

## ICS Lower Secondary Math Standards

Adopted from NCTM

### Numbers and Operations Standards

#### N1. Understand numbers, ways of representing numbers, relationships among numbers, and number systems

Benchmark	Grade 6	Grade 7	Pre-Algebra	Algebra 1
N1a. Work flexibly with fractions, decimals, and percents to solve problems				
N1b. Compare and order fractions, decimals, and percents efficiently and find their approximate locations on a number line				
N1c. Develop meaning for percents greater than 100 and less than 1				
N1d. Understand and use ratios and proportions to represent quantitative relationships	Begin			
N1e. Develop an understanding of large numbers and recognize and appropriately use exponential, scientific, and calculator notation				
N1f. Use factors, multiples, prime factorization, and relatively prime numbers to solve problems				
N1g. Develop meaning for integers and represent and compare quantities with them				

**N2. Understand meanings of operations and how they relate to one another**

<b>Benchmark</b>	<b>Grade 6</b>	<b>Grade 7</b>	<b>Pre-Algebra</b>	<b>Algebra 1</b>
N2a. Understand the meaning and effects of arithmetic operations with fractions, decimals, and integers				
N2b. Use the associative and commutative properties of addition and multiplication and the distributive property of multiplication over addition to simplify computations with integers, fractions, and decimals				
N2c. Understand and use the inverse relationships of addition and subtraction, multiplication and division, and squaring and finding square roots to simplify computations and solve problems				

**N3. Compute fluently and make reasonable estimates**

<b>Benchmark</b>	<b>Grade 6</b>	<b>Grade 7</b>	<b>Pre-Algebra</b>	<b>Algebra 1</b>
N3a. 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				
N3b. Develop and analyze algorithms for computing with fractions, decimals, and integers and develop fluency in their use				

N3c. Develop and use strategies to estimate the results of rational-number computations and judge the reasonableness of the results				
N3d. Develop, analyze, and explain methods for solving problems involving proportions, such as scaling and finding equivalent ratios				

## Algebra Standards

### **A1. Understand patterns, relations, and functions**

<b>Benchmark</b>	<b>Grade 6</b>	<b>Grade 7</b>	<b>Pre-Algebra</b>	<b>Algebra 1</b>
A1a. Represent, analyze, and generalize a variety of patterns with tables, graphs, words, and, when possible, symbolic rules				
A1b. Relate and compare different forms of representation for a relationship				
A1c. Identify functions as linear or nonlinear and contrast their properties from tables, graphs, or equations				

### **A2. Represent and analyze mathematical situations and structures using algebraic symbols**

<b>Benchmark</b>	<b>Grade 6</b>	<b>Grade 7</b>	<b>Pre-Algebra</b>	<b>Algebra 1</b>
A2a. Develop an initial conceptual understanding of different uses of variables				

A2b. Explore relationships between symbolic expressions and graphs of lines, paying particular attention to the meaning of intercept and slope				
A2c. Use symbolic algebra to represent situations and to solve problems, especially those that involve linear relationships				
A2d. Recognize and generate equivalent forms for simple algebraic expressions and solve linear equations				

### A3. Use mathematical models to represent and understand quantitative relationships

Benchmark	Grade 6	Grade 7	Pre-Algebra	Algebra 1
A3a. Model and solve contextualized problems using various representations, such as graphs, tables, and equations				

### A4. Analyze change in various contexts

Benchmark	Grade 6	Grade 7	Pre-Algebra	Algebra 1
A4a. Use graphs to analyze the nature of changes in quantities in linear relationships				

**Geometry Standards****G1. Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships**

<b>Benchmark</b>	<b>Grade 6</b>	<b>Grade 7</b>	<b>Pre- Algebra</b>	<b>Algebra 1</b>
G1a. Precisely describe, classify, and understand relationships among types of two- and three-dimensional objects using their defining properties				
G1b. Understand relationships among the angles, side lengths, perimeters, areas, and volumes of similar objects				
G1c. Create and critique inductive and deductive arguments concerning geometric ideas and relationships, such as congruence, similarity, and the Pythagorean relationship		Begin		

**G2. Specify locations and describe spatial relationships using coordinate geometry and other representational systems**

<b>Benchmark</b>	<b>Grade 6</b>	<b>Grade 7</b>	<b>Pre- Algebra</b>	<b>Algebra 1</b>
G2a. Use coordinate geometry to represent and examine the properties of geometric shapes				
G2b. Use coordinate geometry to examine special geometric shapes, such as regular polygons or those with pairs of parallel or perpendicular sides				

**G3. Apply transformations and use symmetry to analyze mathematical situations**

<b>Benchmark</b>	<b>Grade 6</b>	<b>Grade 7</b>	<b>Pre-Algebra</b>	<b>Algebra 1</b>
G3a. Describe sizes, positions, and orientations of shapes under informal transformations such as flips, turns, slides, and scaling				
G3b. Examine the congruence, similarity, and line or rotational symmetry of objects using transformations			Begin	

**G4. Use visualization, spatial reasoning, and geometric modeling to solve problems**

<b>Benchmark</b>	<b>Grade 6</b>	<b>Grade 7</b>	<b>Pre-Algebra</b>	<b>Algebra 1</b>
G4a. Draw geometric objects with specified properties, such as side lengths or angle measures	Begin			
G4b. Use two-dimensional representations of three-dimensional objects to visualize and solve problems such as those involving surface area and volume		Begin		
G4c. Use visual tools such as networks to represent and solve problems		Begin		
G4d. Use geometric models to represent and explain numerical and algebraic relationships		Begin		
G4e. Recognize and apply geometric ideas and relationships in areas outside the mathematics classroom, such as art, science, and everyday life		Begin		

