

ROBOTICS STATE TOURNAMENT

Sponsored by *FIRST* and Presenting Partner-MSHSL

Season Begins

The season shall correspond with all dates and guidelines outlined by the *FIRST* Robotics Competition.

Contest

All MN *FIRST* robotics teams are eligible to participate in the 36-team MSHSL/*FIRST* INFINITE RECHARGE at Home Championship. Teams will qualify for the event based on their performance in their *FIRST* INFINITE RECHARGE at Home Skills Challenge group.

Robot Requirements

Teams will follow all the rules and guidelines of the *FIRST* Robotics Competition.

Team Membership

All students eligible for membership on a *FIRST* Robotics team will be eligible for the State Championship. Students must be in Good Standing as defined by MSHSL rules to participate. Exception: No students in grade 6 or under will be eligible.

MSHSL Eligibility Information Brochure

Prior to participation in the state co-sponsored event, the student and one parent or guardian must sign and return one copy of the 2021 Robotics Eligibility Form to the student's school or the lead team mentor. The student and parent or guardian signature will certify that they have read, understand, and agree to abide by the information provided. The form may be found at this web page:

(<http://www.mshsl.org/mshsl/robotics.asp>)

State Competition Qualification

Teams qualify based on their overall score total and computed scores in their INFINITE RECHARGE at Home group.

Tiebreaker

If any teams have the same number of points, the following hierarchy of tiebreakers will be used to break the tie:

1st Order Sort: Overall Score

2nd Order Sort: Highest Computed Score

3rd Order Sort: Second highest Computed Score

4th Order Sort: Fourth highest Computed Score

5th Order Sort: Fifth highest Computed Score

6th Order Sort: Random Selection

Note that “third highest Computed Score” is omitted because it’s moot if the Overall Score, highest Computed Score, and second highest Computed Score are tied.

Alternate Teams

If, prior to the competition, any team is unable to participate, an alternate will replace that team. Teams must accept their invitation to the MSHSL Championship event within one week of final notification.

If a qualifying team declines an invitation, the next highest qualifying team will be selected from the list of eligible teams. Alternate teams will have 48 hours to respond to an invitation.

Tournament Details

State Competition Scoring

Each team will submit their raw score for each challenge, as defined in sections 2.4.6.3, 2.4.7.3, 2.4.8.3, 2.4.9.3, 2.4.10.3 from the *FIRST* Game Manual (<https://www.firstinspires.org/resource-library/frc/competition-manual-qa-system>) and the special Minnesota challenge detailed below.

Computed and overall scores will be calculated for each team according to the process described in section 2.4.11 of the *FIRST* Game Manual with the following changes:

- C_{max} is 170 for the two **Minnesota Challenges only**
- C_{min} is calculated as follows:

$$C_{min} = \max (C_{max} - 20(N - 1), 70)$$

This means that the **Minnesota Challenges** are worth an additional 20 points over the INFINITE RECHARGE at Home skills challenges. Since the overall score is still computed using each team's top three (3) computed scores, it is possible (though unlikely) for a team to have the highest overall score without submitting for any of the Minnesota Challenges.

Timeline

April 24: FUM will announce which 36 teams qualify, submission portal opens

May 1: Deadline for teams to respond to invitations

May 22: Submissions due (8:00pm CDT)

May 29: Virtual state championship Awards Show

Submission

FUM will provide a submission system that teams will use to report their raw scores for each challenge along with a videos of their robot completing the challenges.

This submission system will open April 18th, 2021 and will close May 22nd, 2021 at 8:00pm CDT.

Teams will provide the following:

- Team name, number, and contact information for the lead mentor and a second adult mentor
- Raw scores for each challenge the team participates in (see **State Competition Scoring**)
- A video for each challenge the team submits for that complies with the rules in section 2.4.5 of the *FIRST* Game Manual
- A photo of the robot suitable for use during the awards show

Questions & Answers

If you are having trouble submitting or have questions about the challenges, please email mshsl2021@firstuppermidwest.org.

