MATHEMATICS CURRICULUM

Yorkville CUSD 115

UPDATED: August 2020

Acknowledgements

During the 2015-2016 school year, our school district sought the expertise and enthusiasm of a “Mathematics Subject Area Committee” (SAC) in order to revise our K-12 mathematics curriculum. This committee represented our district in gathering teacher feedback; updating skill alignment to Common Core State Standards; revising outcomes and components to increase rigor and student engagement; and aligning the curriculum to the 8 Mathematical Practices.

This team of professionals has demonstrated passion, enthusiasm, expertise, and a highly collaborative spirit. These teachers’ commitment to the students we serve is evident in their desire to implement an excellent mathematics curriculum. We would like to thank the members of the Mathematics SAC for their contributions and continued leadership.

Mathematics SAC Members

Meghan Albright	Robin Gonzalez	Jennifer Munch
Ashley Badger	Melinda Graham	Kellie O’Connor
Sandy Berge	Blair Haake	Dana Parkhill
Josh Blomberg	Melinda Hafenrichter	Jaci Pezeshki
Nate Campbell	Layna Heubel	Tina Romano
Sarah Countryman	Breah Jerger	Makane Salerno
Maureen Courtwright	Allison Johnson	Heather Siebert
Nick DeCaluwe	Stacy Judy	Megan Stemmet
Lindsay Decker	Sonya Kolowski	Ashley Urbaniak
Michael Duback	Joyous Link	Christine Warren
Laura Garbe	Brittany McNish	Karen Weir

Table of Contents

Kindergarten Mathematics Curriculum

Yorkville CUSD #115

Grade-Level Focus Statement:
Students will demonstrate number sense from 0-20 and solve addition and subtraction problems within 10. Students will analyze the characteristics of two and three-dimensional shapes and construct simple two-dimensional shapes.

Counting and Cardinality			**Resource Topic(s) 1-5**
1st Quarter			
M.K.1	**Outcome 1: Students will demonstrate number sense from 0-10.**		
	Students will…		
Local Component Code	**Component**	**Example**	**Priority Component (P) Supporting Component (S)**
M.K.1.1	count a group of 0 to 10 objects with one-to-one correspondence. (K.CC.4)	Use manipulatives such as counting bears or unifix cubes.	P
M.K.1.2	compare written numerals from 0-10. (K.CC.7)	When given 2 numbers, students will identify which number is larger or smaller.	P
M.K.1.3	create a group of objects that represent any written numeral from 0- 10. (K.CC.5)	Count objects up to 10 in a variety of arrangements.	P

M.K.1.4	write numbers 0-10. (K.CC.3)	Using a number grid, students will write the numbers 0-10.	P
M.K.1.5	represent a number of objects with a written numeral, using groups of 0-10. (K.CC.3)	Students will write a number that matches a given number of pictures.	P
M.K.1.6	identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group. (K.CC.6)	Demonstrate by using matching, and counting strategies.	P
M.K.1.7	explain that the next consecutive number is one more than the previous number. (K.CC.4)	Using calendar, the students will explain that 7 is one more than 6.	P
M.K.1.8	classify and sort a group of objects into given categories and compare to determine which group has the most objects. (K.MD.3)	Give the students a bar graph template with pictures to sort. Then ask them to circle which shows the most.	P

Operations and Algebraic Thinking			**Resource Topic(s) 6-8**
2nd Quarter			
M.K.2	**Outcome 2: Students will create a number story and matching sentence for addition and subtraction.**		
	Students will…		
Local Component Code	**Component**	**Example**	**Priority Component (P) Supporting Component (S)**
M.K.2.1	represent an addition problem using objects or drawings. (K.OA.1)	Using unifix cubes ask students to use them to match the number sentence given.	P
M.K.2.2	identify the “+” symbol and explain the meaning.	Show the students a picture of a plus sign and ask them to tell you the name of the symbol and what it means.	P

M.K.2.3	solve an addition word problem using objects or drawings within 10. (K.OA.2)	Using unifix cubes ask students to use them to solve the number sentence given.	P
M.K.2.4	identify the "-" symbol and explain the meaning.	Show the students a picture of a minus sign and ask them to tell you the name of the symbol and what it means.	P
M.K.2.5	solve a subtraction problem using objects or drawings. (K.OA.1)	Using unifix cubes ask students to use them to solve the number sentence given.	P
M.K.2.6	produce all possible combinations of addends for a given sum, no larger than ten, recording with objects, drawings, or equations. (K.OA.3).	By using objects or drawings, and record each decomposition by a drawing or equation (e.g., 5=2+3 and 5=4+1).	P
M.K.2.7	find the complement of ten for each single digit number using objects or drawings. (K.OA.5).	Using a T chart divided into 11 rows and 2 columns with the number 10 on top and numbers 0-10 randomly in the left column, ask students to find the complement of 10. Unifix cubes or ten frame boxes may be given to students to use.	P
M.K.2.8	add all sums within five fluently. (K.OA.5).	Give the students 10 addition problems with a sum within 5 and ask them to solve.	P
M.K.2.9	subtract all differences of numbers 0-5 fluently. (K.OA.5)	Give the students 10 subtraction problems. *Note: numbers in the subtraction problems must not be greater than 5.	P

