

2020 Competition Events

Notes to Teams:

- ★ You do not need to complete or compete in all events. Each event has different point ranges. Do what you can in an event to earn the most points. The overall winner is awarded to the team with the most points in all events. Plan your strategy/time to maximize your points during the competition time.
- ★ We suggest that part of your team focus on the EV3 events and the other part of the team focus on the Sphero events.
- ★ Events close at staggered times. You will not be allowed to compete in an event after closing time.
- ★ Robots that destroy a playing field are disqualified from the event.
- ★ We will have backup Chromebooks and MacBook computers for teams that may need them.
- ★ The judge's decision is final. If you have a question, your team captain may talk with the head judge.

Building the Robot

- ★ For most events, you will need the basic robot build.
- ★ Build attachments that can be quickly added to the robot to compete in an event.
- ★ Be prepared to calibrate the color sensor with the lighting in the gymnasium.
- ★ What you can use to build attachments:
 - Any raw materials that do not damage the field or another robot. If you have questions about what you can or cannot use, ask! Email (lholmes@ncmcs.org)
 - Any materials from the [Lego Expansion pack](#).
 - There is no limitation on the number of motors.

STEM Careers

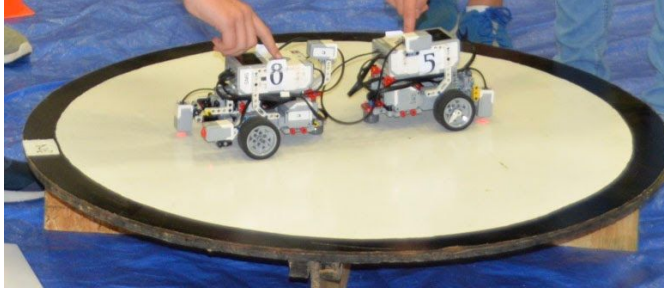
STEM Career Mission	Robot Type	Description Pictures for Events	Points <i>(Links to score cards available at a later date)</i>
Line Repairman	EV3	<p>Objective: Turn off power and run a new electrical line.</p> <p>Event Directions:</p> <ul style="list-style-type: none"> ● Robot begins in the base zone. ● Press a button to turn off the power. ● Take transformer off and bring to base for repair. ● Bring a new transformer to pole. <p>Event Notes</p> <ul style="list-style-type: none"> ● Old transformer must be removed before points can be awarded for adding a new transformer. ● New transformer can only be added to the 	<p>+10 points for turning off power</p> <p>+20 taking off transformer</p> <p>+5 taking to base</p> <p>+20 to add new transformer to pole</p> <p>-3 points for robots reset out of base zone</p> <p>Total Points Possible: 55</p>

		<p>robot in the base zone.</p> <ul style="list-style-type: none"> • 2 min time limit • Robot can be reset during the 2 min time limit if the robot drives back to the base zone. Points deducted for robots reset out of base zone. • Number of attempts: 2 per team (highest total score recorded) 	
Zookeeper <i>Animal Science Career</i>	EV3	<p>Objective: Feed the animals by getting food to each of the correct locations.</p> <p>Event Directions:</p> <ul style="list-style-type: none"> • Robot begins in the base zone. • Robot travels to each enclosure to push and/or drop food for the animals. • Picture <p>Event Notes:</p> <ul style="list-style-type: none"> • Food = centimeter cubes • 3 possible enclosures with different heights. • Food can be pre-loaded on robot. • Robot can be reset during the 2 min time limit if the robot drives back to the base zone. Points deducted for robots reset out of base zone. • Amount of food dropped does not affect points. • Number of attempts: 2 per team (highest total score recorded) 	<p>+10 points for food in each in push enclosure.</p> <p>+15 points for 1.75"</p> <p>+20 points for 3.5"</p> <p>+20 points bonus for food dropped in ALL 3 enclosures without robot being reset.</p> <p>-3 points for robots reset out of base zone.</p> <p>Total points possible: 65</p>
Delivery Driver	EV3	<p>Objective: Push a yellow brick somewhere on the map.</p> <p>Event Directions:</p> <ul style="list-style-type: none"> • Teams randomly given a color card (red, blue or green). • Teams randomly given a start area (1-12). • Robot must drive forward, stop on the selected color and leave the block (2"x2"x2") • Return to starting location using the touch or ultrasonic sensor to stop in the drop zone. • See Pictures <p>Event Notes:</p> <ul style="list-style-type: none"> • Package can be touching any part of the color circle for points. • Number of attempts: 2 per team (highest total score recorded) 	<p>+10 for finding the correct color</p> <p>+10 points for dropping package in color zone</p> <p>+5 points for backing up any distance</p> <p>+10 backing into base area using a sensor to stop.</p> <p>Total Point Possible: 35</p>