Awards Show

FIRST in Upper Midwest will host a virtual Awards Show on May 29th. During this show FUM will showcase Minnesota's amazing teams and announce the 2021 state champions and runners-up. Stay tuned for more information on the awards show later in the season!

Certificate of Participation:

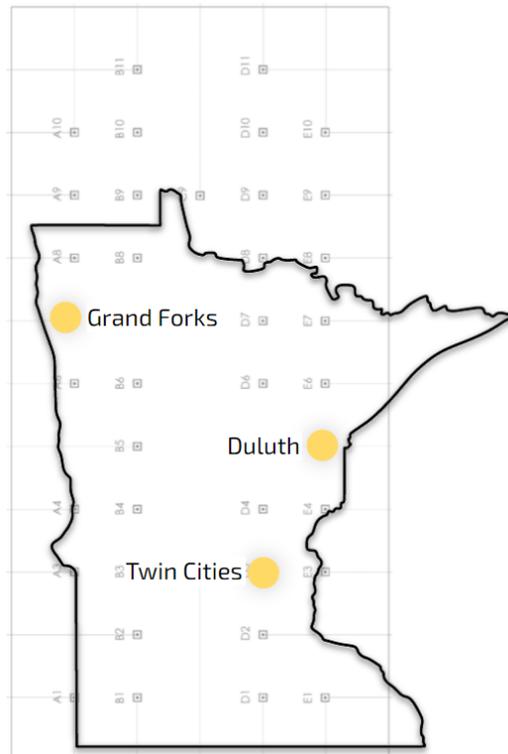
Each team qualifying for the state tournament will be given 25 certificates of participation. Additional certificates can be purchased after the event.

Minnesota Challenges

Minnesota Challenges

These challenges were specially made with Minnesota in mind. Inspired by the regional competition locations in the state of Minnesota, we have created a set of challenges that represent those regions. These challenges are designed to leverage the same Challenge Space as the INFINITE RECHARGE at Home Skills Competition.

The following two challenges are additional options for teams to submit in participation with this year's MSHSL Tournament.