Numbers and Operations in Base Ten			Resource Topic(s) 9 & 10
3rd Quarter			
M.K.3	**Outcome 3: Students will decompose teen numbers and compose tens and ones into teen numbers.**		
	Students will…		
Local Component Code	**Component**	**Example**	**Priority Component (P) Supporting Component (S)**
M.K.3.1	count a group of 0 to 20 objects with one-to-one correspondence. (K.CC.4)	Use manipulatives such as counting bears or unifix cubes.	P
M.K.3.2	compare written numerals from 0-20. (K.CC.7)	When given 2 numbers, students will identify which number is larger or smaller.	P
M.K.3.3	create a group of objects that represent any written numeral from 0- 20. (K.CC.5)	Using manipulatives such as counting bears or unifix cubes, students will create groups to match the number given.	P
M.K.3.4	write numbers 0-20. (K.CC.3)	Using a number grid, students will write the numbers 0-20.	P
M.K.3.5	represent a number of objects with a written numeral, using groups of 0-20. (K.CC.3)	Students will write a number that matches a given number of pictures.	P
M.K.3.6	decompose numbers by separating teen numbers into one group of ten and the proper number of ones by writing the appropriate equation. (K.NBT.1)	Show the students the number 17, ask the students to use unifix cubes to represent that number. Use the terms “longs” (10 unifix cubes stacked together) and “shorts” (individual unifix cubes).	P
M.K.3.7	compose a number by combining a group of ten and the proper number of ones into a teen number. (K.NBT.1)	Give the students 1“long” (10 unifix cubes stacked together) and 4 “shorts” (individual unifix cubes). Ask them to tell you the number it represents.	P

Counting and Cardinality			Resource Topic(s) 11
4th Quarter			
M.K.4	**Outcome 4: Students will demonstrate number sense through counting and using numbers to represent quantities.**		
	Students will…		
Local Component Code	**Component**	**Example**	**Priority Component (P) Supporting Component (S)**
M.K.4.1	count by ones to 100. (K.CC.1)	Start at 1 and count by ones to 100.	P
M.K.4.2	count by ones to 100 beginning at any number smaller than 100. (K.CC.2)	Start at 56 and count by ones to 100.	P
M.K.4.3	count by tens to 100. (K.CC.1)	Start at 0 and count by 10's to 100.	P
M.K.4.4	identify numbers 0-30.	When shown a random number from 0-30, the student must say the name of the number.	P

Geometry			Resource Topic(s) 12
4th Quarter			
M.K.5	**Outcome 5: Students will identify two dimensional and three dimensional shapes.**		
	Students will…		
Local Component Code	**Component**	**Example**	**Priority Component (P) Supporting Component (S)**
M.K.5.1	identify circles and squares regardless of their orientation and overall size. (K.G.2)	Show students a visual representation of a circle and a square; ask them to name each.	S
M.K.5.2	identify rectangles and triangles squares regardless of their orientation and overall size. (K.G.2)	Show students a visual representation of a rectangle and a triangle; ask them to name each.	S
M.K.5.3	identify hexagons and ovals squares regardless of their orientation and overall size. (K.G.2)	Show students a visual representation of a hexagon and an oval; ask them to name each.	S
M.K.5.4	identify cubes and spheres regardless of their orientation and overall size. (K.G.2)	Show students a 3D block of a cube and a sphere; ask them to name each.	S
M.K.5.5	identify cylinders and cones regardless of their orientation and overall size. (K.G.2)	Show students a 3D block of a cylinder and a cone; ask them to name each.	S
M.K.5.6	describe the attributes of cubes, spheres, cylinders, and cones using informal language. (K.G.4)	sides, corners, vertices	S
M.K.5.7	find or describe examples of three-dimensional shapes in the real world. (K.G.1)	Show students a sphere and ask them to tell you what real life object it looks like.	S

Geometry			Resource Topic(s) 13
4th Quarter			
M.K.6	**Outcome 6: Students will construct, compare, and sort two dimensional shapes.**		
	Students will…		
Local Component Code	**Component**	**Example**	**Priority Component (P) Supporting Component (S)**
M.K.6.1	construct and draw circles and squares. (K.G.5)	Construct using manipulatives such as wiki stix or string.	S
M.K.6.2	construct and draw rectangles and triangles. (K.G.5)	Construct using manipulatives such as wiki stix or string.	S
M.K.6.3	construct and draw hexagons and ovals. (K.G.2)	Construct using manipulatives such as wiki stix or string.	S
M.K.6.4	create a larger shape using two or more smaller shapes. (K.G.6)	Show students the shape sheet containing a drawing of a triangle, a square, a hexagon, and a rectangle. Use pattern blocks to create one of the larger shapes.	S
M.K.6.5	compare and sort two-dimensional shapes by identifiable attributes. (K.G.4)	Use attribute blocks and ask students to explain how they sorted.	S
M.K.6.6	compare and sort three-dimensional shapes by identifiable attributes. (K.G.4)	Use 3D blocks and ask students to explain how they sorted.	S
M.K.6.7	explain the difference of two and three-dimensional shapes. (K.G.3)	Using words flat or solid	S

