INTRODUCTION TO ROBOTICS WITH AXLE

GRADES 6–8

This document lists the Montana 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 Montana Office of Public Instruction.

31	6	9	46
MATH	SCIENCE	CS	TOTAL STANDARDS

MATHEMATICS

31 STANDARDS

Based on the Montana state standards

GRADE	CODE	STANDARD
6	MT.6.NS.1	Represent, interpret, and compute quotients of fractions and solve problems in context involving division of fractions by fractions.
6	MT.6.NS.8	Graph points in all four quadrants of the coordinate plane and include the use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate. This standard should incorporate cultural context relating to Montana Indigenous Peoples and local communities.
6	MT.6.EE.4	Understand how to solve an equation or inequality as a process by using substitution to determine whether a given number in a specified set makes an equation or inequality true.
6	MT.6.EE.5	Write expressions when solving problems in context and understand that a variable can represent an unknown number, or any number in a specified set.
6	MT.6.EE.6	Solve problems including problems in context by writing and solving equations of the form $x + p = q$ and $p \cdot x = q$ for cases in which p, q, and x are all nonnegative rational numbers.
6	MT.6.EE.8	Use variables to represent two quantities that change in relationship to one another, analyze the relationship between the dependent and independent variables using graphs and tables, and write an equation to express one quantity in terms of the other. This standard should incorporate cultural context relating to Montana Indigenous Peoples and local communities.
6	MT.6.G.1	Find the area of triangles, quadrilaterals, and other polygons by composing them into rectangles or decomposing them into triangles and other shapes. This standard should incorporate cultural context relating to Montana Indigenous Peoples and local communities.

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GRADE	CODE	STANDARD
6	MT.6.G.2	Find the volume of a right rectangular prism with fractional edge lengths by filling it with unit cubes of the appropriate unit fraction edge lengths and connect and apply the formulas V = l·w·h and V = B·h to find volumes of right rectangular prisms with fractional edge lengths to solve problems in context.
6	MT.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 in problems including problems in context. This standard should incorporate cultural context relating to Montana Indigenous Peoples and local communities.
6	MT.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	MT.6.SP.2	Understand that a set of data collected to answer a statistical question has a distribution that can be described by its center, spread, and overall shape. This standard should incorporate cultural context relating to Montana Indigenous Peoples and local communities.
6	MT.6.SP.4	Display numerical data in plots on a number line, including dot plots, histograms, and box plots, and describe any overall pattern and any striking deviations from the overall pattern with reference to the context from which the data were gathered.
6	MT.6.SP.5	Characterize numerical data sets from a sample in relation to their context, such as by: Finding quantitative measures of central tendency (mode, median, and/or mean) and variability (interquartile range and/or mean absolute deviation), for numerical data sets and relating the choice of measures of central tendency and variability to the shape of the data distribution and the context in which the data were gathered.
7	MT.7.RP.1	Compute unit rates associated with ratios of fractions, measured in like or different units.
7	MT.7.RP.2	Recognize and represent proportional relationships between quantities, using tables, graphs, and equations
7	MT.7.RP.3	Use proportional relationships to solve multi-step ratio and percent problems, including problems in context that involve simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, and percent error. This standard should incorporate cultural context relating to Montana Indigenous Peoples and local communities.
7	MT.7.NS.1	Add and subtract rational numbers, represent addition and subtraction on a horizontal or vertical number line diagram, and understand subtraction as adding the additive inverse p – q = p + (–q).
7	MT.7.NS.2	Multiply and divide rational numbers and use operations of rational numbers to solve problems in context. This standard should incorporate cultural context relating to Montana Indigenous Peoples and local communities.
7	MT.7.EE.4	Use variables to represent quantities and construct simple equations and inequalities to solve problems in context. This standard should incorporate cultural context relating to Montana Indigenous Peoples and local communities by: Solving, accurately and efficiently, problems in context leading to equations of the form p·x + q = r and p(x + q) = r, where p, q, and r are specific rational numbers, comparing an algebraic solution to an arithmetic solution, and identifying the sequence of the operations used in each approach
7	MT.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	MT.7.G.3	Know and use the formulas for the area and circumference of a circle and give an informal derivation of the relationship between the circumference and area of a circle. This standard should incorporate cultural context relating to Montana Indigenous Peoples and local communities.
7	MT.7.G.5	Solve geometrical problems including problems in context that involve area, volume, and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms. This standard should incorporate cultural context relating to Montana Indigenous Peoples and local communities.
8	MT.8.NS.1	Know real numbers are made up of rational and irrational numbers, understand informally that every number has a decimal expansion, and convert a decimal expansion which repeats eventually into a rational number.
8	MT.8.NS.2	Use rational approximations of irrational numbers to compare the value of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions.
8	MT.8.EE.5	Graph proportional relationships, interpret the unit rate as the slope of the graph, and compare two different proportional relationships as tables, graphs, and equations.
8	MT.8.EE.8	Analyze and solve pairs of simultaneous linear equations
8	MT.8.F.3	Interpret the equation y = mx + b as defining a linear function whose graph is a straight line with slope m passing through the point (0, b).
8	MT.8.F.4	Given linear data relating two quantities, construct a linear function that models the data and interpret the rate of change and initial value of a linear function in terms of the situation it models.
8	MT.8.G.7	Apply the Pythagorean Theorem to determine unknown side lengths in right triangle problems, including problems in context in two and three dimensions. This standard should incorporate cultural context relating to Montana Indigenous Peoples and local communities.
8	MT.8.G.8	Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.
8	MT.8.G.9	Know, use, and apply the formulas for the volumes of cones, cylinders, and spheres to solve problems, including problems in context.

SCIENCE

6 STANDARDS

Based on the Montana state standards

GRADE	CODE	STANDARD
6	MT.6-8.PS.17	use mathematical representations to describe a simple model for waves that includes how the amplitude and wavelength of a wave is related to the energy in a wave
6	MT.6-8.PS.18	develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials
7	MT.6-8.PS.12	construct and interpret graphic displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object

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GRADE	CODE	STANDARD
8	MT.6-8.PS.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	MT.6-8.PS.7	apply Newton's Third Law of Motion to design a solution to a problem involving the motion of two colliding objects
8	MT.6-8.PS.8	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

9 STANDARDS

Based on the Montana state standards

GRADE	CODE	STANDARD
6–8	CS.AP.6-8.1	use algorithms to address complex problems
6–8	CS.AP.6-8.2	create clearly named variables that represent different data types and perform operations on their values
6–8	CS.AP.6-8.3	develop programs that combine control structures, including nested loops and compound conditionals
6–8	CS.AP.6-8.4	decompose problems and subproblems into parts to facilitate the design, implementation, and review of programs
6–8	CS.AP.6-8.5	create procedures with parameters to organize code and make it easier to reuse
6–8	CS.AP.6-8.8	systematically test and refine programs using a range of test cases
6–8	CS.CS.6-8.2	design projects that combine hardware and software components to collect and exchange data
6–8	CS.IC.6-8.1	compare tradeoffs associated with computing technologies that affect people's everyday activities and career options in Montana and the world, urban, rural, and reservation communities
6–8	CS.NI.6-8.3	demonstrate how information is broken down and transmitted through multiple devices over networks and the internet and reassembled at the destination

SOURCES & NOTES

- The official mathematics, science and computer science standards for Montana, as published by the Montana Office 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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- A lesson-level crosswalk is available on request at info@truerobotics.org.

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