HARFORD COUNTY PUBLIC SCHOOLS
PREALGEBRA CURRICULUM

CLICK HERE for the Maryland College and Career Ready Standards for Grade 6 Mathematics.

CLICK HERE for the Maryland College and Career Ready Standards for Grade 7 Mathematics.

Unit 1: Reading and Writing Numbers

Primary Resource: *Transition Mathematics,* 3rd ed., University of Chicago School Mathematics.

Enduring Understandings

- The set of real numbers is infinite, and each real number can be associated with a unique point on the number line.
- For a given set of numbers there are relationships that are always true, and these are the rules that govern arithmetic and algebra.

Essential Questions

- How does a given number line dictate which real numbers can be realistically associated on the number line?
- How does a modified number line measure more accurately?
- Why is it important to maintain rules when evaluating expressions with addition, subtraction, multiplication, division, and parentheses?
- How can real numbers model real-world situations to help solve problems?

Lesson Title	Lesson Overview	Standards
The Number Line	Students will determine relationships between numbers as well as placement of numbers on a number line.	7.NS.A.1a 7.NS.A.1b 7.NS.A.1c 7.NS.A.1d
Situations with Negative Numbers	Students will solve real-world and mathematical problems involving negative numbers.	6.NS.C.5 6.NS.C.6a 6.NS.C.6c 6.NS.C.7a 6.NS.C.7b

Rational Numbers and Names for Decimal Places	Students will solve real-world and mathematical problems involving rational numbers.	6.NS.C.7b
Intervals, Tick Marks, and Comparing Decimals	Students will create number lines and determine appropriate intervals.	6.NS.C.6c
Powers of 10 and Other Numbers	Students will evaluate numerical expressions involving powers of 10 and will use a number line to both compute and compare two quantities.	6.EE.A.1
More Powers of 10	Students will evaluate numerical expressions involving positive and negative powers of 10 and will use number lines and tables to both compute and compare two quantities.	6.EE.A.1
Order of Operations	Students will simplify numerical expressions involving powers and other mathematical operations.	6.EE.A.1 6.EE.A.3
Other Grouping Symbols	Students will simplify numerical expressions involving powers and other mathematical operations.	6.EE.A.1 6.EE.A.3
Plotting Points on Coordinate Graphs	Students will use integer and rational coordinates to label points on a number line.	6.NS.C.8
Properties of Numbers	Students will use properties to write equivalent expressions.	6.EE.A.3

Unit 2: Using Variables

Primary Resource: *Transition Mathematics,* 3rd ed., University of Chicago School Mathematics.

Enduring Understandings

- Mathematical situations and structures can be represented abstractly using variables, expressions, and equations.
- Any number, measure, numerical expression, algebraic expression, or equation can be represented in an infinite number of ways that have the same value.

Essential Questions

- How are some situations or mathematical phrases represented as algebraic expressions?
- How can any given algebraic expression be written in different but equivalent ways?
- How can algebraic expressions model real-world situations to help solve problems?

Lesson Title	Lesson Overview	Standards
Expressions, Equations, and Inequalities	Students will identify and differentiate between mathematical expressions, equations, and inequalities that represent real-world situations.	6.EE.A.2a 6.EE.A.2b
Translating Words into Algebraic Expressions	Students will represent real-world and mathematical problems with variables and expressions.	6.EE.A.2a 6.EE.A.2b 6.EE.A.3 6.EE.A.4
Evaluating Algebraic Expressions	Students will evaluate algebraic expressions.	6.EE.A.2a 6.EE.A.2b 6.EE.A.2c
Expressions and Formulas	Students will evaluate expressions and mathematical formulas.	6.EE.A.2c 6.EE.A.3 6.EE.B.6
Open Sentences	Students will solve equations and inequalities using number sense and mental math.	6.EE.A.2c 6.EE.A.3 6.EE.A.4 7.EE.B.4b
Graphing Inequalities	Students will represent solutions to simple inequalities on a number line.	6.EE.B.6 7.EE.B.4b

Unit 3: Representing Numbers

Primary Resource: *Transition Mathematics,* 3rd ed., University of Chicago School Mathematics.

