INTRODUCTION TO ROBOTICS WITH AXLE

GRADES 6–8

This document lists the Arizona 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 Arizona Department of Education.

37	6	12	55
MATH	SCIENCE	CS	TOTAL STANDARDS

MATHEMATICS

37 STANDARDS

Based on the Arizona state standards

GRADE	CODE	STANDARD
6	6.NS.A.1	Interpret and compute quotients of fractions to solve mathematical problems and problems in real-world context involving division of fractions by fractions using visual fraction models and equations to represent the problem.
6	6.NS.C.8	Solve mathematical problems and problems in real-world context 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 solving an equation or inequality as a process of reasoning to find the value(s) of the variables that make that 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.B.6	Use variables to represent numbers and write expressions when solving mathematical problems and problems in real-world context; understand that a variable can represent an unknown number or any number in a specified set.
6	6.EE.B.7	Solve mathematical problems and problems in real-world context 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 non-negative rational numbers.
6	6.EE.C.9	Use variables to represent two quantities that change in relationship to one another to solve mathematical problems and problems in real-world context. Write an equation to express one quantity (the dependent variable) in terms of the other quantity (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.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; apply these techniques to solve mathematical problems and problems in real-world context.

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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. Understand and use the formula V = B · h, where in this case, B is the area of the base (B = l x w) to find volumes of right rectangular prisms with fractional edge lengths in mathematical problems and problems in real-world context.
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 to solve mathematical problems and problems in real-world context.
6	6.SP.A.1	Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for variability in the answers.
6	6.SP.A.2	Understand that a set of data collected to answer a statistical question has a distribution whose general characteristics can be described by its center, spread, and overall shape.
6	6.SP.B.5c	Summarize numerical data sets in relation to their context by: Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.
7	7.RP.A.1	Compute unit rates associated with ratios involving both simple and complex fractions, including ratios of quantities measured in like or different units.
7	7.RP.A.2b	Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.
7	7.RP.A.2c	Represent proportional relationships by equations.
7	7.RP.A.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.A.3	Use proportional relationships to solve multi-step ratio and percent problems (e.g., simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error).
7	7.NS.A.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 context.
7	7.NS.A.1d	Apply properties of operations as strategies to add and subtract rational numbers.
7	7.NS.A.2c	Apply properties of operations as strategies to multiply and divide rational numbers.
7	7.NS.A.2d	Convert a rational number to decimal form using long division; know that the decimal form of a rational number terminates in 0's or eventually repeats
7	7.NS.A.3	Solve mathematical problems and problems in real-world context involving the four operations with rational numbers.
7	7.EE.B.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.

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GRADE	CODE	STANDARD
7	7.G.A.1	Solve problems involving scale drawings of geometric figures, such as computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.
7	7.G.B.4	Understand and use the formulas for the area and circumference of a circle to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.
7	7.G.B.6	Solve mathematical problems and problems in a real-world context involving area of two-dimensional objects composed of triangles, quadrilaterals, and other polygons. Solve mathematical problems and problems in real-world context involving volume and surface area of three-dimensional objects composed of cubes and right prisms.
8	8.NS.A.1	Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion. Know that numbers whose decimal expansions do not terminate in zeros or in a repeating sequence of fixed digits are called irrational.
8	8.NS.A.2	Use rational approximations of irrational numbers to compare the size of irrational numbers. Locate them approximately on a number line diagram, and estimate their values.
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.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.
8	8.EE.C.8b	Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations including cases of no solution and infinite number of solutions. Solve simple cases by inspection.
8	8.EE.C.8c	Solve mathematical problems and problems in real-world context leading to two linear equations in two variables.
8	8.F.A.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.B.4	Given a description of a situation, generate 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 a graph. Track how the values of the two quantities change together. Interpret the rate of change and initial value of a linear function in terms of the situation it models, its graph, or its table of values.
8	8.G.B.7	Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world context and mathematical problems in two and three dimensions.
8	8.G.B.8	Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.
8	8.G.C.9	Understand and use formulas for volumes of cones, cylinders and spheres and use them to solve real-world context and mathematical problems.

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SCIENCE

6 STANDARDS

Based on the Arizona state standards

GRADE	CODE	STANDARD
6	6.P1U1.1	Analyze and interpret data to show that changes in states of matter are caused by different rates of movement of atoms in solids, liquids, and gases (Kinetic Theory).
6	6.P1U1.2	Plan and carry out an investigation to demonstrate that variations in temperature and/or pressure affect changes in state of matter.
6	6.P4U2.5	Analyze how humans use technology to store (potential) and/or use (kinetic) energy.
7	7.P3U1.4	Use non-algebraic mathematics and computational thinking to explain Newton's laws of motion.
8	8.P1U1.2	Obtain and evaluate information regarding how scientists identify substances based on unique physical and chemical properties.
8	8.P4U1.4	Develop and use mathematical models to explain wave characteristics and interactions.

COMPUTER SCIENCE

12 STANDARDS

Based on the Arizona state standards

GRADE	CODE	STANDARD
6	6.CS.HS.1	Explain how hardware and software can be used to collect and exchange data.
6	6.DA.S.1	Identify multiple encoding schemes used to represent data, including binary and ASCII.
6	6.AP.C.1	Design programs that combine control structures, including nested loops and compound conditionals.
6	6.AP.M.1	Decompose problems into parts to facilitate the design, implementation, and review of programs.
6	6.AP.PD.3	Test programs using a range of inputs and identify expected outputs.
6	6-8.4.b	Students select and use digital tools to support a design process and expand their understanding to identify constraints and trade-offs and to weigh risks.
7	7.AP.C.1	Design and develop programs that combine control structures, including nested loops and compound conditionals.
7	7.IC.C.1	Explain how some of the tradeoffs associated with computing technologies can affect people's everyday activities and career options.
8	8.NI.NCO.1	Develop models to illustrate the role of protocols in transmitting data across networks and the Internet.
8	8.AP.V.1	Create named variables that represent different data types and perform operations on their values.
8	8.AP.C.1	Design and iteratively develop programs that combine control structures, including nested loops and compound conditionals.
8	8.AP.M.2	Create procedures with parameters to organize code and make it easier to reuse.

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SOURCES & NOTES

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