INTRODUCTION TO ROBOTICS WITH AXLE

GRADES 6–8

This document lists the Kansas 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 Kansas State Department of Education and the NGSS Lead States, as adopted by Kansas.

35	8	6	49
MATH	SCIENCE	CS	TOTAL STANDARDS

MATHEMATICS

35 STANDARDS

Based on the Kansas 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, requiring multiple exposures connecting various concrete and abstract models.
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.4	Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the 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.5	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.6	Write and solve one-step equations involving non-negative rational numbers using addition, subtraction, multiplication, and division.
6	6.EE.8	Use variables to represent two quantities in a real-world problem that change in relationship to one another.
6	6.G.1	Find the area of all triangles, special quadrilaterals (including parallelograms, kites, and trapezoids), and polygons whose edges meet at right angles (rectilinear figure 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 applying the formulas V = lwh and V = Bh (B is the area of the base and h is the height) 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 and generate 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	Analyze a set of data collected to answer a statistical question with a distribution which can be described by its center (mean, median and/or mode), spread (range and/or interquartile range), and overall shape (cluster, peak, gap, symmetry, skew (data) and/or outlier).
6	6.SP.5c	Summarize numerical data sets in relation to their context, such as by: Giving quantitative measures of center (mean, median and/or mode) and variability (range and/or interquartile range), 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	Analyze a table or graph and recognize that, in a proportional relationship, every pair of numbers has the same unit rate (referred to as the "m").
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	Model subtraction of rational numbers as adding the additive inverse, p - q = p + (-q).
7	7.NS.1d	Model subtraction as the distance between two rational numbers on the number line where the distance is the absolute value of their difference.
7	7.NS.1e	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 and interpret 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 (efficiently, accurately, and flexibly). 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, such as computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.
7	7.G.4	Use the formulas for the area and circumference of a circle and solve problems; give an informal derivation of the relationship between the circumference and area of a circle.

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GRADE	CODE	STANDARD
7	7.G.6	Solve real-world and mathematical problems involving area of two-dimensional objects and volume and surface area of three-dimensional objects including cylinders 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 eventually and convert a decimal expansion which repeats eventually into a rational number.
8	8.NS.2	Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π^2).
8	8.EE.4	Graph proportional relationships, interpreting its unit rate as the slope (m) of the graph. Compare two different proportional relationships represented in different ways.
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.8	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.9	Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.
8	8.G.10	Use the formulas or informal reasoning to find the arc length, areas of sectors, surface areas and volumes of pyramids, cones, and spheres.
8	8.G.12	Solve real-world and mathematical problems involving arc length, area of two-dimensional shapes including sectors, volume, and surface area of three-dimensional objects including pyramids, cones and spheres.

SCIENCE

8 STANDARDS

Based on the Kansas 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 that waves are reflected, absorbed, or transmitted through various materials.
6	MS-PS4-3	Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.

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GRADE	CODE	STANDARD
6	MS-ETS1-1	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
7	MS-PS3-1	Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object 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	Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.
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

6 STANDARDS

Based on the Kansas state standards

GRADE	CODE	STANDARD
6–8	MG.CS.HS.01	Model a computing system involving multiple considerations and potential tradeoffs of software and hardware, such as functionality, cost, size, speed, accessibility, and aesthetics
6–8	MG.NI.NCO.01	Explain protocols and their importance to data transmission; model how packets are broken down into smaller pieces and how they are delivered.
6–8	MG.AP.C.01	Develop programs that utilize combinations of nested repetition, compound conditionals, procedures without parameters, and the manipulation of variables representing different data types.
6–8	MG.AP.M.01	Decompose problems and subproblems into parts to facilitate the design, implementation, and review of complex programs.
6–8	MG.AP.PD.03	Systematically test and refine programs using a range of student created inputs.
6–8	MG.IC.C.01	Describe the trade-offs associated with computing technologies (e.g. automation), explaining their effects on economies and global societies, and explore careers related to the field of computer science.

SOURCES & NOTES

- The official mathematics, science and computer science standards for Kansas, as published by the Kansas State Department of Education and the NGSS Lead States, as adopted by Kansas.
- 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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