TRUE ROBOTICS

# INTRODUCTION TO ROBOTICS WITH AXLE

GRADES 6–8

This document lists the New York learning standards addressed by Introduction to Robotics with Axle, True Robotics' grades 6–8 robotics curriculum. Standards are grouped by subject and grade level, with codes and wording as published by the New York State Education Department.

| 36 | 9 | 11 | 56 |
|---|---|---|---|
| MATH | SCIENCE | CS | TOTAL STANDARDS |

## MATHEMATICS

36 STANDARDS

Based on the New York state standards

| GRADE | CODE | STANDARD |
|---|---|---|
| 6 | NY-6.NS.1 | Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions. |
| 6 | NY-6.NS.8 | Solve real-world and mathematical problems by graphing points on a coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate. |
| 6 | NY-6.EE.5 | Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true. |
| 6 | NY-6.EE.6 | Use variables to represent numbers and write expressions when solving a real-world or mathematical problem. Understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. |
| 6 | NY-6.EE.7 | Solve real-world and mathematical problems by writing and solving equations of the form x + p = q; x – p = q; px = q; and x/p = q for cases in which p, q, and x are all nonnegative rational numbers. |
| 6 | NY-6.EE.9 | Use variables to represent two quantities in a real-world problem that change in relationship to one another. Given a verbal context and an equation, identify the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. |
| 6 | NY-6.G.1 | Find area of triangles, trapezoids, and other polygons by composing into rectangles or decomposing into triangles and quadrilaterals. Apply these techniques in the context of solving real-world and mathematical problems. |

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| GRADE | CODE | STANDARD |
|---|---|---|
| 6 | NY-6.G.2 | Find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems. |
| 6 | NY-6.G.4 | Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems. |
| 6 | NY-6.SP.1a | Recognize that a statistical question is one that anticipates variability in the data related to the question and accounts for it in the answers. |
| 6 | NY-6.SP.2 | Understand that a set of quantitative data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. |
| 6 | NY-6.SP.5c | Calculate range and measures of center, as well as describe any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered. |
| 7 | NY-7.RP.1 | Compute unit rates associated with ratios of fractions. |
| 7 | NY-7.RP.2b | Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. |
| 7 | NY-7.RP.2c | Represent a proportional relationship using an equation. |
| 7 | NY-7.RP.2d | Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, r) where r is the unit rate. |
| 7 | NY-7.RP.3 | Use proportional relationships to solve multistep ratio and percent problems. |
| 7 | NY-7.NS.1c | Understand subtraction of rational numbers as adding the additive inverse, p – q = p + (–q). Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts. |
| 7 | NY-7.NS.1d | Apply properties of operations as strategies to add and subtract rational numbers. |
| 7 | NY-7.NS.2c | Apply properties of operations as strategies to multiply and divide rational numbers. |
| 7 | NY-7.NS.3 | Solve real-world and mathematical problems involving the four operations with rational numbers. |
| 7 | NY-7.EE.4a | Solve word problems leading to equations of the form px + q = r and p(x + q) = r, where p, q, and r are rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. |
| 7 | NY-7.G.1 | Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale. |
| 7 | NY-7.G.4 | Apply the formulas for the area and circumference of a circle to solve problems. |
| 7 | NY-7.G.6 | Solve real-world and mathematical problems involving area of two-dimensional objects composed of triangles and trapezoids. Solve surface area problems involving right prisms and right pyramids composed of triangles and trapezoids. Find the volume of right triangular prisms, and solve volume problems involving three-dimensional objects composed of right rectangular prisms. |

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| GRADE | CODE | STANDARD |
|---|---|---|
| 8 | NY-8.NS.1 | Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion eventually repeats. Know that other numbers that are not rational are called irrational. |
| 8 | NY-8.NS.2 | Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line, and estimate the value of expressions. |
| 8 | NY-8.EE.5 | Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. |
| 8 | NY-8.EE.8a | Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously. Recognize when the system has one solution, no solution, or infinitely many solutions. |
| 8 | NY-8.EE.8b | Solve systems of two linear equations in two variables with integer coefficients: graphically, numerically using a table, and algebraically. Solve simple cases by inspection. |
| 8 | NY-8.EE.8c | Solve real-world and mathematical problems involving systems of two linear equations in two variables with integer coefficients. |
| 8 | NY-8.F.3 | Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line. Recognize examples of functions that are linear and non-linear. |
| 8 | NY-8.F.4 | Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values. |
| 8 | NY-8.G.7 | Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. |
| 8 | NY-8.G.8 | Apply the Pythagorean Theorem to find the distance between two points in a coordinate system. |
| 8 | NY-8.G.9 | Given the formulas for the volume of cones, cylinders, and spheres, solve mathematical and real-world problems. |

## SCIENCE

9 STANDARDS

Based on the New York state standards

| GRADE | CODE | STANDARD |
|---|---|---|
| 6 | MS-PS1-7 | Use evidence to illustrate that density is a property that can be used to identify samples of matter. |
| 6 | MS-PS4-1 | Develop a model and use mathematical representations to describe waves that includes frequency, wavelength, and how the amplitude of a wave is related to the energy in a wave. |
| 6 | MS-PS4-2 | Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. |

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| GRADE | CODE | STANDARD |
|---|---|---|
| 6 | MS-PS4-3 | Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals. |
| 6 | MS-ETS1-1 | Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. |
| 7 | MS-PS3-1 | Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object. |
| 8 | MS-PS1-4 | Develop a model that predicts and describes changes in particle motion, temperature, and phase (state) of a substance when thermal energy is added or removed. |
| 8 | MS-PS2-1 | Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects. |
| 8 | MS-PS2-2 | Plan and conduct an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object. |

## COMPUTER SCIENCE AND DIGITAL FLUENCY

11 STANDARDS

Based on the New York state standards

| GRADE | CODE | STANDARD |
|---|---|---|
| 6 | 4-6.IC.3 | Explain current events that involve computing technologies. |
| 6 | 4-6.CT.4 | Decompose a problem into smaller named tasks, some of which can themselves be decomposed into smaller steps. |
| 6 | 4-6.CT.6 | Compare two or more algorithms and discuss the advantages and disadvantages of each for a specific task. |
| 6 | 4-6.CT.8 | Develop algorithms or programs that use repetition and conditionals for creative expression or to solve a problem. |
| 7–8 | 7-8.IC.1 | Compare and contrast tradeoffs associated with computing technologies that affect individuals and society. |
| 7–8 | 7-8.CT.4 | Write a program using functions or procedures whose names or other documentation convey their purpose within the larger task. |
| 7–8 | 7-8.CT.7 | Design or remix a program that uses a variable to maintain the current value of a key piece of information. |
| 7–8 | 7-8.CT.8 | Develop or remix a program that effectively combines one or more control structures for creative expression or to solve a problem. |
| 7–8 | 7-8.CT.9 | Read and interpret code to predict the outcome of various programs that involve conditionals and repetition for the purposes of debugging. |
| 7–8 | 7-8.NSD.2 | Design a project that combines hardware and software components. |
| 7–8 | 7-8.NSD.4 | Design a protocol for transmitting data through a multi-point network. |

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## SOURCES & NOTES

- The official mathematics, science and computer science standards for New York, as published by the New York State Education Department.
- Codes and standard wording are reproduced from the official standards documents. Clarification statements, examples and assessment boundaries are omitted.
- Grade shows the grade level at which True Robotics lessons address each standard. A range (for example K–2) marks a standard written for a grade band.
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