

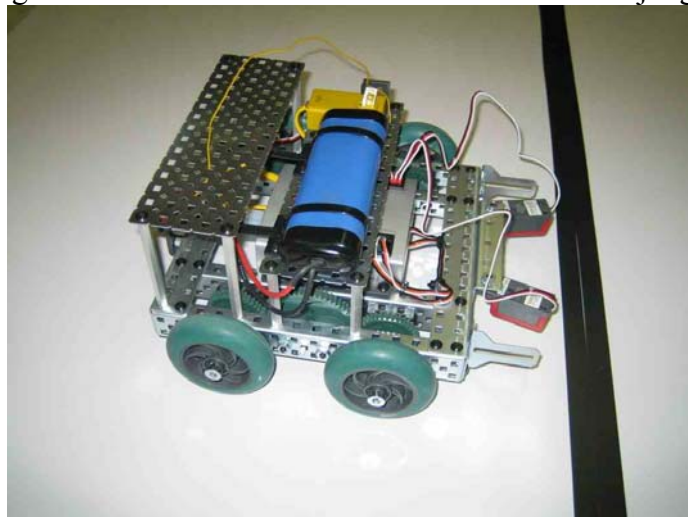
## **VEX PENTATHLON COMPETITION RULES (Feb 27, 2006 DRAFT 2.0)**

### **OBJECTIVE**

To design and program Vex robots that will work autonomously to sense and search for light and objects, navigate different paths, launch objects and pull loads.

### **GENERAL RULES**

1. Robots must be constructed only from Vex parts and common hardware store springs or elastic tubing.
2. The robots can be pre-assembled and re-configured within the constraints of the assigned competition times on the day of the Pentathlon.
3. Robots must be programmed to be autonomous. Joystick control is not allowed.
4. Pneumatics are not allowed.
5. If a robot is touched or goes off the field after a run has begun, the attempt is finished.
6. A team may choose to enter one event, several events, or all events. A different robot may be used for each event.
7. A team may enter more than one robot per event for the warm up competition on April 29<sup>th</sup>. For the World Finals at Robofest, however, each team is allowed only one robot entry per event.
8. Judges will make rulings in situations where the rules are unclear. The judges' rulings are final.



**Figure 1- Basic Vex Robot**

## VEX PENTATHALON EVENTS

- 1. Skeeball-** Robot launches a standard size golf practice ball (plastic, approx. 1.5” dia, 5.2 gm) from a set distance at a series of four buckets. Points are scored for getting the ball into a bucket (directly or from a bounce). The higher the bucket on the ladder, the higher the points earned. Robots can start anywhere on the field behind the last black line and must remain behind the last black line. If any part of the robot breaks the plane perpendicular to the last line, it is disqualified for the try. Each robot will get three tries per round.



Figure 2- Skeeball Field

- 2. 1600 Meter Dash-** Robot runs four laps counter clockwise around an oval track. Robot can use line following, wall following, dead reckoning or any other method to navigate track. Fastest time wins. A 2 sec penalty is assessed for each can moved out of position in the center of the track. Cans are filled full. If a robot is touched the run ends at that point. Distance traveled is used if robot does not complete 4 laps. Robots will get three tries per round. Maximum time allowed for each run is 2 minutes.



Figure 3- 1600 meter Field

- 3. Tug of War-** Two robots are tied together with a piece of medium weight twine. Robots will initiate using a touch sensor or light sensor. The exact method of initiation will be UNKNOWN until the day of the competition. The first robot to pull its opponent over the boundary line wins the match. A robot is disqualified if it drives off the playing field, or is touched. If a winner has not been decided after 2 minutes, the judges will declare the winner of the match based on the robots progress towards the goal. There will be three matches played in a round. The pairings will be determined on the day of the competition.