Measurement & Data			Resource Topic(s) 14
4th Quarter			
M.K.7	**Outcome 7: Students will compare two units using measurable attributes.**		
	Students will…		
Local Component Code	**Component**	**Example**	**Priority Component (P) Supporting Component (S)**
M.K.7.1	compare the weight of two objects using the terms lighter and heavier. (K.MD.2)	Give the students 2 different sized water bottles and ask them to tell you something about how much they weigh.	S
M.K.7.2	compare the length of two objects using the terms taller and shorter. (K.MD.2)	Give the students a pencil and a crayon and ask them to tell you something about their length.	S
M.K.7.3	describe two measurable attributes of a single object. (K.MD.1)	Give the students a single unifix cube and ask them to tell you something about it using 2 measurable terms such as light and short.	S
M.K.7.4	classify and sort a group of objects into given categories and compare to determine which group has the most objects. (K.MD.3)	Give the students a bar graph template with pictures to sort. Then ask them to circle which shows the most.	S

Grade 1 Mathematics Curriculum

Yorkville CUSD #115

Grade-Level Focus Statement:
Students will demonstrate number sense from 0-120, and solve addition and subtraction problems within 20. Students will distinguish between attributes of two and three-dimensional shapes and partition into equal quantities.

Operations and Algebraic Thinking			**Resource Topic(s) 1-3**
1st Quarter			
M.1.1	**Outcome 1: Students will demonstrate addition and subtraction strategies within 10.**		
	Students will…		
Local Component Code	**Component**	**Example**	**Priority Component(P) Supporting Component (S)**
M.1.1.1	demonstrate addition within 10 to solve word problems using strategies including adding to, taking from, putting together, taking apart and comparing with unknowns in all positions. (1.OA.1)	(See chart.) http://www.corestandards.org/Math/Content/mathematics-glossary/Table-1, can you counters, unifix cubes, and drawings	P
M.1.1.2	demonstrate subtraction within 10 to solve word problems using strategies such as adding to, taking from, putting together, taking apart, and comparing with unknowns in all positions. (1.OA.1)	(See chart.) http://www.corestandards.org/Math/Content/mathematics-glossary/Table-1/ can you counters, unifix cubes, and drawings	P
M.1.1.3	compose sums to create equivalent but easier or known sums (doubles to 10, facts to 5, near doubles to 10). (1.OA.6)	*Number bonds*	P

M.1.1.4	compute sums using the commutative property. (1.OA.3)	*(8+3=11 is the same as 3+8=11) turn around facts*	P
M.1.1.5	add within 10 fluently. (1.OA.6)	*Can use ten frame, rekenrek, shake and spill with 10 counters, cuisenaire rods, unifix cubes, number balance*	P
M.1.1.6	subtract within 10 fluently (1.OA.6)	*Can use ten frame, rekenrek, shake and spill with 10 counters, cuisenaire rods, unifix cubes, number balance*	P

Operations and Algebraic Thinking			**Resource Topic(s) 4 & 5**
2nd Quarter			
M.1.2	**Outcome 2: Students will demonstrate addition and subtraction strategies within 20 and produce unknown whole numbers in equations.**		
	Students will…		
Local Component Code	**Component**	**Example**	**Priority Component (P) Supporting Component (S)**
M.1.2.1	demonstrate addition within 20 to solve word problems using strategies including adding to, taking from, putting together, taking apart and comparing with unknowns in all positions. (1.OA.1)	(See chart.) http://www.corestandards.org/Math/Content/mathematics-glossary/Table-1, can you counters, unifix cubes, and drawings	P
M.1.2.2	demonstrate subtraction within 20 to solve word problems using strategies such as adding to, taking from, putting together, taking apart, and comparing with unknowns in all positions. (1.OA.1)	(See chart.) http://www.corestandards.org/Math/Content/mathematics-glossary/Table-1/ can you counters, unifix cubes, and drawings	P

M.1.2.3	compose sums to create equivalent but easier or known sums (doubles, facts of 10, doubles plus 1). (1.OA.6)	*Number bonds*	P
M.1.2.4	relate “counting on” and “counting back” within 20 as addition and subtraction strategies, respectively. (1.OA.5)	Dots, Ten Frames, and fingers could be used Example: Tell student they have 5 what is 2 more. Student should count on, **not count all**. Tell student that they have 6, what is 3 less. Student should count back.	P
M.1.2.5	decompose a number leading to 10. (1.O.A.6)	Number bonds	P
M.1.2.6	understand subtraction as an unknown addend problem (i.e., fact families). (1.OA.4)	Fact triangles, number balance, ten frames, rekenrek	P
M.1.2.7	produce the unknown number in an equation to make the equation true. (1.OA.8)	part/part/whole diagrams, counters, drawings, unifix cubes	P
M.1.2.8	produce the unknown whole number in an addition equation relating three whole numbers. (1.OA.8)	part/part/whole diagrams, counters, drawings, unifix cubes	P

