

General Ideas for Robot Mats Product: Robots of the Round Table

<https://robotmats.com/home-3/97-robots-of-the-round-table-csrrt1>

Robotics 101: Robots of the Round Table

"Become a robot engineer as you design, build, and test a rover using LEGO® Education's EV3 software and technology. Use drag and drop programming to create a robot that can complete challenges such as climbing a ramp, traversing a maze, and even battling other robots!"

Day 1

- Introductions/Ice Breakers
- Robots
 - Ask campers to share base knowledge of robots and robotics. Discuss where real robots can be found. What's the difference between a robot and a machine? What kinds of jobs do they do? Why should a robot do a job instead of a person? Is there anything a robot can or cannot do?
- Introduction to LEGO Mindstorms and EV3 Kits
 - Pass out kits, review parts and pieces, motors, sensors, explain the basics of the EV3 brick and buttons
- Engineers, Blueprints & Designs
 - Discuss how engineers use blueprints to design and brainstorm their ideas and projects. Have campers work together to plan out a simple idea for their first robot. Explain the Engineer Design Process. If something doesn't work out, what do engineers do? They start the process all over again.
- Our First Robot
 - The first task is to design a robot that is able to move forward using wheels. The best part of robotics is that there is no right or wrong way to do something! Show campers some examples of different styles of robots, then let them free-design. (Pass out Beta Bot and Alpha Bot designs if campers are struggling and need extra help)
- Robot Movement
 - Teach campers basic programming that can be completed on the EV3 itself. Use the on-screen programming editor to program robots to move forward for 5 seconds. Test out a robot's speed and stability. Have campers complete this programming, then make changes to their robot as needed.

Day 2

- Robot Races
 - Have campers use specified areas on the mat or floor to conduct races against each other. Even though everyone is using the same programming, are there robots that appear faster than others? Is everyone's robot moving in a straight line? Why or why not?
- Introduction To Programming with Lego Mindstorms

- Assign computers to each group and take time to introduce the programming language of Lego Mindstorms.
- Challenge: Write a program to make the robot drive forward for 5 seconds, stop, turn around, and return to the starting position. (Use Zones on Castle Mat)
- Fine-Tuning
 - Challenge: Give different groups of campers different sets of instructions, having them start at one of the zones and drive to a specific spots on the mat, i.e. the sword in the stone, to practice using various types of motor programming, turning, and using angles and degrees.
- Gears & Torque
 - Discuss/define gears and torque, show a demonstration of how a gear can make a wheel spin faster or slower. We gear up for more speed and gear down for more power. What will help us climb a ramp: speed or power?
 - Challenge: Redesign the robots to use gears to be able to climb the ramp to cross the moat and reach the castle.
 - Bonus Challenge: Use extra ramp at Easy, Medium, and Difficult gradients to challenge campers to reach the top.
- Jousting
 - Talk about historical jousting. Set up the jousting arena and discuss rules for jousting.
 - Challenge: Campers must design a “jousting lance” attachment for their robot and write a program for their robot to move forward without hitting/bumping/touching the jousting lane. Goal is to knock the Lego Knight and Horse off of the other EV3!
 - Bonus Challenge: Use a medium motor to make the jousting lance start raised upwards at 90 degrees and lower before driving forward.

Day 3

- Medium Motors
 - Introduce the medium motor. How is it different from the regular motors we’ve been using?
 - Challenge: Design and program an attachment to pick up supplies and deliver them to the castle.
 - Challenge: Design and program a different attachment to transport a Lego animal (horse, goat, etc.) and take it to the Meeting Area in front of the castle.
 - Challenge: Design and program an attachment to pick up multiple “fruits and vegetables” (Different colored Lego pieces) from the village and deliver them to Supply Zone 2.
 - Bonus: Timed challenge
 - Bonus: see how many they can transport at once.
 - Bonus: Can they all be dropped off and stay within the boundaries of the zone
 - Challenge: Use a Lego slope to place a farm animal at the top that has gotten stuck. Place slope somewhere near the mountains. The robot’s task is to climb the slope, rescue the farm animal, and return it to the village.

- Introduction To Sensors

- Introduce the Touch Sensor and Infrared Sensor. Explain how they work, the best location to mount them, and how to program them.
- Challenge: Use the red barriers and set up the first “labyrinth” for campers to navigate through following the first/easy path (the line following path with no curves). They must be able to use the sensors to sense the barrier and react accordingly (i.e. touch sensor activated, stop moving forward, back up, turn right or left, continue forward)
 - Time each team, compete for the fastest results
 - Compare Touch/IR Sensors: Is there a difference? Which one works better? Why would you choose one over the other?

Day 4

- The Dragon Zone: Includes multiple challenge ideas.

- Challenge 1: Start in a specific zone, steal treasure from the Dragon Zone (must be able to pick up and carry the treasure), and take the treasure to Supply Zone 2 or back to the village in a specific amount of time (otherwise the dragon wakes up!)
- Challenge 2: Transport a knight to the Dragon Zone. Leave specified starting zone, pick up Knight and Horse from Meeting Area, and deliver within the boundaries of the Dragon Zone. (Return to starting point is optional)
- Challenge 3: Design a “Dragon Proof Structure” out of Legos that the robot must then carry and deliver to the Dragon Zone.

- Light/Color Sensor (2-day project)

- Introduce campers to Light/Color sensor, explain how it works, and programming basics.
- Challenge 1: Complete the easy Labyrinth challenge, now using the Light/Color Sensor
 - Time each team, compete for the fastest results
- Challenge 2: Complete the hard Labyrinth challenge (the one with the loops)
 - Time each team, compete for the fastest results

Day 5

- Finish Up Light/Color Sensor Challenges
- Battle Bots
- Repeat Jousting if extra time
- Clean Up / Inventory Kits