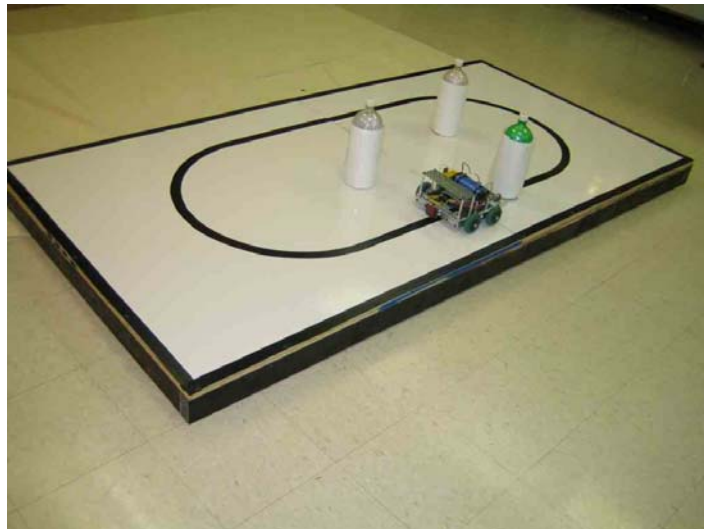
**Figure 4- Tug of War Field**

- 4. Long Jump-** The robot goes as far as possible without breaking the plane marked by the inside of the black lines. In other words, the try ends if the robot touches the line or enters the space above or outside the line. A try ends if the robot breaks the plane, or runs the full course. Time will be used as a tie-breaker if more than one robot goes the same distance. A round consists of three tries.



**Figure 5- Long Jump Field**

5. **Bottle Bowling-** The robot pushes pre-arranged bottles off of a field, similar to the Robofest problem. One bottle is positioned along the back straight and two bottles are positioned randomly in the center of the oval. The bottles will be filled with 200ml of water and covered with white paper. A black border around the edge of the field may be used to help identify the edge. Time is used as a tie-breaker if the same number of bottles are knocked over by two or more robots. Three tries per round. Maximum time allowed for each run is 2 minutes.



**Figure 6- Bottle Bowling Field**

## ACTIVITIES AND SCORING ON COMPETITION DAY

Events will be run on a first come basis. Teams can come to the field when they are ready. However, teams that fail to complete at least one round by a given time will forfeit the event. To encourage teams to participate early, a 1 pt “Flash Bonus” for each event will be given to the team that reaches the flash goal first.

Each team will get three tries for each round. Scoring will be based on the average of the two best tries. The flash bonus is applied after each event ranking is determined (See scoring below).

As time permits, teams will be allowed to make adjustments and participate in additional rounds. Teams competing in their first round will have priority. Other teams will make additional rounds on a first come first serve basis, as time permits and up to a maximum of three rounds per event. The details of each event are summarized in the table below:

**Table 1- Robot and Event Limits**

	Event	Max Robot Size (includes any extensions)	Max Wt.	# of tries per round	Max Time	Flash Bonus Criteria
1	Skeeball	18" x 18" x 36"	n/a	3	n/a	1st ball in basket
2	1600 m Run	18" x 18" x 36"	n/a	3	2 min	1st to 4 laps
3	Tug of War	18" x 18" x 36"	8 lbs	3	2 min	n/a
4	Long Jump	18" x 18" x 36"	n/a	3	n/a	1st to half way
5	Bottle Bowling	18" x 18" x 36"	n/a	3	2 min	1st to 3 bottles

Teams must participate in an event to receive points for that event. Points for each round will be given according to the following schedule:

**Table 2- Scoring**

Ranking	Points
1	10
2	8
3	6
4	5
5	4
6	3
7	2
8	1
9	1
10	1
FLASH Bonus	1

## AWARDS

Awards will be given at World Robofest only, not at the practice event. Awards will be given for 1<sup>st</sup> place in each individual event. The cumulative point total for all events determines a team’s overall placement. Teams must participate in all events to be considered for overall awards. 1<sup>st</sup> and 2<sup>nd</sup> place awards will be given to the teams with the highest cumulative totals.

