

**Utah Elementary Robotics
(UTER) Capture the Flag
Rules**

**Competition during
USU Physics Day
@ Lagoon in
Farmington, UT**

**May 15, 2020
Starting at 10:30 AM**

1. COMPETITION OBJECTIVE

The aim of the competition is to foster math, science, engineering and team work in students in junior high students.

2. DESIGN STATEMENT

3. Prior to the day of the competition, students will construct and program a small remote controlled mobile robot. This robot will use designated pieces from the Lego Mindstorms Education Kit (EV3 or NXT) or VEX IQ Super Kit. There is two separate challenges, the Mindstorms challenge using either EV3 or NXT and the VEX IQ challenge.

4. Capture the Flag CHALLENGE RULES

- a. Suggestion is for two person teams (here after referred to as the team). The reason for this is that for the overall first place team, there are two identical prizes that are for each of the winners of that team. If there are more than two members on a team, it should be discussed with the team members prior to the competition that this may occur.
- b. A school is limited to one team with an odd number of students. That is either a single three person team or a single one person team. All other teams will be two person teams.
- c. The game course will be made from a VIX IQ Challenge Field Perimeter (item 228-2550) that can be purchased from <https://www.vexrobotics.com/iq-field.html>. Teams not using VEX may build a suitable replacement for practice. The dimensions are 4'x8' with a perimeter wall ~3 inches high.
- d. All robots shall be built by the team. Any robot where it has been determined that was built by a third party other than the team members shall be disqualified. Only exception to this is assistance by the Teachers/Mentors during the instruction time and prior to the competition. **At the competition, only the team is allowed to perform any modification of their robots or rebuilding. Any violation of this rule could result in disqualification.**
- e. No glue, tape or modification of pieces are allowed in the construction of Team Robots.
- f. Each robot will be identified with the team number and school. Lettering shall be easily visible so that judges can identify what robot is competing. Minimum height for lettering is 1 inch.
- g. Each team must design their own "flag", see figure 2, using 3 pieces from the kit associated with their robot. These 3 pieces consist of two gears and one axle. One of the gears must be larger than the other and go on bottom, with one axle in between. The gears are placed on both ends of the axle and the axle must be at least 2 inches long. The flag must be marked or a piece of tape placed on it such that the Judges may clearly know which flag belongs to whom.
- h. Each robot may only use the contents of a single Lego Mindstorms Education or VEX IQ Kit.

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- i. The weight of the Mindstorms (NXT or EV3) robot cannot exceed 1000 grams. The weight of the VEX IQ robot cannot exceed 2000 grams.
- j. All robots must fit within a 12 inch by 12 inch square frame at the start of the challenge match. They can have any flat orientation within that frame; in other words, the front of the robot could be diagonal within the frame if the rest of it fits in a 12 inch by 12 inch square frame. The robot may be programmed to change its dimensions such that after the match starts, the robot may exceed these dimensions autonomously. The team may not physically change the dimensions to exceed these limits at any time.
- k. The robot will come built and programmed on the day of the competition.
- l. Participants shall only use the Lego Mindstorms Education NXT, EV3 or VEQ IQ software provided with the kits.
- m. Remote control may be used and is encouraged, however if a team desires to use programming to perform actions autonomously during the competition they may do so, so long as the programming is done prior to the day of the competition.
- n. The Capture the Flag Challenge is limited to 7th, 8th or 9th grade students. If a younger student wishes to participate, it will need to be coordinated with the other mentors on a one for one basis. Students in High School will not be allowed to compete.
- o. On the day of competition, each student team, with their robot will check in with the judges to have their robots measured and weighed. The judges will verify that each robot meets the requirements of items **f, g, i, j, k, l, m and n** above, and then mark the robots to show that it meets these requirements.

5. UTER Capture the Flag

- a. UTER Capture the Flag is a competitive sport where two remote controlled LEGO MINDSTORMS or VEX IQ robot contestants try to capture the flag of their opponent and return it to their base within 1 minute, while at the same time, attempting to deny their opponent from capturing their flag. The robot to return their opponent's flag to their base the fastest or the closest wins.
 - i. Figure 1 shows the robot starting position, position of their flag, and location of their home base.
 - ii. The robot successfully capturing the opponent's flag and returning it to their home base in the shortest time is the winner of the match.
 - iii. If neither robot successfully accomplishes 5.a.ii within 1 minute then the robot at the end of the bout coming closest to satisfying 5.a.ii is the winner. Some examples are needed to help explain the meaning of "coming closest"
 1. If robot A captures (holding or pushing) their opponent's flag and robot B does not, then robot A wins.
 2. If both robots capture their opponent's flags, then the robot nearest ("as a bird flies") to their home base is the winner.
 3. If neither robot captures their opponent's flag, then the robot nearest ("as a bird flies") to their opponent's flag is the winner.