**Measurement Standards****M1. Understand measurable attributes of objects and the units, systems, and processes of measurement**

<b>Benchmark</b>	<b>Grade 6</b>	<b>Grade 7</b>	<b>Pre- Algebra</b>	<b>Algebra 1</b>
M1a. Understand both metric and customary systems of measurement				
M1b. Understand relationships among units and convert from one unit to another within the same system				
M1c. Understand, select, and use units of appropriate size and type to measure angles, perimeter, area, surface area, and volume		Begin		

**M2. Apply appropriate techniques, tools, and formulas to determine measurements**

<b>Benchmark</b>	<b>Grade 6</b>	<b>Grade 7</b>	<b>Pre- Algebra</b>	<b>Algebra 1</b>
M2a. Use common benchmarks to select appropriate methods for estimating measurements				
M2b. Select and apply techniques and tools to accurately find length, area, volume, and angle measures to appropriate levels of precision	Begin			
M2c. Develop and use formulas to determine the circumference of circles and the area of triangles, parallelograms, trapezoids, and circles and develop strategies to find the area of more-complex shapes		Begin		

M2d. Develop strategies to determine the surface area and volume of selected prisms, pyramids, and cylinders		Begin		
M2e. Solve problems involving scale factors, using ratio and proportion		Begin		
M2f. Solve simple problems involving rates and derived measurements for such attributes as velocity and density				

### Data Analysis and Probability Standards

**DP1. Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them**

Benchmark	Grade 6	Grade 7	Pre-Algebra	Algebra 1
DP1a. Formulate questions, design studies, and collect data about a characteristic shared by two populations or different characteristics within one population				
DP1b. Select, create, and use appropriate graphical representations of data, including histograms, box plots, and scatterplots				

**DP2. Select and use appropriate statistical methods to analyze data**

<b>Benchmark</b>	<b>Grade 6</b>	<b>Grade 7</b>	<b>Pre-Algebra</b>	<b>Algebra 1</b>
DP2a. Find, use, and interpret measures of center and spread, including mean and interquartile range	Begin		Begin	
DP2b. Discuss and understand the correspondence between data sets and their graphical representations, especially histograms, stem-and-leaf plots, box plots, and scatterplots	Begin			

**DP3. Develop and evaluate inferences and predictions that are based on data**

<b>Benchmark</b>	<b>Grade 6</b>	<b>Grade 7</b>	<b>Pre-Algebra</b>	<b>Algebra 1</b>
DP3a. Use observations about differences between two or more samples to make conjectures about the populations from which the samples were taken	Begin			
DP3b. Make conjectures about possible relationships between two characteristics of a sample on the basis of scatterplots of the data and approximate lines of fit	Begin			
DP3c. Use conjectures to formulate new questions and plan new studies to answer them				

**DP4. Understand and apply basic concepts of probability**

<b>Benchmark</b>	<b>Grade 6</b>	<b>Grade 7</b>	<b>Pre- Algebra</b>	<b>Algebra 1</b>
DP4a. Understand and use appropriate terminology to describe complementary and mutually exclusive events		Begin		
DP4b. Use proportionality and a basic understanding of probability to make and test conjectures about the results of experiments and simulations	Begin	Begin		
DP4c. Compute probabilities for simple compound events, using such methods as organized lists, tree diagrams, and area models	Begin			

**Mathematical Process Standards****P1. Develop and use problem solving skills**

<b>Benchmark</b>	<b>Grade 6</b>	<b>Grade 7</b>	<b>Pre- Algebra</b>	<b>Algebra 1</b>
P1a. Build new mathematical knowledge through problem solving				
P1b. Solve problems that arise in mathematics and in other contexts				
P1c. Apply and adapt a variety of appropriate strategies to solve problems				
P1d. Monitor and reflect on the process of mathematical problem solving				

**P2. Develop and use mathematical reasoning and proof**

<b>Benchmark</b>	<b>Grade 6</b>	<b>Grade 7</b>	<b>Pre-Algebra</b>	<b>Algebra 1</b>
P2a. Recognize reasoning and proof as fundamental aspects of mathematics				
P2b. Make and investigate mathematical conjectures				
P2c. Develop and evaluate mathematical arguments and proofs				
P2d. Select and use various types of reasoning and methods of proof				

**P3. Communicate mathematical thinking clearly**

<b>Benchmark</b>	<b>Grade 6</b>	<b>Grade 7</b>	<b>Pre-Algebra</b>	<b>Algebra 1</b>
P3a. Organize and consolidate their mathematical thinking through communication				
P3b. Communicate their mathematical thinking coherently and clearly to peers, teachers, and others				
P3c. Analyze and evaluate the mathematical thinking and strategies of others			Briefly	
P3d. Use the language of mathematics to express mathematical ideas precisely			Briefly	

**P4. Connect mathematical ideas inside and outside of mathematical contexts**

<b>Benchmark</b>	<b>Grade 6</b>	<b>Grade 7</b>	<b>Pre-Algebra</b>	<b>Algebra 1</b>
P4a. Recognize and use connections among mathematical ideas				
P4b. Understand how mathematical ideas interconnect and build on one another to produce a coherent whole				
P4c. Recognize and apply mathematics in contexts outside of mathematics				

**P5. Represent mathematical ideas clearly**

<b>Benchmark</b>	<b>Grade 6</b>	<b>Grade 7</b>	<b>Pre-Algebra</b>	<b>Algebra 1</b>
P5a. Create and use representations to organize, record, and communicate mathematical ideas				
P5b. Select, apply, and translate among mathematical representations to solve problems				
P5c. Use representations to model and interpret physical, social, and mathematical phenomena	Briefly			