



LEARNING PREP SCHOOL

Math Curriculum

Middle School, Grades 5-8

Statement:

Learning Prep School common core values and program components are consistent with the mission stated by the DESE curriculum frameworks which noted the following goals: to articulate and assess high quality learning standards, identify, develop, and disseminate a rich array of resources and tools, to support high quality professional development, facilitate opportunities for educators to network, and to actively communicate and collaborate with our partners.

The LPS middle school students are being taught from the Number Worlds Math Curriculum, which is an intervention curriculum offering research-proven approaches to instructional teaching. Math connections are made through daily math lessons. Flexible and adaptable lesson structures are provided. Students are exposed to a variety of daily warm ups (through activities and hands-on games and/or digital activities), engaging instructional lessons, and given a chance to reflect through critical thinking before progress monitoring through weekly quizzes and assessments.

All middle school students are taught at their instructional level. For example, an 8th grader with an instructional level of grade 4 skills, will be taught in a grade 4 curriculum. Students are exposed to higher level concepts when appropriate.

Goal:

Information in math is presented to students according to the guidelines of an effective language-based program and the use of “best practices” to plan, modify, and teach curriculum. The approach considers instruction for the “whole student” and goes far beyond the basic presentation of information. Students are given opportunities to work towards improvement in the following areas (in relation to math):

- Learning organizational and study skills through the use of consistent work and social routines, charts/organizers, models, and expectations.
- Receptive and expressive language development in the areas of math vocabulary, sequencing, cause/effect, categorization, problem solving, memorization, etc.
- Pragmatic language skills including staying on topic, taking turns, asking/answering math related questions, reading non-verbal messages and body language.
- Social skills development including learning and working in staff mediated interactive, small group formats.

The “gradual release of responsibility” is encouraged to foster the development of independence in all students dealing with learning and social challenges (both growing in chronological years and progressing through academic levels). In addition, the department heads and 8th and 9th grade teachers in the Math Department meet to ensure continuity of programming during the transition from Middle School to High School.

Assessment:

Instruction for middle school students is aligned with the Number Worlds Math Curriculum, which is an intervention curriculum offering research-proven approaches to instructional teaching.

Assessments allow teachers to monitor students, including evaluating proficiency. Assessments come in many forms.

- Placement tests are available for visiting and incoming new students to informally assess their skill levels to improve appropriate placement in the correct level upon enrollment.
- Informal assessments are ongoing during all class lessons and activities through observation and discussions.
- Formal assessments occur throughout the year.
 - Pretests: given at the start of each new unit as a “show what you know” assessment before immersing students in the content.
 - Weekly assessments: measure concepts covered throughout the previous 4 lessons and provide immediate feedback for the teacher on current concepts being taught.
 - Unit assessments: given at the end of each unit and cover the skills taught during the previous 6 weeks.

Curriculum Overview

MATHEMATICS grade 5

Operations and Algebraic Thinking:

- Write and interpret numerical expressions.
- Analyze patterns and relationships.

Number and Operations in Base Ten:

- Understand the place value system.
- Perform operations with multi-digit whole numbers and with decimals to hundredths.

Number and Operations- Fractions:

- Use equivalent fractions as a strategy to add and subtract fractions.
- Apply and extend previous understandings of multiplication and division to multiply and divide fractions.

Measurement and Data:

- Convert like measurement units within a given measurement system.
- Represent and interpret data.
- Geometric measurement: Understand concepts of volume and relate volume to multiplication and to addition.

Geometry:

- Graph points on the coordinate plane to solve real-world and mathematical problems.
- Classify two-dimensional figures into categories based on their properties.

MATHEMATICS grade 6

Ratios and Proportional Relationships:

- Understand ratio and rate concepts and use ratio reasoning to solve problems.

The Number System:

- Apply and extend previous understandings of multiplication and division to divide fractions.
- Compute fluently with multi-digit numbers and find common factors and multiples.
- Apply and extend previous understandings of numbers to the system of rational numbers.

Expressions and Equations:

- Apply and extend previous understandings of arithmetic to algebraic expressions.
- Reason about and solve one-variable equations and inequalities.
- Represent and analyze quantitative relationships between dependent and independent variables.

Geometry:

- Solve real-world and mathematical problems involving area, surface area, and volume.

