TRUE ROBOTICS

INTRODUCTION TO ROBOTICS WITH AXLE

GRADES 6–8

This document lists the Virginia 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 Virginia Department of Education.

39	11	9	59
MATH	SCIENCE	CS	TOTAL STANDARDS

MATHEMATICS

39 STANDARDS

Based on the Virginia state standards

GRADE	CODE	STANDARD
6	6.CE.1b	Multiply and divide fractions (proper or improper) and mixed numbers that include denominators of 12 or less. Answers are expressed in simplest form.
6	6.CE.1e	Estimate, determine, and justify the solution to single-step and multistep problems in context that involve multiplication and division with fractions (proper or improper) and mixed numbers that include denominators of 12 or less. Answers are expressed in simplest form.
6	6.CE.2c	Simplify an expression that contains absolute value bars | | and an operation with two integers (e.g., –|5 – 8| or |–12|/8) and represent the result on a number line.
6	6.MG.1a	Identify and describe chord, diameter, radius, circumference, and area of a circle.
6	6.MG.1b	Investigate and describe the relationship between: i) diameter and radius; ii) radius and circumference; and iii) diameter and circumference.
6	6.MG.1d	Develop the formula for circumference using the relationship between diameter, radius, and pi.
6	6.MG.1e	Solve problems, including those in context, involving circumference and area of a circle when given the length of the diameter or radius.
6	6.MG.2a	Develop the formula for determining the area of parallelograms and triangles using pictorial representations and concrete manipulatives (e.g., two-dimensional diagrams, grid paper).
6	6.MG.2b	Solve problems, including those in context, involving the perimeter and area of triangles and parallelograms.
6	6.MG.3c	Graph ordered pairs in the four quadrants and on the axes of a coordinate plane. Ordered pairs will be limited to coordinates expressed as integers.

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GRADE	CODE	STANDARD
6	6.MG.3f	Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to determine the length of a side joining points with the same first coordinate or the same second coordinate. Ordered pairs will be limited to coordinates expressed as integers. Apply these techniques in the context of solving contextual and mathematical problems.
6	6.PS.1a	Formulate questions that require the collection or acquisition of data with a focus on circle graphs.
6	6.PS.2c	Observe patterns in data to identify outliers and determine their effect on mean, median, mode, or range.
6	6.PFA.2a	Identify the unit rate of a proportional relationship represented by a table of values, a contextual situation, or a graph.
6	6.PFA.2e	Make connections between and among multiple representations of the same proportional relationship using verbal descriptions, ratio tables, and graphs.
6	6.PFA.3	The student will write and solve one-step linear equations in one variable, including contextual problems that require the solution of a one-step linear equation in one variable.
6	6.PFA.3a	Identify and develop examples of the following algebraic vocabulary: equation, variable, expression, term, and coefficient.
6	6.PFA.3e	Write a one-step linear equation in one variable to represent a verbal situation, including those in context.
6	6.PFA.4d	Use substitution or a number line graph to justify whether a given number in a specified set makes a linear inequality in one variable true.
7	7.CE.1	The student will estimate, solve, and justify solutions to multistep contextual problems involving operations with rational numbers.
7	7.CE.2	The student will solve problems, including those in context, involving proportional relationships.
7	7.MG.1a	Develop the formulas for determining the volume of right cylinders and solve problems, including those in contextual situations, using concrete objects, diagrams, and formulas.
7	7.MG.1b	Develop the formulas for determining the surface area of rectangular prisms and right cylinders and solve problems, including those in contextual situations, using concrete objects, two-dimensional diagrams, nets, and formulas.
7	7.MG.1c	Determine if a problem in context, involving a rectangular prism or right cylinder, represents the application of volume or surface area.
7	7.MG.1d	Describe how the volume of a rectangular prism is affected when one measured attribute is multiplied by a factor of 1/4, 1/3, 1/2, 2, 3, or 4, including those in contextual situations.
7	7.MG.2h	Apply proportional reasoning to solve problems in context including scale drawings. Scale factors shall have denominators no greater than 12 and decimals no less than tenths.
7	7.PFA.1a	Determine the slope, m, as the rate of change in a proportional relationship between two quantities given a table of values, graph, or contextual situation and write an equation in the form y = mx to represent the direct variation relationship. Slope may include positive or negative values (slope will be limited to positive values in a contextual situation).