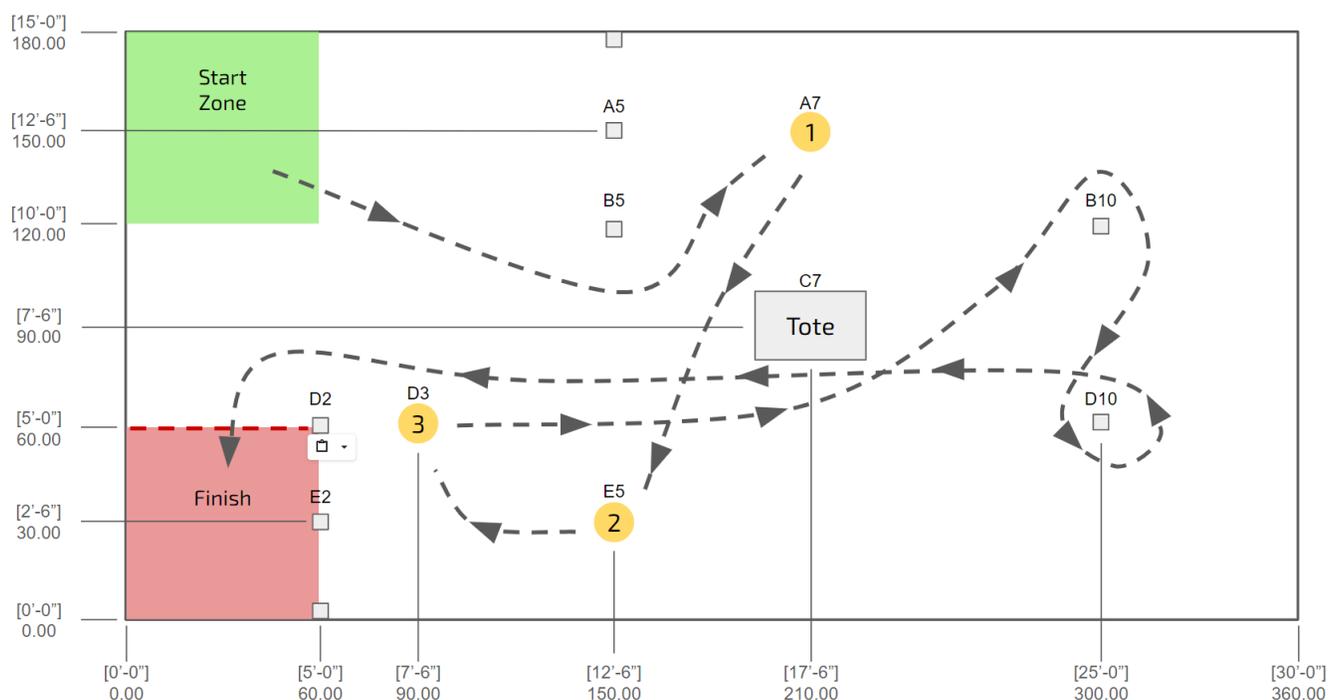
Snow Removal Challenge

In the Snow Removal challenge, teams must follow the specific route to pick up Snowballs from key FRC cities, store them in their Robot, and deliver them to the Finish Zone.

Layout

Teams should mark the boundary zones from the diagram below by placing at least one MARKER on the NAV POINTS shown as small gray squares below, a total of eight (8). A standard FRC TOTE (provided as part of Kit of Parts kickoff kits) will be placed centered on C7.

One POWER CELL must be placed on each of the Key Cities (A7, D3, and E5).



Rules

- SRC1** Teams must remotely drive their ROBOTS to complete the challenge path. Teams can either teleoperate their robots or run their robots fully autonomously.
- SRC2** The ROBOT must start completely within the Start Zone.
- SRC3** Teams must start the timer as soon as the ROBOT begins motion to navigate the path.
- SRC4** ROBOTS follow the prescribed path marked by the black dashed line in the layout diagram above. While the exact path indicated on the layout diagram is for illustration purposes only, the ROBOT is expected to navigate the same general path with respect to the MARKERS.
- SRC5** A ROBOT that contacts a MARKER or TOTE while navigating the path incurs a five (5) second penalty each time contact is made. Since this challenge is timed starting at 0, these five second penalties are added to the final challenge time.

- SRC6** Teams may not use a penalty in order to skip MARKERS or complete the path any other way than via the described path marked by the dashed lines in the layout diagrams
- SRC7** ROBOTS must successfully CONTROL each POWER CELL in the order it is prescribed in the navigation layout above.
- SRC8** ROBOTS must CONTROL all three (3) POWER CELLS as they enter the Finish Zone.
- SRC9** Teams must stop their timer as soon as the ROBOT completes the prescribed path, and any part of its BUMPERS breaks the plane defined by the dashed red line on the path's layout diagram.
- SRC10** Teams must record the completion time and video of the successful run.

Scoring

The raw score for this challenge is the total time (in seconds) to complete the collection and path. Teams should enter the time exactly as they record them, as they will be rounded automatically to the nearest tenth of a second (x.x5 is rounded up to the nearest tenth, e.g. 0.15 is rounded to 0.2).

