The FBISD Robotics Competition allows campus teams to compete separately on identical competition areas. Teams work to complete their jobs as efficiently and effectively as possible. The robot is the cornerstone of the competition.

Below are general game rules and supporting information. Please see the district [Robotics Competition website](#) for information related to when the tasks will be released. The tasks are normally not released until November to allow students the opportunity to practice and hone their programming skills with mini-challenges as they prepare for the competition.

Teams design and build a prototype, program, and test their robots prior to the competition date. Teams compete virtually in late March using the completed robots. If necessary, the top teams in elementary and middle school will complete a second round of competition to determine the first-place team.

Awards for the Robotics Competition are announced during the STEM Showcase held in late spring. Please see the districts [STEM Showcase website](#) for information related to this event. All robots must be built and programmed using the components only of the **Lego Mindstorm EV3 Core Set (5003400 EV3)** or **LEGO Spike Prime (#45345)** purchased by the district *(The use of components from the Lego Expansion Kit may not be used as a part of this competition).* Students should conduct the work and programming while sponsors serve only to advise.

1. Teams are comprised of up to **THREE** students and are led by at least ONE team sponsor.
2. Students are not allowed to be a part of multiple teams.
3. Three district sponsored teams from each campus may compete in the district challenge. If you have more than three teams interested, then we recommend holding a campus-based contest to determine the top qualifying teams.
4. Only FBISD elementary and middle school students from the competing teams are allowed to touch the robot and the computer or iPad that is used to program the robot – the only exception is when technical problems with the computer occur. Student problem solving is the spirit of this competition!
5. The role of the sponsor leading up to the event is vital but during the actual competition the sponsor should refrain from providing extensive assistance that could be interpreted as giving an unfair advantage to a team. For example, a sponsor telling students they forgot to place an object on the mat, touching the mat, laptop or robot during the competition, guiding students to change their code, or any action that could be seen as changing the outcome of the robot and teams' performance. Sponsors may take an active role leading up to the competition, but once the event starts, they should refrain from actions that could appear to be aiding the outcome of the competition. This rule also applies to students not on the competing team giving advice during the competition.
   - First offense - 5-point penalty
   - Second offence – 20 second time penalty
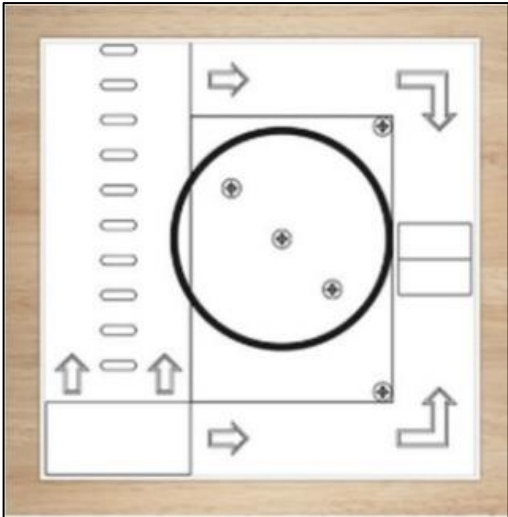   - Third offence – possible disqualification of job points

6. Each team is allowed to use exactly one LEGO Mindstorms EV3 Core set (district provided **#5003400 EV3** kit) or one LEGO Spike Prime (**#45345** kit) to build their robot. Spike Prime Expansion kits are not to be used during this competition.

7. Teams are not allowed to melt, deform, cut, bend, glue, solder, or otherwise alter LEGO elements or competition pieces (plastic and electrical) for use in the competition.

8. Teams are not allowed to use extra items (tape, string, rubber bands, etc.) to enhance or modify their robots.

9. Teams are not allowed to use remote controls to move the robots; robots should be programmed to run autonomously.

10. Your robot and mat will be inspected prior to the competition. If either is deemed to be in violation of competition rules, your team will have 10 minutes to correct the violation, if not the team will be disqualified.
As long as you utilize the parts within the allowed kits and follow the rules, your robot and mat should have no issues with passing inspection.

11. Students are responsible for setting up the mat for each event and should practice and be familiar with each of the challenges.

12. Teams are allowed to tape the mat to the floor using painter's tape, masking tape or scotch tape. It is recommended not to use duct tape as it may damage the floor. The tape should not touch any of the interior mat markings and competitors may want to consider the color of the tape so that it does not conflict with required markings that may be necessary for a job.

13. Elementary is allowed to place markings within only the starting point for the robot but should also consider the color, shape, and size of the markings so that they don't interfere with the robot's program. Markings that interfere with the robot running a program will be scored as a reset, so use caution when applying tape to the mat. The only other exception to this is if there are requirements for a job that require something, such as tape for a sensor, to be added to the mat.