		<ul style="list-style-type: none"> Teams should be prepared to run a red, blue, or green program. Note: Location of colors on diagram will not be the same on competition day. 	
Air Traffic Controller	EV3	<p>Objective: Park your robot at the correct gate.</p> <p>Event Directions:</p> <ul style="list-style-type: none"> Teams randomly given a color card (red, yellow or green). Teams randomly given a start area (1-3). Robots drive to the color given by the judge. Turn left, and drive forward. Robots must stop within 3" of the gate. <p>Event Notes:</p> <ul style="list-style-type: none"> No points awarded for robots that do not turn at the correct color. Gate points will not be awarded if the robot touches the gate or doesn't stop within 3" of the gate. Number of attempts: 2 per team (highest total score recorded) 	<p>+10 points for stopping at the correct color.</p> <p>+10 points for stopping within 3" of gate without touching the gate.</p> <p>Total Points Possible: 20 pts.</p>
Warehouse Specialist	EV3	<p>Objective: Robot must load the 3-level warehouse with the new inventory.</p> <p>Event Directions:</p> <ul style="list-style-type: none"> Robot begins in Base Zone. Robot will carry a box to Level 1, 2, or 3 in the warehouse. Teams may preload a box in the Base Zone, and robot can return to the Base Zone for additional boxes. <p>Event Notes:</p> <ul style="list-style-type: none"> Robots may only carry one box per delivery. 2 minute time limit Robot can be reset and re-loaded with a box during the 2 min time limit if the robot drives back to the base zone. Points deducted for robots reset out of base zone. Boxes will be given to each school before the competition. Number of attempts: 2 per team (highest total score recorded) 	<p>+5 points for each box loaded onto the first level</p> <p>+10 points for each box loaded onto the second level</p> <p>+15 points for each box loaded onto the third level</p> <p>-3 points for robots reset out of base zone</p> <p>Max Points Possible: 60 points</p>
Crane Operator <i>Construction</i>	EV3	<p>Objective: Robot must move the debris from the construction site.</p>	<p>+15 per debris in disposal area.</p>

<p>Career</p>		<p>Event Directions:</p> <ul style="list-style-type: none"> ● Robots may be placed at any location in the gray area (see pic) at the beginning of the event; however, the robot cannot be moved once the program has started. ● Robot must pick up the debris from the construction area and placed in the disposal collection area. ● Robot can be reset after each “pick-up” program run for no penalty. <p>Event Notes:</p> <ul style="list-style-type: none"> ● Debris placed at the center of the square. ● Debris will be given to each school before the competition. ● Teams can “orient” the debris for pick-up. ● New debris is placed at the center after each pick-up attempt after the program has finished running. Teams may run the program as many times as needed during the 2 min. Time limit. ● 2 minute time limit. ● There is a 2” wall between the construction and disposal area. ● Debris can be touching the disposal area for points. ● Number of attempts: 2 per team (highest total score recorded) 	<p>Total points possible: 60 points.</p>
<p>Pharmacist or Pharmacist Tech</p>	<p>EV3</p>	<p>Objective: Dispense the medicine.</p> <p>Event Directions:</p> <ul style="list-style-type: none"> ● Color order is given before each try. ● Robot follows the black line to each color. ● Robot dispenses medicine by pushing down the lever. ● Robot returns to base zone to reset for the next color. <p>Event Notes:</p> <ul style="list-style-type: none"> ● Black line to dispenser with a red stop line. ● Lever will be 8” from the red stop line. ● Teams will be given the order to dispense the medicine. <ul style="list-style-type: none"> ○ Example: blue, purple, red, green ● Robot can be reset during the 2 min time limit if the robot drives back to the base zone. Points deducted for robots reset out of base zone. ● 2 minute time limit. ● Number of attempts: 2 per team (highest 	<p>+15 points per color dispensed</p> <p>-2 points for robot reset outside of Base Zone</p> <p>Total points possible: 60 points</p>