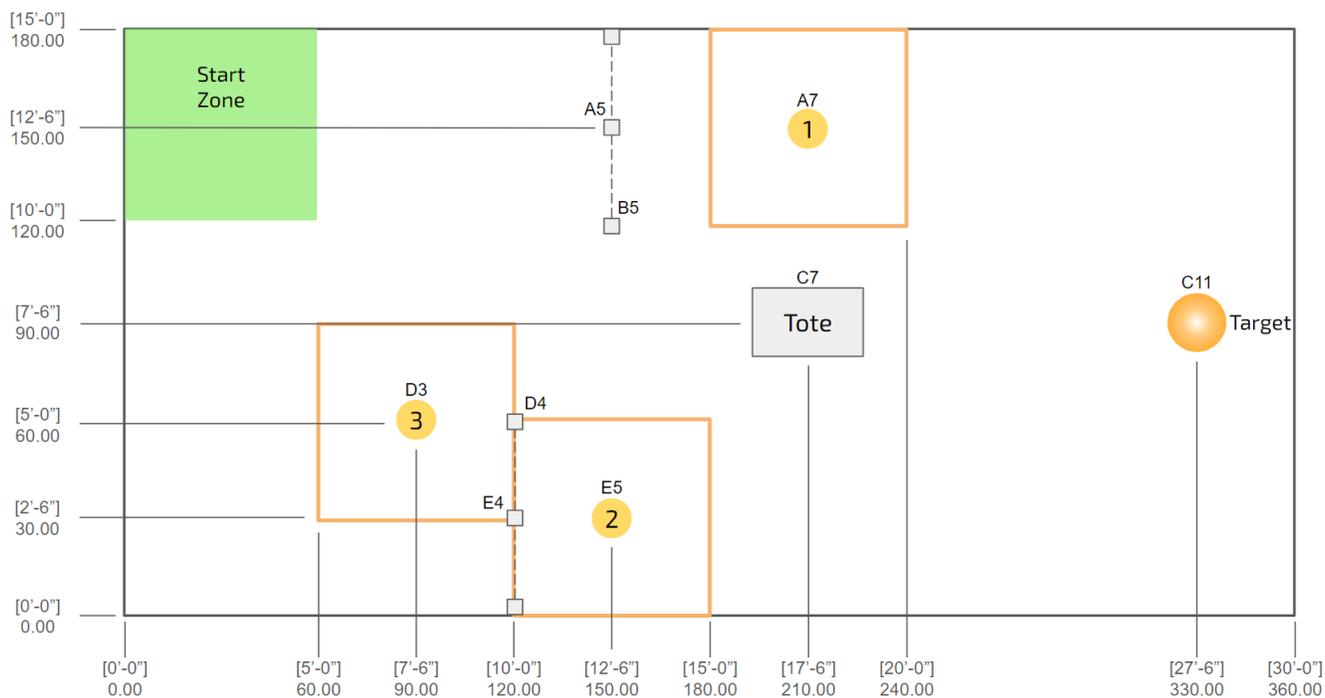
Snow Thrower Challenge

In the Snow Thrower challenge, teams must pick up Snowballs and shoot them into the PORT openings in the shortest amount of time. Each Snowball scored into a PORT opening counts as a time reduction bonus, with an added bonus for scoring that Snowball from one of the key Minnesota FRC cities.

Layout

Teams should mark the boundary zones from the diagram below by placing at least one MARKER on the NAV POINTS as seen by small gray squares below, a total of six (6). A standard FRC TOTE (provided as part of Kit of Parts kickoff kits) will be placed centered on C7 and the Target located and centered on C11, similar to how it can be located on the field for the Interstellar Accuracy Challenge (Figure 2-10, pg. 25).

One POWER CELL must be placed on each of the Key Cities (A7, D3, and E5). Each Key City is bounded by a Key City Zone, which is shown as a yellow box in the diagram below. It is recommended, but not required, that teams measure and place marks on the floor (e.g. with tape) to be able to identify the Key City Zones.



Rules

- STC1** Teams must remotely drive their ROBOTS to complete the challenge. Teams can either teleoperate their robots or run their robots fully autonomously.
- STC2** The ROBOT must start completely within the Start Zone.
- STC3** Teams must start the timer as soon as the ROBOT begins motion to navigate the Challenge Space.
- STC4** Like in the Snow Removal Challenge, teams must collect POWER CELLS in the numbered order seen in the layout above.
- STC5** Shots must be taken with the ROBOT stationary. “Stationary” here means that the robot’s bumpers remain in a fixed position relative to the Challenge Space until the ball is no longer in direct contact with the ROBOT.
- STC6** Teams may shoot POWER CELLS from any location within the provided Challenge Space but shooting from completely within a Key City Zone (including BUMPERS) provides a bonus to a successfully scored POWER CELL from that Zone.
- STC7** Only one (1) POWER CELL will be rewarded a bonus from a Key City Zone. If multiple POWER CELLS are shot from the same Key City Zone, then the highest valued POWER CELL scored will receive the bonus.
- STC8** Teams may retrieve missed POWER CELLS that leave the Challenge Space if it is safe to do so and must reintroduce them directly to the ROBOT while the ROBOT is completely within the Start Zone. A ROBOT may pick up any missed POWER CELL that remains in the Challenge Space at any time..
- STC9** Teams must stop their timer once all POWER CELLS have been successfully scored. See Scoring section below for clarification on a Scored POWER CELL using either a 2D or 3D POWER PORT.
- STC10** Teams must record the completion time including time reductions from scored POWER CELLS and video of the successful run.
- STC11** A ROBOT that contacts a MARKER or TOTE while navigating the path incurs a five (5) second penalty each time contact is made. Since this challenge is timed starting at 0, these five second penalties are added to the final challenge time.

