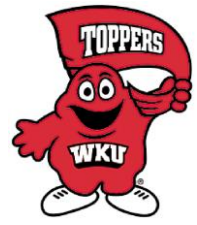




# WKU Engineering LEGO Robotics

## Rules for February 24, 2018 Competition

*Competition check-in starts at 8:00 am, the competition begins ~9:00*



The 2018 WKU Engineering LEGO competition returns to one old favorite course from a few years ago, and a new game requiring teams to be able to quickly determine a program to use, or to actually modify a program during the competition. To do well in the overall competition challenge, teams must design a LEGO Mindstorm device that play **both** of these games. For the Road Course game you will compete against the clock to navigate a winding road, while avoiding the need to adjust your robot during the journey. For the Finding Big Red game, you will compete against another team to try to be the first to get to the Big Red figure that will be placed on the playing surface just as each game starts. Details of the rules for each of these two games and the rules for building and operating your device are provided below.

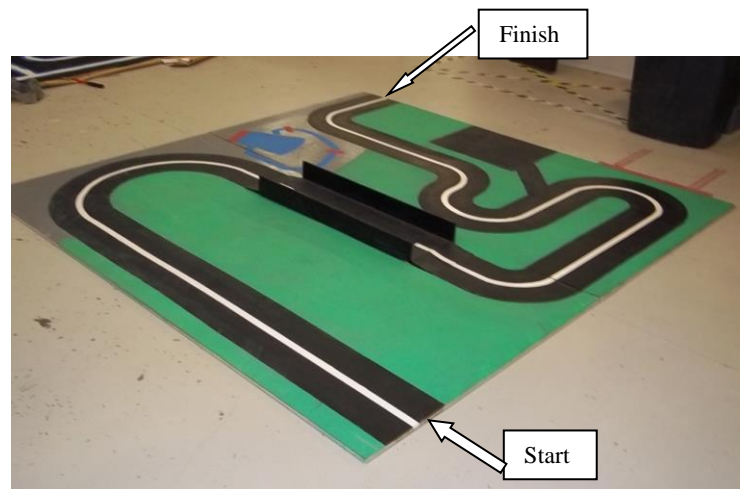
There are no differences between the courses for the EIT and PE Divisions, but EIT teams may only use the materials from a single LEGO Mindstorm kit (any of the various editions are acceptable). PE teams may use any LEGO materials they have access to, including materials from more than one kit. Teams with older students, or with considerable LEGO competition experience might consider registering for the PE Division even if you only use one kit – however this is not required.

### ***Device Construction and Competition Day Modification Rules***

- EIT division devices must be entirely from **a single** LEGO Mindstorm kit (any kit version is allowed) – use of additional materials not in a single kit may result in your team being disqualified. PE division teams do not have this restriction.
- No bonding element, such as glue, may be used in construction. Failure to comply may result in disqualification.
- The device must fit in an 8 inch x 8 inch x 8 inch cube at the start of each round.
- All devices will be inspected for compliance with the regulations before the contest. The winning devices may be inspected again following the tournament.
- You must bring your own batteries; plan to charge an extra battery that you can swap out between your rounds.
- You may make program modifications between rounds of the competition; you must provide your own computer.
- While physical changes are allowed between rounds to your device, it must still meet all design and construction rules after the modifications are made. No substitute devices are allowed, the same device must be used for all competition rounds.
- All programming modifications will either take place in a pit area or at the side of the Finding Big Red game. Only team participants are allowed in either of these areas – **no coaches, friends, family, etc.** – violation of this rule may result in team disqualification.

### **The Road Course**

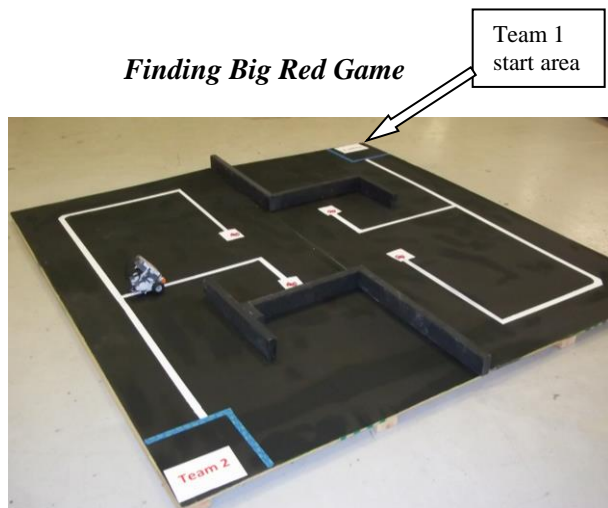
The Road Course is shown to the right. It is a flat, 8 ft x 8 ft (96" x 96") overall surface with a 10" wide black road that has a 1" white centerline. Teams will start in the lower left corner, and finish at the top right edge as shown. The course has a bridge midway that does not have a white line but does have side walls; PE Division teams must run this course with the bridge, EIT Division teams may choose to remove the bridge and run with a continuous white line from start to finish, or a team may navigate the road with the bridge to earn a 15 second time bonus. Each team will have two runs through this course, the final score for each run will be elapsed time + touch penalties. A team's best score will be used to determine the finish place in this course for the overall competition scoring.