## DESCRIPTION OF FIELD ELEMENTS

The basic field element is a 48”x 48”x 3/25” white “thrifty white tileboard” which is made by cutting a 48”x 96”x 3/25” board in half.

Lines can be made from 3/4” black electrical tape and will be two tape widths, approximately 1 1/2” wide. All dimensions are to the front edge of the tape.

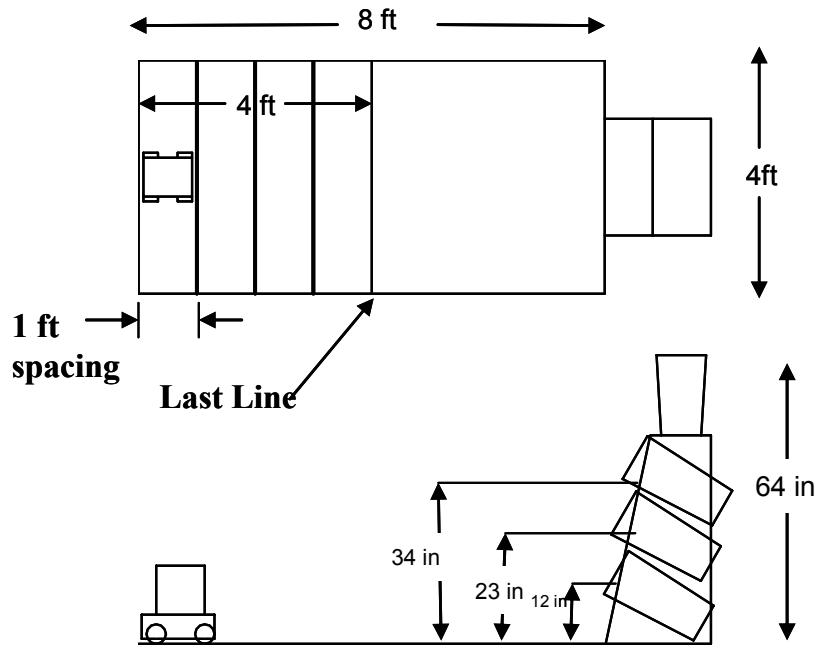
All items can be bought at Home Depot and Meijer or similar stores.

If you have First Lego League table available, it could be used to create the “1600 m” track, by cutting the white tileboard to size and inserting it.

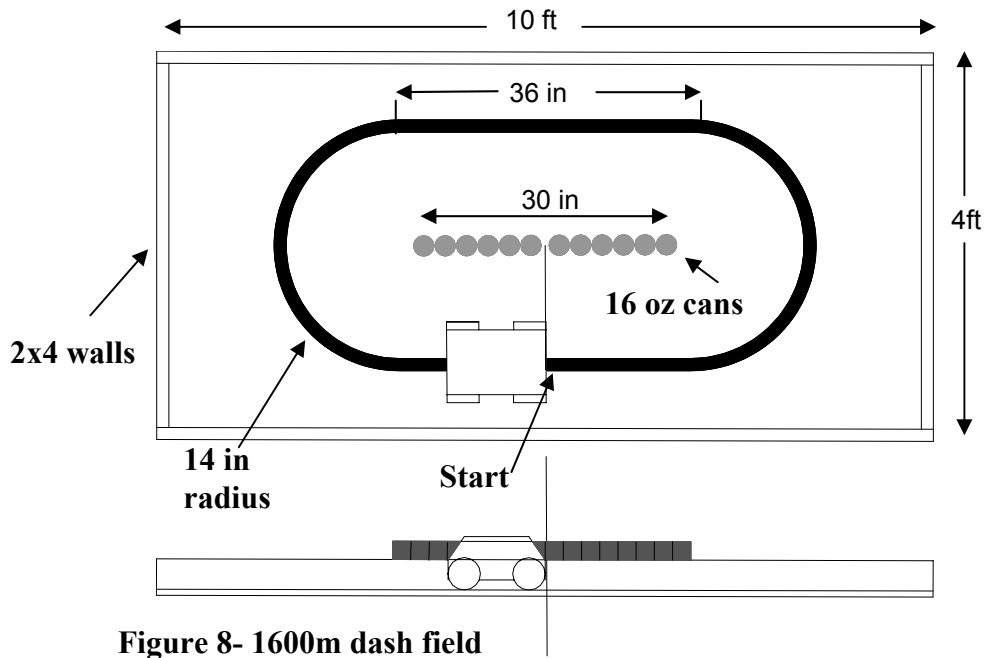
The bottle bowling table is essentially the same table as the “1600 m” table except the bottom side is up.

