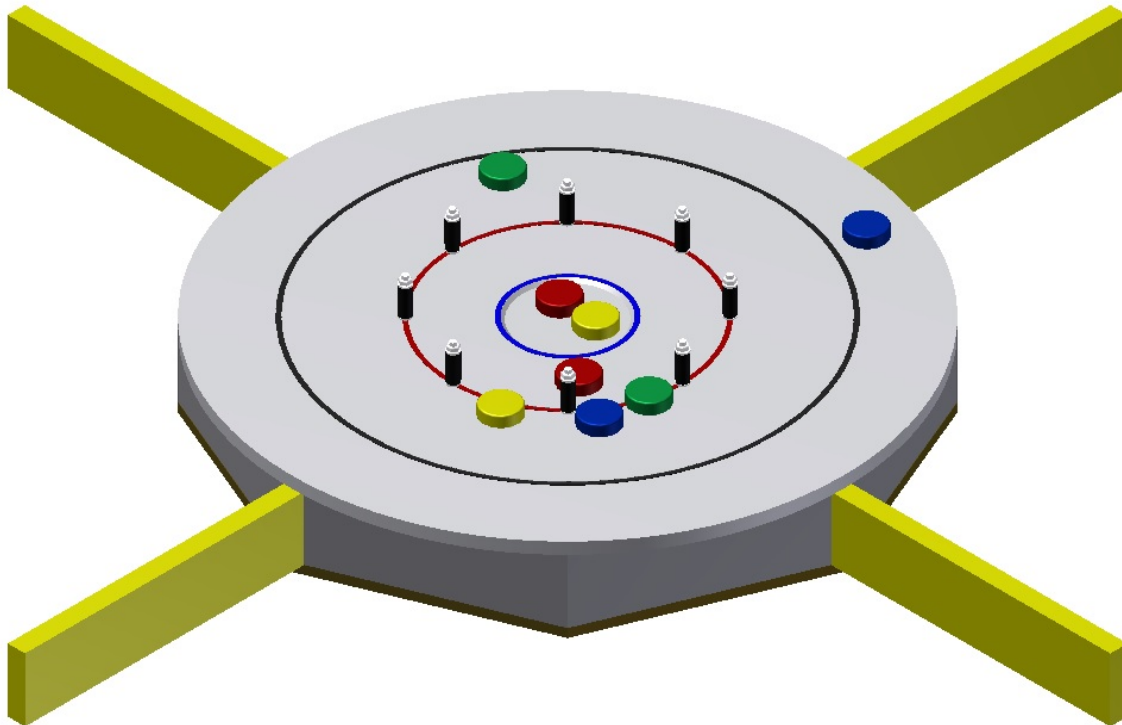
# THE GAME



The Core Game Concept is to have 2, 3 or 4 Robots playing the traditional game of Crokinole which involves shooting pucks onto a Four Ring Table Top Target using a 'Flick Based Shooting Process'.

The Pucks used during the Crokinole Game are Standard Ice Hockey Pucks.

# The Crokinole Table



- Teams are awarded Points based on the 'End of the Game Puck Positions' on the Crokinole Table Top Target.
- Pucks in the Center 'Pocket' have a value of 6 points.
- Pucks in the First Ring have a value of 3 points.
- Pucks in the Second Ring have a value of 5 points.
- Pucks in the Outer Ring have a value of 2 points.

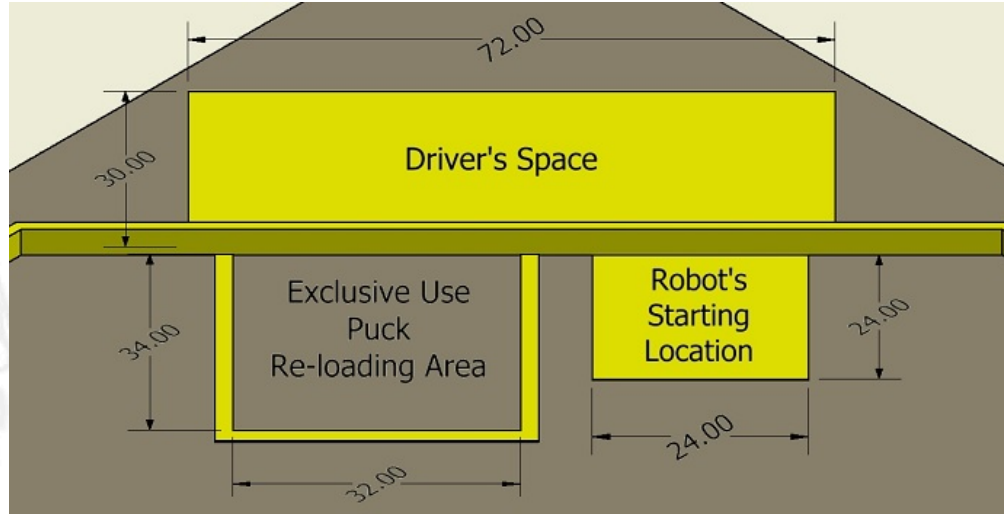
**Note:** The Scoring Areas are defined by 0.75 IN. wide Rings and each Scoring Ring identifies a Higher and a Lower Value Scoring Area. If a Puck breaks the Edge Plane of a Scoring Ring then that Puck will be awarded the LOWER Scoring Area Points associated with that Scoring Ring. A detailed scoring sample is provided later in this document.

**Note:** Robots may be in possession of a MAXIMUM of ONE Puck at a time.

Note: Robots will have One Puck in their 'Shooting / Launching Mechanism' at the Start of the Game.

Note: Robots will have an additional 15 Pucks available in their Team's Designated Exclusive Use Puck Storage Area at the start of the game.

