Math Planned Course: Math Edge – Grade 9

Unit: **Numbers and Operations/Pythagorean Theorem**

Content Standard: **Numbers, number systems and number relationships**
Computation and estimation
Algebra and functions
Trigonometry

State Curriculum Standard:

2.1.8.A	**Represent and use numbers in equivalent forms (e.g., integers, fractions, decimals, percents, exponents, scientific notation, square roots).**
2.1.8.B	**Simplify numerical expressions involving exponents, scientific notation and using order of operations.**
2.1.8.E	**Simplify and expand algebraic expressions using exponential forms.**
2.1.11.A	**Use operations (e.g., opposite, reciprocal, absolute value, raising to a power, finding roots, finding logarithms).**
2.2.8.A	**Complete calculations by applying the order of operations.**
2.2.8.C	**Estimate the value of irrational numbers.**
2.2.11.A	**Develop/use computation concepts, operations and procedures with real numbers in problem-solving situations.**
2.2.11.B	**Use estimation to solve problems for which an exact answer is not needed.**
2.2.11.D	**Describe and explain the amount of error that may exist in a computation using estimates.**
2.8.11.P	**Analyze a relation to determine whether a direct or inverse variation exists and represent it algebraically and graphically.**
2.10.11.B	**Identify, create and solve practical problems involving right triangles using the trigonometric functions and the Pythagorean Theorem.**

ISTE Standards: **4 Technology productivity tools**

PSSA Anchor:

M11.A.1.1.1	**Find the square root of an integer to the nearest tenth using either a calculator or estimation.**
M11.A.1.1.2	**Express numbers and/or simplify expressions using scientific notation (including numbers less than 1).**
M11.A.1.1.3	**Simplify square roots. (e.g., $\sqrt{24} = 2\sqrt{6}$)**
M11.A.1.2.1	**Find the Greatest Common Factor (GCF) and/or the Least Common Multiple (LCM) for sets of monomials.**
M11.A.1.3.1	**Locate/identify irrational numbers at the approximate location on a number line.**
M11.A.1.3.2	**Compare and/or plot irrational numbers at the approximate location on a number line.**
M11.A.2.1.1	**Solve problems using operations with rational numbers including rates and percents (single and multi-step and multiple procedure operations) (e.g., distance, work and mixture problems, etc.).**
M11.A.2.1.2	**Solve problems using direct and inverse proportions.**
M11.A.2.1.3	**Identify and/or use proportional relationships in problem solving settings.**
M11.A.2.2.1	**Simplify/evaluate expressions involving positive and negative exponents, roots and/or absolute value (may contain all types of real numbers - exponents should not exceed power of 10).**
M11.A.2.2.2	**Simplify/evaluate expressions involving multiplying with exponents (e.g. x^6 * x^7 = x^13), powers of powers (e.g., (x^6)7=x^42) and powers of products (2x2)3=8x6 (positive exponents only).**
M11.A.3.1.1	**Simplify/evaluate expressions using order of operations to solve problems (any rational numbers may be used).**
M11.A.3.2.1	**Use estimation to solve problems.**
M11.C.1.4.1	**Find the measure of a side of a right triangle using the Pythagorean Theorem (Pythagorean Theorem included on the reference sheet).**

Appendix: **A – Anchor Checklist**
B - Grade 11 PA Formula Sheet
C - PA Academic Standards for Mathematics Glossary
D - PA Rubric

Pacing Guide**: 15 Days**

Math Planned Course: Math Edge – Grade 9

Course Content	Student Performance	Resources	Assessments

A. Number Theory
 	
B. Integers
 	
C. Rational Numbers
 	
D. Irrational Numbers
 	
E. Scientific Notation
 	
F. Exponents
 	
G. Simplifying Square Roots
 	
H. Estimation
 	
I. Pythagorean Theorem
 	
J. Test-Taking Strategy
• Working backward
• Consider simpler case
• Eliminating obviously wrong answer choices
 	
K. Calculator Skills
	• Find the root of an integer
	• Convert to and from scientific notation
	• Simplify square roots
	• Identify LCM and GCF
	• Identify irrational numbers
	• Solve problems using rates and percents
	• Simplify/evaluate expressions using order of operations
	• Solve problems using proportional relationships (percents and discounts)
	• Simplify exponential expressions
	• Solve problems using the Pythagorean Theorem
	• Use/apply calculator skills to solve problems involving order of operations, exponents, roots, scientific notation, and square roots
	• Use and apply applicable vocabulary terms from the PA Academic Standards for Mathematics Glossary (Appendix E)
	• Demonstrate standardized test taking strategies and skills
		• Math Matters 1 (For page numbers – see Appendix A)
		  • Ch. 2
		  • Ch. 3
		  • Ch. 6
		  • Ch. 5 Lesson 7 Working Backward
		  • Ch. 9 Lesson 7: Consider a Simpler Case
		  • Ch. 2 Lesson 5 and Ch.11 Lesson 6 - Eliminating Wrong Answers
		