**Table 3- Suggested Parts List for Playing Fields**

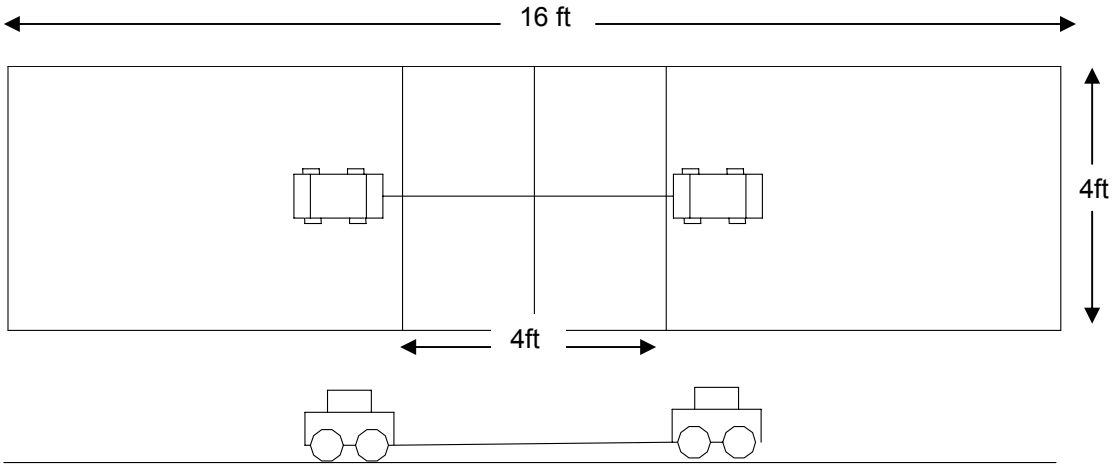
Description	Qty	Cost per piece	Source
<b>Common Parts List</b>			
48"x 96" x 3/25" white tileboard	8- 96" sheets cut in half	\$9.93	Home Depot
3M "Tartan" 3/4" black general use electrical tape	4	\$0.99	Meijer
"Gorilla Glue" wood glue	2	\$6.95	
<b>1. Skee-ball Parts List</b>			
48"x 48" x 3/25" white tileboard	2	see above	
JP Lann white plastic hollow practice golf balls	1	\$1.99	Meijer
Rubbermaid 21 qt.(#2805) white plastic trash buckets	4	\$4.97	Home Depot
"Gorilla" Medium Duty 3 step aluminum step ladder	1	\$29.98	Home Depot
<b>2. 1600m Dash</b>			
48"x 48" x 3/25" white tileboard	2	see above	
2' x 4' x 96" stud lumber	3	\$2.79	Home Depot
4' x 8' x 5/8" sheet plywood	1	\$19.97	Home Depot
12 pack of soda	1	\$4.00	Meijer
<b>3. Tug of War</b>			
48"x 48" x 3/25" white tileboard	4	see above	
Medium weight twine	1	\$2.49	Meijer
Spring lock key ring 2" rectangular		0.89	Neighborhood Hardware, Woodward Ave, Birmingham
<b>4. Long Jump</b>			
48"x 48" x 3/25" white tileboard	5	see above	
<b>5. Bottle Bowling</b>			
48"x 48" x 3/25" white tileboard	2	see above	
4' x 8' x 5/8" sheet plywood	1	\$19.97	Home Depot
2 liter plastic bottle	3	\$0.89	Meijer
Note: this field can be made by putting white tile board on underside of 1600 m field			
( drop cloth is recommended if field is made this way)			