Enduring Understandings

- Numbers, expressions, and measures can be compared by their relative values.
- Numerical calculations can be approximated by replacing numbers with other numbers that are close and easy to compute with mentally.

Essential Questions

- How can values be compared when they are written in different forms?
- When is approximating a calculation advantageous to finding an exact value?
- How can fractions model real-world situations to help solve problems?

Lesson Title	Lesson Overview	Standards
Fraction Frenzy	Students will perform mathematical operations with fractions.	5.NF.A 5.NF.B
Equal Fractions/ Adding and Subtracting Fractions	Students will perform mathematical operations with fractions.	7.NS.A.1b 7.NS.A.1c 7.NS.A.1d
Estimating by Rounding	Students will solve real-world and mathematical problems using rounding and estimation.	5.NBT.A.4
Fraction-Decimal Equivalence	Students will compare rational numbers in different forms. Students will convert rational numbers to other forms.	7.NS.A.2d
Fraction, Decimals, and Percents	Students will compare rational numbers in different forms. Students will convert rational numbers to other forms.	6.RP.A.3a 6.RP.A.3c
Using Percents	Students will solve real-world and mathematical problems involving percents.	6.RP.A.3a 6.RP.A.3c

Operations with Fractions and Decimals	Students will extend their understanding of equivalent fractions and decimals by adding, subtracting, and using the order of operations with expressions that include both fractions and decimals.	7.NS.A.1a 7.NS.A.1d 7.NS.A.2d
Classifying Numbers	Students will sort, classify, and categorize various types of numbers.	6.NS.C.6c

Unit 4: Patterns Leading to Addition and Subtraction

Primary Resource: *Transition Mathematics,* 3rd ed., University of Chicago School Mathematics.

Enduring Understandings

- For a given set of numbers there are relationships that are always true, and these are the rules that govern arithmetic and algebra.
- Basic facts and algorithms for operations with rational numbers use notions of equivalence to transform calculations into simpler ones.

Essential Questions

- How do addition and subtraction rules lead to simpler expressions?
- How can addition and subtraction operations be used to create equivalence of expressions and equations?
- How can algebraic expressions model real-world situations to help solve problems?

Lesson Title	Lesson Overview	Standards
Adding Integers	Students will explore various methods for adding integers.	7.NS.A.1a 7.NS.A.1b 7.NS.A.1d
Absolute Value	Students will understand absolute value in the context of different real-world and mathematical situations.	6.NS.C.7c 7.NS.A.1b 7.NS.A.1c
Rules for Adding Positive and Negative Numbers	Students will solve real-world and mathematical problems involving combinations of positive and negative numbers.	6.NS.B.4 7.NS.A.1a 7.NS.A.1b 7.NS.A.1c 7.NS.A.1d
Subtracting with Integer Tiles	Students will model subtraction of integers using two-color counters.	7.NS.A.1a 7.NS.A.1c
Models for Subtraction	Students will understand that subtracting rational numbers is the same as adding the additive inverse, $p - q = p + (-q)$.	7.NS.A.1a 7.NS.A.1c

Connecting Addition and Subtraction	Students will understand that subtracting rational numbers is the same as adding the additive inverse, $p - q = p + (-q)$. Students will understand that the rules for adding integers apply to all rational numbers.	7.NS.A.1a 7.NS.A.1c
Solving $x + a = b$	Students will be able to write and solve one-variable equations that represent real-world and mathematical problems.	6.EE.B.5 6.EE.B.7
Writing Equations	Students will be able to write and solve one-variable equations by reasoning about real-world situations.	6.EE.B.7 6.EE.C.9 7.EE.B.3
Solving $x + a < b$	Students will solve word problems leading to inequalities, graph the solution set, and interpret the solutions in the context of the problem.	6.EE.B.8 6.EE.C.9 7.EE.B.3

Unit 5: Multiplication in Geometry

Primary Resource: *Transition Mathematics,* 3rd ed., University of Chicago School Mathematics.

Enduring Understandings

- Relationships can be described, and generalizations made for mathematical situations that have numbers of objects that repeat in predictable ways.
- Two- and Three-dimensional objects with or without curved surfaces can be described, classified, and analyzed by their attributes.