## Team Exclusive Use Area



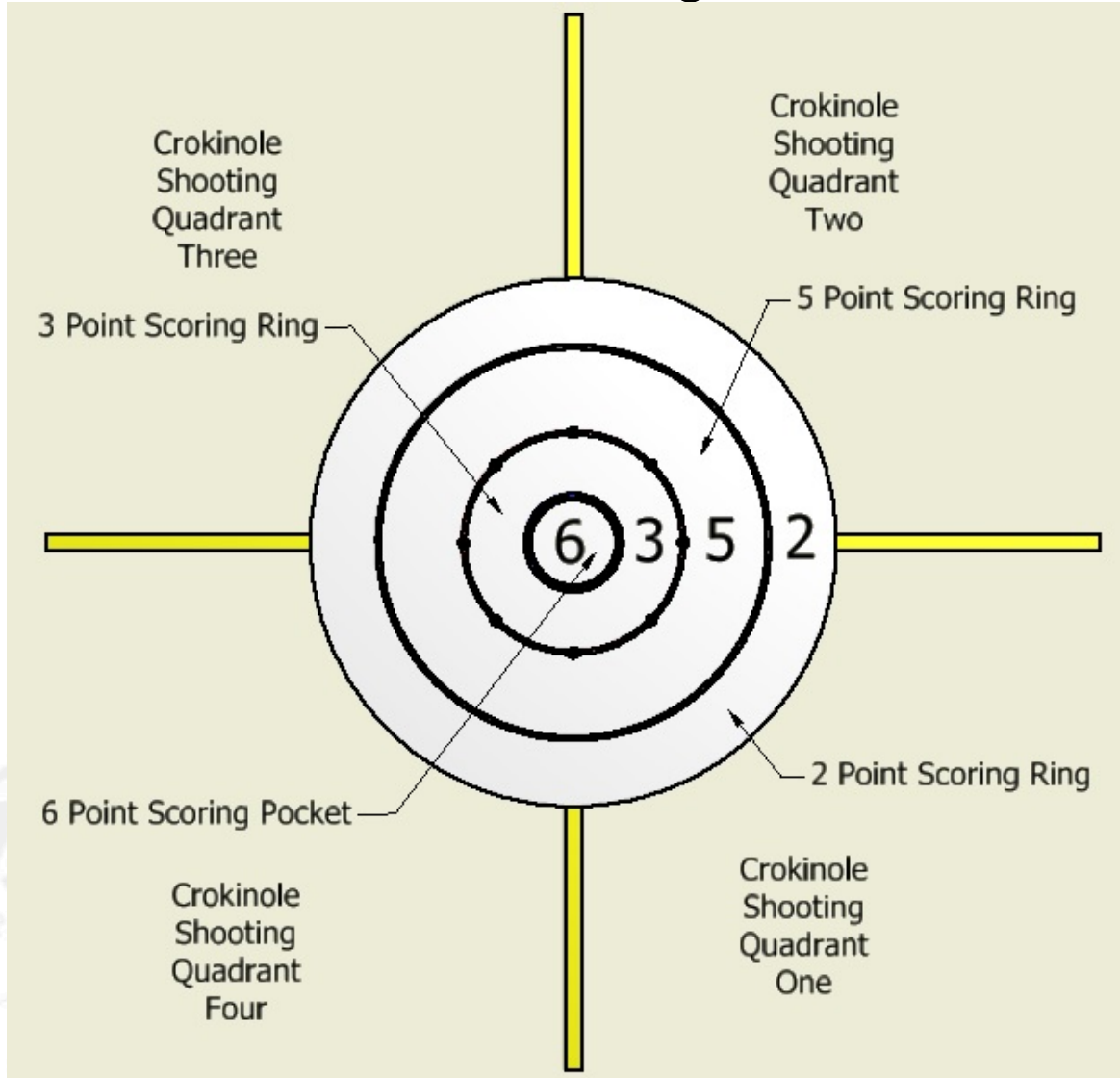
### Exclusive Use Puck Re-loading Area

- 1) Teams have the option to place their 15 Replacement Pucks Directly on the Court Floor in their Re-loading Area.
- 2) Teams also have the option to create and use a Puck Loading Station under the following terms:
  - a. Loading Stations must be free standing independent units
  - b. Loading Stations can arrive at the competition site ready to use or in a 'Some Assembly Required Condition' as long as 100% of the Loading Station Components can fit in a standard size photocopy paper box (11.5 by 9.5 by 17.5 inches) with the box Lid in place.'

Note: A standard size photocopy paper box (11.5 by 9.5 by 17.5 inches) with the box Lid will be available 'On-site' to confirm Robot's are in compliance with this size restriction.

- b. Fully Assembled Loading Stations must fit in the 34 by 32 inch team loading space and there is NO Loading Station Height Restriction
    - d. Loading Stations may involve Mechanical / Electrical Systems but these systems cannot be managed through a radio
    - e. Loading Station Mechanical / Electrical Systems must be managed through the direct interaction of the Robot with the Loading Station The Robot's Starting Location displayed defines a 'General Area Only' and is NOT imposing a Start of the Game Robot Size Restriction. It is a Team responsibility to decide the specific Start of the Game Orientation of their Robot in this General Area.

# Crokinole Scoring Details

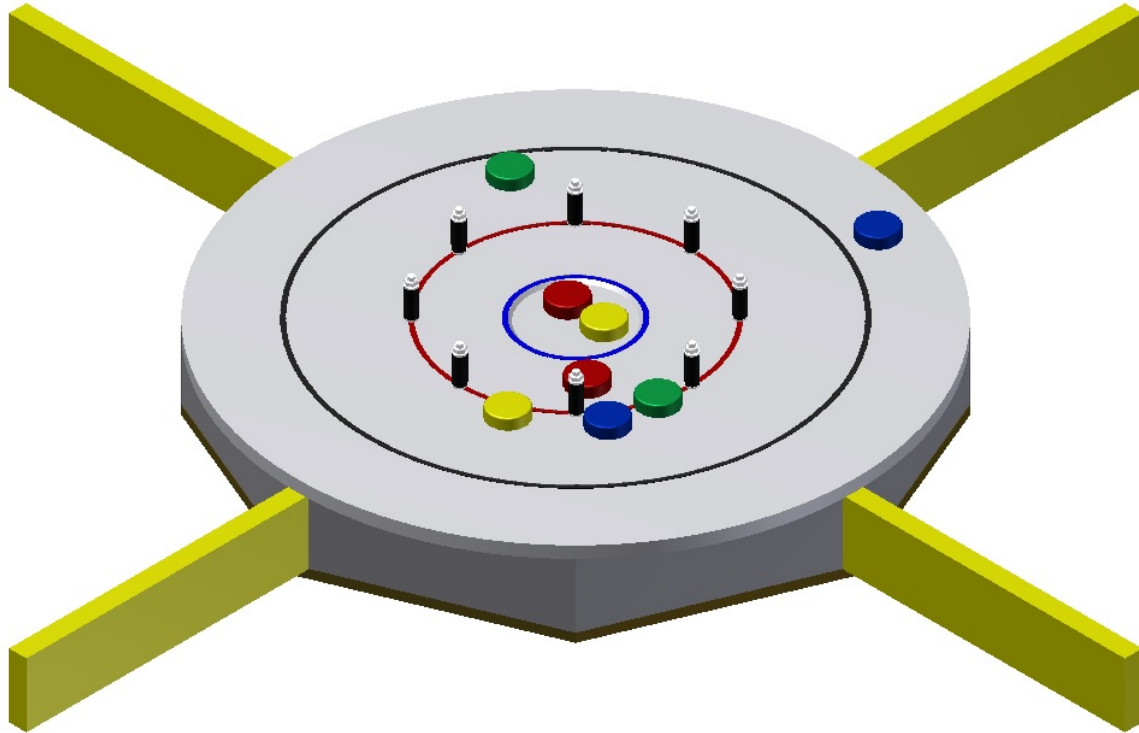


## Crokinole Shooting Quadrants

- Each Crokinole Shooting Quadrant is defined by the Curved Edge of the Crokinole Table and Two Crokinole Table Extensions
- Robots **MUST** be in possession of a Puck when they are occupying a Shooting Quadrant
- There is **NO** Time Restriction on how long a Robot occupies a Shooting Quadrant
- Robots **MUST** exit a Shooting Quadrant **IMMEDIATELY** following the completion of their shooting procedure
- All Shooting Quadrants are available for use by **ALL** Teams