Measurement and Data			Resource Topic(s) 6
2nd Quarter			
M.1.3	**Outcome 3: Students will organize, represent, interpret, and compare data in up to three different categories.**		
	Students will…		
Local Component Code	**Component**	**Example**	**Priority Component (P) Supporting Component (S)**
M.1.3.1	organize, represent, and interpret data with three categories. (1.MD.4)	Counting or tally	S
M.1.3.2	record the difference between three categories, distinguishing the total number of data points in each category. (1.MD.4)	Number sense or a provided bar graph to be completed by students.	S
M.1.3.3	compare at least three categories to determine how many *more* or *fewer* data points are in each category. (1.MD.4)	How many more cats than dogs are there? How many fewer fish than dogs are there?	S

Numbers and Operations in Base Ten			Resource Topic(s) 7
2nd Quarter			
M.1.4	**Outcome 4: Students will demonstrate number sense 0-120.**		
	Students will…		
Local Component Code	**Component**	**Example**	**Priority Component (P) Supporting Component (S)**
M.1.4.1	count by ones to 120, beginning with 0. (1.NBT.1)	*The student may not use a number grid or number line.	P

M.1.4.2	count by ones to 120, beginning with any whole number less than 120. (1.NBT.1)	Start at 68 and count by ones to 120.	P
M.1.4.3	read numbers from 0-120. (1.NBT.1)	When shown a random number from 0-120, the student must say the name of the number.	P
M.1.4.4	write numbers from 0-120. (1.NBT.1)	*The student may not use a number grid or number line to complete this task. Use the 120 grid paper.	P
M.1.4.5	demonstrate counting by fives and tens to 100.	Start at 0 and count by 5's to 100. Start at 0 and count by 10's to 100.	P
M.1.4.6	represent a number of objects with a written numeral within the range of 0-120. (1.NBT.1)	Give students 47 objects and ask them to count them.	P

Measurement and Data			**Resource Topic(s) 8-9**
3rd Quarter			
M.1.5	**Outcome 5: Students will classify, compare, and analyze two-digit numbers by examining the amount of tens and ones in each number.**		
	Students will…		
Local Component Code	**Component**	**Example**	**Priority Component (P) Supporting Component (S)**
M.1.5.1	classify multiples of 10 up to 90 as one, two, three, etc. *tens* and zero *ones.* (1.NBT.2c)	Students would show using ten blocks	P

M.1.5.2	identify that a group of two digits placed together represents a two-digit number. (1.NBT.2)	4 and 2 put next to each other makes 42, a number with 2 digits.	P
M.1.5.3	convert a group of ten ones into one bundle of *ten*. (1.NBT.2a)	Use ten blocks and/or ten frames	P
M.1.5.4	analyze a two-digit number by identifying the ones and tens place. (1.NBT.2)	Students would how using base ten blocks	P
M.1.5.5	show that the numbers 11-19 are composed of a ten and one, two, three, four, five, six, seven, eight, or nine, ones. (1.NBT.2b)	Students would show using ten blocks and/or ten frames	P
M.1.5.6	compare two two-digit numbers by comparing place values, and use <, >, = symbols to represent the comparison. (1.NBT.3)	Use vocabulary: "Greater than", "Less than", "Equal to"	P

Numbers and Operations in Base Ten			**Resource Topic(s) 10-11**
3rd Quarter			
M.1.6	**Outcome 6: Students will add and subtract within 100 using bundles or multiples of ten with concrete models or drawings.**		
	Students will…		
Local Component Code	**Component**	**Example**	**Priority Component (P) Supporting Component (S)**
M.1.6.1	add a two-digit number to a one-digit number (within 100) using concrete models or drawings, understanding that it is sometimes necessary to compose into a bundle of 10 from a group of ones. (1.NBT.4)	Use base ten blocks, drawings of base ten blocks *Students should not be exposed to the standard algorithm of carrying or borrowing. Ex.17 + 12, should be thought of as 1 ten and 7 ones plus 1 ten and 2 ones. (No circling the one and carrying.)	P

M.1.6.2	add a two-digit number and a multiple of ten with concrete models or drawings. (1.NBT.4)	Ex. 17 + 30, should be thought of as 1 ten and 7 ones plus 3 tens. Use base ten blocks, drawings of base ten blocks	P
M.1.6.3	compute sums using the associative property by grouping tens. (1.OA.3)	(2 + 4 + 6 can be rephrased as 2 + 10)	P
M.1.6.4	subtract within 100 utilizing multiples of ten with concrete models or drawings. (1.NBT.6)	Use base ten blocks, drawings of base ten blocks, unifix cubes and number grid *Students should not be exposed to the standard algorithm of carrying or borrowing. Ex. 60-30 ,should be thought of as 6 tens minus 3 tens. (No circling the one and carrying.)	P
M.1.6.5	find 10 more or less than a given number mentally, *without having to count,* and explain the reasoning used. (1.NBT.5)	With number grid or base ten, but student can't use manipulatives while being assessed.	P

Measurement and Data			**Resource Topic(s) 12**
3rd Quarter			
M.1.7	**Outcome 7: Students will compare, order, and measure the lengths of objects.**		
	Students will…		
Local Component Code	**Component**	**Example**	**Priority Component (P) Supporting Component (S)**
M.1.7.1	compare and order the lengths of three objects. (1.MD.1)	Order a pen, eraser, and a paperclip by length. Use the words shorter and longer.	P