Essential Questions

- How can generalities of number properties be used to apply to the study of multiplication? (ex. Commutative, Associative, and Distributive Properties).
- How can the attributes of triangles and quadrilaterals be used to distinctly describe and classify them?
- How are the attributes of circles distinct from those of triangles and quadrilaterals?
- How can geometric figures model real-world situations to help solve problems?

Lesson Title	Lesson Overview	Standards
Area Models	Students will explore numeric and algebraic properties and simplify numeric and algebraic expressions using the area model for multiplication.	7.NS.1d 7.NS.2c
Dimensions and Area, Commutative Property of Multiplication	Students will find a missing dimension given the area of a rectangle, will understand rectangular arrays, and will plot the vertices of a rectangle on a coordinate plane and find its area. Students will use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate.	6.G.A.1 6.G.A.3
Multiplication of Fractions	Students will solve real-world and mathematical problems involving multiplying fractions. Students will find reciprocals of numbers that are given first as decimals or mixed numbers.	7.NS.A.2a
The Distributive Property	Students will write equivalent expressions using the Distributive Property.	6.EE.A.2c 6.EE.A.3 6.EE.A.4

The Area of a Triangle The Area of a Trapezoid	Students will solve real-world and mathematical problems involving the area of right triangles, other triangles, and trapezoids.	6.G.A.1 7.G.B.6
Circles	Students will solve real-world and mathematical problems involving the formulas for area and circumference. Students will find the diameter of a circle given its area. Students will give an informal derivation of the relationship between the circumference and area of a circle.	7.G.B.4
The Size-Change Model for Multiplication	Students will solve real-world or mathematical problems involving size change factors that are either an expansion or a contraction.	7.G.A.1

Unit 6: Multiplication in Algebra

Primary Resource: *Transition Mathematics,* 3rd ed., University of Chicago School Mathematics.

Enduring Understandings

- Relationships can be described, and generalizations made for mathematical situations that have numbers or objects that repeat in predictable ways.
- Rules of arithmetic and algebra can be used together with notions of equivalence to transform equations and inequalities so solutions can be found.

Essential Questions

- What value(s) of the unknown will make the equation or inequality true?
- What equivalent equation/inequality will transform the given equation/inequality?
- What are the multiplication algorithms for fractions, decimals, and integers?
- How can algebraic expressions model real-world situations to help solve problems?

Lesson Title	Lesson Overview	Standards
Understanding Multiplication	In order to recognize equivalent relationships, students will solve real-world and mathematical problems involving repeated addition and/or multiplicative reasoning.	6.EE.A.3 6.NS.B.3 7.RP.A.3
Multiplication as Shortcut for Addition	Students will simplify numerical and algebraic expressions involving multiplication. Students will connect repeated addition on a number line to multiplication.	6.EE.A.3 6.NS.B.3
The Rate-Factor Model for Multiplication	Students will connect rate factors to multiplication to solve real-world and mathematical problems.	6.RP.A.2 6.RP.A.3b 6.RP.A.3d
Operations with Decimals – Add, Subtract, and Multiply. No Division.	Students will be able to solve real-world problems involving the four operations with decimals.	7.NS.A.3
Multiplication with Negative Numbers	Students will view multiplication of positive and negative numbers as repeated addition.	7.NS.A.3

Solving Equations with Manipulatives	Students will use mathematics and manipulatives to model situations and solve for unknown values using one- and two-step equations.	SMP4 6.EE.B.7
Solving $ax = b$	To solve real-world and mathematical problems, in an equation, students will eliminate a coefficient of a variable by multiplying both sides of an equation by the reciprocal of the coefficient.	6.EE.B.7 7.EE.B.3
Solving $ax + b = c$	Students will solve real-world and mathematical problems involving two-step equations.	7.EE.B.4a
Solving $ax + b < c$	Students will solve real-world and mathematical problems involving two-step inequalities. Students will graph solutions to inequalities on a number line.	7.EE.B.4b

Unit 7: Patterns Leading to Division

Primary Resource: *Transition Mathematics,* 3rd ed., University of Chicago School Mathematics.

