INTRODUCTION TO ROBOTICS WITH AXLE

GRADES 6–8

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

37	12	10	59
MATH	SCIENCE	CS	TOTAL STANDARDS

MATHEMATICS

37 STANDARDS

Based on the Maryland state standards

GRADE	CODE	STANDARD
6	6.NOS.A.1	Divide fractions by fractions in context.
6	6.NOS.C.9	Solve problems in context by graphing points (with the same first coordinate or the same second coordinate) in all four quadrants of the Coordinate Plane.
6	6.AT.C.8	Solve problems in context by writing and solving equations and interpreting the solutions in context.
6	6.AT.C.8a	Explain that a variable can represent an unknown number and use substitution to determine whether a given number makes an equation true.
6	6.AT.C.10a	Explain that a variable can represent an unknown number in a set and use substitution to determine whether a given number in a set makes an inequality true.
6	6.AT.D.11	Use variables to represent two quantities in context that change in relationship to one another.
6	6.GR.A.1	Find the area of triangles, quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and quadrilaterals to solve problems.
6	6.GR.A.2	Find the volume of a right rectangular prism with fractional edge lengths.
6	6.GR.A.4	Represent three-dimensional figures (triangular prism, rectangular prism, pyramid) using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures to solve problems.
6	6.DS.A.1	Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers (e.g., "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students' ages).

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GRADE	CODE	STANDARD
6	6.DS.A.3	Explain how 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.DS.B.6c	Give quantitative measures of center (median and/or mean) and variability (interquartile range), as well as describing outliers with reference to the context in which the data were gathered.
7	7.NOS.A.1c	Rewrite subtraction as addition using the additive inverse ($p - q = p + (-q)$). Use strategies such as number lines and applying absolute value of the difference to determine the distance between two rational numbers and solve problems in context.
7	7.NOS.A.2c	Use properties of operations to multiply and divide rational numbers flexibly and efficiently.
7	7.NOS.A.2d	Analyze the decimal representation of a quotient resulting from dividing rational numbers to determine whether it terminates or repeats and use this pattern to explain why all rational numbers have decimal forms that either terminate or repeat.
7	7.NOS.A.3	Solve multistep problems involving positive and negative rational numbers in any form (i.e., fractions, decimals, percents) using all four operations.
7	7.NOS.A.3a	Apply properties of operations to efficiently compute with rational numbers and convert between forms when appropriate to support problem solving.
7	7.AT.A.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.AT.A.2b	Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and narrative descriptions of proportional relationships.
7	7.AT.A.3a	Represent proportional relationships using equations.
7	7.AT.A.3b	Explain what a point (x, y) on the graph of a proportional relationship represents in terms of the context, with special attention to the points (0, 0) and (1, r), where r is the unit rate.
7	7.AT.A.4	Solve ratio and percent problems in context (e.g., simple interest, tax, markups and markdowns, tips, commissions, fees, percent increase or decrease, and percent error) by applying proportional reasoning.
7	7.AT.C.8	Use variables to represent quantities and write and solve equations to model and reason about relationships in context.
7	7.GR.A.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.
7	7.GR.B.3	Apply the formulas for the area and circumference of a circle to solve problems in context. Use informal reasoning and visual models to explain the relationship between the circumference and area of a circle.
7	7.GR.B.4a	Solve problems involving area, surface area, and volume of polygonal figures and polyhedral solids, including triangles, quadrilaterals, other polygons, cubes, right prisms, and pyramids—figures defined by edges and flat faces.
7	7.GR.B.4b	Solve problems involving volume of curved-surface solids, including cones, cylinders, and spheres—figures without edges.
8	8.NOS.A.1	Identify a number as irrational when its decimal expansion neither terminates nor repeats, and explain that irrational numbers cannot be expressed as the ratio of two integers.

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GRADE	CODE	STANDARD
8	8.NOS.A.2	Use rational approximations of irrational numbers to estimate their locations on a number line, compare their size, and apply this understanding to estimate the value of expressions (e.g., π^2) in context.
8	8.AT.A.1	Analyze and compare proportional relationships using slope.
8	8.AT.B.5a	Interpret the solution to a system of two linear equations as the point where their graphs intersect and verify that the coordinates of the intersection satisfy both equations.
8	8.AT.B.5b	Solve systems of two linear equations by graphing and substitution. When using graphing, find an approximate or exact solution depending on the precision of the graph. Select a method strategically based on the structure of the system or the context of the problem and explain why the method is appropriate.
8	8.AT.B.5d	Model and solve contextual problems using systems of two linear equations.
8	8.AT.C.8	Identify whether a function is linear or non-linear given equations, graphs, or input-output pairs, and provide a justification using reasoning about the constant rate of change and its relationship to proportional reasoning.
8	8.AT.D.10	Construct and interpret a linear function to model a relationship between two quantities.
8	8.GR.B.5a	Determine unknown side lengths in right triangles.
8	8.GR.B.5b	Find the distance between two points in a coordinate system using the Pythagorean Theorem.

SCIENCE

12 STANDARDS

Based on the Maryland 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.
6	MS-LS1-3	Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.
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.
7	MS-LS2-3	Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.

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GRADE	CODE	STANDARD
7	MS-LS2-4	Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
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.
8	MS-LS4-5	Gather and synthesize information about technologies that have changed the way humans influence the inheritance of desired traits in organisms.

COMPUTER SCIENCE

10 STANDARDS

Based on the Maryland state standards

GRADE	CODE	STANDARD
6	6.CS.HS.01	Identify ways that hardware and software are combined and work synchronously to collect, store, retrieve, and exchange data.
6	6.NI.NCO.01	Model a simple protocol for transferring information, using packets, across networks and the internet
6	6.AP.C.01	Develop secure programs that utilize combinations of loops, conditionals, and the manipulation of variables representing different data types.
6	6.AP.M.01	Decompose problems and subproblems into parts to facilitate the secure design, implementation, and review of programs.
6	6.AP.PD.03	Test and refine existing and original programs.
7	7.AP.A.01	Select and modify existing algorithms and pseudocode to solve complex problems.
7	7.IC.C.01	Explain how computing impacts people's everyday activities, career options, and diversity in innovation in computing and non-computing fields.
8	8.AP.A.01	Develop and implement algorithms and pseudocode to solve complex problems.
8	8.AP.C.01	Develop secure programs that utilize combinations of nested loops, compound conditionals, procedures with and without parameters, and the manipulation of variables representing different data types.
8	8.IC.C.01	Compare the tradeoffs associated with computing concepts (e.g., automation, communication, privacy, cybersecurity), explaining their effects on economics and global societies.

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SOURCES & NOTES

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