

# MATLAB Programming Section 2: Data Types & Operators

## Teacher Page

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[The student MATLAB files for this section can be found at this link here.](#)

[The teacher MATLAB Drive Link can be found here.](#)

### Storyline

The lesson begins with a short video about machine learning and how it works. Then, the lesson continues with the discussion of some basic MATLAB skills and tools. The focus is on the following specific skills: requesting and filtering multiple outputs, accessing MATLAB documentation, plotting, importing data, using relational operators and logical indices, and when to use "if" statements vs. "for" loops. Each concept is important for understanding how MATLAB "thinks" and for coding with MATLAB. With the conclusion of the MATLAB onramp content, the students have an interactive MATLAB assignment with some Formula 1 racing data. This activity is designed to have the students practice the skills outlined above and build confidence in their MATLAB skills. Once they complete this activity, they will form groups and reflect on the assignment through a discussion post.

### Main Learning Goal

Students will continue to learn the basics of MATLAB and gain useful tools for writing their own programs. Students will also gain hands-on experience in importing data into MATLAB to create plots and learn when to apply common programming constructs.

### Focus Question

How do programmers supply and process data in order to design intelligent computers?

### Elicit: "How do Machines Learn?"

*How will I engage students and elicit their ideas?*

Activity Name and Description	Teacher Moves	Student Moves	Resources
<ul style="list-style-type: none"><li>• 5 minutes</li><li>• Students will watch a 3-minute introductory video about</li></ul>	<ul style="list-style-type: none"><li>• Teacher will play the video about machine learning and provide the students with</li></ul>		<ul style="list-style-type: none"><li>• <a href="#">What is Machine Learning? - IBM</a></li><li>• <a href="#">What is Machine</a></li></ul>

Activity Name and Description	Teacher Moves	Student Moves	Resources
<p>machine learning and consider a few questions about machine learning applications.</p> <ul style="list-style-type: none"> <li>• This activity is intended to facilitate and broach the topic of machine learning as a building block for later lessons.</li> <li>• The video is accessible at this link: <a href="#">Machine Learning Fundamentals</a></li> </ul>	<p>the following questions to consider.</p> <ul style="list-style-type: none"> <li>• What are the common scenarios where machine learning is applied? Have the students encountered any of these applications in their daily lives?</li> <li>• According to the video what are the two main learning techniques employed by machine learning? How are these similar or different to how people learn?</li> <li>• Teacher should give the students a few minutes to discuss their thoughts and answers with their classmates.</li> <li>• Teacher will encourage the students to share their</li> </ul>	<ul style="list-style-type: none"> <li>• Students will watch the brief video about machine learning.</li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">Learning? - MATLAB Introduction to Machine Learning</a></li> </ul>

Activity Name and Description	Teacher Moves	Student Moves	Resources
	answers and thoughts.		

### Develop: "Continuation of MATLAB Onramp"

*How will I get students to explore, explain, and develop ideas?*

Activity Name and Description	Teacher Moves	Student Moves	Resources
<ul style="list-style-type: none"> <li>• 30 minutes</li> <li>• Teacher will instruct students on MATLAB syntax, functions, and tools.</li> <li>• The lesson will focus on the following topics:             <ul style="list-style-type: none"> <li>– Requesting multiple outputs</li> <li>– Accessing MATLAB documentation</li> <li>– Plot generation and formatting</li> <li>– Data importation</li> <li>– Use of logical indices and relational operators</li> <li>– Use of if statements and for loops</li> </ul> </li> <li>• These topics will build the foundational skills for future MATLAB coding.</li> </ul>	<ul style="list-style-type: none"> <li>• Teacher will provide students with the student notebook and the corresponding .xlsx file if they would like to actively follow along</li> <li>• Teacher will begin lecture with a discussion of two new functions: "randi()" and "size()" which provide multiple outputs and describe how to control the type of output in these cases.</li> <li>• Teacher will then show how to plot and format</li> </ul>	<ul style="list-style-type: none"> <li>• Students will download the section livescript and .xlsx file if they would like to follow along.</li> <li>• Students should actively engage and ask questions as needed.</li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">MATLAB Documentation</a></li> <li>• <a href="#">Plotting Data in MATLAB</a></li> <li>• <a href="#">Array Comparison with Relational Operators</a></li> <li>• <a href="#">Branching and Looping</a></li> </ul>

Activity Name and Description	Teacher Moves	Student Moves	Resources
	<p>the plots generated by the "plot()" function.</p> <ul style="list-style-type: none"> <li>• Teacher will show how to import and store data for future use.</li> <li>• Teacher will emphasize the importance of relational operators as a comparison tool and show how they can be used for logical indexing.</li> <li>• Teacher will finish the lecture with a comparison between if statements and for loops, two helpful tools for branched and iterative code.</li> <li>• Teacher should encourage students to</li> </ul>		

Activity Name and Description	Teacher Moves	Student Moves	Resources
	ask questions as needed.		

### Deploy: "Formula 1 Data Analysis"

*How will I get students to use and apply their ideas to what they've learned?*

Activity Name and Description	Teacher Moves	Student Moves	Resources
<ul style="list-style-type: none"> <li>• 40 minutes</li> <li>• Students will complete the Formula 1 Data Analysis assignment and submit their livescript.</li> <li>• The student and teacher livescripts provided at the top of the teacher page.</li> <li>• The assignment can be found here: <a href="#">Programming Section 2 Assignment - Formula 1 Data Analysis</a></li> </ul>	<ul style="list-style-type: none"> <li>• Teacher will ensure the students have the necessary files for the assignment.</li> <li>• The teacher will encourage independent work and provide assistance as needed.</li> </ul>	<ul style="list-style-type: none"> <li>• The students will open the assignment and download all necessary files.</li> <li>• The students will work independently on their livescript.</li> <li>• Students should ask questions as necessary.</li> <li>• Once completed, the students will submit their work as a livescript to the assignment.</li> </ul>	

### Refine: "How Can Machines Learn About Sports?"

*How will I get students to extend, elaborate, and change their ideas based on what we now understand?*

Activity Name and Description	Teacher Moves	Student Moves	Resources
<ul style="list-style-type: none"> <li>• 10 minutes</li> <li>• Students will form groups of four and reflect the</li> </ul>		<ul style="list-style-type: none"> <li>• Students will form groups of four and pull up the</li> </ul>	

Activity Name and Description	Teacher Moves	Student Moves	Resources
<ul style="list-style-type: none"> <li>implications of their findings in the Formula 1 Analysis.</li> <li>The discussion board can be accessed here: <a href="#">Programming Section 2 Discussion - How Can Machines Learn About Sports?</a></li> </ul>	<ul style="list-style-type: none"> <li>Teacher will assist students in forming groups four.</li> <li>Teacher will direct students to the discussion board to consider and answer the following questions: <ul style="list-style-type: none"> <li>What types of data can Formula 1 teams use to make a machine learning model more accurate?</li> <li>Are there variables that cannot be accounted for (e.g. car breakdowns, injuries)?</li> </ul> </li> <li>Teacher should provide assistance as needed.</li> </ul>	<ul style="list-style-type: none"> <li>discussion board.</li> <li>Students will think about the results of the Formula 1 Analysis activity and discuss their thoughts with the group.</li> <li>Students will consider the questions and as a group post a response to the discussion board.</li> <li>Students should also respond to one (at the least) other post.</li> </ul>	