Enduring Understandings

- Relationships can be described, and generalizations made for mathematical situations that have numbers or objects that repeat in predictable ways.
- Basic facts and algorithms for operations with rational numbers use notions of equivalence to transform calculations into simpler ones.

Essential Questions

- What patterns are found when multiplying or dividing decimals by powers of 10?
- How is fraction division related to an equivalent multiplication calculation?
- What equivalent equation/inequality will transform the given equation/inequality?
- How can algebraic expressions model real-world situations to help solve problems?

Lesson Title	Lesson Overview	Standards
Understanding Division	Students will develop a mathematical model to solve a problem involving fraction division.	6.NS.A.1
Long Division	Students will apply and extend prior knowledge of division with whole numbers to division with decimals.	6.NS.B.2 6.NS.B.3
Integer Division	Students will apply and extend prior knowledge of division with positive numbers to division with negative numbers.	6.NS.B.2
Rate Model for Division	Students will solve real-world and mathematical problems involving division by using unit rates.	6.RP.A.2 6.RP.A.3b
Division of Fractions	Students will solve real-world and mathematical problems involving division of fractions.	6.NS.A.1
Division with Negative Numbers	Students will solve real-world and mathematical problems involving division of fractions of positive and negative numbers.	6.NS.A.1 7.NS.A.2b 7.NS.A.3

Division in Equations and Inequalities	Students will solve real-world and mathematical problems involving two-step equations and inequalities.	6.NS.A.1 7.EE.B.3 7.NS.A.2b 7.NS.A.2c

Unit 8: Ratios and Proportional Relationships

Primary Resource: *Transition Mathematics,* 3rd ed., University of Chicago School Mathematics.

Enduring Understandings

- Mathematical situations and structures can be translated and represented abstractly using variables, expressions, and equations.
- If two quantities vary proportionally, that relationship can be represented as a linear function.

Essential Questions

- How are variables used to represent unknowns in equations and relationships between quantities?
- How are proportions a relationship between relationships?
- How can proportions model real-world situations to help solve problems?

Lesson Title	Lesson Overview	Standards
Rate Exploration	Students will develop a mathematical model to solve a problem involving ratios.	6.RP.A.3b 7.EE.B.3 7.RP.A.1
Ratios	Students will represent real-world and mathematical situations using ratios.	6.RP.A.1 6.RP.A.2 7.RP.A.1
Rate Tables	Students will use ratio tables to solve real-world and mathematical problems.	6.RP.A.3a 6.RP.A.3d 7.RP.A.2a
Double Number Lines	Students will extend and use a double number line diagram to solve real-world and mathematical ratio problems.	6.RP.A.3a 7.EE.B.3 7.RP.A.1
Tape Diagrams	Students will develop an intuitive understanding of equivalent ratios by using tape diagrams to represent and solve problems. Students will formalize a definition of equivalent ratios.	6.RP.A.3a 7.EE.B.3 7.RP.A.1 7.RP.A.3

The Rate Model for Division	Students will solve constant rate work problems by calculating and comparing unit rates.	6.RP.A.3a 7.EE.B.3 7.RP.A.1 7.RP.A.3
Percent of a Number	Students will solve real-world and mathematical problems involving percents.	7.EE.B.3 7.RP.A.1 7.RP.A.3
The Ratio-Comparison Model for Division	Students will use proportional relationships to solve multistep ratio and percent problems.	7.EE.B.3 7.RP.A.1 7.RP.A.3
Proportional Thinking	Students will use proportional relationships to solve multistep ratio and percent problems.	7.EE.B.3 7.RP.A.1 7.RP.A.3
Constant of Proportionality	Students will represent proportional relationships with verbal statements, tables, graphs, and equations.	7.EE.B.3 7.RP.A.1 7.RP.A.3

Unit 9: Linear Equations and Inequalities

Primary Resource: *Transition Mathematics,* 3rd ed., University of Chicago School Mathematics.

Enduring Understandings

- Rules of arithmetic and algebra can be used together with notions of equivalence to transform equations and inequalities so solutions can be found.