At the start of each run, the team's driver will have 30 seconds to get the device onto the track and ready to start. Once the judge signals the start, the team driver may not touch the device again without incurring a penalty. A robot is considered "off course" when no part of the robot is above the white line. Judges will tell the team driver to pick up and restart their device, and will indicate where on the course the restart should happen – this will be where the device became completely off the white line. Each time the robot must be touched will count 5 seconds to the team score. Drivers may not touch the device without the judge's permission, if they do so the penalty for that touch will be 10 seconds.

When teams reach the bridge (all PE teams and EIT choosing to keep the bridge for the bonus), the device will attempt to cross the bridge without a line. If necessary the driver may ask the judge to touch the device (a 5 second penalty) if the device does not autonomously get to the white line on the far side of the bridge. Fastest time with fewest time penalties wins. Good luck!!

## Finding Big Red Game



The Finding Big Red Course is shown to the left. The overall course is 8 feet wide by 8 feet deep, the surface is flat and painted black with 1" white lines as shown. Two teams will run at the same time for each game, the starting areas are shown. There are four possible places where the Big Red figure will be placed in the middle of the game; after both teams are ready to start, just before each round the judge will place the Big Red figure in one of these four locations and both teams will race to touch Big Red first. The first team to touch Big Red earns one point. This will be repeated with teams starting from the same location, but with Big Red being placed in a different location until one team has earned two points. In addition to the white lines beginning at each team's starting area and running to possible Big Red locations, there are also fixed walls on the course. *Additional drawings with dimensions and pictures are provided at the end of this document.*

Team 2  
start area

One person from your team will be the driver. Only the driver may touch the robot during each round, but a different team member should be the driver for each round. The device must always be started inside the starting area. Drivers may pick up the device, return it to the start area and try again. Touching does not require any permission from the judge. In addition to the fixed walls, the judge may randomly place small walls on the course at the start. These will be 1 foot long, and will never block a white line, but they may block the path you wanted to take to touch Big Red. You should have a variety of path programs to choose from; **teams may also quickly reprogram the device during the run if this can be done before the other team touches Big Red (teams may have their computer at the edge of the game surface).**

The first team to touch Big Red two times is the winner of the round and moves on to face the winner of another round. This will continue until we reach a semi-final and then a final round to determine the overall Finding Big Red course winner. Each team will receive a place in this competition based on how they do for each of these rounds.

## General Competition Details

- Each team will compete two times on the Road course, and will get at least two tries to Find Big Red. Teams will be placed (1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, etc.) according to the best time score plus penalties from the Road course, and the results of the Finding Big Red tournament (there will be ties for some teams based on their position).
- Each team's overall competition score will be the sum of the places from the Road course and the Finding Big Red course. Lowest total wins! In the case of a tie, the tiebreaker is sum of both runs on the Road Course.
- The team driver will set the device on either course at the beginning of the run within the designated starting location, and will activate the device when designated by the official. A maximum setup time of 30 seconds will be allowed once the team arrives at either playing surface.
- Drivers cannot wave something or shine a light or in any way signal to the device to do something. For both game courses only the driver may pick up the device.

## Student Participation

- Student eligibility is left to each individual school. **At device check-in the teams will sign a sheet pledging that they were responsible for the design, construction and all testing of their device.** Coaches/mentors are expected to guide and assist the teams, but this is not a competition between the coaches!
- We would ask, where possible, that different team members act as device starters for different round.

## *Miscellaneous Comments*

*Videos of the competition courses are available on YouTube at:*

WKU Lego 2018 General Overview <https://youtu.be/aRRmXgpz78M>

Road Course WKU Lego 2018 <https://youtu.be/ZRnpgSMhf0s>

Finding Big Red WKU Lego 2018 <https://youtu.be/3Q0K64Cfncl>

- The courses will be available for viewing and for practice at WKU starting early February.
- Practice time on the competition surfaces will be made available as often as possible in the weeks preceding the competition at the request of teams. Submit access requests appropriately in advance via email to [kevin.schmaltz@wku.edu](mailto:kevin.schmaltz@wku.edu).
- There will be a referee for each team during each game to keep the time, watch for line tracking, award time penalties, determine touches, etc.
- Judges decisions are final and should not be questioned.
- An effort will be made to allow teams to practice on Competition Day prior to team/device check in. After check in the device will be impounded. Competition Day practice will only be allowed if **ALL** teams are behaving graciously towards each other and sharing the courses and are not damaging the surfaces. Practice may be cancelled at any time if it impedes the preparation for the competition.
- Most questions about the game can be answered by **READING THE RULES THOROUGHLY FIRST**. All questions concerning these rules during the design and construction phase should be submitted via email to [kevin.schmaltz@wku.edu](mailto:kevin.schmaltz@wku.edu). All coach questions and suggestions will be forwarded to the entire e-mail distribution list, so that every team receives the same assistance.