		• PSSA Coach: Grade 9 (pgs.7 - 43)
		
		• Study Island
		
		• Compass online learning tool
		
		• Teacher-tube
		
		• PSSA open-ended practice questions
		
		• Calculators
			• Observations
			
			• Homework
			
			• Class work
			
			• Projects/oral presentations
			
			• PSSA problems
			
			• At the bell problems
			
			• Tests/quizzes
			
			• Compass learning
			
			• Kids college
			
			• Study Island (8th grade)
			
			<u>Remediation</u>
			• Software
			• Tutoring
			• Video clips
			• Re-teaching
			
			<u>Enrichment</u>
			• Internet/research activities
			• Group projects
			• Teacher-driven assignments

Math Planned Course: Math Edge – Grade 9

Unit: **Measurement**

Content Standard: **Measurement and estimation**

State Curriculum Standard:

2.3.8.A	**Develop formulas and procedures for determining measurements (e.g., area, volume, distance).**
2.3.8.D	**Estimate, use and describe measures of distance, rate, perimeter, area, volume, weight, mass and angles.**
2.3.8.E	**Describe how a change in linear dimension of an object affects its perimeter, area and volume.**
2.3.11.A	**Select and use appropriate units and tools to measure to the degree of accuracy required in particular measurement situations.**
2.3.11.B	**Measure and compare angles in degrees and radians.**

ISTE Standards: **6 – Technology problem-solving and decision-making tools**

PSSA Anchor:

M11.B.2.1.1	**Measure and/or compare angles in degrees (up to 360°) (protractor must be provided or drawn).**
M11.B.2.2.1	**Calculate the surface area of prisms, cylinders, cones, pyramids and/or spheres. Formulas are provided on the reference sheet**
M11.B.2.2.2	**Calculate the volume of prisms, cylinders, cones, pyramids and/or spheres. Formulas are provided on the reference sheet.**
M11.B.2.2.3	**Estimate area, perimeter or circumference of an irregular figure.**
M11.B.2.2.4	**Find the measurement of a missing length given the perimeter, circumference, area or volume.**
M11.B.2.3.1	**Describe how a change in the linear dimension of a figure affects its perimeter, circumference, area or volume.**
M11.B.2.3.1	**How does changing the length of the radius of a circle affect the circumference of the circle?**
M11.B.2.3.1	**How does changing the length of the edge of a cube affect the volume of the cube?**
M11.B.2.3.1	**How does changing the length of the base of a triangle affect the area of the triangle?**

Appendix: **A – Anchor Checklist**
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Pacing Guide: **15 Days**

Math Planned Course: Math Edge – Grade 9

Course Content	Student Performance	Resources	Assessments

A. Measurements of Angles
 	
B. Perimeter
 	
C. Circumference
 	
D. Area
 	
E. Surface Area
 	
F. Volume
 	
G. Scale / Changing Dimensions
 	
H. Test-Taking Strategy: Use a Formula
 	
I. Calculator Skills
	• Measure and compare angles
	
	• Calculate perimeter, circumference, area, surface area and volume
	
	• Solve for unknown length given circumference, area, perimeter, or volume
	
	• Describe how a change in dimension affects perimeter, area and volume
	
	• Use apply calculator skills to solve problems involving pi and order of operations
	
	• Use and apply applicable vocabulary terms from the PA Academic Standards for Mathematics Glossary (Appendix E)
	
	• Use and apply formulas from PSSA formula sheet
	
	• Demonstrate standardized test taking strategies and skills
		• Math Matters 1 (For page numbers – see Appendix A)
		  • Ch. 2
		  • Ch. 4
		  • Ch. 6 Lesson 8
		
		• PSSA Coach: Grade 9 (pgs.47 - 64)
		
		• Study Island
		
		• Compass online learning tool
		
		• Teacher-tube
		
		• PSSA open-ended practice questions
		
		• Calculators
		
		• Appendix
			• Observations
			
			• Homework
			
			• Class work
			
			• Projects/oral presentations
			
			• PSSA problems
			
			• At the bell problems
			
			• Tests/quizzes
			
			• Compass learning
			
			• Kids college
			
			• Study Island (8th grade)
			