14. Sponsors should secure a campus staff member to assist with judging the campus robotics event.

Arena Layout

The competition arena is composed of an official TCEA robotics competition mat and contest materials. Campuses will use the TCEA mat and the contest materials (see below). Each campus team is responsible for the replacement of any lost/damaged materials. You may have more than the materials listed below, but we have limited how many of each you will need to use.

	Materials Detail from TCEA Contest Material

TCEA Race Against Time Mat	• TCEA Mat
	 • 3 checkers
	 • 3 PVC couplers
	 • 1 EV3 Mindstorm or Spike Prime container
	 • 1 EV3 Cuboid or 1 Spike Boxes – directions may be found in Lego software
	 • Lego bricks (these should come from the build kit, so students will need to plan their build accordingly to have access to these pieces.
	     o Two 2 by 4 bricks
	     o One yellow 11 by 19 panel, and pieces to support it standing upright
	     o One 11 by 15 technic frame (light blue)
	     o Kate and Kyle or 2 mini-figs
	 • Three Ping Pong Balls (provided in past years)
	 • Three wooden blocks (provided in past years)
	 • One 3 by 5 index card
	 • 6" by 1" strips of colored paper:
	     o 1 red strip for Elementary and Middle School teams
	     o 1 green strip and 1 blue strip for Middle School teams only

The materials were chosen to provide each team with the same layout for the game so that teams reproduce in the same environment for practice and competition. The mat will be set up for one job at a time. Once the job is completed and judged, the mat will be cleared and set up for the next job.

Game Specific Rules

1. Teams start out with 0 points.
   - Points are earned as the robot completes portions of the jobs, so even if the robot fails to pick up an item or avoid an obstacle, teams can still earn sufficient points for that job.
   - Points are totaled for the final run of each job. If a job is restarted or reset, points are restarted for that job, minus any touch penalties. Only points earned on the final run of a job will count towards your team's total points.

2. During play, team members can pick up their robot from anywhere on the game map, but a touch penalty will occur if the robot is picked up from any location other than a designated area where the

robot may be handled.

- A team can "reset" their robot no more than **5 times total through ALL jobs.**
- Each reset incurs a touch penalty of -5 points.
- If a team has used up all their resets, they must wait until the robot has stopped moving or gone off the mat before they may recover.
- The robot earns points when it returns successfully to a designated area at the end of each job.
- The jobs are designed to earn points throughout the event. Students should be encouraged to allow the robot to complete the job if they feel that it could earn sufficient points rather than take the touch penalty.
- Teams should consider if resetting or restarting is worth the loss of points vs. the points they would earn during a second attempt.

Example of scoring situations:

Scoring Example for One Job in the Competition			
	Run #1	**Run #2**	
Team Action	Team decides to stop after this run.	Team decides to restart, score from run #1 overwritten by score from run #2.	
Results of run	The robot completes the job and earns 100 points but goes off the mat with both wheels one time, leading to a 5-point deduction.	This time the robot stays on mat the entire time.	This time the adjustment causes the robot to go off the mat twice.
Total points earned	The team scores 95 points for this job.	The team earns the full 100 points for that job, but their overall time could become a factor.	This would lead to two 5-point deductions so the team would score 90 points but will have also lost valuable time in the process.

What is the difference between resetting and restarting?

- Resetting is when a student physically stops the robot while it is on the mat and brings it back to the beginning to retry the job. This could happen at any time during a robot's run. A reset is penalized by a 5-point deduction, but you save on your total time.
- A restart is when students decide to rerun the job from the beginning, after the robot has completed its program and returned to a designated end location. At no time during the run do the students touch or stop the robot program. This eliminates a touch penalty, but adds the additional time needed to complete a second run of the job and students miss out on the points for completing a job in one take.
- For a run to be considered a restart and not a reset the robot must have returned and stopped at the designated end location. If the robot runs off the mat, or stops somewhere on the mat, and must be

touched to bring it back to the designated start/end location, then it is considered a reset, not a restart and the touch penalty applies.

- A restart means the robot begins at the designated start location and begins the job over. Earned points start over but any earned reset penalties carry over.

Scoring Example for One Job in the Competition with Restart vs Reset		
	Reset Penalty	Restart
Team Action	The robot is running a job worth 100 points and students realize that the robot is off course so to save time they grab the robot from the mat and bring it back to the designated start location.	The robot is running a job worth 100 points and students realize that the robot is off course but select to let it run the course. The robot completes and returns to the designated end location and earns 50 points but no other penalties. The students adjust and rerun the job and this time the robot runs the job perfectly and earns 100 points.
Results of run	This would be considered a reset.	Since they did a restart there is no point penalty.
Total points earned	On the new run the robot scores a perfect 100 points, but they will lose 5 points for the reset for a score of 95.	The robot would score 100 points, but since they chose to let the robot run the course and not reset, their time used could be higher and may impact the standings if there is a tie. Also, this team may not have time to complete all jobs in the competition.