M.1.7.2	compare the lengths of two objects by using a third object. (1.MD.1)	Jim is taller than Mary. Bill is shorter than Mary. Put them in order.	P
M.1.7.3	measure the length of an object as a whole by arranging objects end to end.	Do not use rulers, inches, or centimeters. Use nonstandard units such as paper clips, unifix cubes.	P

Measurement & Data			**Resource Topic(s) 13**
4th Quarter			
M.1.8	**Outcome 8: Students will tell and write time using analog and digital clocks.**		
	Students will…		
Local Component Code	**Component**	**Example**	**Priority Component (P) Supporting Component (S)**
M.1.8.1	tell and write time to the hour and half hour using analog and digital clocks. (1.MD.3)	Student must explain where the hour and minute hand are located on the clock "I know the hour hand is in between the 6 and the 7 and the minute hand is on the 6, which tells me it is 6:30	S

Geometry			Resource Topic(s) 14
4th Quarter			
M.1.9	**Outcome 9: Students will distinguish between two-and three- dimensional shapes. Students will construct and draw shapes to define attributes.**		
	Students will…		
Local Component Code	**Component**	**Example**	**Priority Component (P) Supporting Component (S)**
M.1.9.1	distinguish between defining attributes and non-defining attributes using two-dimensional shapes (rectangles, squares, trapezoids, triangles, circles, half circles, and quarter circles). (1.G.1)	Defining attributes:(#vertices, # sides, length of sides) Non-defining attributes: (color, position, size, location) Example- Tell how many corners or sides are in a shape.	S
M.1.9.2	construct and draw shapes to possess defining attributes. (1.G.1)	Example- Draw a closed 3 sides shape. Vocabulary- sides, vertices, edges, faces	S
M.1.9.3	compose two- and three-dimensional shapes to create composite shapes, and use that composite shape to create new shapes. (1.G.2)	Note: Students do not need to identify the names of composite shapes. Example- a trapezoid is made up of three small triangles, a hexagon could be made up of 6 triangles or two trapezoids, a square could be made out of 4 smaller squares, a rectangle can be made of 2 squares	S

Geometry			Resource Topic(s) 15
4th Quarter			
M.1.10	**Outcome 10: Students will identify equal shares of a whole and partition two-dimensional shapes.**		
	Students will…		
Local Component Code	**Component**	**Example**	**Priority Component (P) Supporting Component (S)**
M.1.10.1	identify equal shares using words: halves (half of), fourths (fourth of), and quarters (quarter of). (1.G.3)	Fractions bars, 3D.	S
M.1.10.2	partition two-dimensional shapes (circles and rectangles) to create two and four equal shares. (1.G.3)	Ex. Divide circles and rectangles into 2 or 4 equal shares Only circles and rectangles and only halves and fourths Use fraction bars, 3D shapes	S
M.1.10.3	explain that decomposing a “whole” into a larger number of shares means that each share is smaller. (1.G.3)	Fraction bars and 3D magnetic shapes, pizza, pies, candy bars	S
M.1.10.4	describe that a “whole” is made of two equal halves or four equal quarters. (1.G.3)	Fraction bars and 3D magnetic shapes, pizza, pies, candy bars	S

Money			Resource Topic(s) N/A
4th Quarter			
M.1.11	**Outcome 11: Students will calculate coins and compute values.**		
	Students will…		
Local Component Code	**Component**	**Example**	**Priority Component (P) Supporting Component (S)**
M.1.11.1	identify the value of a penny, nickel, dime, and quarter.	Use manipulative or real coins. Use the cents sign. Identify the value when shown a picture or real coin and when told the word penny, nickel, dime and quarter.	S
M.1.11.2	calculate the value of unlike coin combinations up to one dollar using the cents symbol (¢).	Show 2 quarters, 1 dime, 1 nickel and 3 pennies and the student must say that there is 68 cents.	S
M.1.11.3	identify a dollar bill and its value, and use the dollar sign ($).	$1 and 100 cents	S

Measurement & Data			Resource Topic(s) N/A
Year Long			
M.1.12	**Outcome 12: Students will read and understand calendars**		
	Students will…		
M.1.12.1	arrange days of the week in order.	Cut and glue the days of the week in order. Discuss this during calendar time.	S
M.1.12.2	arrange months of the year in order.	Cut and glue the months of the year in order. Discuss this during calendar time.	S

Grade 2 Mathematics Curriculum

Yorkville CUSD #115

Grade-Level Focus Statement:
Students will demonstrate counting, reading, and writing all numbers to 1000. Students will compute all sums of two single-digit numbers fluently.