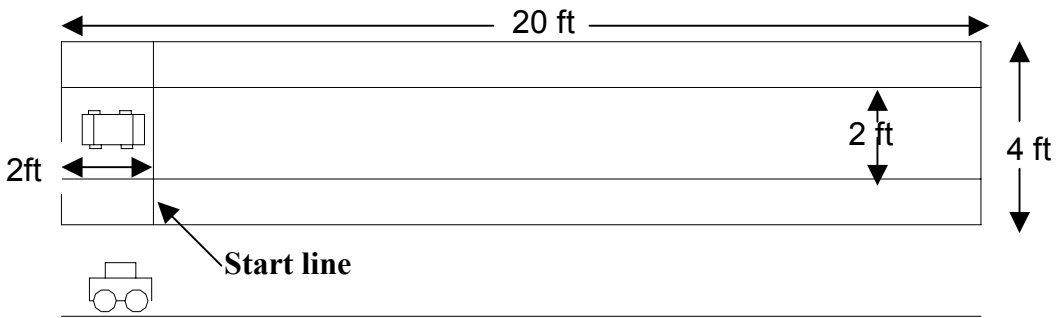
**Figure 7- Skeeball field**



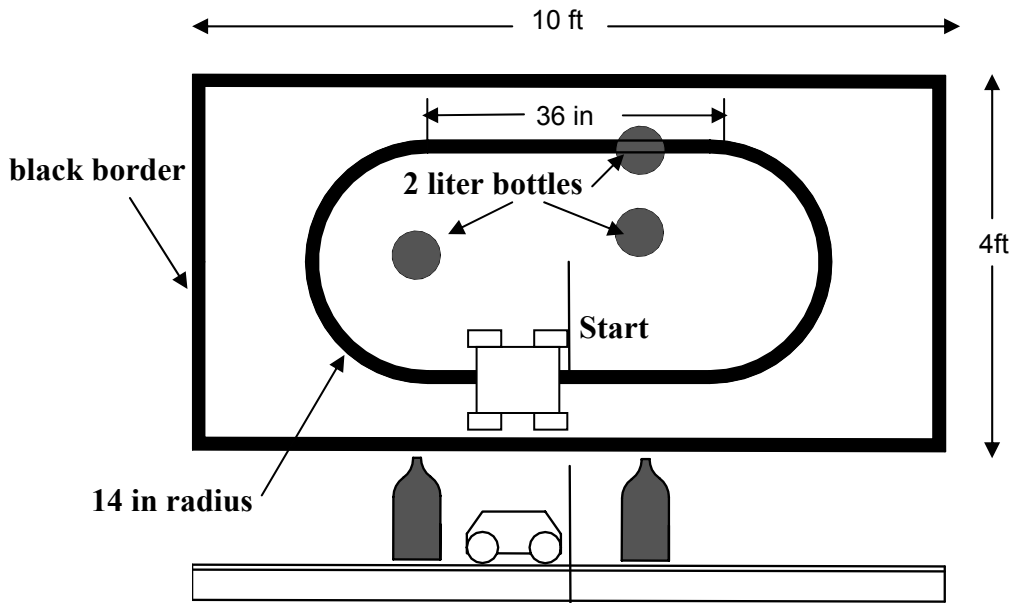
**Figure 8- 1600m dash field**



**Figure 9- Tug of War field**



**Figure 10- Long Jump field**



**Figure 11- Bottle Bowling field**