INTRODUCTION TO ROBOTICS WITH AXLE

GRADES 6–8

This document lists the Tennessee 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 Tennessee State Board of Education.

36	8	8	52
MATH	SCIENCE	CS	TOTAL STANDARDS

MATHEMATICS

36 STANDARDS

Based on the Tennessee state standards

GRADE	CODE	STANDARD
6	6.NS.A.1	Interpret and compute quotients of fractions, and solve real-world and mathematical problems involving division of fractions by fractions (e.g., connecting visual fraction models and equations to represent the problem is suggested).
6	6.NS.C.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.B.5	Understand that a solution to an equation or inequality is the value(s) that makes that statement true. Use substitution to determine whether a given number in a specified set makes an equation or inequality true.
6	6.EE.B.6	Use variables to represent numbers and write expressions when solving real-world and mathematical problems; 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.B.7	Solve real-world and mathematical problems by writing and solving one-step equations of the form $x + p = q$, $px = q$, $x - p = q$, and $x/p = q$ for cases in which p, q, and x are all nonnegative rational numbers and $p \neq 0$.
6	6.EE.C.9	Use variables to represent two quantities in a real-world problem that change in relationship to one another.
6	6.G.A.1	Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; know and apply these techniques in the context of solving real-world and mathematical problems.

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GRADE	CODE	STANDARD
6	6.G.A.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 = lwh and V = Bh where B is the area of the base to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.
6	6.G.A.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.A.1	Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers.
6	6.SP.A.2	Understand that a set of data collected to answer a statistical question has a distribution which can be described by its measures of center (mean, median, mode), measures of variation (range only), and overall shape.
6	6.SP.B.5.c	Give quantitative measures of center (median and/or mean) and variability (range) as well as describing any overall pattern with reference to the context in which the data were gathered.
7	7.RP.A.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.A.2.b	Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.
7	7.RP.A.2.c	Use the concept of equality to represent proportional relationships with equations.
7	7.RP.A.2.d	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.A.3	Use proportional relationships to solve multi-step ratio and percent problems.
7	7.NS.A.1.b	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.A.1.c	Apply properties of operations as strategies to add and subtract rational numbers.
7	7.NS.A.2.c	Apply properties of operations as strategies to multiply and divide rational numbers.
7	7.NS.A.3	Solve real-world and mathematical problems involving the four operations with rational numbers.
7	7.EE.B.4.a	Solve real-world and mathematical 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.A.1	Solve problems involving scale drawings of congruent and similar geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.
7	7.G.B.3	Know the formulas for the area and circumference of a circle and use them to solve problems. Explore the relationships between the radius, the circumference, and the area of a circle, and the number π.

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GRADE	CODE	STANDARD
7	7.G.B.5	Solve real-world and mathematical problems involving area of two-dimensional figures composed of triangles, quadrilaterals, and polygons, and volume and surface area of three-dimensional objects composed of cubes and right prisms.
7	7.SP.D.8.a	Give quantitative measures of center (median and/or mean) and variability (range and/or interquartile range), 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.
8	8.NS.A.1	Know that real numbers that are not rational are called irrational (e.g., π, √2, etc.). Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually or terminates, and convert a decimal expansion which repeats eventually or terminates into a rational number.
8	8.NS.A.2	Use rational approximations of irrational numbers to compare the size of irrational numbers by locating them approximately on a number line diagram. Estimate the value of irrational expressions (such as π^2).
8	8.EE.B.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.C.8.a	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.
8	8.EE.C.8.b	Estimate solutions by graphing a system of two linear equations in two variables. Identify solutions by inspecting graphs of a system of linear equations in two variables.
8	8.F.A.3	Know and 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.B.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.B.4	Know and 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.B.5	Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.
8	8.G.C.6	Apply the formulas for the volumes of cones, cylinders, and spheres to solve real-world and mathematical problems.

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SCIENCE

8 STANDARDS

Based on the Tennessee state standards

GRADE	CODE	STANDARD
6	6.ETS1.2	Design, construct, and test a device that either minimizes or maximizes thermal energy transfer by combining solutions or parts of solutions to solve a problem that can be communicated and explained to others.
7	7.PS1.3	Develop a model to explain how changes to a system can be explained by changes in temperature and/or pressure and the effect of those changes on particle motion and/or spatial arrangement.
7	7.ETS1.1	Examine a problem from the medical field (e.g., prosthetic limbs, organ transplants) and design a solution taking into consideration the criteria, constraints, and relevant scientific principles of the problem that may limit possible solutions.
8	8.PS2.5	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.
8	8.PS2.6	Evaluate and interpret that for every force exerted on an object there is an equal force exerted in the opposite direction.
8	8.PS4.1	Develop and use models to represent the basic properties of waves in a system including frequency, amplitude, wavelength, and speed.
8	8.PS4.2	Construct explanations from observed patterns of wave behaviors to compare and contrast mechanical waves and electromagnetic waves based on refraction, reflection, transmission, absorption, and their behavior through a vacuum and/or various media.
8	8.PS4.3	Engage in argument from evidence to support the claim that digitized signals, sent as wave pulses, are more reliable than analog signals to transmit information in a system.

COMPUTER SCIENCE

8 STANDARDS

Based on the Tennessee state standards

GRADE	CODE	STANDARD
6–8	MS.FC.4	Understand how collaboration is essential to computer science and apply collaborative skills to develop computational solutions.
6–8	MS.AT.1	Use clearly named variables of various data types to create generalized algorithms.
6–8	MS.AT.2	Create algorithms which include methods of controlling the flow of computation using "if…then… else" type conditional statements to perform different operations depending on the values of inputs.
6–8	MS.AT.3	Identify algorithms that make use of sequencing, selection, or iteration.
6–8	MS.PC.1	Decompose problems and subproblems into parts to facilitate the design, implementation, and review of programs.
6–8	MS.PC.5	Use the iterative design process to systematically test and refine programs to improve performance and eliminate errors.
6–8	MS.PC.7	Design a function using a programming language.

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GRADE	CODE	STANDARD
6–8	MS.IC.1	Identify and evaluate the impacts computer science innovations have had on our society.

SOURCES & NOTES

- The official mathematics, science and computer science standards for Tennessee, as published by the Tennessee State Board of Education.
- 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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- A lesson-level crosswalk is available on request at info@truerobotics.org.

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