

### Concepts by Discipline: National Council of Teachers of Mathematics, Grades 6-8

Projects and Investigations	Full Speed Ahead	Right Face	Clap On, Clap Off	Follow the Guidelines	Obstacle Detection	Get in Gear	Wheels and Distance	Measured Turns	Frequency vs. Amplitude	Faster Line Tracking	Field of View	Gears and Speeds	Hello My Name Is...	Full Stop	Ramp It Up
<b>Standard 1: Number and Operations</b>															
<b>1.0 All students should understand numbers, ways of representing numbers, relationships among numbers, and number systems</b>															
1.1 Work flexibly with fractions, decimals, and percents to solve problems			X	X			X	X		X	X	X			
1.4 Understand and use ratios and proportions to represent quantitative relationships							X	X	X	X	X	X			
<b>2.0 All students should understand meanings of operations and how they relate to one another</b>															
2.1 Understand the meaning and effects of arithmetic operations with fractions, decimals, and integers			X	X			X	X		X	X	X			
2.2 Use the associative and commutative properties of addition and multiplication and the distributive property of multiplication over addition to simplify computations							X					X			

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3.0 All students should compute fluently and make reasonable estimates															
3.1 Select appropriate methods and tools for computing with fractions and decimals from among mental computation, estimation, calculators or computers, and paper and pencil, depending on the situation, and apply the selected methods	X	X	X	X			X	X		X	X	X			
3.4 Develop and explain methods for solving problems involving proportions, such as scaling and finding equivalent ratios							X	X			X	X			

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<b>Standard 2: Algebra</b>															
<b>1.0 All students should understand patterns, relations, and functions</b>															
1.1 Represent, analyze, and generalize a variety of patterns with tables, graph, words, and , when possible, symbolic rules						X	X		X		X	X			
1.2 Relate and compare different forms of representation for relationships subjected to a force						X			X		X	X			X
<b>2.0 All students should represent and analyze mathematical situations and structures using algebraic symbols</b>															
2.1 Develop an initial conceptual understanding of different uses of variables							X	X	X		X	X			
2.2 Use symbolic algebra to represent situations and to solve problems especially those that involve linear relationships						X	X	X				X			

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3.0 All students should: Use mathematical models to represent and understand quantitative relationships															
3.1 Model and solve contextualized problems using various representations, such as graphs, tables, and equations							X	X	X	X	X	X			X
4.0 All students should: Analyze change in various contexts															
Use graphs to analyze the nature of changes in quantities in linear relationships									X						

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<b>Standard 3: Geometry</b>															
1.0 All students should: analyze characteristics and properties of two- and three-dimensional shapes and develop mathematical arguments about geometric relationships															
1.1 Describe, classify , and understand relationships among types of two- and three-dimensional objects using their defining properties						X	X	X				X			X
1.2 Understand relationships among the angles, side lengths, perimeters, areas, and volumes of similar objects						X	X	X							X
2.0 All students should: Specify locations and describe spatial relationships using coordinate geometry and other representational systems															
2.1 Use coordinate geometry to represent and examine the properties of geometric shapes;											X				

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4.0 All students should: Use visualization, spatial reasoning, and geometric modeling to solve problems															
4.4 Use geometric models to represent and explain numerical and algebraic relationships							X	X			X				X
4.5 Recognize and apply geometric ideas and relationships in area outside the mathematics classroom, friction, safety and aesthetics						X	X	X			X	X			X
<b>Standard 4: Measurement</b>															
1.0 All students should: Understand measurable attributes of objects and the units, systems, and processes of measurement															
1.1 Understand both metric and customary systems of measurement							X	X			X	X			
1.2 Understand relationships among units and convert from one unit to another within the same system							X	X	X			X			
1.3 Understand, select, and use units of appropriate size and type to measure angles, perimeter, area...			X	X	X	X	X	X	X		X	X			

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2.0 All students should apply appropriate techniques, tools, and formulas to determine measurements															
2.1 Use common benchmarks to select appropriate methods for estimating measurements						X	X	X			X	X			
2.2 Apply techniques and tools to accurately find length, area...and angle measures to appropriate levels of precision			X	X		X	X	X	X	X	X	X			
2.3 Develop and use formulas to determine the circumference of circles and the area of triangles...and circles							X	X				X			
2.5 Solve problems involving scale factors, using ratio and proportion							X	X			X	X			
2.6 Solve problems involving rates and derived measurements for ...velocity							X		X	X		X			

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<b>Standard 5: Data Analysis and Probability</b>															
2.0 All students should formulate questions that can be addressed with data collect, organize, and display relevant data to answer them															
2.1 Find, use and interpret measures of center and spread, including mean			X	X			X	X				X			
3.0 All students should develop and evaluate inferences and predictions that are based on data															
3.3 Use conjectures to formulate new questions and plan new studies to answer them	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
<b>Standard 6: Problem Solving</b>															
1.0 Build new mathematical knowledge through problem solving	X	X	X	X	X	X	X	X	X		X	X			X
2.0 Solve problems that arise in mathematics and in other contexts	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3.0 Apply and adapt a variety of appropriate strategies to solve problems	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
4.0 Monitor and reflect on the process of mathematical problem solving				X			X	X	X		X	X			X

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<b>Standard 7: Reasoning and Proof</b>															
1.0 Recognize reasoning and proof as fundamental aspects of mathematics							X	X	X			X			
2.0 Make and investigate mathematical conjectures							X	X				X			X
3.0 Develop and evaluate mathematical arguments							X	X				X			X
<b>Standard 8: Communication</b>															
1.0 Organize and consolidate mathematical thinking through communication						X	X	X	X		X	X			X
2.0 Communicate mathematical thinking coherently and clearly to peers, teachers, and others.						X	X	X	X		X	X			X
3.0 Analyze and evaluate the mathematical thinking and strategies of others							X	X	X		X	X			X

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<b>Standard 9: Connections</b>															
1.0 Recognize and use connections among mathematical ideas		X	X			X	X	X	X		X	X			X
3.0 Recognize and apply mathematics in contexts outside of mathematics		X	X	X	X	X	X	X	X	X	X	X			X
<b>Standard 10: Representation</b>															
1.0 Create and use representations to organize, record, and communicate mathematical ideas		X					X	X	X		X	X			
2.0 Select, apply, and translate among mathematical representations to solve problems								X				X			
3.0 Use representations to model and interpret physical, social, and mathematical phenomena	X	X			X		X	X	X	X	X	X			X