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GRADE	CODE	STANDARD
7	7.PFA.1d	Graph a line representing a proportional relationship between two quantities given the equation of the line in the form y = mx, where m represents the slope as rate of change. Slope may include positive or negative values.
7	7.PFA.1e	Make connections between and among representations of a proportional relationship between two quantities using problems in context, tables, equations, and graphs. Slope may include positive or negative values (slope will be limited to positive values in a contextual situation).
7	7.PFA.2a	Use the order of operations and apply the properties of real numbers to simplify numerical expressions. Exponents are limited to 1, 2, 3, or 4 and bases are limited to positive integers. Expressions should not include braces { } but may include brackets [ ] and absolute value bars | |. Square roots are limited to perfect squares.
7	7.PFA.3	The student will write and solve two-step linear equations in one variable, including problems in context, that require the solution of a two-step linear equation in one variable.
8	8.NS.1b	Use rational approximations (to the nearest hundredth) of irrational numbers to compare, order, and locate values on a number line. Radicals may include both positive and negative square roots of values from 0 to 400 yielding an irrational number.
8	8.NS.2	The student will investigate and describe the relationship between the subsets of the real number system.
8	8.MG.2b	Determine the volume of cones and square-based pyramids, using concrete objects, diagrams, and formulas.
8	8.MG.4d	Determine the measure of a side of a right triangle, given the measures of the other two sides.
8	8.MG.4e	Apply the Pythagorean Theorem, and its converse, to solve problems involving right triangles in context.
8	8.MG.5	The student will solve area and perimeter problems involving composite plane figures, including those in context.
8	8.PFA.3b	Describe key characteristics of linear functions including slope (m), y-intercept (b), and independent and dependent variables.
8	8.PFA.3e	Write an equation of a linear function in the form y = mx + b, given a graph, table, or a situation in context.

SCIENCE

11 STANDARDS

Based on the Virginia state standards

GRADE	CODE	STANDARD
6	6.1a	The student will demonstrate an understanding of scientific and engineering practices by: asking questions and defining problems
6	6.1b	The student will demonstrate an understanding of scientific and engineering practices by: planning and carrying out investigations
6	PS.3a	pure substances can be identified based on their chemical and physical properties

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GRADE	CODE	STANDARD
6	PS.6	The student will investigate and understand that waves are important in the movement of energy.
6	PS.6c	waves can interact
6	PS.7a	electromagnetic radiation, including visible light, has wave characteristics and behavior
6	PS.9b	materials have different conductive properties
7	PS.1e	The student will demonstrate an understanding of scientific and engineering practices by: developing and using models
7	PS.5a	energy takes many forms
8	PS.2c	the kinetic molecular theory is used to predict and explain matter interactions
8	PS.8b	motion is described by Newton's laws

COMPUTER SCIENCE

9 STANDARDS

Based on the Virginia state standards

GRADE	CODE	STANDARD
6	6.AP.1b	Decompose an algorithm, problem, or process into sub-components.
6	6.AP.3c	Trace and predict outcomes of programs.
7	7.AP.1d	Contrast various algorithms to solve reasoning problems when accomplishing a task.
7	7.AP.2	The student will plan and implement algorithms that include sequencing, loops, variables, user input, conditional control structures, and functions using a block-based or text-based programming tool.
7	7.AP.2d	Read and write programs that contain nested conditionals and nested loops.
7	7.CSY.1c	Describe how hardware and software can be used together to collect and exchange data.
7	7.IC.1b	Analyze the implications of emerging technologies and potential real-world impact nationally and globally.
8	8.AP.1	The student will apply computational thinking to construct programs to accomplish a task as a means of creative expression or scientific exploration.
8	8.NI.1	The student will model and describe the role of computing devices in transmitting data in and on computing networks and the Internet.

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SOURCES & NOTES

- The official mathematics, science and computer science standards for Virginia, as published by the Virginia Department 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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