

# High School Robotics - Year 2

## Computational Thinking and Problem Solving

### 1 Students will analyze and utilize problem-solving strategies.

- 1 Leverage problem-solving strategies to solve problems of level-appropriate complexity [CSRB.Y2.1.1](#)
- 2 Analyze and utilize multiple representations of problem-solving logic used to solve problems of appropriate complexity [CSRB.Y2.1.2](#)
- 3 Analyze and utilize collaborative methods in problem solving of level-appropriate complexity [CSRB.Y2.1.3](#)
- 4 Analyze and utilize level-appropriate troubleshooting strategies for hardware and software [CSRB.Y2.1.4](#)

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### 2 Students will analyze and utilize connections between concepts of mathematics and computer science.

- 1 Continuation of this standard is not specifically included or excluded [CSRB.Y2.2.1](#)
  - 2 Classify and utilize types of information that are stored in robotics systems including, but not limited to, 2D and 3D coordinate system and sensor data [CSRB.Y2.2.2](#)
  - 3 Continuation of this standard is not specifically included or excluded [CSRB.Y2.2.3](#)
  - 4 Analyze and utilize concepts of abstraction as modeling and abstraction as encapsulation [CSRB.Y2.2.4](#)
  - 5 Perform operations of level-appropriate complexity with binary, octal, decimal, and hexadecimal numbers [CSRB.Y2.2.5](#)
  - 6 Continuation of this standard is not specifically included or excluded [CSRB.Y2.2.6](#)
  - 7 Explain how concepts of mechanical engineering including, but not limited to, gear ratios, speed, stability, and torque relate to the implementation of robotics systems and subsystems [CSRB.Y2.2.7](#)
  - 8 Explain how concepts of electrical engineering including, but not limited to, applying Ohm's law, using a multimeter, and understanding electric motors as they relate to the implementation of robotics systems and subsystems [CSRB.Y2.2.8](#)
  - 9 Describe and represent basic electrical quantities including, but not limited to charge, current, energy, power, and voltage and describe the relationships among them [CSRB.Y2.2.9](#)
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## Data, Information, and Security

### 3 Students will analyze and utilize data through the use of computing devices.

- 1 Create programs to store, access, and manipulate level-appropriate data (e.g., structured data, objects) [CSRB.Y2.3.1](#)
  - 2 Define and discuss different examples of level-appropriate quantitative and qualitative data [CSRB.Y2.3.2](#)
  - 3 Research, discuss, and create level-appropriate programs to model and simulate probabilistic and real-world scenarios [CSRB.Y2.3.3](#)
  - 4 Analyze, utilize, and visually represent level-appropriate static and dynamic data [CSRB.Y2.3.4](#)
  - 5 Perform level-appropriate data analysis using computing tools [CSRB.Y2.3.5](#)
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### 4 Students will analyze and utilize concepts of cybersecurity.

- 1 Apply the five pillars of cybersecurity as applicable to level-appropriate computer science concepts [CSRB.Y2.4.1](#)
  - 2 Continuation of this standard is not specifically included or excluded [CSRB.Y2.4.2](#)
  - 3 Research and describe common attacks on software, hardware, and networks [CSRB.Y2.4.3](#)
  - 4 Continuation of this standard is not specifically included or excluded [CSRB.Y2.4.4](#)
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## Algorithms and Programs

### 5 Students will create, evaluate, and modify algorithms.

- 1 Design and implement level-appropriate algorithms that use iteration, recursion, selection, and sequence [CSRB.Y2.5.1](#)
- 2 Continuation of this standard is not specifically included or excluded [CSRB.Y2.5.2](#)
- 3 Evaluate the qualities of level-appropriate student-created and non-student-created algorithms including classic search and sort algorithms [CSRB.Y2.5.3](#)
- 4 Use a systematic approach to detect and resolve errors in a given algorithm [CSRB.Y2.5.4](#)

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**6 Students will create programs to solve problems.**

- 1 Create programs to solve problems of levelappropriate complexity [CSRB.Y2.6.1](#)
- 2 Discuss and apply best practices of program design and format (e.g., descriptive names, documentation, indentation, user experience design, whitespace) [CSRB.Y2.6.2](#)
- 3 Determine the scope and state of variables defined in procedures and classes [CSRB.Y2.6.3](#)
- 4 Create programs that read from, write to, and append to a file of level-appropriate complexity that includes structured data [CSRB.Y2.6.4](#)
- 5 Use a systematic approach to detect logic, runtime, and syntax errors within a program [CSRB.Y2.6.5](#)
- 6 Create programs that utilize various robotics system operations to solve problems [CSRB.Y2.6.6](#)