		total score recorded)	
Career: Engineering Mystery Engineering Challenge	EV3	Objective: Teams must solve a problem by engineering and programming a solution on the day of the competition. The problem and provided materials will be given to each team upon arrival at the competition.	Total points possible: 60 points
Career Mystery Board 1	EV3	Objective: Teams must program the robot to complete basic move tasks and sensor tasks.	Level 1: 10 points Level 2: 15 points Total points possible: 25 points
Career Mystery Board 2	EV3	Objective: Teams must program the robot to complete basic move tasks and sensor tasks.	Level 1: 10 points Level 2: 15 points Total points possible: 25 points
Wildlife Biologist	EV3	Objective: Survey the species in a geographical area. Robot will drive across an area and count different colored dots to estimate the animal population. Event Directions: <ul style="list-style-type: none"> ● Robot begins in the Base Zone. ● Robot drives forward and counts the number of each color. ● Survey result must appear on robot display with a +/- 1 accuracy. Event Notes: <ul style="list-style-type: none"> ● 2 minute time limit ● Path is 4' ● Colors = red, blue, green, yellow ● Robot can be reset during the 2 minute time limit with no penalty. ● Robot must always start in the base zone. ● Wording on screen must correctly identify the color with amounts. ● Number of attempts: 2 per team (highest total score recorded) 	+15 points for each color total with color name displayed on the robot screen (with a +/- 1 accuracy). Total points possible: 60 points
Battlebots	EV3	This is a heat based event. Your team will be provided a competition schedule. Teams not on the field at the assigned time forfeits their game. The winning robot must push it's opponent off of the battlebot board. The board has an outside black line. Robots can be modified to assist with the push; however, the robot is not allowed to destroy the other robot. Heats are 1 min. The	This competition is NOT counted in the overall totals. Separate trophies given for 1st and 2nd place teams.

		<p>judge may call for a reset of both robots if necessary.</p> <p>Each robot must fit in a 10" x 10" x 10" box at the start of the competition. Each team must demonstrate a working program before they can compete. Link to working program.</p> <p>Robots cannot weigh over 1000 grams.</p> <p>Picture:</p> 	
<p>Mine Rescue <i>Search and Rescue Career</i> (Programming Challenge)</p>	<p>Sphero</p>	<p>Objective: Find the miners without knocking over the wrong bottles and collapsing the mine</p> <p>Event Directions:</p> <ul style="list-style-type: none"> ● Program Sphero to knock down the bottles that are clear. Teams lose points if they knock down the incorrect bottles ● No attachments allowed. ● Picture to print ● Picture with dimensions ● Max time limit: 2 min. ● Number of attempts: 2 per team (highest total score recorded) 	<p>+2 pts for clear bottles -3 for color bottles +7 for 2 liter</p> <p>Total Points possible = 45 pts.</p>
<p>Feed the Animals <i>Agriculture Career</i> Obstacle Course (Free Drive)</p>	<p>Sphero</p>	<p>Objective: Maneuver around the farm to feed the animals.</p> <p>Event Directions</p> <ul style="list-style-type: none"> ● Drive the robot through various obstacles. ● Points awarded for successfully feeding the animals at each waypoint by knocking off the ping pong balls from a 16-18 oz. solo cup. ● Max time limit: 2 min. ● Number of attempts: 2 per team (highest total score recorded) 	<p>+5 points for each ping pong ball knocked from top of solo cup</p> <p>Total points possible = 35 pts.</p>
<p>Map the Area <i>Geologist Career</i> (Programming)</p>	<p>Sphero</p>	<p>Objective: Robot must complete a scientific study to map the metals, oil, natural gas or groundwater in the geographical area.</p>	<p>Complete maze = 35 pts</p>