Statistics and Probability:

- Develop understanding of statistical variability.
- Summarize and describe distributions.

MATHEMATICS grade 7

Ratios and Proportional Relationships:

- Analyze proportional relationships and use them to solve real-world and mathematical problems.

The Number System:

- Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.

Expressions and Equations:

- Use properties of operations to generate equivalent expressions.
- Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

Geometry:

- Draw, construct and describe geometrical figures and describe the relationships between them.
- Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

Statistics and Probability:

- Use random sampling to draw inferences about a problem.
- Draw informal comparative inferences about two populations.
- Investigate chance process and develop, use, and evaluate probability models.

MATHEMATICS grade 8

The Number System:

- Know that there are numbers that are not rational, and approximate them by rational numbers.

Expressions and Equations:

- Work with radicals and integer exponents
- Understand the connections between proportional relationships, lines, and linear equations.
- Analyze and solve linear equations and pairs of simultaneous linear equations.

Functions:

- Define, evaluate, and compare functions.
- Use functions to model relationships between quantities.

Geometry:

- Understand congruence and similarity using physical models, transparencies, or geometry software.
- Understands and apply the Pythagorean Theorem.
- Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.

Statistics and Probability:

- Investigate patterns of association in bivariate data.

Entering students are assessed to determine their math proficiency and subsequently are placed at the appropriate instructional level.

MATHEMATICS grade 2 equivalent

Operations and Algebraic Thinking:

- Represent and solve problems involving addition and subtraction.
- Add and subtract within 20.
- Work with equal groups of objects to gain foundations for multiplication.

Number and Operations in Base Ten:

- Understand place value.
- Use place value understanding and properties of operations to add and subtract.

Measurement and Data:

- Measure lengths indirectly and by iterating length units.
- Relate addition and subtraction to length.
- Work with time and money.
- Represent and interpret data.

Geometry:

- Reason with shapes and their attributes.

MATHEMATICS grade 3 equivalent

Operations and Algebraic Thinking:

- Represent and solve problems involving multiplication and division.
- Understand properties of multiplication and the relationship between multiplication and division.
- Multiply and divide within 100.
- Solve problems involving the four operations, and identify and explain patterns in arithmetic.

Number and Operations in Base Ten:

- Use place value understanding and properties of operations to perform multi-digit arithmetic.

Number and Operations- Fractions:

- Develop understanding of fractions as numbers.

Measurement and Data:

- Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.
- Represent and interpret data.
- Geometric measurement: understand concepts of area and relate area to multiplication and to addition.
- Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.

Geometry:

- Reason with shapes and their attributes.

MATHEMATICS grade 4 equivalent

Operations and Algebraic Thinking:

- Use the four operations with whole numbers to solve problems.
- Gain familiarity with factors and multiples.
- Generate and analyze patterns.

Number and Operations in Base Ten:

- Generalize place value understanding for multi-digit whole numbers less than or equal to 1,000,000.
- Use place value understanding and properties of operations to perform multi-digit arithmetic on whole numbers less than or equal to 1,000,000.

Number and Operations- Fractions:

- Extend understanding of fraction equivalence and ordering for fractions with denominators 2,3,4,5,6,8,10, 12, and 100.
- Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers for fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100.
- Understand decimal notation for fractions, and compare decimal fractions.

Measurement and Data:

- Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.
- Represent and interpret data.
- Geometric measurement: Understand concepts of angle and measure angles.

Geometry:

- Draw and identify lines and angles, and classify shapes by properties of their lines and angles.



LEARNING PREP SCHOOL

Math Curriculum

High School, Grades 9-12

Statement

Learning Prep School common core values and program components are consistent with the mission stated by the DESE curriculum frameworks which noted the following goals: to articulate and assess high quality teaching standards, identify, develop, and disseminate a rich array of resources and tools, to support high quality professional development, facilitate opportunities for educators to network, and to actively communicate and collaborate with our partners.