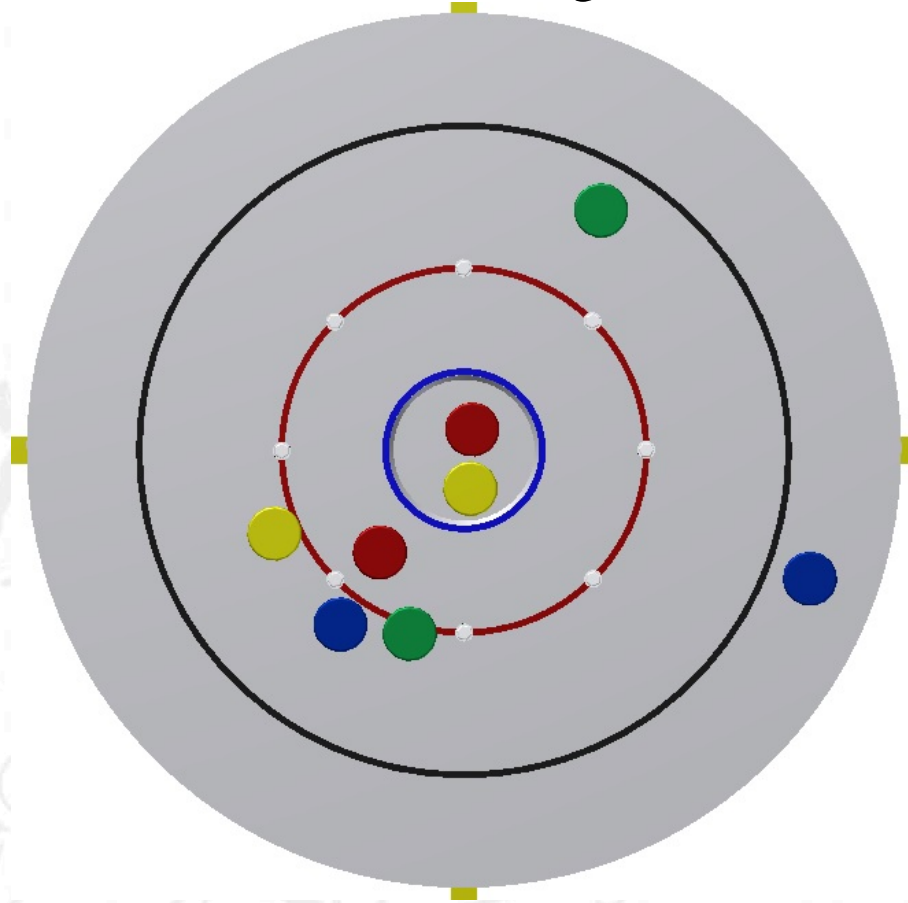
# Crokinole Scoring Details



- When Robots are in a Shooting Quadrant they MAY come in contact:
  - a) With the Edge of the Crokinole Table Top
  - b) The Face of the Crokinole Table's Lower Structure
  - c) The Face of the Crokinole Table Extensions
- At NO TIME when a Robot is in a Shooting Quadrant can any Part / Element of a Robot or a Robot's Shooting Mechanism BREAK the VERTICAL PLANE defined by the Face of the Crokinole Table Top

**Note:** All Teams will be required during the Robot Inspection Process to demonstrate their Puck Shooting / Launching Mechanism to confirm they are in compliance with the 'Do Not Break the Vertical Plane defined by the Crokinole Table Top's Outer Edge'

## Crokinole Scoring Details



**NOTE:** There will be a Camera Positioned ABOVE the Crokinole Table. In the event an 'End of the Game Shot is ruled as being After the Buzzer' then this camera image will be the ONLY resource referenced to determine the 'Correct End of the Game Puck Positions'.

How the above End of Game Puck Positions would be marked.

**Blue Team:** 1 Puck **IN** 2 Point Scoring Area plus 1 Puck **IN** the 5 Point Scoring Area  
Total: 7 Points

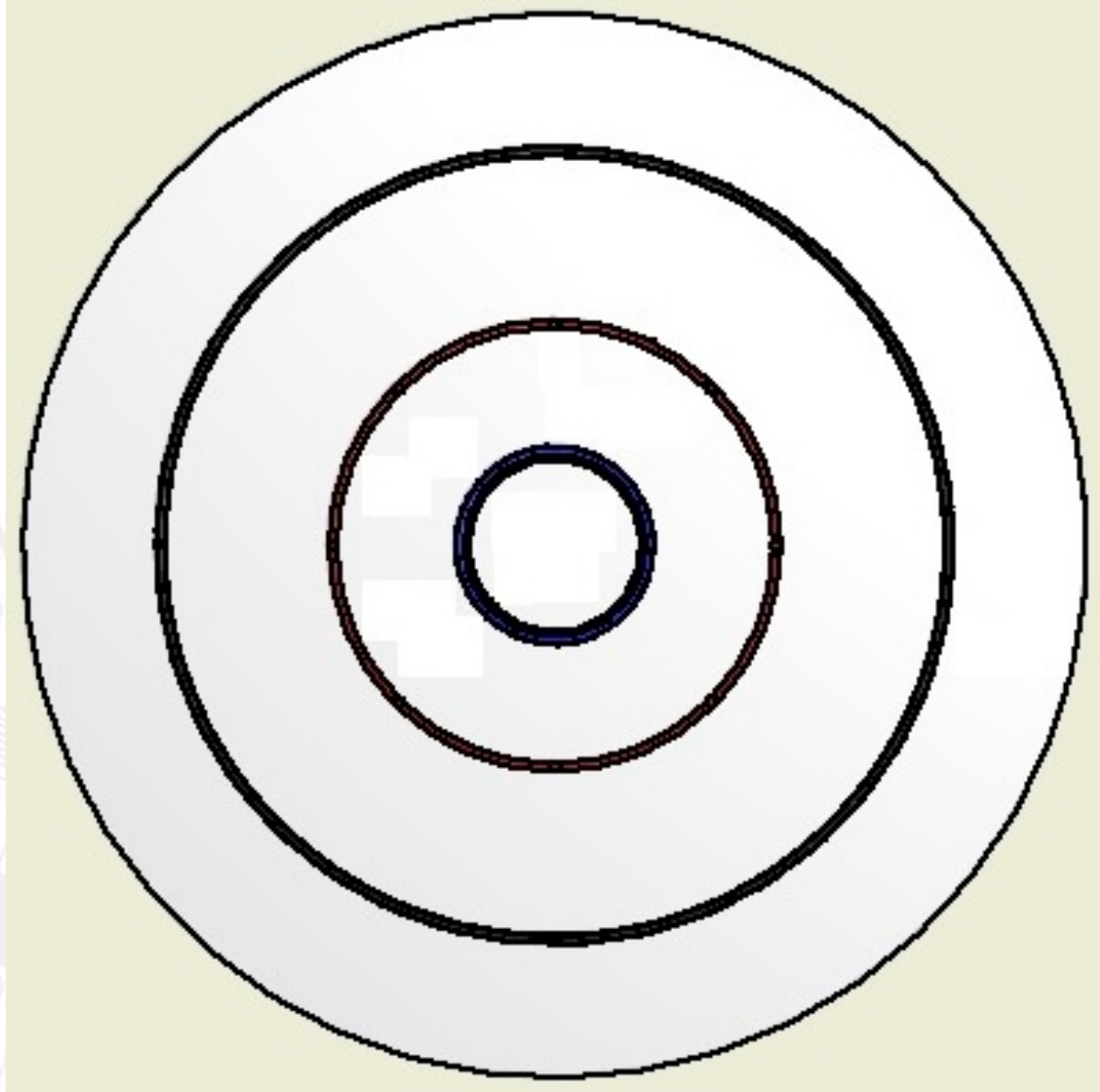
**Yellow Team:** 1 Puck **ON** the 3 / 5 Point Ring Line awarded the **LOWER** Value, 1 Puck **IN** the 6 Point Scoring Area Total: 9 Points

**Green Team:** 1 Puck **ON** the 3 / 5 Point Ring Line awarded the **LOWER** Value, 1 Puck **IN** the 5 Point Scoring Area Total: 8 Points

**Red Team:** 1 Puck **IN** the 3 Point Scoring Area, 1 Puck **IN** the 6 Point Scoring Area  
Total: 9 Points

**2014 Mississauga Referee's End of Game Puck Position Record Sheet :**

Referee's will use a Crokinole Table Top Image to record the End of a Game Puck Positions.



**2014 Mississauga Scoring Sheet** : Referee's will use a Crokinole Scoring Table to calculate the End of Game Points awarded to Teams.