			• Shape mobile
			
			<u>Remediation</u>
			• Software
			• Tutoring
			• Video clips
			• Re-teaching
			
			<u>Enrichment</u>
			• Internet/research activities
			• Group projects
			• Teacher-driven assignments

Math Planned Course: Math Edge – Grade 9

Unit: **Algebraic Concepts**

Content Standard: **Algebra and functions**
Concepts of calculus

State Curriculum Standard:

2.8.8.F	**Solve and graph equations and inequalities using scientific and graphing calculators and computer spreadsheets.**
2.8.8.J	**Show that an equality relationship between two quantities remains the same as long as the same change is made to both quantities; explain how a change in one quantity determines another quantity in a functional relationship.**
2.8.11.A	**Analyze a given set of data for the existence of a pattern and represent the pattern algebraically and graphically.**
2.8.11.D	**Formulate expressions, equations, inequalities, systems of equations, systems of inequalities and matrices to model routine and non-routine problem situations.**
2.8.11.H	**Select and use an appropriate strategy to solve systems of equations and inequalities using graphing calculators, symbol manipulators, spreadsheets and other software.**
2.8.11.J	**Demonstrate the connection between algebraic equations and inequalities and the geometry of relations in the coordinate plane.**
2.8.11.K	**Select, justify and apply an appropriate technique to graph a linear function in two variables, including slope-intercept, x- and y-intercepts, graphing by transformations and the use of a graphing calculator.**
2.8.11.L	**Write the equation of a line when given the graph of the line, two points on the line, or the slope of the line and a point on the line.**
2.8.11.N	**Solve linear, quadratic and exponential equations both symbolically and graphically.**
2.8.11.O	**Determine the domain and range of a relation, given a graph or set of ordered pairs.**
2.8.11.Q	**Represent functional relationships in tables, charts and graphs.**
2.8.11.S	**Analyze properties and relationships of functions (e.g., linear, polynomial, rational, trigonometric, exponential, logarithmic).**
2.11.8.B	**Describe the concept of unit rate, ratio and slope in the context of rate of change.**

ISTE Standards: **1 – Basic operations and concepts**
2 – Social, ethics, and human issues

PSSA Anchor:

M11.D.1.1.1	**Analyze a set of data for the existence of a pattern and represent the pattern algebraically and/or graphically.**
M11.D.1.1.2	**Determine if a relation is a function given a set of points or a graph.**
M11.D.1.1.3	**Identify the domain, range or inverse of a relation (may be presented as ordered pairs or a table).**
M11.D.2.1.1	**Solve compound inequalities and/or graph their solution sets on a number line (may include absolute values).**
M11.D.2.1.2	**Identify or graph functions, linear equations, or linear inequalities on a coordinate plane.**
M11.D.2.1.3	**Write, solve and/or apply a linear equation (including problem situations).**
M11.D.2.1.4	**Write and/or solve systems of equations using graphing, substitution, and/or elimination (limit systems to 2 equations).**
M11.D.2.1.5	**Solve quadratic equations using factoring (integers only - not including completing the square or the Quadratic Formula).**
M11.D.2.2.1	**Add, subtract, and/or multiply polynomial expressions (express answers in simplest form - nothing larger than a binomial multiplied by a trinomial).**
M11.D.2.2.2	**Factor algebraic expressions, including difference of squares and trinomials (trinomials limited to the form ax^2+bx+c where a is not equal to 0).**
M11.D.2.2.3	**Simplify algebraic fractions.**
M11.D.3.1.1	**Identify, describe and/or use constant or varying rates of change.**
M11.D.3.1.2	**Determine how a change in one variable relates to a change in a second variable (e.g., y = 4/x, if x doubles, what happens to y?).**
M11.D.3.2.1	**Apply the formula for the slope of a line to solve problems (formula given on reference sheet).**

M11.D.3.2.2 **Given the graph of the line, two points on the line, or the slope and a point on a line, write or identify the linear equation in point-slope, standard and/or slope intercept form.**
M11.D.3.2.3 **Compute the slope and/or y-intercept represented by a linear equation or graph.**
M11.D.4.1.1 **Match the graph of a given function to its table or equation.**

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Pacing Guide: **30 Days** (makes up 40% of PSSA questions)

