TRUE ROBOTICS

INTRODUCTION TO ROBOTICS WITH AXLE

GRADES 6–8

This document lists the North Carolina 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 North Carolina Department of Public Instruction.

33	8	9	50
MATH	SCIENCE	CS	TOTAL STANDARDS

MATHEMATICS

33 STANDARDS

Based on the North Carolina state standards

GRADE	CODE	STANDARD
6	NC.6.NS.1	Use visual models and common denominators to: • Interpret and compute quotients of fractions. • Solve real-world and mathematical problems involving division of fractions.
6	NC.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	NC.6.NS.9	Apply and extend previous understandings of addition and subtraction. • Describe situations in which opposite quantities combine to make 0. • Understand p + q as the number located a distance q from p, in the positive or negative direction depending on the sign of q. Show that a number and its additive inverse create a zero pair. • Understand subtraction of integers as adding the additive inverse, p – q = p + (–q). Show that the distance between two integers on the number line is the absolute value of their difference. • Use models to add and subtract integers from -20 to 20 and describe real-world contexts using sums and differences.
6	NC.6.EE.5	Use substitution to determine whether a given number in a specified set makes an equation true.
6	NC.6.EE.6	Use variables to represent numbers and write expressions when solving a real-world or mathematical problem.
6	NC.6.EE.7	Solve real-world and mathematical problems by writing and solving equations of the form: • x + p = q in which p, q and x are all nonnegative rational numbers; and, • p · x = q for cases in which p, q and x are all nonnegative rational numbers.
6	NC.6.EE.8	Reason about inequalities by: • Using substitution to determine whether a given number in a specified set makes an inequality true. • Writing an inequality of the form x > c or x < c to represent a constraint or condition in a real-world or mathematical problem. • Recognizing that inequalities of the form x > c or x < c have infinitely many solutions. • Representing solutions of inequalities on number line diagrams.

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GRADE	CODE	STANDARD
6	NC.6.EE.9	Represent and analyze quantitative relationships by: • Using variables to represent two quantities in a real-world or mathematical context that change in relationship to one another. • Analyze the relationship between quantities in different representations (context, equations, tables, and graphs).
6	NC.6.G.1	Create geometric models to solve real-world and mathematical problems to: • Find the area of triangles by composing into rectangles and decomposing into right triangles. • Find the area of special quadrilaterals and polygons by decomposing into triangles or rectangles.
6	NC.6.G.2	Apply and extend previous understandings of the volume of a right rectangular prism to find the volume of right rectangular prisms with fractional edge lengths. Apply this understanding to the context of solving real-world and mathematical problems.
6	NC.6.G.4	Represent right prisms and right pyramids 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	NC.6.SP.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	NC.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	NC.6.SP.5b	Analyze center and variability by: • Giving quantitative measures of center, describing variability, and any overall pattern, and noting any striking deviations. • Justifying the appropriate choice of measures of center using the shape of the data distribution.
7	NC.7.RP.1	Compute unit rates associated with ratios of fractions to solve real-world and mathematical problems.
7	NC.7.RP.2	Recognize and represent proportional relationships between quantities.
7	NC.7.RP.3	Use scale factors and unit rates in proportional relationships to solve ratio and percent problems.
7	NC.7.NS.1	Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers, using the properties of operations, and describing real-world contexts using sums and differences.
7	NC.7.NS.2b	Apply properties of operations as strategies, including the standard algorithms, to multiply and divide rational numbers and describe the product and quotient in real-world contexts.
7	NC.7.NS.2c	Use division and previous understandings of fractions and decimals. • Convert a fraction to a decimal using long division. • Understand that the decimal form of a rational number terminates in 0s or eventually repeats.
7	NC.7.NS.3	Solve real-world and mathematical problems involving numerical expressions with rational numbers using the four operations.
7	NC.7.EE.4a	Construct equations to solve problems by reasoning about the quantities. • Fluently solve multistep equations with the variable on one side, including those generated by word problems. • Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. • Interpret the solution in context.