<b>2014 Mississauga Robotics Score Sheet</b>					
<b>Game #</b>	Total Number of Pucks Delivered into the 2 Point Scoring Ring Value Two Points Each	Total Number of Pucks Delivered into the 5 Point Scoring Ring Value Five Points Each	Total Number of Pucks Delivered into the 3 Point Scoring Ring Value Three Points Each	Total Number of Pucks Delivered into the 6 Point Center Pocket Value Six Points Each	Total Game Score
<b>Team Name</b>					
<b>Team Signature:</b>					
<b>Game #</b>	Total Number of Pucks Delivered into the 2 Point Scoring Ring Value Two Points Each	Total Number of Pucks Delivered into the 5 Point Scoring Ring Value Five Points Each	Total Number of Pucks Delivered into the 3 Point Scoring Ring Value Three Points Each	Total Number of Pucks Delivered into the 6 Point Center Pocket Value Six Points Each	Total Game Score
<b>Team Name</b>					
<b>Team Signature:</b>					
<b>Game #</b>	Total Number of Pucks Delivered into the 2 Point Scoring Ring Value Two Points Each	Total Number of Pucks Delivered into the 5 Point Scoring Ring Value Five Points Each	Total Number of Pucks Delivered into the 3 Point Scoring Ring Value Three Points Each	Total Number of Pucks Delivered into the 6 Point Center Pocket Value Six Points Each	Total Game Score
<b>Team Name</b>					
<b>Team Signature:</b>					
<b>Game #</b>	Total Number of Pucks Delivered into the 2 Point Scoring Ring Value Two Points Each	Total Number of Pucks Delivered into the 5 Point Scoring Ring Value Five Points Each	Total Number of Pucks Delivered into the 3 Point Scoring Ring Value Three Points Each	Total Number of Pucks Delivered into the 6 Point Center Pocket Value Six Points Each	Total Game Score
<b>Team Name</b>					
<b>Team Signature:</b>					

### Game Overview

- Games will involve Two, Three or Four Robots at a time.
- All Teams will participate in an equal number of 2, 3 and 4 Team Games.
- Robots share a court area with:
  - An Open Smooth Surface
  - A Center Crokinole Table
  - And EACH Team has an Exclusive Use Puck Loading Area
- Robots will attempt to Re-Load and Shoot Pucks onto the Crokinole Table Top.
- Robots must stop all operation when the time ends.

Robots must be designed and built by students to the criteria outlined in this document.

A pit area is provided so that students may make repairs and improvements to their robots between games. (Note: Teachers are not permitted in the pit area once the competition has started).

**Teams are NOT Allowed to remove their Robot from the Competition Area during the over-night period between Day 1 and 2 of the competition.**

The Pit Area and Competition Court may be available to Teams to work or practice during Lunch Breaks.

Strategies aimed at deliberately damaging other robots is not in the spirit of the competition and will not be allowed.

Teams must understand that deliberate Bumping / Ramming of your opponent robot is not allowed. However, when two very mobile robots are sharing an open court space **THERE WILL BE ACCIDENTAL ROBOT COLLISIONS.** Teams need to take this into consideration when designing their robot.

Teams MUST understand that when their Robot is in a Crokinole Table Shooting Quadrant that it will be near the edge of the Crokinole Table. It is expected Pucks will exit the Crokinole Table Top in a Random Manner and at Random Speeds. **The potential is VERY HIGH that Robots WILL BE HIT by Pucks exiting the Crokinole Table and it is a Team's Responsibility to ensure sensitive elements of their Robot are protected from being damaged / broken by Pucks exiting the Crokinole Table Top.**

Traditional Crokinole Play involves shooting the Crokinole Disks using a 'Finger Flick'. Robot Puck Shooting / Launching Mechanisms MUST emulate a 'Flicking Motion' which means Pucks must be Shot / Launched by some variation on a Striking / Hitting Action.

**Puck Shooting / Launching Mechanisms CANNOT use Spinning Wheel / Pitching Machine based designs.**

**Medals will be awarded based on:**

- Robot on the court performance in the competition task set as identified through the results of tournament play and playoffs.

## RULES AND REGULATIONS

1. Each Team will be assigned a Start of the Game Position.
2. Each team will be assigned a Driver's Area at the Mid-point of One Segment of the Court's Octagon Perimeter Wall behind their Start of the Game Robot Position.
3. A Robot may be in possession of a Maximum of 1 Puck at a time.
4. Robots **ARE NOT ALLOWED** to take possession of an Opponent's Pucks. Possession of an Opponent's Puck means it is in either your Puck collection or Puck Shooting / Launching Mechanism. IF a Robot accidentally takes possession of an Opponent's Puck then this Robot must return the Opponent's Puck to the Open Court Surface **BEFORE** they will be allowed to deliver any of their own Pucks onto the Crokinole Table.

Note: If an Opponent's Puck lands on a robot or becomes stuck under a robot then the robot will NOT be considered to be in possession of this Puck in either of these situations.

Note: Teams may NOT attempt to retrieve their Pucks from on or under an Opponent robot.

Note: If an Opponent's Puck lands on a Robot then this Puck must be left where it is independent of whether or not it is in a position where it is interfering with the Robot's operation.

Note: Teams should shield critical components such as their Emergency Switch from being hit or interfered with by random Pucks.

5. If a Puck Falls / Is Pushed Off of the Crokinole Table onto the Open Court Floor then a Robot may retrieve this Puck and attempt to deliver it onto the Crokinole Table.
6. If a Puck exits the Court Area then this Puck will be deemed Out of Play and NOT returned to the Court.
7. Robots may NOT Grasp / Pull / Push the Crokinole Table.
8. Teams may NOT install a camera or other image generating device on their robot for the purpose of sending a signal / image to an outside the court surface lap top or other type of signal receiver visible to either the Spotter or Driver.

## TOURNAMENT PLAY

1. Tournament Standing will be based on the Total Number of Points scored in all games played by each Team.
2. Teams will play in an equal number of Tournament Games.
3. If Time Permits, Teams will participate in an equal number of games against each opponent Team.
4. The Tournament will be structured to provide all teams with an equal number of 2, 3 and 4 Team Robot game experiences. Example: In 2012 each Team had 12 Game Experiences during Tournament Play.
5. Tournament games will last 4 minutes.
6. The amount of time between games will be determined by the number of participants. This information will be provided to teams at the start of the tournament.
7. Between tournament games, battery changes and repairs to robots may be completed at the team's assigned Pit Area Worktable.
8. During the competition, students must maintain safety at industry standards such as the wearing of safety glasses at all times in the Pit Area.
9. During game play, referees will have ultimate authority over game rulings, and will have full authority over team conduct in the court area.
10. Damaging the court and or the Crokinole Table / Pucks is illegal. If a robot's design causes damage to the court / Crokinole Table / Pucks then it will not be allowed to compete until it can operate without causing damage. Games missed due to this situation will be forfeited.

NOTE: Damage is considered to be BREAKING court components. Robots bumping into court components and causing them to shift position without breaking any court element will NOT be considered to be damaging the court. It is expected that all court components will be fixed firmly in place so that the court is a Neutral Factor in the competition.

Deliberate strategies aimed at the destruction, collision, damage, overturning, entanglement or active blocking of competitor robots are not in the spirit of the game and are strictly forbidden. Ramming and pushing are not allowed.

Note: A warning will be given for the first offense. **Only ONE Warning will be given for the entire Tournament.** Forfeiture of, and removal from the game will result with the Second occurrence. Expulsion from the competition will occur after the third.

**NOTE: Teams MUST expect there WILL BE ACCIDENTAL COLLISIONS during game play.**

11. Games will start on time. Teams are responsible to know when their games are scheduled. Teams arriving late will be allowed to use the remainder of the time in the game.
12. If teams must withdraw from a scheduled game due to mechanical problems then they are asked to inform the Referee as promptly as possible of their decision to Default 'Forfeit the Game'.
13. Competitors cannot enter onto the court surface or make adjustments to their robot during a game.
14. If a robot is mal-functioning and represents a hazard to participants, other robots or itself in the opinion of the Referee, then, the referee may stop the clock, and may authorize the shutting off of the robot during a game. Disabled robots or parts of robots not generating any safety concerns will be left on the court until the game time expires.
15. Teams will be allowed two competitors in the courtside area. Drivers and spotters may switch roles during a game. The driver is the competitor holding the robot controller and controlling the robot. The spotter is the competitor providing navigational guidance to the driver through verbal instructions and hand gestures.
16. Drivers must remain in their Assigned Area throughout the game.
17. Spotters may move freely within the shared spotter's areas.
18. Spotters may **not** enter an opponent team's Drivers area.
19. At the start of a game, robots are expected to be in their assigned starting positions. Robots arriving **AFTER** the game has started will be allowed to enter the game and use the Time remaining in the 4 min. game.
20. Competitors must remain outside the court boundaries.
21. Robots must not leave the competition court at any time during a game.
22. It will be a referee's ruling that decides if an 'End of the Game Puck Shot' took place before or after the game-ending buzzer sounded.
23. Pucks landing outside the court boundaries, as a result of Robot Behavior, **will not be returned** to the Competition Court.
24. Deliberate ramming of an opponent robot will **not** be allowed.