Essential Questions

- How might solutions to equations or inequalities be found in multiple ways?
- How will properties of equations/inequalities be used to generate equivalent equations/ inequalities to find solutions?
- How can linear equations and inequalities model real-world situations to help solve problems?

Lesson Title	Lesson Overview	Standards
Solving Equations with Manipulatives II	Students will use mathematics to model real-world situations and solve for unknown values.	7.EE.B.4a 8.EE.C.7b
Review Solving Equations that require Combining Like Terms as well as the Distributive Property	Students will solve multi-step equations, including those that require expanding expressions using the Distributive Property and collecting like terms.	7.EE.B.4a 8.EE.C.7b
Solving $ax + b = cx + d$	Students will solve multi-step equations, including those that require expanding expressions using the Distributive Property and collecting like terms.	7.EE.B.4a 8.EE.C.7b
One, None or Infinitely Many Solutions	Students will solve equations that have one solution, no solutions, or infinitely many solutions.	7.EE.B.4a 8.EE.C.7a 8.EE.C.7b
Solving $ax + b < cx + d$	Students will solve multi-step inequalities, including those that require expanding expressions using the Distributive Property and collecting like terms.	7.EE.B.4b
Linear Combinations	Students will write equations in standard form and then solve for one of the variables given a value for the other.	7.EE.B.4a 8.EE.C.7b

Unit 10: Statistics and Probability

Primary Resource: *Transition Mathematics,* 3rd ed., University of Chicago School Mathematics.

Enduring Understandings

- Rules of arithmetic and algebra can be used together with notions of equivalence to transform equations and inequalities so solutions can be found.
- Some questions can be answered by collecting and analyzing data, and the question to be answered determines the data that needs to be collected and how best to collect it.
- Data can be represented visually using tables, charts, and graphs. The type of data determines the best choice of visual representation.

Essential Questions

- How do we determine whether a selected sample is appropriate to describe and make predictions?
- Why would some data displays be misleading or not good indicators to mirror a population?
- How can real-world data be represented and summarized to help solve problems?

Lesson Title	Lesson Overview	Standards
Data Collection and Displays	Students will determine the importance of displaying data in a way that accurately represents the information.	6.SP.B.4
Summarizing and Describing Distributions	Students will distinguish between statistical questions and those that are not statistical. Students will distinguish between categorical data and numerical data.	7.SP.A.1 7.SP.A.2 7.SP.B.3 7.SP.B.4 7.SP.C.5
Posing Statistical Questions	Students will formulate a statistical question and explain what data could be collected to answer the question.	6.SP.A.1
Displaying a Data Distribution Using Statistical Questions	Given a dot plot, students will describe the distribution of the points on the dot plot in terms of center and variability.	6.SP.A.2 6.SP.B.4
Creating a Histogram	Students will construct a frequency histogram and recognize that the number of intervals used may affect the shape of the histogram.	6.SP.B.4

Describing the Center of a Distribution Using the Median	Given a data set, students will determine the median of the data.	6.SP.A.3 6.SP.B.5c
Describing the Center of a Distribution Using the Mean	Students will describe the center of a data distribution using a *fair share* value called the *mean*. Students will connect the *fair share* concept with the mathematical formula for finding the mean.	6.SP.A.3 6.SP.B.5c
Variability in a Data Distribution	Students will describe a data distribution using its mean as well as its variability. Students will informally evaluate how precise the mean is as an indicator of a typical value for a distribution, based on the variability.	6.SP.A.2 6.SP.A.3 6.SP.B.5c
Mean Absolute Deviation (MAD)	Students will calculate the mean absolute deviation for a given data set and interpret the value as the average distance of the data values from the mean.	6.SP.A.2 6.SP.A.3 6.SP.B.5c
Describing Distributions Using the Mean and the MAD	Students will calculate the mean and MAD for a data distribution and use the values to describe a data distribution in terms of center and variability.	6.SP.A.2 6.SP.A.3 6.SP.B.5c 6.SP.B.5d
Describing Distributions Using the Mean and the MAD	Students will use the mean and MAD to describe a data distribution in terms of center and variability and describe similarities and differences between two distributions.	6.SP.A.2 6.SP.A.3 6.SP.B.5c 6.SP.B.5d
Describing Variability Using the Interquartile Range (IQR)	Given a set of data, students will describe how the data might have been collected as well as the unit of measurement for observations in a data set. They will calculate the median of the data and describe the variability in the data by calculating the interquartile range.	6.SP.A.2 6.SP.B.5c 6.SP.B.5d
Summarizing a Distribution Using a Box Plot	Students will construct a box plot from a given set of data.	6.SP.B.4 6.SP.B.5c