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GRADE	CODE	STANDARD
7	NC.7.G.1	Solve problems involving scale drawings of geometric figures by: • Building an understanding that angle measures remain the same and side lengths are proportional. • Using a scale factor to compute actual lengths and areas from a scale drawing. • Creating a scale drawing.
7	NC.7.G.4	Understand area and circumference of a circle. • Understand the relationships between the radius, diameter, circumference, and area. • Apply the formulas for area and circumference of a circle to solve problems.
7	NC.7.G.6	Solve real-world and mathematical problems involving: • Area and perimeter of two-dimensional objects composed of triangles, quadrilaterals, and polygons. • Volume and surface area of pyramids, prisms, or three-dimensional objects composed of cubes, pyramids, and right prisms.
8	NC.8.NS.1	Understand that every number has a decimal expansion. Building upon the definition of a rational number, know that an irrational number is defined as a non-repeating, non-terminating decimal.
8	NC.8.NS.2	Use rational approximations of irrational numbers to compare the size of irrational numbers and locate them approximately on a number line. Estimate the value of expressions involving: • Square roots and cube roots to the tenths. • π to the hundredths.
8	NC.8.EE.8	Analyze and solve a system of two linear equations in two variables in slope-intercept form. • Understand that solutions to a system of two linear equations correspond to the points of intersection of their graphs because the point of intersection satisfies both equations simultaneously. • Solve real-world and mathematical problems leading to systems of linear equations by graphing the equations. Solve simple cases by inspection.
8	NC.8.F.3	Identify linear functions from tables, equations, and graphs.
8	NC.8.F.4	Analyze functions that model linear relationships. • Understand that a linear relationship can be generalized by y = mx + b. • Write an equation in slope-intercept form to model a linear relationship by determining the rate of change and the initial value, given at least two (x, y) values or a graph. • Construct a graph of a linear relationship given an equation in slope-intercept form. • Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of the slope and y-intercept of its graph or a table of values.
8	NC.8.G.7	Apply the Pythagorean Theorem and its converse to solve real-world and mathematical problems.
8	NC.8.G.8	Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.
8	NC.8.G.9	Understand how the formulas for the volumes of cones, cylinders, and spheres are related and use the relationship to solve real-world and mathematical problems.

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SCIENCE

8 STANDARDS

Based on the North Carolina state standards

GRADE	CODE	STANDARD
6	PS.6.1.2	Use models to explain the relationship between changes in thermal energy in a substance and the motion of its particles (including phase changes).
6	PS.6.1.3	Carry out investigations to compare the physical properties of pure substances that are independent of the amount of matter present including density, melting point, boiling point and solubility to properties that are dependent on the amount of matter present to include volume, mass and weight.
6	PS.6.2.4	Engage in argument from evidence to classify materials as conductors and insulators of energy (both thermal and electrical).
6	PS.6.3.1	Use models of a simple wave to explain wave properties in seismic, light, and sound waves that include: waves having a repeating pattern with a specific amplitude, frequency, and wavelength, and the amplitude of a wave is related to the energy of the wave.
6	PS.6.3.4	Use models to explain that various waves (seismic, sound, electromagnetic, including visible light) are reflected, absorbed or transmitted through various materials.
7	PS.7.1.2	Use models to illustrate the effects of balanced and unbalanced forces acting on an object (including friction, gravity, and magnetism).
7	PS.7.1.4	Analyze and interpret graphical data to summarize the motion of an object to show a change in distance over a period of time for constant speed and variable motion.
7	PS.7.2.1	Construct an explanation to summarize how kinetic and potential energy contribute to the mechanical energy of an object.

COMPUTER SCIENCE

9 STANDARDS

Based on the North Carolina state standards

GRADE	CODE	STANDARD
6–8	68-CS-02	Design projects that combine hardware and software components to collect and exchange data.
6–8	68-NI-01	Analyze different ways that data is transferred across a network and the role of protocols in transmitting data.
6–8	68-AP-02	Create clearly named variables that represent different data types.
6–8	68-AP-03	Design and iteratively develop programs that combine control structures including nested loops and compound conditionals.
6–8	68-AP-05	Organize problems and subproblems into parts.
6–8	68-AP-07	Create procedures with parameters to organize code and make it easier to reuse groups of instructions.
6–8	68-AP-10	Systematically test and refine programs using a range of test cases.
6–8	68-IC-01	Compare tradeoffs associated with computing technologies that affect everyday activities and career options.

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GRADE	CODE	STANDARD
6	68-DA-01	Represent data using multiple encoding schemes.

SOURCES & NOTES

- The official mathematics, science and computer science standards for North Carolina, as published by the North Carolina Department of Public Instruction.
- 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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