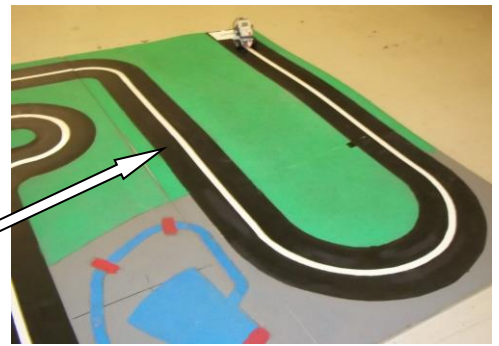
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### **Road Course Bridge and No-Bridge Images**

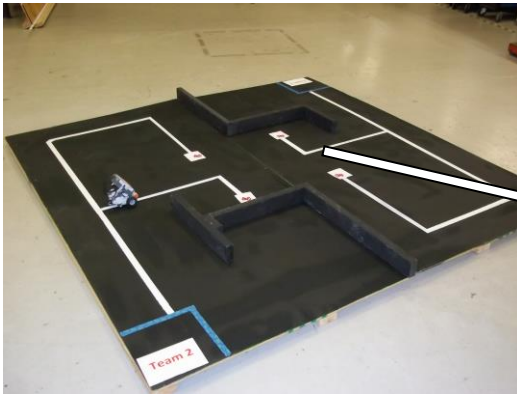


The picture to the left shows the course with the bridge in position. There is a small ramp up to the bridge, the transition will be attached to the ground.

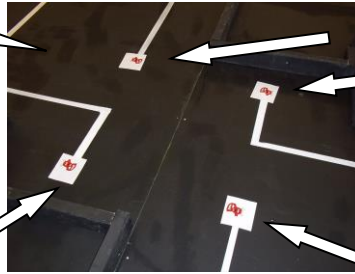
The image to the right shows the course without a bridge. This option is only available for EIT teams, and there would be no time bonus for this option.



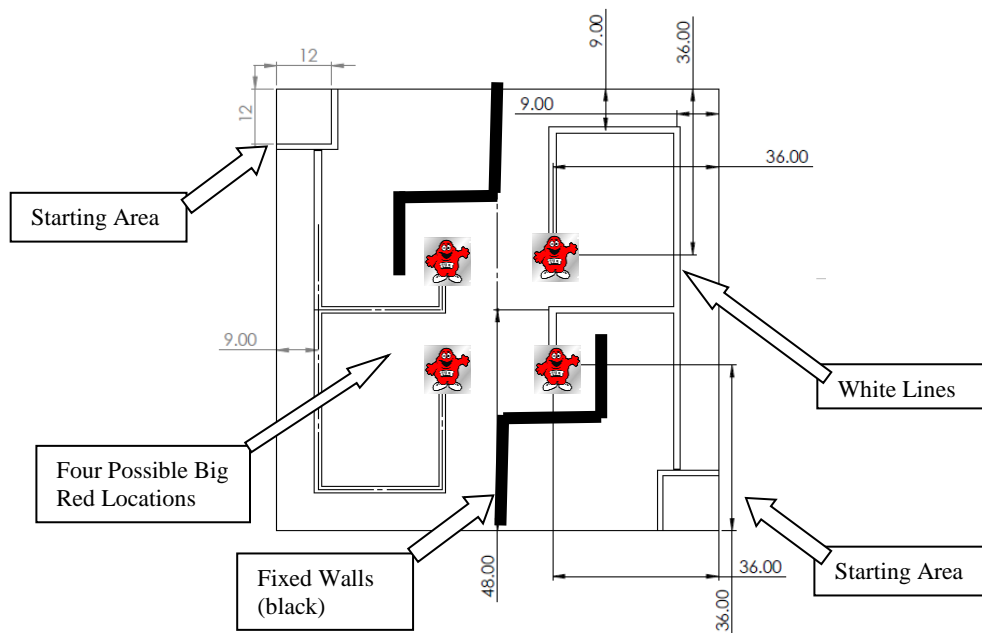
## Finding Big Red Course Images and Comments



The overall game surface is shown to the left, and below the four possible locations for Big Red are shown. The Big Red figure will be placed at the end of one of the white lines just before the game is started, both teams will not see this location until just before the start. The device that first touches the Big Red figure will earn one point.



Overall Dimensions (shown in inches) of “Find Big Red” Game (layout is symmetrical)



Fixed Wall Dimensions (shown in inches) for the “Find Big Red” Game (layout is symmetrical)