Numbers & Operations in Base Ten			Resource Topic(s) 1
1st Quarter			
M.2.1	**Outcome 1: Students add and subtract within 20 and relate addition and subtraction to length.**		
	Students will…		
Local Component Code	**Component**	**Examples**	**Priority Component(P) Supporting Component(S)**
M.2.1.1	add and subtract within 20 using mental strategies. (2.OA.B.2)	4+6= 14-5=	P
M.2.1.2	recall from memory all sums of two one-digit numbers. (2.OA.B.2)	Flash cards used for instant recall	P
M.2.1.3	show whole number sums and differences within 100 on a number line diagram. (2.MD.B.6)	Show the hops on a number line for addition and subtraction problems	P
M.2.1.4	record whole numbers as lengths on a number line with equal spaced lengths beginning at zero. (2.MD.B.6)	Record numbers on a number line	P

Numbers & Operations in Base Ten			Resource Topic(s) 2
1st Quarter			
M.2.2	**Outcome 2: Students represent foundational multiplication concepts utilizing equal groups of objects.**		
	Students will…		
Local Component Code	**Component**	**Examples**	**Priority Component(P) Supporting Component(S)**
M.2.2.1	determine whether a group of objects, within 20, has an odd or even number of members (e.g., by pairing objects or counting by 2s). (2.OA.C.3)	Can 17 apples be shared between two people equally? (use a drawing to support answer)	S
M.2.2.2	write an equation to express an even number as a sum of two equal addends. (2.OA.C.3)	Create and solve doubles facts	P
M.2.2.3	use addition to find the total number of items arranged in an array of up to 5 rows and 5 columns and write an equation to express the total as a sum of equal addends. (2.OA.C.4)	Create an array for each addition problem. 3+3+3=9 and then give the number model for an array pictured.	P

Numbers & Operations in Base Ten			Resource Topic(s) 3-7
Quarter 1 and 2			
M.2.3	**Outcome 3: Students utilize place value understanding to add and subtract within 100 and solve problems involving addition and subtraction.**		
	Students will…		
Local Component Code	**Component**	**Examples**	**Priority Component(P) Supporting Component(S)**
M.2.3.1	add and subtract fluently within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction. (2.NBT.B.5)	45+25= Show your work and solve. Now solve another way.	P
M.2.3.2	solve one- and two-step addition word problems within 100 involving situations of adding to, putting together, and comparing with unknowns in all positions. (2.OA.A.1)	Solve addition word problems and show work in any form	P
M.2.3.3	solve one- and two-step subtraction word problems within 100 involving situations of taking apart, taking from, and comparing with unknowns in all positions. (2.OA.A.1)	Solve subtraction word problems and show work in any form	P
M.2.3.4	explain why addition and subtraction strategies work, using place value and properties of operations. (2.NBT.B.9)	One of your classmates solved the problem 25 + 35 by adding 20 + 30 + 5 + 5. Is this strategy correct? Explain your answer.	P
M.2.3.5	add up to four two-digit numbers using the concept of place value. (2.NBT.B.6)	Show work and solve- focus on addition strategies	P

Operations & Algebraic Thinking: Subtraction			Resource Topic 8
3rd Quarter			
M.2.4	**Outcome 4: Students tell and write time using analog and digital clocks and solve problems involving money.**		
	Students will…		
Local Component Code	**Component**	**Example**	**Priority Component(P) Supporting Component(S)**
M.2.4.1	tell and write time from analog and digital clocks to the nearest five minutes, using am and pm. (2.MD.C.7)	Read analog clocks Read time written in word form and convert to digital time. 8:00 breakfast: AM or PM?	S
M.2.4.2	calculate the total value of a given amount of coins and bills, up to $5.00, both with visual representation and with words, using $ and ¢ signs. (2.MD.C.8)	Count up an amount of coins pictured Count up an amount of bills pictured Label correctly	S
M.2.4.3	represent a given value with different combinations of dollar bills, quarters, dimes, and nickels, and pennies. (2.MD.C.8)	Draw coins/bills to equal 25 cents two ways. Draw coins/bills to equal $1.00 two ways	S

Numbers & Operations in Base Ten			Resource Topic(s) 9
3rd Quarter			
M.2.5	**Outcome 5: Students will demonstrate number sense by counting, comparing, and analyzing numbers within 1000.**		
	Students will…		
Local Component Code	**Component**	**Examples**	**Priority Component(P) Supporting Component(S)**
M.2.5.1	convert a group of 10 tens into a bundle of 100. (2.NBT.A.1a)	13 tens 5 ones= 0 hundreds 1 tens 8 ones	P
M.2.5.2	classify multiples of 100 up to 900 as one, two, three, etc. hundreds and zero ones and tens. (2.NBT.A.1b)	Draw base ten blocks and count up base ten blocks pictured in hundreds place	P
M.2.5.3	identify the value of each digit in a three-digit number. (2.NBT.A.1)	285 can be shown as 2 hundreds, 8 tens, and 5 ones but it is also correct as 28 tens and 5 ones or 100, 18 tens, and 5 ones.	P
M.2.5.4	compare two three-digit numbers by comparing place values using >, =, and < symbols to record the results of the comparisons. (2.NBT.A.4)	Use greater than, less than, and equal symbols correctly	P
M.2.5.5	count by ones, 5s, 10s, and 100s, starting at any given number less than 1000. (2.NBT.A.2)	Fill in blanks between starting and ending number	P
M.2.5.6	read and write numbers to 1000 using base ten numerals, number names, and expanded form. (2.NBT.A.3)	921= _ + _ + _ (fill in the blanks) 242=two hundred forty- two (Students should be able to write both ways)	P

M.2.5.7	Find 10 or 100 more or less than a given number between 100 and 900 mentally without having to count. (2.NBT.B.8)	100 more than 653 is... 10 more than 284 is... 10 less than 200 is... 100 less than 729 is...	P