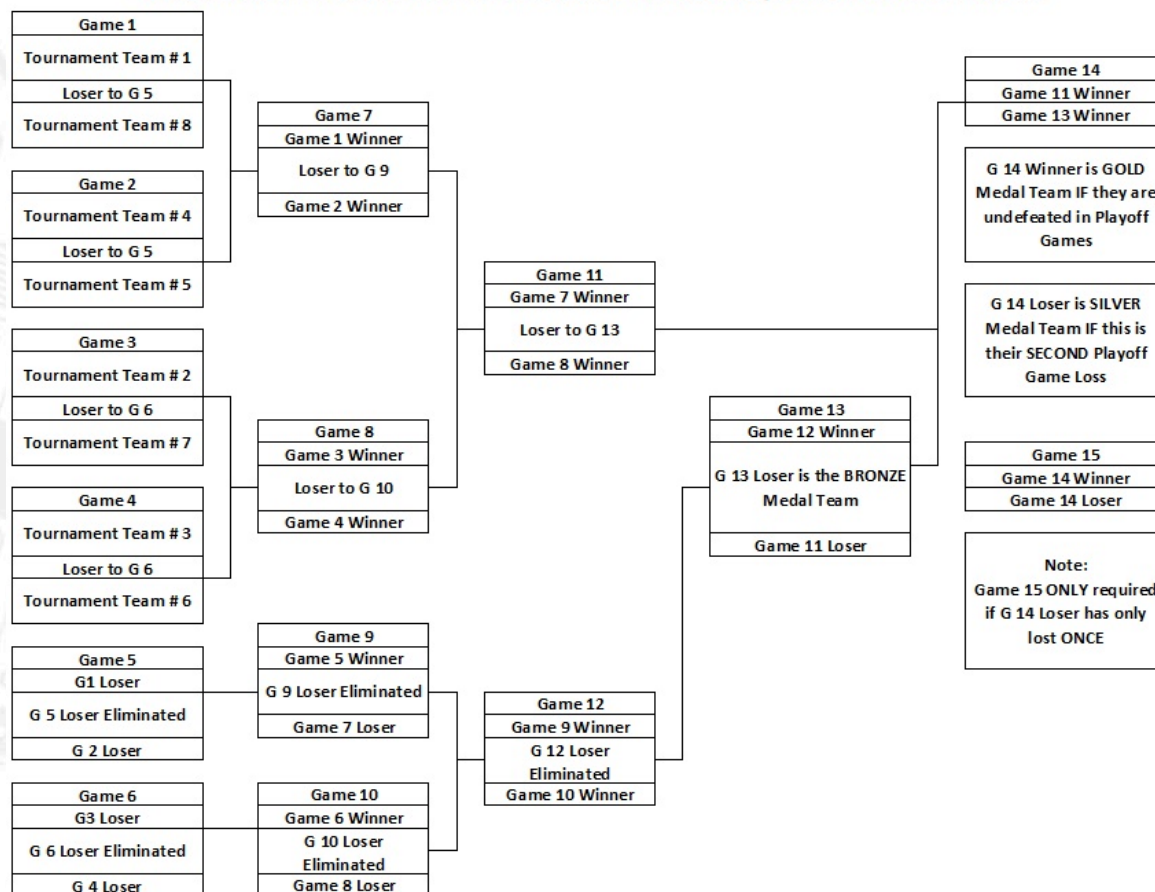


## PLAYOFF PLAY

1. All teams will advance to the playoffs following the Tournament.
2. Two Robots will play on the court in playoff games.
3. Playoff games will be Standard Game Length (4-minutes).
4. Playoff games cannot end in a tie. If a tie score exists in a Playoff Game then additional 4 minute periods will be played (as many as needed) until one of these extra periods ends with one team ahead. Note: Teams will be allowed to return to their Pit Area Table to make repairs, change batteries between the extra periods of a playoff game. If 'Overtime Periods' are required the time between these periods will be set at 4 min.
5. The Playoffs will be structured on a Double Knock-Out Format. Teams will need to lose TWO Playoff Games to be eliminated.
6. Initial Playoff Game Pairings will be based on the Final Tournament Standings.

The Playoff Pattern displayed in this scope is based on eight teams. If the number of Teams in Mississauga is not eight then the Playoff Structure will be adjusted accordingly.

**2013 Skills Canada 8 Team Robotics Double Elimination Playoff Tournament Schedule**



## THE COURT

### COURT LAYOUT

Please note: Although great pains will be made to keep the court in compliance with the drawings, some inaccuracies in construction may occur. Please make your robot designs allowing for a possible ½ inch tolerance.

The primary court items that have a direct bearing on robot design are:

- 1) The open court surface consists of masonite sheets smooth side up with duct taped seams, OR the Good Side of a 'Good One Side Plywood Sheet', OR, the smooth facility floor.
- 2) The perimeter court wall is made from 2 by 4 inch planks laying on their narrow edge.
- 3) The Crokinole Table Top is ¾ inch Melamine

Detailed court information has been included in the Appendix Section of this scope document.

## THE ROBOT

### RESTRICTIONS

All robots must **pass** a pre-competition inspection for compliance with the safety and design rules before they will be allowed to participate in tournament games.

Note: Robots must remain in compliance with these rules throughout the competition. If teams fall out of compliance with these rules then they will not be permitted to compete and will forfeit all of their scheduled games until they have corrected the problem.

Pitching Machine style devices (based on the use of Spinning Wheels) cannot be used in Puck Shooter / Launch Mechanism Designs **BUT** Pitching Machine style devices (based on the use of Spinning Wheels) **CAN** be used in Puck Loading Mechanism Designs.

## START OF THE GAME ROBOT STATUS

When a robot's main power is turned on prior to the start of a game the robot must be in an overall 'Idle State' and the following conditions must exist:

1. The Robot must be stationary in its assigned starting location.
2. The Robot must be in compliance with the Maximum Overall Size Restriction of 8 Cubic Feet.
3. All systems may be ON.
4. All required System Start-up Adjustments must be completed.
5. All Electrical / Mechanical Systems and Student Made Electronic Circuits must be under the control of a Kill Switch(es) capable of being shut off with a Single Hand Motion.
6. Air System Circuits may be fully charged to 100 PSI and their compressors can be ON.

## OVERALL ROBOT SIZE

Robots must not exceed an overall size of 8 cubic feet (13,824 cubic inches) at the start of each game. Robots may expand to a larger size once a game has started.

Overall robot size will be calculated by using the maximum single dimension in each category (length / width / height) of the robot not average dimensions.

This overall size maximum will allow a robot to be any of the following example sizes, or indeed some other variation that does not exceed 13,824 cubic inches:

- (a) an overall dimension of **24 by 24 by 24-inches**, (13,824 cubic inches), or
- (b) an overall dimension of **42 by 18 by 18-inches**, (13,608 cubic inches), or
- (c) an overall dimension of **36 by 21 by 18-inches**, (13,608 cubic inches), or
- (d) an overall dimension of **48 by 24 by 12-inches**, (13,824 cubic inches).

NOTE: The top of your radio antenna may be a maximum of 48" above the court floor. The radio antenna is not considered when defining the overall robot size.

