INTRODUCTION TO ROBOTICS WITH AXLE

GRADES 6–8

This document lists the South Dakota 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 South Dakota Department of Education.

36	8	8	52
MATH	SCIENCE	CS	TOTAL STANDARDS

MATHEMATICS

36 STANDARDS

Based on the South Dakota 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 is a process in which you determine values from a set that make an 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	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 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 = 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.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.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.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	Summarize numerical data sets in relation to their context, such as 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.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.1	Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

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GRADE	CODE	STANDARD
7	7.G.4	Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.
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 numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats or terminates. Convert a decimal expansion which repeats or terminates into a rational number.
8	8.NS.2	Use rational approximations of irrational numbers to compare the size of irrational numbers. Locate irrational numbers approximately on a number line diagram, and estimate the value of expressions such as (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 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.8b	Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection.
8	8.EE.8c	Solve real-world and mathematical problems involving leading to two linear equations in one and/or two variables.
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	Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

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SCIENCE

8 STANDARDS

Based on the South Dakota state standards

GRADE	CODE	STANDARD
6	MS-PS4-1	Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.
6	MS-PS4-2	Develop and use a model to describe how waves are reflected, absorbed, or transmitted through various materials.
6	MS-PS4-3	Obtain, evaluate and communicate information to support an evidence-based claim for the reliability of digitized signals to encode and transmit information compared to analog signals.
6	MS-ETS1-1	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, considering relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
7	MS-PS3-1	Construct and analyze graphical displays of data to describe the relationships of kinetic energy to the mass and to the speed of an object.
8	MS-PS1-4	Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.
8	MS-PS2-1	Design a solution to a problem involving the motion of two colliding objects that illustrates Newton's Third Law.
8	MS-PS2-2	Plan 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.

COMPUTER SCIENCE

8 STANDARDS

Based on the South Dakota state standards

GRADE	CODE	STANDARD
6–8	6-8.CS.02	Design projects that combine hardware and software components to collect and exchange data.
6–8	6-8.NI.01	Simulate the flow of information as packets on the Internet and networks.
6–8	6-8.AP.02	Create clearly named variables that represent different data types and perform operations on their values.
6–8	6-8.AP.03	Design and iteratively develop programs that combine control structures, including nested loops and compound conditionals.
6–8	6-8.AP.04	Decompose problems and subproblems into parts to facilitate the design, implementation, and review of programs.
6–8	6-8.AP.05	Create procedures with parameters to organize code and make it easier to reuse.
6–8	6-8.AP.08	Systematically test and refine programs using a range of test cases.
6–8	6-8.IC.01	Compare tradeoffs associated with computing technologies that affect people's everyday activities and career options in South Dakota and the world, as well as urban, rural, and reservation communities.

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SOURCES & NOTES

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