Challenge)		<p>Event Directions:</p> <ul style="list-style-type: none"> ● Program your Sphero to maneuver through the maze ● Max time limit = 2 min. ● Picture with dimensions 	<p>½ maze 20 pts</p> <p>Total Points Possible: 35 pts.</p>
<p>Hit the Waypoints (Program) <i>Computer Science Career (Self-Driving Vehicles)</i></p>	Sphero	<p>Objective: Program the Sphero to drive to 4 randomly chosen directions.</p> <p>Event Directions:</p> <ul style="list-style-type: none"> ● Teams will spin for the 4 random locations and given 15 minutes to program. ● Robot must travel to the 4 locations in order chosen. ● Robot must stop at each location for at least 3 seconds or change the Sphero to the selected color to identify correct location. <p>Event Notes:</p> <ul style="list-style-type: none"> ● Playing field: Twister Map 	<p>+10 points for each correct waypoint.</p> <p>Total Points Possible: 40 points</p> <p>+5 bonus points for changing to the color of all 4 waypoints correctly</p>
<p><i>Aquaculture Career (Build and Free Drive)</i></p>	Sphero	<p>Objective: Teams must build a barge that will transport the most people across the water. This is a water event.</p> <p>Event Directions:</p> <ul style="list-style-type: none"> ● Teams must engineer a barge that will transport the most people (little people person) ● Teams will need to engineer how the Sphero robot will pull/push the barge across the water. ● Barges must be built from raw materials and cannot be 3D printed. ● Barges should be waterproof. ● For barges that will be pulled, distance between Sphero and barge must be less than 3.5" ● Barge must cross finish line for points to be awarded. <p>Event Notes:</p> <ul style="list-style-type: none"> ● Water area dimensions: <ul style="list-style-type: none"> ○ 42 3/4" x 22" x 18" ○ Container Link 	<p>+5 points per person carried to the finish line.</p> <p>Total points possible: 60 points</p>
<p><i>Auto Industry (Build and Program)</i></p>	Sphero	<p>Objective: Build the fastest, safest, and cheapest vehicle that can carry 50 marbles 8 ft. <i>This event is modified from Project Vahana at edu.sphero.com.</i></p>	<p>Winners are determined by the ranking points</p>

		<p>Event Directions:</p> <ul style="list-style-type: none">● Using the list of allowable materials, build a vehicle that can carry 50 marbles.● Goal is to deliver the marbles as fast as possible with the most profit.● No “sled” designs are allowed. Vehicles must have at least two wheels constructed from the allowable materials.● To compete in this event, teams must submit the vehicle costing sheet prior to competing. Max amount to spend is \$50.00.● Teams may ONLY use materials from the costing sheet.● Sphero must be programmed to drive straight through an 8 ft. course. <p>Event Notes:</p> <ul style="list-style-type: none">● Winners are calculated by total highest quality points calculated from the fastest time with the most profit.● In the event of a tie, winner will be awarded from the fastest time.	<p>1st place = 35 points 2nd place = 25 points 3rd place = 15 points</p> <p>+20 points for crossing the finish line with 50 marbles with a cost <= \$50.00</p>
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