3. There is a 5-minute time limit to complete all events.
   - The time will start once the students have set up the first event and an identified student states to the judge, they are ready to begin. Time stops when the student states to the judge that they are finished working through all jobs. The same student should announce the start and end and be sure to state it loudly and clearly so that the judge is accurate with the time.
   - Teams should announce each time they are starting a new job, so the judges are aware of which job to evaluate.
   - If time expires while a robot is completing a job, the points the robot has accumulated for that job, up until the time expired, are counted. This means teams need to consider if they can complete a job before restarting so that they do not miss points that were earned with the previous run.

Scoring Example for One Job in the Competition with Time Issues		
	Run Completes Within Time Limit	Run Out of Time
Team Action	The robot completed a run and only earned 75 of a possible 100 points, but the team thinks they can earn more and attempt another run.	The robot completed a run and only earned 75 of a possible 100 points, but the team thinks they can earn more and attempt another run.
Results of run	The robot completes the second run within	Time ran out and the robot completed less

	the time limit and with no errors.	jobs than the previous run.
Total points earned	The team's new score would be 100 points.	In this example, the team would earn less points in that run instead of the 75 points they initially earned.

4. Tiebreaker Procedure
   - In the event of a tie, the first tiebreaker is the highest number of jobs completed with a perfect score, the second tiebreaker is the fewest number of restarts/resets, and the final tiebreaker is total time to complete jobs.

5. Students are responsible for setting up the arena (mat) before each event.
   - They should only remove objects from the prior event and add objects for the current job once the robot has stopped moving.
   - If an object is left on the mat from a previous job and <u>removed</u> while the robot is in motion, that will be considered a touch penalty.
   - An incorrect object left on the mat, but not touched, is not considered a touch penalty, even if it interferes with the robot. Teams must decide if the touch penalty for removing the object is worth it compared to leaving it on the mat as the robot runs.

6. Robots must start each job with both wheels inside the designated starting area, including during restarts and resets.
   - One wheel must always remain on the mat. If both wheels leave the mat, the team will receive a point deduction.

7. At the beginning of the match, the robot shall be no larger than a 12-inch cube, unrestrained.
   - This means that at rest, with nothing holding any part of the robot back, the robot's dimensions measure no more than 12" x 12" x 12" in size.
   - Once the robot is in play, there is no restriction on the size of the robot when it opens its arms or lowers/raises a piece of equipment.
   - There is no weight limit on the robot, but only parts from the supplied kit may be used when building the robot.
   - Only use the LEGO Mindstorms EV3 Core set (district provided **#5003400 EV3** kit) or one LEGO Spike Prime (**#45345** kit) to build their robot.

8. Robots must start in the designated starting area for all jobs, including during restarts and resets.
   - While the robot is in the designated starting area, students can change programs, repair/rebuild the robot, and add or remove parts without a penalty.
   - The robot may be started anywhere within the designated starting area, as long as both wheels are inside the area.

9. Requests to reset during a job
   - Teams may request to reset the competition space at any time during the 5-minute time limit.
   - A reset will be considered a touch penalty (-5 points)
   - Whether it is a reset or a restart, the robot must begin the current job from the beginning of the
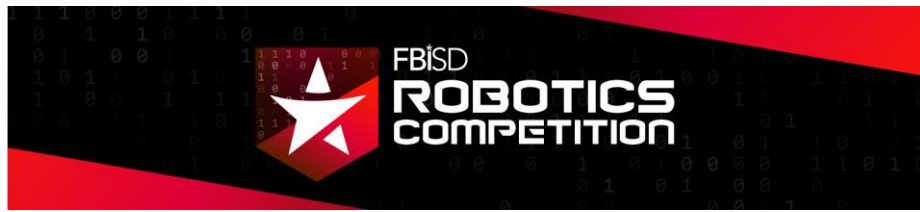
program and from within the designated starting area. Time will continue to run, and points earned will not carry over for that job but reset penalty points do.

10. Robots must be able to handle some field variances, such as slight waves in the competition mat. It is recommended that the mat be laid out and practiced on in the same location as where they will compete so that the team is aware of any differences in the field of play. Also, storing the mats with the print facing out will allow them to lay flatter when unrolled.

11. Points will be totaled after the team has signaled that they are done working through all jobs or once time has expired, whichever happens first.