Metric Robot Size Conversion:

24 inch = 60.96 cm

61 cm x 61 cm x 61 cm = 226,981 cubic cm

8 cubic foot = 226 534.773 693 507 cubic cm

## OVERALL ROBOT WEIGHT

- No weight restriction is imposed on the robots.
- Robots should be built with robustness in mind. Accidental bumps and scrapes will happen.
- Teams must consider protection of sensitive components and durability of exposed ones when designing all elements of their robots.

## SUGGESTED PARTS LIST

A quick note about manufactured parts: Although it is impossible to create a comprehensive list of all acceptable parts, a list has been made to provide guidance for teams.

Acceptable components:

- electronic speed controllers
- motors
- gears
- sprockets
- chains
- belts
- pulleys
- tires
- rims
- bearings
- compressed air tanks
- gauges
- tubing connectors
- RC transmitter / receiver
- servo motors
- batteries
- harvested gearboxes from mechanical devices
- PLC unit and interface
- Microprocessor

## **Examples**

Wheel assembly: tire, tube, hub & bearing.

Power plants, this could involve complete core systems. The intention is to enable power to be delivered to student-created mechanisms.

- A power drill where the complete motor/gear box/clutch/chuck is used.
- An automobile power headrest motor/flexible drive shaft/linear gear assembly are used.
- A photocopier chain drive involving the motor/drive shaft/drive chain sprocket is used.
- A photocopier gearbox to be used to manage a non-photo-copier motor.
- An electric scooter or wheelchair motor mounted on a student designed and created frame.

It is a team's responsibility to ensure robot compliance to standards.

## POWER SOURCES / MANAGEMENT

1. The total voltage in any individual circuit **cannot** exceed **24 Volts**.
2. The **maximum continuous** power rating allowed in any circuit is **240 W**, which will be limited by voltage and fuse selection. Example: 12Volts\*20 Amps=240 Watts
3. Teams are reminded that it is the purpose of a fuse to protect the students themselves and the equipment in their circuits. Teams must develop circuit diagrams, and calculate the appropriate values for all circuits on their robot. Teams must submit a wiring diagram of their robot's circuits.
4. Each current branch path from the battery must include either an **in-line fuse, circuit breaker** or be connected to a dedicated fuse in a rack.
5. Fuse blocks, in line fuses must be readily accessible for inspection purposes.
6. Teams must use a wire gauge which is appropriate to the current values in each circuit.
7. Batteries must be complete sealed commercial battery packs.
8. All **wires** and **batteries** are to be mounted **securely** to the robot taking into consideration that they must be protected from damage due to abrasion when the various robot elements move.
9. Teams are responsible for charging their own batteries and must have a complete set of batteries. It is recommended that a spare set be available.
10. Robots must be able to be turned off with a single motion. Robot Controller receivers may be in an independent circuit.
11. Teams may use new or re-cycled motors. See list of suggested parts.
12. There is no restriction on the number of motors used on a single robot.
13. No explosive materials of any kind may be used (ether, gunpowder, acetylene etc).

## NON-ELECTRICAL (BATTERY) ENERGY SOURCES

Pressure based energy sources (air or other) may be pre-charged to a maximum of 100-PSI pressure in their reservoirs (cylinders) at the start of each game.

1. Air pressure systems using Competitor-made or modified air pressure hardware are **NOT** permitted.
2. All pressurized tanks on robots must have a pressure gauge to indicate the stored pressure and a form of automatic overpressure safety relief.
3. The pressure tanks and related gauges / controls must be shielded from damage due to collisions or flying target objects.
4. The stored pressure in the tank must not exceed a maximum of 100 PSI at any time.
5. Tension-based energy sources (elastics, springs or other) may be in either a relaxed at rest state or in a tense / compressed state at the start of each game.
6. Laser devices are prohibited.

## ROBOT CONTROLLERS

1. All teams must use 2.4 GHz “non-crystal” control systems.
2. **Teams are allowed the use only 6 Channels managed through the use of a Maximum of 6 controller components (Joy Sticks / Toggle Sticks / Push Buttons / Dials / Sliding Switches) on their operator held control unit to support operator to robot communication.**
3. Robots may not transmit information or a signal of any type to ‘Off the Robot’ devices.

## PIT AREA

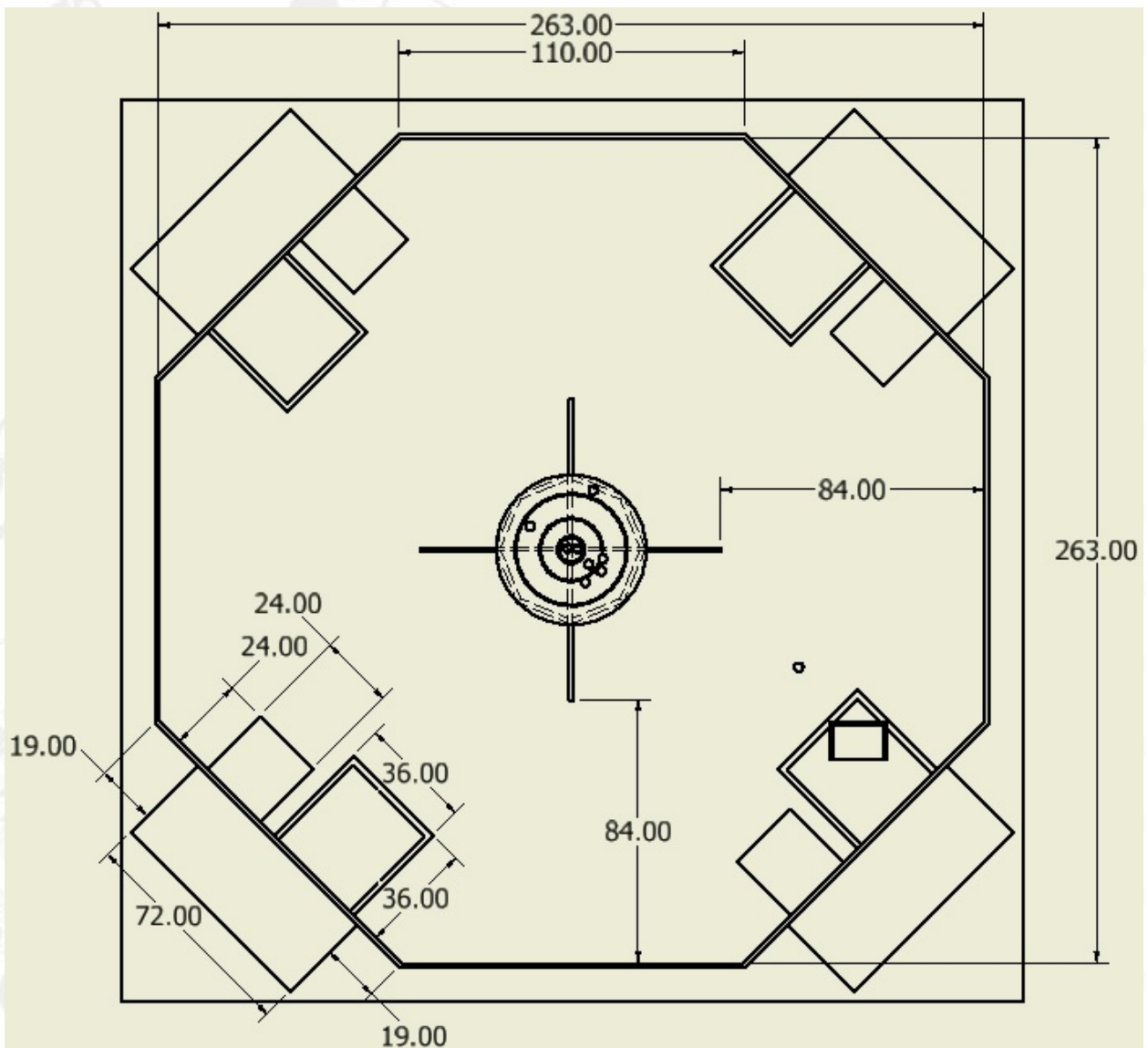
1. Competitors **MUST** wear Safety Glasses in the Pit Area and it is a Competitor’s Responsibility to provide their own Safety Glasses.
2. Only registered robot competitors are permitted in the pit area.
3. Designated teacher/industry team advisors are permitted in the pit area **only** to inspect the worktable setup of their team prior to the start of the tournament.
4. Designated teacher/industry team advisors are **not** allowed in the pit area during tournament and playoff play.
5. Teachers and industry advisors are not permitted to handle tools or robot parts. Students must affect all repairs and modifications on their robot.
6. Teams will be provided with Pit Area Workspace on a standard project table. Depending on the number of teams and availability of space, teams may have to **share** a 60 by 30 inch table.
7. Each pit area table will have access to one electrical outlet. Teams are requested to bring a 25-foot multi-outlet extension cord / power bar as part of their equipment.
8. It is required that teams fabricate a **tabletop stand** for holding their robot in the pit area. This stand should hold the robot securely and be capable of preventing the robot from driving on or off the table in the case of either deliberate motor testing during repairs or due to random, unexpected motor activity.