Numbers & Operations in Base Ten			**Resource Topic(s) 10**
3rd Quarter			
M.2.6	**Outcome 6: Students will add and subtract within 1000.**		
	Students will…		
Local Component Code	**Component**	**Examples**	**Priority Component(P) Supporting Component(S)**
M.2.6.1	add within 1000 using models and drawings. (2.NBT.B.7)	Draw base ten blocks to solve an addition problem	P
M.2.6.2	add numbers within 1000, understanding that it is sometimes necessary to compose a bundle of 100 from a group of 10s or a bundle of 10s from a group of 1s. (2.NBT.B.7)	Draw the sum of an addition problem using base ten blocks	P
M.2.6.3	subtract within 1000 using models and drawings. (2.NBT.B.7)	Draw base ten blocks to solve a subtraction problem	P
M.2.6.4	subtract numbers within 1000, understanding that it is sometimes necessary to decompose a bundle of 100 to form a group of 10s, or a bundle of 10s to form a group of 1s. (2.NBT.B.7)	Draw the difference of a subtraction problem using base ten blocks	P

Numbers & Operations in Base Ten			Resource Topic(s) 12 & 13
4th Quarter			
M.2.7	**Outcome 7: Students will measure and estimate lengths in standard units.**		
	Students will…		
Local Component Code	**Component**	**Examples**	**Priority Component(P) Supporting Component(S)**
M.2.7.1	choose the appropriate tool for measurement (ruler, yardstick, meter stick, measuring tape). (2.MD.A.1)	Ellie wants to measure her pencil to see how long it is. What would she use?	P
M.2.7.2	measure the length of an object accurately with the appropriate tool. (2.MD.A.1)	Measure a given object in your classroom using inches or centimeters..	P
M.2.7.3	estimate a unit of length using whole numbers (inch, feet, centimeters, meters). (2.MD.A.3))	Estimate a given object in your classroom using a given unit.	P
M.2.7.4	compare the measurements of one item with two different measuring units (e.g., inches and centimeters). (2.MD.A.2)	Measure a picture using centimeters and inches then describe the difference between the two units.	P
M.2.7.5	measure to compare lengths between two objects and record the differences using a standard length unit. (2MD.A.4)	Using inches or centimeters measure two objects then subtract to find difference.	P
M.2.7.6	solve word problems involving lengths that are given in the same units. (2.MD.B.5)	Mary is making a dress. She has 10 yards of fabric. She uses some of the fabric and has 2 yards left. How many yards did Mary use?	P

Numbers & Operations in Base Ten			Resource Topic(s) 14
4th Quarter			
M.2.8	**Outcome 8: Students represent and interpret data.**		
	Students will…		
Local Component Code	**Component**	**Examples**	**Priority Component(P) Supporting Component(S)**
M.2.8.1	generate measurement data by measuring lengths of several objects to the nearest whole unit, or by making repeated measurement of the same object. (2.MD.D.9)	Give ten pictures of pencils (various lengths) and measure each to nearest inch then record answers on a chart.	S
M.2.8.2	show the measurements by making a line plot, where the horizontal scale is marked off in whole-number units. (2.MD.D.9)	Graph measurements of pencils measured on a line plot.	S
M.2.8.3	construct a picture graph with a single unit scale to represent a data set with up to four categories. (2.MD.D.10)	Collect data from class in a tally chart then create a picture graph.	S
M.2.8.4	solve simple put-together, take-apart, and compare problems using information from a picture graph.	Answer given questions about picture graph (Which flavor had the least votes?).	S
M.2.8.5	construct a bar graph with a single unit scale to represent a data set with up to four categories. (2.MD.D.10)	Construct a horizontal and a vertical bar graph (using data from tally chart already collected); include a title, scale, scale label, and category label.	S
M.2.8.6	solve simple put-together, take-apart, and compare problems using information from a bar graph. (2.MD.D.10)	Answer given questions about the bar graphs (How many students voted altogether for their favorite ice cream?).	S

Numbers & Operations in Base Ten			Resource Topic(s) 15
4th Quarter			
M.2.9	**Outcome 9: Students reason with shapes and their attributes.**		
	Students will…		
Local Component Code	**Component**	**Examples**	**Priority Component(P) Supporting Component(S)**
M.2.9.1	identify and draw/construct shapes given specific attributes including angles, sides, and faces (triangles, quadrilaterals, pentagons, hexagons, cubes). (2.G.A.1)	Using a word bank identify shapes and be able to draw a shape with a given number of sides.	S
M.2.9.2	partition a rectangle into rows and columns of same size squares and count to find the total number of them. (2.G.A.2)	Split the rectangle into 3 rows and 4 columns. How many squares did you make?	S
M.2.9.3	divide circles and rectangles into equal shares (up to four). (2.G.A.3)	Decompose a rectangle and circle into halves, thirds, and fourths).	S
M.2.9.4	describe the "whole" as being made up of two halves, three thirds, or four fourths. (2.G.A.3)	Using a word bank, tell whether a rectangle or circle is divided into halves, thirds, or fourths.	S
M.2.9.5	explain that equal shares of identical wholes need not have the same shape. (2.G.A.3)	*How much of the rectangle below is shaded?*  *How much of the rectangle below is shaded?* 	S

Grade 3 Mathematics Curriculum

Yorkville CUSD #115

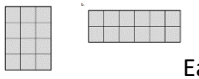
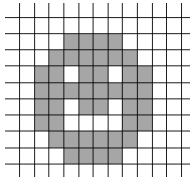
Grade-Level Focus Statement:
Students will apply appropriate skills for recognizing, manipulating and solving higher order questions with an emphasis on real world applications for problem solving.