Connecting Graphical Representations and Numerical Summaries	Students will match numerical summaries to graphical representations of distributions (dot plots and histograms).	6.SP.B.4 6.SP.B.5c
Comparing Data Distributions	Given box plots, students will identify similarities and differences in data distributions.	6.SP.B.4 6.SP.B.5c
Describing Center, Variability, and Shape of a Data Distribution from a Graphical Representation	Given a frequency histogram, students will estimate the values of the mean and mean absolute deviation or the median and interquartile range.	6.SP.B.4 6.SP.B.5c 6.SP.B.5d
Use Probability Models	Students will develop a probability model and use it to evaluate a situation and make an estimate.	7.SP.C.5 7.SP.C.7a 7.SP.C.8b
Determine Outcomes of Compound Events	Students will use a tree diagram, a table, or an organized list to represent the sample space for a compound event.	7.SP.C.5 7.SP.C.8a 7.SP.C.8b
Find Probabilities of Compound Events	Students will organize information about a compound event on a table, tree diagram, or an organized list. Students will find the probability of a compound event.	7.SP.C.5 7.SP.C.8a 7.SP.C.8b
Simulate Compound Events	Students will use different tools to simulate a compound event. They will model a real-world situation involving a compound event and predict its outcome using a simulation.	7.SP.C.6 7.SP.C.7a 7.SP.C.7b

Unit 11: Geometry

Primary Resource: *Transition Mathematics,* 3rd ed., University of Chicago School Mathematics.

Enduring Understandings

- Two- and three-dimensional objects with or without curved surfaces can be described, classified, and analyzed by their attributes.

Essential Questions

- How are a point, line, line segment and plane core attributes of space objects?
- How does measurement of selected attributes of an object (length, area, mass, volume, capacity) affect a comparison of the object being measured against a unit of the same attribute?
- How can geometric figures model real-world situations to help solve problems?

Lesson Title	Lesson Overview	Standards
Area and Perimeter	Students will identify the relationship between the area and perimeter of rectangles.	6.G.A.1 7.G.B.6
Introduction to Constructions	Students will use compasses and straightedges to copy segments and to construct a triangle from three segments.	7.G.A.2
Angles and Lines	Students will write and solve simple equations for unknown angle measures and use facts about supplementary, complementary, vertical, and adjacent angles in multi-step problems.	7.G.B.5
The Triangle-Sum Property	Students will write and solve simple equations for unknown angle measures and use facts about supplementary, complementary, vertical, and adjacent angles in multi-step problems.	7.G.B.5
Solve Problems Involving Scale Drawings	Students will use a scale drawing as a representation of actual lengths and areas.	7.G.A.1
Calculating the Distance Between Points	Students will solve real-world and mathematical problems involving the Pythagorean Theorem and distances between coordinate points.	6.NS.C.8
2-Dimensional Nets for 3-Dimensional Shapes	Students will solve real-world and mathematical problems by representing 3-dimensional figures using nets made up of rectangles and triangles.	6.G.A.4

2-Dimensional Views of 3-Dimensional Figures	Students will describe the 2-dimensional figures that result from slicing 3-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.	7.G.A.3
Surface Area and Volume of a Box	Students will find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths and then showing that the volume would be the same as would be found by multiplying the edge lengths of the prism. Students will apply the formulas $V = lwh$ and $V = Bh$ to find volumes of right rectangular prisms.	6.G.A.2 7.G.B.6
Surface Areas of Prisms	Students will find the surface area of prisms.	7.G.B.6
Volume of Composite Figures	Students will compute volumes of three-dimensional objects composed of right prisms by using the fact that volume is additive.	7.G.B.6