TRUE ROBOTICS

INTRODUCTION TO ROBOTICS WITH AXLE

GRADES 6–8

This document lists the Ohio 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 Ohio Department of Education and Workforce.

37	7	16	60
MATH	SCIENCE	CS	TOTAL STANDARDS

MATHEMATICS

37 STANDARDS

Based on the Ohio state standards

GRADE	CODE	STANDARD
6	6.NS.1	Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem.
6	6.NS.8	Solve real-world and mathematical problems by graphing points in all four quadrants of the 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	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	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	6.EE.7	Solve real-world and mathematical problems by writing and solving equations of the form x + p = q and px = q for cases in which p, q, and x are all nonnegative rational numbers.
6	6.EE.9	Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as 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	6.G.1	Through composition into rectangles or decomposition into triangles, find the area of right triangles, other triangles, special quadrilaterals, and polygons; apply these techniques in the context of solving real-world and mathematical problems.

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GRADE	CODE	STANDARD
6	6.G.2	Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas V = l·w·h and V = B·h to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.
6	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	6.SP.1a	Formulate Questions: Recognize and formulate a statistical question as one that anticipates variability and can be answered with quantitative data.
6	6.SP.2	Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.
6	6.SP.5c	Find the quantitative measures of center (median and/or mean) for a numerical data set and recognize that this value summarizes the data set with a single number. Interpret mean as an equal or fair share. Find measures of variability (range and interquartile range) as well as informally describe the shape and the presence of clusters, gaps, peaks, and outliers in a distribution.
7	7.RP.1	Compute unit rates associated with ratios of fractions, including ratios of lengths, areas, and other quantities measured in like or different units.
7	7.RP.2b	Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.
7	7.RP.2c	Represent proportional relationships by equations.
7	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	7.RP.3	Use proportional relationships to solve multistep ratio and percent problems.
7	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	7.NS.1d	Apply properties of operations as strategies to add and subtract rational numbers.
7	7.NS.2c	Apply properties of operations as strategies to multiply and divide rational numbers.
7	7.NS.3	Solve real-world and mathematical problems involving the four operations with rational numbers.
7	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 specific 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	7.G.1a	Compute actual lengths and areas from a scale drawing and reproduce a scale drawing at a different scale.
7	7.G.4a	Explore and understand the relationships among the circumference, diameter, area, and radius of a circle.
7	7.G.4b	Know and use the formulas for the area and circumference of a circle and use them to solve real-world and mathematical problems.

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GRADE	CODE	STANDARD
7	7.G.6	Solve real-world and mathematical problems involving area, volume, and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.
8	8.NS.1	Know that real numbers are either rational or irrational. Understand informally that every number has a decimal expansion which is repeating, terminating, or is non-repeating and non-terminating.
8	8.NS.2	Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions, e.g., π^2.
8	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	8.EE.8a	Understand that the solution to a pair of linear equations in two variables corresponds to the point(s) of intersection of their graphs, because the point(s) of intersection satisfy both equations simultaneously.
8	8.EE.8b	Use graphs to find or estimate the solution to a pair of two simultaneous linear equations in two variables. Equations should include all three solution types: one solution, no solution, and infinitely many solutions. Solve simple cases by inspection.
8	8.EE.8c	Solve real-world and mathematical problems leading to pairs of linear equations in two variables. (Limit solutions to those that can be addressed by graphing.)
8	8.F.3	Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear.
8	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	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	8.G.8	Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.
8	8.G.9	Solve real-world and mathematical problems involving volumes of cones, cylinders, and spheres.

SCIENCE

7 STANDARDS

Based on the Ohio state standards

GRADE	CODE	STANDARD
6	6.ESS.5	Rocks, minerals and soils have common and practical uses.
6	6.PS.1	Matter is made up of small particles called atoms.
6	6.PS.2	Changes of state are explained by a model of matter composed of particles that are in motion.

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GRADE	CODE	STANDARD
6	6.PS.3	There are two categories of energy: kinetic and potential.
7	7.PS.1	Elements can be organized by properties.
7	7.PS.4	Energy can be transferred through a variety of ways.
8	8.PS.2	Forces can act to change the motion of objects.

COMPUTER SCIENCE

16 STANDARDS

Based on the Ohio state standards

GRADE	CODE	STANDARD
6	CS.D.6.a	Identify the benefits and limitations of a given computing device's functions (including individual components) to explain how the functions and components work together to create the computing system.
6	NI.IOT.6.a	Define and explore aspects of embedded devices, smart devices and intelligent devices and the way they record, observe and mimic human habits.
6	ATP.A.6.a	Compare and refine multiple algorithms for the same task to determine which is the most efficient.
6	ATP.M.6.a	Decompose problems into parts to facilitate the design, implementation and review of programs.
6	ATP.PD.6.a	Write code that utilizes algorithms, variables and control structures to solve problems or as a creative expression.
6	IC.Cu.6.a	Identify the change that current technologies have on people's everyday activities to understand the impact within a society.
6	IC.SLE.6.c	Evaluate the development of new technologies in communication, entertainment and business to understand the impact.
6	6-8.ID.4.b	Students select and use digital tools to support a design process and expand their understanding to identify constraints and trade-offs and weigh risks.
6	6-8.ID.4.c	Students engage in a design process to develop, test, and revise prototypes, embracing the cyclical process of trial and error and understanding problems or setbacks as potential opportunities for improvement.
7	ATP.VDR.7.a	Use test cases to trace variable values to determine the result.
7	ATP.CS.7.a	Use and apply decisions and loops in a program to solve a problem.
7	AI.P.7.a	Give examples of how intelligent agents combine information from multiple sensors to react to an input.
8	NI.N.8.a	Model the role of hardware components to diagram the infrastructure of networks and the internet (including cloud servers).
8	NI.IOT.8.b	Model the lifecycle of information in the IoT including data gathering, transmission, reception and analysis to recreate a real-world scenario.
8	ATP.PD.8.c	Use procedures that utilize parameters to pass values.

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GRADE	CODE	STANDARD
8	AI.P.8.a	Explain how sounds and images are represented digitally in a computer to explain how sensor data is stored in a computer.

SOURCES & NOTES

- The official mathematics, science and computer science standards for Ohio, as published by the Ohio Department of Education and Workforce.
- 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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