Components of the LPS Math Curriculum in the High School are implemented through Pearson Education. Pearson's Envisions program provides students with the opportunity to review and practice basic skills required to advance to higher levels of Mathematics. OnRamp to Algebra, also from Pearson Education, provides a path to accessibility of these higher level skills through real-world applications and activities designed to offer hands-on opportunities for learning. In addition, a collection of teacher-developed materials allow for adjustments and modifications based on the complex needs of the LPS student population. Instruction is delivered through predictable classroom routines, such as students solving daily warm-up problems often related to functional skills, or a check for understanding within the current concept being learned. This is often followed by reviewing the previous night's homework where students can receive critical feedback in order to further develop conceptual understanding. Instruction would typically then transition to allow the opportunity for guided, or independent practice, depending on the level of student understanding and the complexity of the skills being addressed.

Goal

Components of an effective language-based program are implemented and presented to students at LPS. Students often learn mathematics most effectively through illustrations, diagrams, and teacher modeling. Additionally, instruction is extended beyond the basic presentation of information, and is geared towards the "whole student". Students are given opportunities to improve upon their skills and understanding in the following areas:

- Learning organizational and study skills through the use of consistent work and social routines, charts/organizers, models, and expectations.
- Receptive and expressive language development in the areas of math vocabulary, sequencing, cause/effect, categorization, problem solving, and memorization.
- Pragmatic language skills including staying on topic, taking turns, asking/answering math related questions, reading non-verbal messages and body language.
- Social skills development including learning and working in staff mediated interactive, small group formats

The "gradual release of responsibility" from the teacher to the student is designed to foster the development of independence in all students attendant to learning and to social/emotional development, as well as the challenges aligned with their respective age and grade level progression.

Assessment

The Envisions and OnRamp to Algebra programs from Pearson Education, along with teacher developed materials serve as a reference for teaching and learning for LPS High School students.

Assessments monitor student progress and understanding, as well as their respective level of proficiency. The range of assessments includes, but is not limited to the following:

- Placement tests are given to visiting and incoming new students to informally assess their skill level and thus determine their appropriate class assignment.
- Informal assessments are ongoing during all class lessons and activities through observation and discussion.
- Formal assessments also occur throughout the year:
 - Pretests: can be given at the start of a new unit as a preliminary assessment of skills and knowledge before immersing students in the content.
 - Weekly or bi-weekly quizzes measure performance on skills covered within the current concept or topic being learned.
 - Midterm and Final Exams are given to 11th and 12th grade students to assess cumulative understanding and proficiency.

Curriculum Overview

Pre-Algebra

Number and Quantity

- The Real Number System
 - Extend the properties of exponents to rational exponents
 - Use properties of rational and irrational numbers
- Quantities
 - Reason quantitatively and use units to solve

Algebra

- Seeing Structure in Expressions
 - Interpret the structure of expressions.
 - Write expressions in equivalent forms to solve problems
- Arithmetic with Polynomials and Rational Expressions
 - Perform arithmetic operations on polynomials
- Creating Equations
 - Create equations that describe numbers or relationships.
- Reasoning with Equations and Inequalities
 - Understand solving equations as a process of reasoning and explain the reasoning.
 - Solve equations and inequalities in one variable

Geometry

- Geometric Measurement and Dimensions
 - Calculate the area of a plane figure
 - Using area, perimeter, and volume in real-life scenarios

Functions

- Interpreting Functions
 - Understand the concept of a function and use function notation.

- Interpret functions that arise in applications in terms of the context.
 - Analyze functions using different representations.
- Building Functions
 - Build a function that models a relationship between two quantities.
- Linear, Quadratic, and Exponential Models
 - Construct and compare linear, quadratic, and exponential models and solve problems

Statistics and Probability

- Interpreting Categorical and Quantitative Data
 - Summarize, represent, and interpret data on a single count or measurement variable
 - Interpret linear models

Algebra 1

Number and Quantity

- The Real Number System
 - Extend the properties of exponents to rational exponents
 - Use properties of rational and irrational numbers
- Quantities
 - Reason quantitatively and use units to solve

Algebra

- Seeing Structure in Expressions
 - Interpret the structure of expressions
 - Write expressions in equivalent forms to solve problems
- Arithmetic with Polynomials and Rational Expressions
 - Perform arithmetic operations on polynomials
- Creating Equations
 - Create equations that describe numbers or relationships
 - Reasoning with Equations and Inequalities
 - Understand solving equations as a process of reasoning and explain the reasoning
 - Solve equations and inequalities in one variable
 - Solve systems of equations
 - Represent and solve equations and inequalities graphically