Math Planned Course: Math Edge – Grade 9

Course Content	Student Performance	Resources	Assessments
A. Patterns B. Relations and Functions C. Distributive Property D. Linear Equations E. Linear Inequalities F. Rates of Change G. Coordinate Plane H. Slope I. Graphing J. Polynomials K. Quadratic Functions L. Exponential Functions M. Test-Taking Strategies • Working backward • Eliminating wrong answers • Making a table • Guess and check N. Calculator Skills	• Look for patterns • Use distributive property and the reverse (GCF) • Determine if a relation is a function • Identify domain and range and multiply meanings/names • Identify quadrants. • Graph solutions. • Solve compound inequalities • Solve systems of equations • Solve quadratic equations • Add, subtract and multiply polynomial expressions • Factor polynomial expressions. • Use rates of change. • Apply the slope formula • Write the equation of a line in various forms • Match a graph to a given function • Use and apply calculator skills to solve equations • Use and apply applicable vocabulary terms from the PA Academic Standards for Mathematics Glossary (Appendix E) • Demonstrate standardized test taking strategies and skills	• Math Matters 1 (For page numbers – see Appendix A) • Ch. 5 • Ch. 7 • Ch. 9 • Ch. 11 Lesson 8 • PSSA Coach: Grade 9 (pgs.87 - 115) • Study Island • Compass online learning tool • Teacher-tube • PSSA open-ended practice questions • Calculators • Appendix	• Observations • Homework • Class work • Projects/oral presentations • PSSA problems • At the bell problems • Tests/quizzes • Compass learning • Kids college • Study Island (8th grade) **<u>Remediation</u>** • Software • Tutoring • Video clips • Re-teaching **<u>Enrichment</u>** • Internet/research activities • Group projects • Teacher-driven assignments

Math Planned Course: Math Edge – Grade 9

Unit: **Data Analysis and Probability**

Content Standard: **Statistics and data analysis.**
Probability and predications.

State Curriculum Standard:

2.6.8.A	**Compare and contrast different plots of data using values of mean, median, mode, quartiles and range.**
2.6.8.E	**Analyze and display data in stem-and-leaf and box-and-whisker plots.**
2.7.8.A	**Determine the number of combinations and permutations for an event.**
2.7.8.E	**Make valid inferences, predictions and arguments based on probability.**
2.6.11.A	**Design and conduct an experiment using random sampling. Describe the data as an example of a distribution using statistical measures of center and spread. Organize and represent the results with graphs. (Use standard deviation, variance and t-tests.)**
2.6.11.C	**Determine the regression equation of best fit (e.g., linear, quadratic, exponential).**
2.6.11.D	**Make predictions using interpolation, extrapolation, regression and estimation using technology to verify them.**
2.7.11.A	**Compare odds and probability.**
2.7.11.E	**Solve problems involving independent simple and compound events.**

ISTE Standards **3 – Technology communication tools**
5 – Technology research tools

PSSA Anchor:

M11.E.1.1.1	**Create and/or use appropriate graphical representations of data, including box-and-whisker plots, stem-and-leaf plots, or scatter plots.**
M11.E.1.1.2	**Analyze data and/or answer questions based on displayed data (box-and-whisker plots, stem-and-leaf plots, or scatter plots).**
M11.E.2.1.1	**Calculate or select the appropriate measure of central tendency (mean, median, or mode) of a set of data given or represented on a table, line plot, or stem-and-leaf plot.**
M11.E.2.1.2	**Calculate and/or interpret the range, quartiles and interquartile range of data.**
M11.E.2.1.3	**Describe how outliers affect measures of central tendency.**
M11.E.3.1.1	**Find probabilities for independent, dependent or compound events and represent probability as a fraction, decimal or percent.**
M11.E.3.1.2	**Find, convert and/or compare the probability and/or odds of a simple event.**
M11.E.3.2.1	**Determine the number of permutations and/or combinations or apply the fundamental counting principle. (Formula provided on the reference sheet).**
M11.E.4.1.1	**Estimate or calculate to make predictions based on a circle, line, bar graph or given situation.**
M11.E.4.1.2	**Use probability to predict outcomes.**
M11.E.4.2.1	**Draw, find and/or write an equation for a line of best fit for a scatter plot.**
M11.E.4.2.2	**Make predictions using the equations of best-fit lines of scatter plots.**