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**Computers and Communications****7 Students will analyze the utilization of computers within industry.**

- 1 Utilize hardware and/or software to solve levelappropriate industry-based problems [CSRB.Y2.7.1](#)
- 2 Research cutting-edge robotics technology (e.g., analytics, artificial intelligence, autonomous vehicles, big data, end-of-arm tools, IoT, machine learning, vision) and its effects on the way business may be conducted in the future [CSRB.Y2.7.2](#)

**8 Students will analyze communication methods and systems used to transmit information among computing devices.**

- 1 Continuation of this standard is not specifically included or excluded [CSRB.Y2.8.1](#)
- 2 Compare and contrast network connectivity options for different types of robotics platforms and communications methods within various robotics systems, including but not limited to, controller area network (CAN) busses [CSRB.Y2.8.2](#)
- 3 Continuation of this standard is not specifically included or excluded [CSRB.Y2.8.3](#)
- 4 Continuation of this standard is not specifically included or excluded [CSRB.Y2.8.4](#)

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## 9 Students will utilize appropriate hardware and software.

- 1 Continuation of this standard is not specifically included or excluded [CSRB.Y2.9.1](#)
- 2 Use collaboration tools and version control systems in a group software project of appropriate complexity [CSRB.Y2.9.2](#)
- 3 Analyze the importance and effect of updating firmware and drivers within robotic systems [CSRB.Y2.9.3](#)
- 4 Utilize robotic hardware components to create levelappropriate robotic systems and subsystems [CSRB.Y2.9.4](#)
- 5 Discuss and apply autonomous and manual robotic control by coding in various robotic programming languages (e.g., C++, Karel, Python) [CSRB.Y2.9.5](#)
- 6 Compare and contrast different types of industryrelevant robotic systems (e.g., 3-axis, 6-axis, AMR, cobot, delta, SCARA, T-700) [CSRB.Y2.9.6](#)
- 7 Utilize breadboarding in the creation of a levelappropriate closed-loop robot [CSRB.Y2.9.7](#)
- 8 Utilize hardware diagnostic tools to design, test, and troubleshoot robotic systems and subsystems [CSRB.Y2.9.8](#)
- 9 Discuss hardware and software requirements and limitations of various robotics systems [CSRB.Y2.9.9](#)

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## Professionalism and Impacts of Computing

## 10 Students will analyze the impacts of technology and professionalism within the computing community.

- 1 Continuation of this standard is not specifically included or excluded [CSRB.Y2.10.1](#)
- 2 Research and describe issues related to creating and enforcing cyber-related laws and regulations (e.g., ethical challenges, policy vacuum, privacy versus security, unintended consequences) [CSRB.Y2.10.2](#)
- 3 Continuation of this standard is not specifically included or excluded [CSRB.Y2.10.3](#)
- 4 Identify the ethical implications encountered in the curation, management, and monetization of data (e.g., harvesting, information overload, knowledge management repositories, sharing, summarizing) [CSRB.Y2.10.4](#)
- 5 Explain advantages and disadvantages of various software life cycle processes (e.g., Agile, spiral, waterfall) [CSRB.Y2.10.5](#)
- 6 Continuation of this standard is not specifically included or excluded [CSRB.Y2.10.6](#)
- 7 Demonstrate industry-relevant technical and soft skills [CSRB.Y2.10.7](#)
- 8 Discuss effective professional collaborative project management tools [CSRB.Y2.10.8](#)
- 9 Identify the components of a quality professional digital portfolio [CSRB.Y2.10.9](#)
- 10 Create and maintain a digital collection of selfcreated work [CSRB.Y2.10.10](#)

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**11 Students will demonstrate understanding of storytelling with data and appropriately communicate about technical information.**

- 1 Communicate robotics concepts to diverse audiences including, but not limited to, non-technical audience members [CSRB.Y2.11.1](#)
- 2 Utilize level-appropriate robotic system data for storytelling [CSRB.Y2.11.2](#)
- 3 Continuation of this standard is not specifically included or excluded [CSRB.Y2.11.3](#)
- 4 Continuation of this standard is not specifically included or excluded [CSRB.Y2.11.4](#)
- 5 Continuation of this standard is not specifically included or excluded [CSRB.Y2.11.5](#)
- 6 Communicate conditions of a robotic system in terms of performance, diagnostics, troubleshooting, and repair [CSRB.Y2.11.6](#)