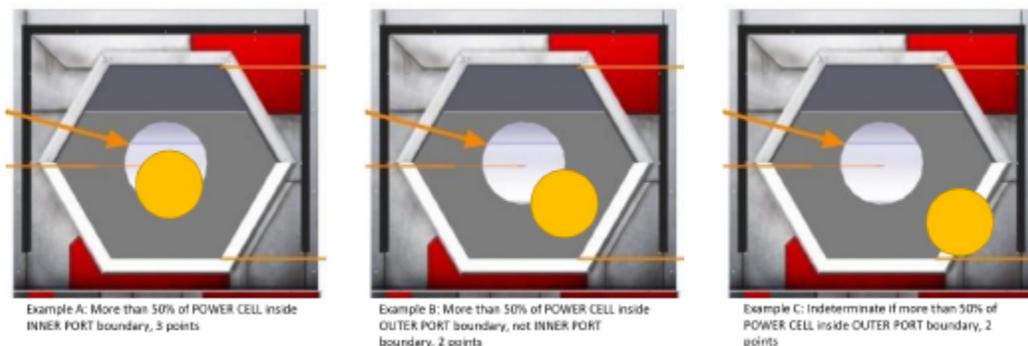
Scoring

The raw score for this challenge is the total time (in seconds) to score all the POWER CELLS as well as the time reduction for the scored POWER CELLS. Teams should enter the time exactly as they record them, as they will be rounded automatically to the nearest tenth of a second (x.x5 is rounded up to the nearest tenth, e.g. 0.15 is rounded to 0.2).

- BOTTOM PORT = 0.2 Seconds per POWER CELL
- OUTER PORT = 0.5 Seconds per POWER CELL
- INNER PORT = 0.8 Seconds per POWER CELL

- Key City Zone = 2x Multiplier to time reduction (in seconds) of POWER CELL scored in that Zone

If using a 2D POWER PORT, a POWER CELL is considered scored if at least 50% of the POWER CELL is inside the boundary. For shots that are indeterminately close to the 50% threshold, the Team may consider the POWER CELL scored accordingly. If using a 3D POWER PORT, a POWER CELL is considered scored if it passes completely through the OUTER POT opening and then the INNER POT opening counts as an INNER PORT score only. A POWER CELL that passes completely through an opening and then bounces back out qualifies as having been scored.



Sample Scoring for Snow Thrower Challenge

A team completes the Snow Thrower Challenge in 25 seconds.

They scored one snowball while at A7 in the OUTER PORT, and one power cells from D3 in the INNER PORT and one power cell from D3 in the OUTER PORT.

- Their base score is 25 (the time to complete the challenge).
- They get a 1 second reduction for scoring in the OUTER PORT from A7 (0.5 seconds for the outer port x2 because A7 is in a Key City Zone)
- They then get a 2.1 second reduction for:
 - Highest scored ball in D3 (a Key City Zone, 2x multiplier) was in the INNER PORT (0.8 seconds * 2 = 1.6)
 - The second ball in D3 does **not** get the 2x bonus, but was still worth a 0.5 second bonus for being scored in the OUTER PORT

This team's final score for the Snow Thrower Challenge is thus **21.9 seconds**.