## APPENDIX

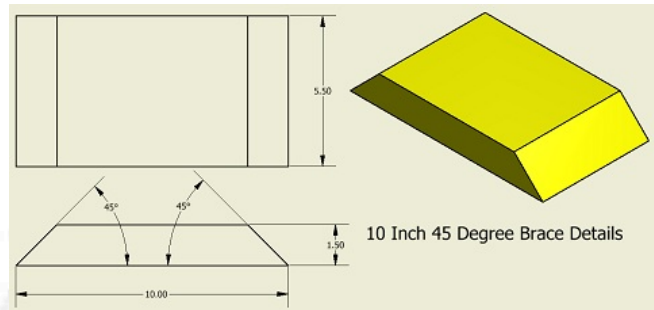
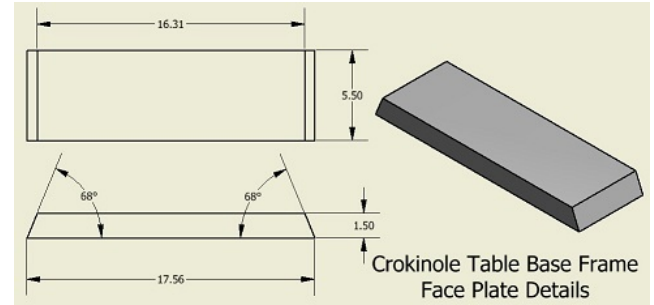
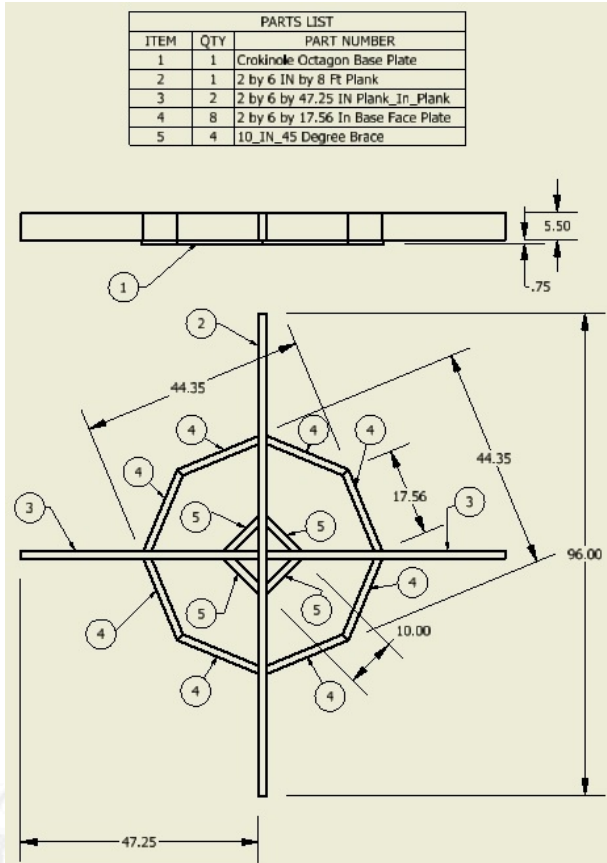
### Overall Court Dimensions:

- The Court Playing Surface will be an Octagon measuring 263 Inches Across the Flats with a 30 Inch Wide Perimeter Pathway All Around the Court.
- The Perimeter Court Walls will be made using 2 by 4 inch planks.
- This wall will as a result be approximately 3.5 inches tall.

### Overall Crokinole Court Size Details:



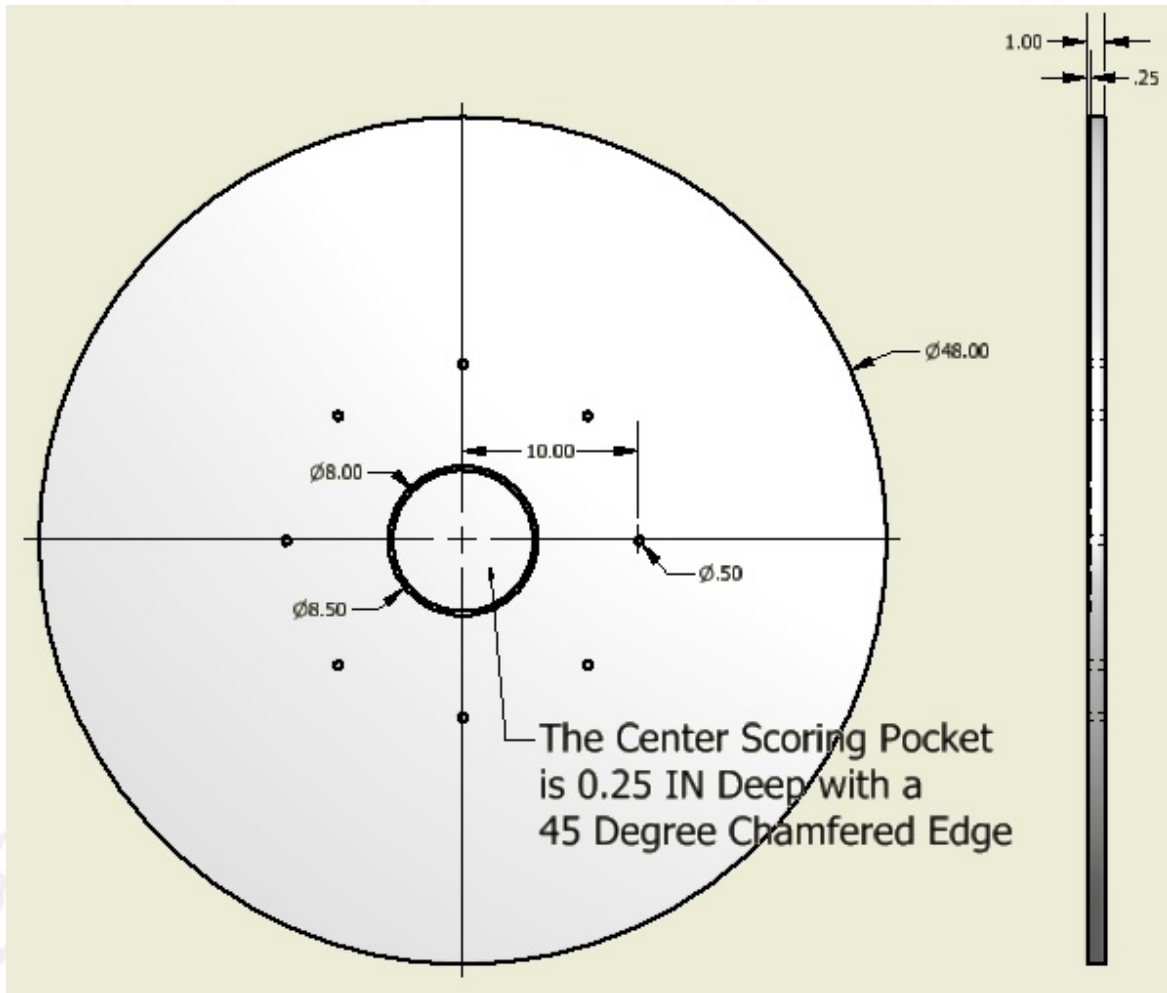
## Crokinole Table Frame Details:



If necessary the 4 Quadrant Pockets defined by the Crokinole Table Extensions, Braces and Face Plates can be filled with Sand to increase the Overall Crokinole Table Weight to hold it in position during Game Play.