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Pacing Guide: **15 Days**

Math Planned Course: Math Edge – Grade 9

Course Content	Student Performance	Resources	Assessments
A. Data Displays B. Measures of Central Tendency C. Probability Outcomes D. Odds E. Counting Techniques F. Correlations G. Test-Taking Strategy: • Making a list, table or chart • Consider a simpler case H. Calculator Skills	• Create box-and-whisker, stem-and-leaf, and scatter plots • Analyze data displays. • Calculate measures of central tendency • Calculate range, inter-quartile range and quartile values • Identify outliers • Determine probabilities • Determine permutations, combinations and apply the fundamental counting principle • Make predications • Write an equation for the line of best fit • Use and apply calculator skills to permutations and counting techniques • Use and apply applicable vocabulary terms from the PA Academic Standards for Mathematics Glossary (Appendix E) • Demonstrate standardized test taking strategies and skills	• Math Matters 1 • Ch. 1 • Ch. 10 • Ch. 1 Lesson 4 (test-taking strategy) and Ch. 7 Lesson 1 • PSSA Coach: Grade 9 (pgs.117-173) • Study Island • Compass online learning tool • Teacher-tube • PSSA open-ended practice questions • Calculators	• Observations • Homework • Class work • Projects/oral presentations • PSSA problems • At the bell problems • Tests/quizzes • Compass learning • Kids college • Study Island (8th grade) **<u>Remediation</u>** • Software • Tutoring • Video clips • Re-teaching **<u>Enrichment</u>** • Internet/research activities • Group projects • Teacher-driven assignments

Math Planned Course: Math Edge – Grade 9

Unit: **Geometry**

Content Standard: **Geometry**

State Curriculum Standard:

2.9.8.D **Identify, name, draw and list all properties of squares, cubes, pyramids, parallelograms, quadrilaterals, trapezoids, polygons, rectangles, rhombi, circles, spheres, triangles, prisms and cylinders.**

2.9.11.B **Prove that two triangles or two polygons are congruent or similar using algebraic, coordinate and deductive proofs.**

2.9.11.C **Identify and prove the properties of quadrilaterals involving opposite sides and angles, consecutive sides and angles and diagonals using deductive proofs.**

2.9.11.F **Use the properties of angles, arcs, chords, tangents and secants to solve problems involving circles.**

2.9.11.G **Solve problems using analytic geometry.**

ISTE Standards: **6 – Technology problem-solving and decision-making tools**

PSSA Anchor:

M11.C.1.1.1 **Identify and/or use the properties of a radius, diameter and/or tangent of a circle (given numbers should be whole.)**

M11.C.1.1.2 **Identify and/or use the properties of arcs, semicircles, inscribed angles and/or central angles.**

M11.C.1.2.1 **Identify and/or use properties of triangles (e.g., medians, altitudes, angle bisectors, side/angle relationships, Triangle Inequality Theorem).**

M11.C.1.2.2 **Identify and/or use properties of quadrilaterals (e.g., parallel sides, diagonals, bisectors, congruent sides/angles and supplementary angles).**

M11.C.1.2.3 **Identify and/or use properties of isosceles and equilateral triangles.**

M11.C.1.3.1 **Identify and/or use properties of congruent and similar polygons or solids.**

M11.C.3.1.1 **Calculate the distance and/or midpoint between 2 points on a number line or on a coordinate plane (formula provided on the reference sheet).**

M11.C.3.1.2 **Relate the slope to perpendicularity and/or parallelism (limit to linear algebraic expressions; slope formula provided on the reference sheet).**

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Pacing Guide: **15 Days**

Math Planned Course: Math Edge – Grade 9

Course Content	Student Performance	Resources	Assessments
A. Circles B. Triangles C. Quadrilaterals D. Congruent and Similar Polygons E. Distance Formula F. Midpoint Formula G. Coordinate Plane H. Perpendicular Lines I. Parallel Lines J. Test-Taking Strategy • Drawing a picture • Using a formula K. Calculator Skills	• Apply properties of radius, diameter and tangent • Apply properties of arcs, semi-circles, inscribed angles and central angles • Apply properties of triangles • Apply properties of quadrilaterals • Identify isosceles and equilateral triangles • Identify congruent figures. • Identify similar figures • Calculate distance and midpoint • Identify quadrants and plot points • Calculate missing coordinate if given distance and midpoint. • Apply properties of perpendicular and parallel lines • Use and apply calculator skills to solve distance and midpoint formulas • Use and apply applicable vocabulary terms from the PA Academic Standards for Mathematics Glossary (Appendix E) • Demonstrate standardized test taking strategies and skills	• Math Matters 1 • Ch. 8 • Ch. 4 Lesson 4 and Ch. 8 Lesson 4 • PSSA Coach: 9 (pgs. 65 – 85) • Study Island • Compass online learning tool • Teacher-tube • PSSA open-ended practice questions • Calculators	• Observations • Homework • Class work • Projects/oral presentations • PSSA problems • At the bell problems • Tests/quizzes • Compass learning • Kids college • Study Island (8th grade) **<u>Remediation</u>** • Software • Tutoring • Video clips • Re-teaching **<u>Enrichment</u>** • Internet/research activities • Group projects • Teacher-driven assignments