Geometry

- Geometric Measurement and Dimensions
 - Calculate the area of a plane figure
 - Using area, perimeter, and volume in real-life scenarios
 - Use algebraic concepts to solve for unknown dimensions of polygons

Functions

- Interpreting Functions
 - Understand the concept of a function and use function notation
 - Interpret functions that arise in applications in terms of the context
 - Analyze functions using different representations
- Building Functions
 - Build a function that models a relationship between two quantities
 - Build new functions from existing functions
- Linear, Quadratic, and Exponential Models
 - Construct and compare linear, quadratic, and exponential models and solve problems
 - Interpret expressions for functions in terms of the situation they model

Statistics and Probability

- Interpreting Categorical and Quantitative Data
 - Summarize, represent, and interpret data on a single count or measurement variable
 - Summarize, represent, and interpret data on two categorical quantitative variables
 - Interpret linear models

Geometry

Number and Quantity

- Use properties of rational and irrational numbers
- Reason quantitatively and use units to solve problems

Algebra

- Write expressions in equivalent forms to solve problems
- Create equations that describe numbers or relationships
- Understand solving equations as a process of reasoning and explain the reasoning
- Solve equations and inequalities in one variable

Geometry

- Experiment with transformations in the plane
- Understand congruence in terms of rigid motions
- Prove geometric theorems and the converse of theorems
- Make geometric constructions
- Understand similarity in terms of similarity transformations
- Prove theorems involving similarity
- Understand and apply theorems about circles
- Find arc lengths and sectors of circles
- Translate between the geometric description and the equation for a conic section
- Use coordinates to prove simple geometric theorems algebraically
- Use volume formulas to solve problems
- Apply geometric concepts in modeling situations

Algebra 2

Number & Quantity

- Extend the properties of exponents to rational exponents
- Perform arithmetic operations with complex numbers
- Use complex numbers in polynomial identities and equations

Algebra

- Interpret the structure of linear, quadratic, exponential, polynomial, and rational expressions
- Write expressions in equivalent forms to solve problems
- Create equations that describe numbers or relationships
- Understand solving equations as a process of reasoning and explain the reasoning
- Solve equations and inequalities in one variable
- Solve systems of equations
- Represent and solve equations and inequalities graphically

Functions

- Understand the concept of a function and use function notation
- Interpret functions that arise in applications in terms of context
- Analyze functions using different representations
- Build a function that models a relationship between two quantities
- Build new functions from existing functions
- Construct and compare linear, quadratic, and exponential models and solve problems
- Interpret expressions for functions in terms of the situation they model

Pre-Calculus

Number and Quantity

- Perform arithmetic operations with complex numbers
- Represent complex numbers and their operations on the complex plane.
- Represent and model with vector quantities
- Perform operations on vectors
- Perform operations on matrices and use matrices in applications

Algebra

- Rewrite rational expressions
- Solve systems of equations

Functions

- Analyze functions using different representations
- Build a function that models a relationship between two quantities
- Build new functions from existing functions
- Construct and compare linear, quadratic, and exponential models and solve problems.
- Extend the domain of trigonometric functions in the unit circle
- Model periodic phenomena with trigonometric functions
- Prove and apply trigonometric identities

Geometry

- Define trigonometric ratios and solve problems involving right triangles.
- Apply trigonometry to general triangles
- Translate between the geometric description and the equation for a conic section

Functional Math

Number and Quantity

- Determining which mathematical operation to use in a one-step word problem
- Combining mixed coins to obtain a total amount of change
- Combining mixed bills to obtain a total amount of dollars
- Working with a budget given an amount of money and items to purchase
- Working with percents as related to real-world applications, such as taxes, tips, and discounts
- Using time in real life situations, such as time required to get to a destination
- Calculating an amount of elapsed time
- Round numbers to a specific place value in real-life and mathematical problems
- Manipulate objects used to add and subtract known and unknown quantities
- Manipulate objects with two hands as they are counted or measured
- Determine the unit rate in real-life situations

Geometry

- Geometric Measurement and Dimensions
 - Calculate the area of a plane figure
 - Using area and perimeter in real-life scenarios

Statistics and Probability

- Interpreting Categorical and Quantitative Data
 - Summarize, represent, and interpret data on a single count or measurement variable