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- iv. A flag is considered “captured” the moment any part of the flag has been moved, such that at least a portion of the flag is no longer in its starting white square space as indicated in Figure 1, regardless of which team moved the flag.
 - v. A flag will be considered “Uncaptured” if a robot, steal’s its flag from the opponent and returns it fully to its starting white square space as indicated in figure 1.
 - vi. **Only the final state of the world when time expires is considered in 5.a.iii.**
 - vii. **No teams may at any point during the bout, physically touch a flag, doing so may result in a loss for that bout.**
- b. There are two Capture the Flag competitions, the Mindstorms exhibition and VEX IQ exhibition.
 - i. Each of these exhibitions will be a double-elimination tournament to determine the champion robot for each technology.
 - ii. The first round of each double-elimination tournament will have all entered robots, randomly seeded with the exception that if possible, a robot will not face another robot from the same school during the first round.
 - c. All Capture the Flag competition matches will be a best of three, head to head competition, double elimination tournament.
 - d. A robot may deliberately block, push or move a robot that has captured their flag to prevent them from returning it to their home base.
 - e. A robot that has fallen, pushed or otherwise been disabled, out of the game course, must be returned to game course at the location it exited. If that robot was holding their opponents flag and the flag remains in the game course, the flag shall remain where it lies.
 - f. A flag that has fallen out of the game course, must be returned to the location it fell out of the course by a judge.
 - g. A robot that has high centered or otherwise becomes “stuck” on the game table, must free itself, or remain in its location until the end of a bout. Being high centered on the perimeter of the game course is considered to having fallen out of the game course.
 - h. Neither e or f will result in a time stoppage, the clock will continue to run.
 - i. A player in a team remote controlling their robot during the first bout, must switch with another team member such that the individual controlling the robot in bout 1 is not the same as bout 2. The team may decide if necessary who controls the robot in bout 3.
 - j. Either player may return their robot back to the game course when it has fallen out, but neither player may manually move the robot once in the game course, nor touch or fix any pieces that have fallen off until the end of the bout.

6. THE UTER Capture the Flag CHALLENGE

- a. Each round of competition consists of three one minute bouts.

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- b. Each bout is limited to one minute. A winner receives 2 points, the loser 0 points.
- c. If no winner has been determined at one minute per section 5.a, this bout is called a draw and both team receive 1 point.
- d. Capture the Flag robots are placed in the approximate center of their starting square.
- e. When the judge says go, if the robot has autonomous programming, the player may hit a button to start.
- f. After the start button is pressed, the teams are not allowed to touch their robots until the bout is over unless the robot exists the field of play.
- g. Parts that have fallen off during the bout may be reattached after each bout but the robot cannot be re-designed. The parts must be attached within one minute.
- h. Winner of the round is the robot with the most points at the end of three bouts. In the case of a tie then sudden death occurs. The third bout is not necessary if a robot wins the first two bouts.
- i. **Sudden death bouts are run according to the same rules as any other bout. After three sudden death matches, (6 total bouts) a coin flip will be used to decide the winner. (Hopefully we never get to this point).**
- j. **The Capture the Flag competition arena is limited to teams that are competing and judges. Teachers, Mentors and other spectators are required to remain outside the competition arena.**

7. JUDGING AND SCORING

- a. Judges decisions during the competition are final. No review of video will be used to overturn a judge's decision.
- b. Judges will monitoring the Capture-the-Flag course and directing students to place and start their robots.
- c. When a team's number is called, proceed to the game arena.
- d. During each Bout of Capture the Flag scoring
 - i. The teams will start their round when instructed by a judge to begin.
 - ii. Judges will place the flags in their designated corners, the players will place their robot such that no part may be outside of their starting square.
 - iii. Judges will monitor the flags and return them to the field of play at any moment during each bout in which a flag has exited the field of play.
 - iv. Judges will time each bout, each bout is 1 minute and the judge will notify players when 10 seconds remain.
 - v. Judge will call the winner and stop the time, when a team returns their component's flag into their home base. In the case where the judge cannot determine which arrived first, a draw may be declared.
 - vi. Between each bout, the robots will switch home zones and the players must alternate controlling the robot, except during bout 3, the teams may choose who controls the robot.
 - vii. At the end of 1 minute, if no winner is declared, the judges will measure the distance ("as a bird flies"), as indicated in rule 5.a.iii to the nearest inch and declare either a winner or a draw (draw implies the same distance within an inch, or a tie capturing a flag).