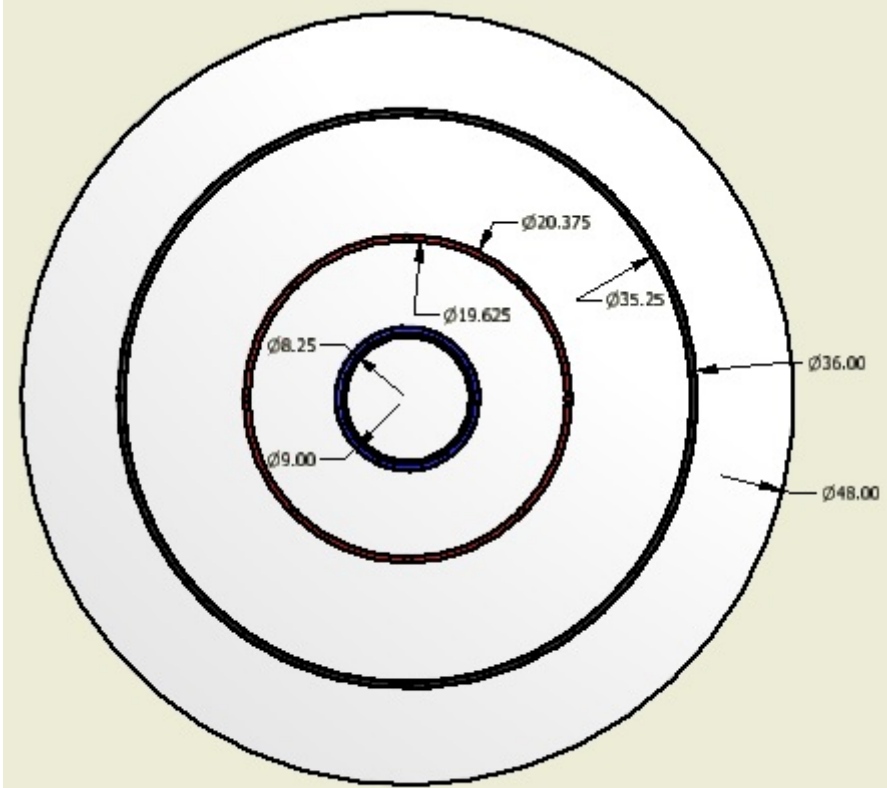
The Crokinole Table Base Plate is made from 0.75 IN Plywood.





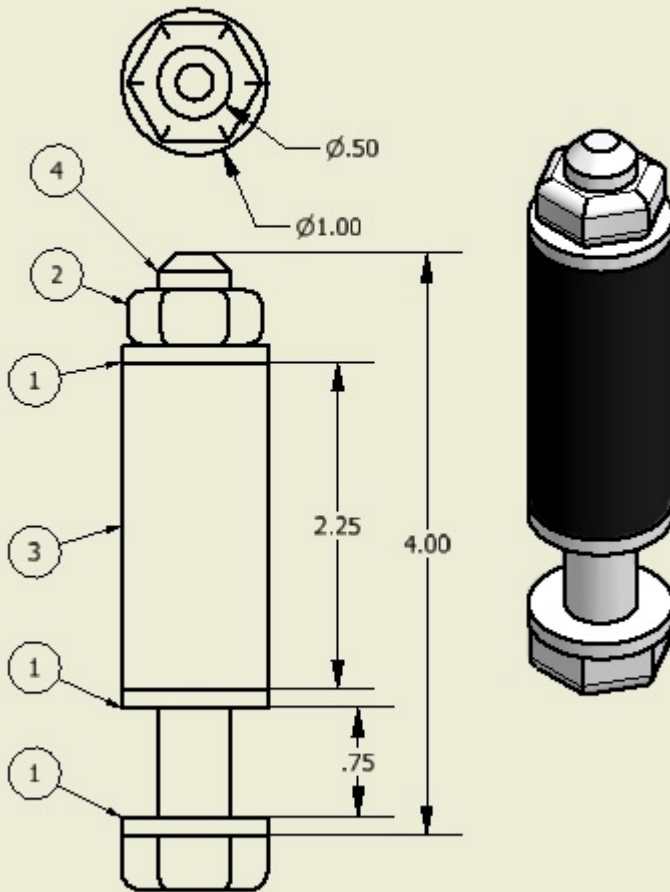
### Crokinole Table Top Center Pocket and Post Hole Details

The Crokinole Table Top is made from 0.75 IN Melamine and provides a Hard Smooth Surface.



Crokinole Table Top Scoring Rings Details

PARTS LIST		
ITEM	QTY	PART NUMBER
1	3	1-in-Washer
2	1	0-5-in-Nut
3	1	0-5-2-25in-Sleeve
4	1	0-5-4-in-Bolt



## Crokinole Table Post

The Crokinole Table Posts are built using a Half Inch Bolt, Washers, a Half Inch ABS Pipe Piece as a Sleeve and a Half Inch Nut.

## PRE-INSPECTION FOR COMPLIANCE WITH SAFETY AND DESIGN RULES

- 'Flick' Puck Shooting / Launching System Performance Criteria Met
- Mandatory Wiring Diagram provided.
- Mandatory Pressure System Circuit Diagram provided.
- Table Top Robot Stand
- Overall volume  $\leq 8 \text{ ft}^3$  or  $13,824 \text{ in}^3$
- Antenna  $< 4 \text{ ft}$  from court floor
- No explosives/combustibles
- No lasers
- All batteries are sealed commercial batteries in good physical condition
- Batteries wired in series should be the same amp hour rating (ex. both 1500 mAh) and batteries in parallel are of same voltage (ex. both 12 volts).
- Batteries securely mounted
- Total voltage in any individual circuit does not exceed 24V
- No circuit exceeds 240W (Voltage x Fuse Current Rating)
- All circuits have a fuse or breaker (breakers must have **DC rating**)
- Appropriately gauged wiring for each circuit
- Wires and connections are in good physical condition
- Wires and connections are not exposed to physical abrasion
- Motors not over-voltaged by more than 50% (a 12V motor can be run at 18V)
- No Competitor-made or modified air pressure hardware being used.
- Only commercially manufactured Pressure Tanks (cylinders) can be used.
- Pressure indicator
- Pressure in tanks does not exceed 100 psi
- Over-pressure safety valve
- Pressure tanks and related gauges and controls are shielded from damage due to collisions
- Robot is able to be turned off with a single motion. Radio receivers may be in an independent circuit.
- Only 6 Channels managed through the use of a Maximum of 6 controller components (Joy Sticks / Toggle Sticks / Push Buttons / Dials / Sliding Switches) on their operator held control unit to support operator to robot communication are being used.
- Demonstration of robot functionality with rated fuses
- 100% of the Loading Station Components can fit in a standard size photocopy paper box (11.5 by 9.5 by 17.5 inches) with the box Lid in place

Additional concerns:

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Robot Evaluator Signature

Team Representative Signature