Consumer Math

Number and Quantity

- Calculating money earned at a job, or hours worked, including overtime
- Analyzing a budget involving income earned from a job vs. everyday expenses/bills
- Problem solving with percents in various applications (discounts, taxes, tips, credit card interest, loan interest)
- Calculating credit card finance charges based on an unpaid balance and an annual percentage rate
- Use rounding strategies to make estimates in real-life or mathematical problems
- Determine the unit rate in real-life situations
- Combining mixed coins to obtain a total amount of change
- Combining mixed bills to obtain a total amount of dollars
- Working with a budget given an amount of money and items to purchase
- Using time in real-life situations, such as time required to get to a destination
- Calculating an amount of elapsed time

Geometry

- Geometric Measurement and Dimensions
 - Calculate the area of a plane figure
 - Using area, perimeter, and volume in real-life scenarios

Statistics and Probability

- Interpreting Categorical and Quantitative Data
 - Summarize, represent, and interpret data on a single count or measurement variable

Integrated Geometry

Number and Quantity

- Evaluate numerical exponential expressions
- Evaluate numerical expressions involving rational numbers
- Rewrite exponential expressions with variables using the properties of exponents
- Perform operations (add, multiply, etc.) on rational and irrational numbers using approximations of irrational numbers
- Identify appropriate quantities for descriptive modeling

Algebra

- Create expressions that describe a variety of contexts
- Interpret parts of mathematical expressions
- Interpret parts of linear expressions
- Translate between standard and slope-intercept forms of linear equations to reveal slope and y-intercept
- Add, subtract and multiply polynomials
- Factor polynomial expressions using Greatest Common Factor
- Create equations and/or inequalities in one variable from a context
- Create equations in two variables from a context
- Graph linear equations on a coordinate plane
- Rearrange formulas to highlight a quantity of interest
- Explain each step in the solutions of equations
- Show when equations have no solution and explain why
- Solve linear equations in one variable
- Solve inequalities in one variable
- Solve systems of linear equations algebraically and/or graphically
- Show whether ordered pairs are solutions of a graphed linear equation
- Graph the solutions of inequalities in two variables on a coordinate plane
- Determine inequalities in two variables from their graphs

Functions

- Distinguish between functional and non-functional relationships
- Extend a linear sequence given a rule or numbers in the sequence
- Evaluate functions for inputs in their domains
- Evaluate functions for inputs in their domains in terms of a context
- Determine the domain and the range of functions
- Calculate (or estimate from a graph) the average rates of change of functions over specific intervals
- Graph linear functions and interpret the slope and the rate of change
- Compare properties and/or key features of two linear functions presented in different ways
- Distinguish between situations that are modeled by linear and exponential functions (or neither)
- Recognize situations in which a quantity changes at a constant rate
- Construct linear functions from graphs, descriptions, or tables of values (including ordered pairs)
- Compare the values of a linear function and an exponential function as the value of the independent variable increases by showing that eventually, for the same input, the output of an exponential function will exceed the output of the linear function

Geometry

- Determine the coordinates of points on a grid after a transformation or a series of transformations
- Perform transformations on figures on a coordinate plane
- Distinguish between transformations or series of transformations, that yield congruent figures and those that do not
- Solve problems that involve vertical angles, corresponding angles, and alternate interior angles
- Solve problems using the triangle sum theorem (including isosceles triangles)
- Determine the coordinates of dilated figures
- Determine missing side lengths and angle measures in similar figures
- Use the Pythagorean Theorem to solve word problems
- Determine the coordinates of the midpoints of line segments graphed on a coordinate plane.
- Using the coordinates of their vertices, calculate the perimeter and the area of figures on a coordinate plane
- Use volume formulas for cylinders, cones, and spheres to solve problems

Statistics and Probability

- Create and analyze dot plots, histograms, and box plots
- Compare centers and spreads of two or more data sets
- Calculate relative frequencies (joint, marginal, and/or conditional) from two-way tables
- Create scatter plots from data, fit trend lines to the scatter plots, and determine equations for the linear functions described by the data
- Describe the intensity and nature of the correlation of data from scatter plots
- Interpret the slope and y-intercept of a line of best fit, shown in a scatter plot, in terms of a context
- Describe events as subsets of a sample space as unions, intersections, or complements of events
- Construct and interpret two-way frequency tables using two associated variables
- Compute probabilities of compound events