UTER Lagoon Day

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UTER Capture the Flag Exhibition Score Sheet

Match _____

Identify Robots below

Robot 1 _____

Robot 2 _____

	Robot 1 Points	Robot 2 Points
Bout 1		
Bout 2		
Bout 3		
Total:		
Winner		

Competition is most points after 3 Bouts. Bout 3 is not necessary if a Robot wins Bouts 1 and 2. In case of a tie, up to 3 additional Sudden Death Bouts may be required.

Figure 1. Capture the Flag Course

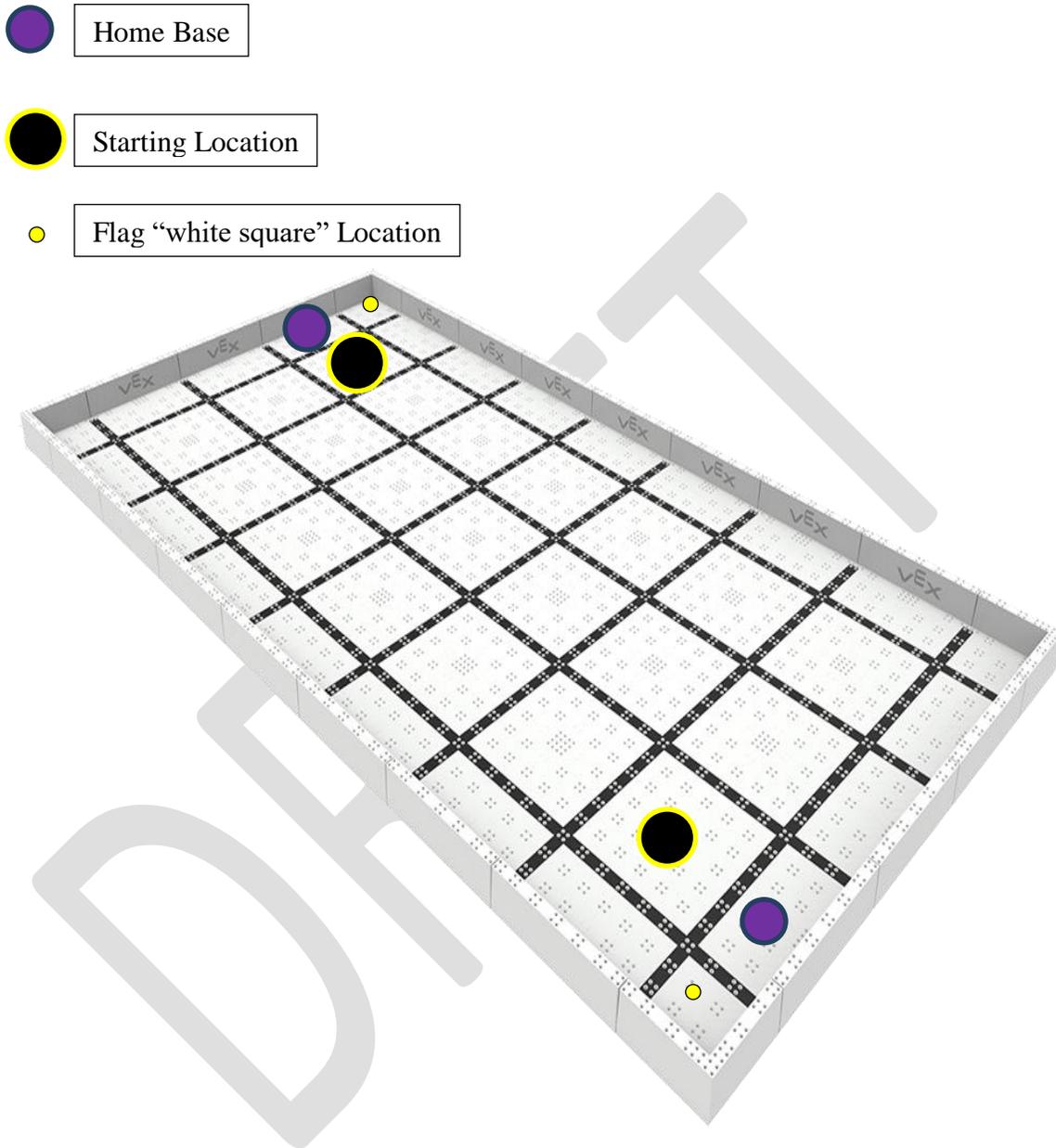


Figure 2. Example Flag (Suggested Parts)