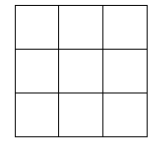
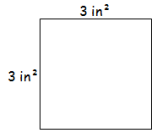
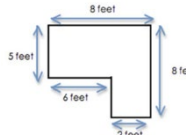
			Resource Topic(s) 1,2,3,4
1st Quarter			
M.3.1	**Outcome 1: Interpret and determine quotients and products of whole numbers.**		
	Students will…		
Local Component Code	**Component**	**Example**	**Priority Component (P) Supporting Component (S**
M.3.1.1	show that the multiplication symbol (x) means group of objects. (3.OA.1)	Jim purchased 5 packages of muffins. Each package contained 3 muffins. How many muffins did Jim purchase? 5 groups of 3, 5 x 3 = 15.	P
M.3.1.2	show that the division symbol (÷) means to share in equal groups. (3.OA.2)	 ***27*** divides into ***3*** equal groups of ***9*** ***27*** ÷ ***3*** = ***9***	P
M.3.1.3	identify and explain various arithmetic patterns. (multiplication)(3.OA.9)	Using a multiplication table, highlight a row of numbers and ask students what they notice about the highlighted numbers.	P

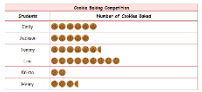
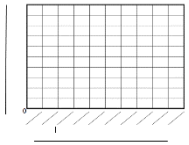
M.3.1.4	apply the properties of operation (Commutative, Associative and Distributive) to multiply and divide. (3.OA.5)	*students ability to apply the property is more important than students knowing the name* **Commutative**- 5 x 3 = 5 x 3 **Associative/** **Distributive-** Students need to know how to break down arrays to use known facts	P
M.3.1.5	produce the unknown whole number by demonstrating the relationship between multiplication and division. (3.OA.4, 3.OA.6)	Use 5 x 6 = 30 to determine the answer to 30 ÷ 6 = ?	P

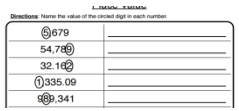
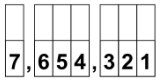
			Resource Topic(s) 5
1st Quarter			
M.3.2	**Outcome 2: Solve multiplication and division problems within real world situations.**		
	Students will...		
Local Component Code	**Component**	**Example**	**Priority Component (P) Supporting Component (S**
M.3.2.1	multiply and divide fluently within 100 recognizing the relationship between them. (3.OA.7)	**Strategies students may use to attain fluency:** -doubles facts -tens facts -five facts -skip counting -decomposing into known facts -fact families	P

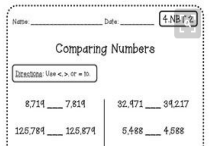
M.3.2.2	solve one and two step multiplication and division word problems within 100 by using drawings and equations with a letter for the unknown number. (3.OA.3, 3.OA.8)	Mike runs 2 miles a day. His goal is to run 25 miles. After 5 days, how many miles does Mike have left to run in order to meet his goal? Write an equation and find the solution (2 x 5 + m = 25).	P
M.3.2.3	know from memory all products of two one-digit numbers (by the end of third grade). (3.OA.7)	Students demonstrate fluency with multiplication facts 0 - 10	P

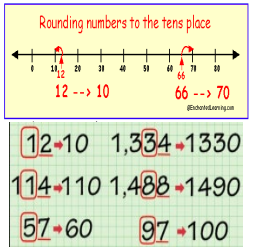
			Resource Topic(s) 6
2nd Quarter			
M.3.3	**Outcome 3: Calculate the area of polygons with and without unknown sides and construct plane figures.**		
	Students will...		
Local Component Code	**Component**	**Example**	**Priority Component (P) Supporting Component (S**
M.3.3.1	describe area as an attribute of plane figures using square units without gaps or overlaps. (3.MD.5a, 3.MD.5b)	 Each square is 1 unit, do both rectangles have same area?	P
M.3.3.2	find the area of a plane shape by counting squares (square cm, square m, square in. etc.). (3.MD.6)	 Find the area of the shape.	P

M.3.3.3	find the area of a rectangle with whole-number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths. (3.MD.7a)	 Area: _____ in^2  Area: _____ in^2 Students must understand that the tiles shape matches the other shape when multiplying side lengths.	P
M.3.3.4	apply multiplication (length x width) operations to find the area of a rectangle in the context of solving real world and mathematical problems. (3.MD.7b)	Find the area of a room given two lengths.	P
M.3.3.5	use tiling to show in a concrete case that the area of a rectangle with whole-number side lengths a and b + c is the sum of a × b and a × c. Use area models to represent the distributive property in mathematical reasoning. (3.MD.7c)	Find the area of something using tiles.	P
M.3.3.6	decompose a figure made up of multiple rectangles into non-overlapping rectangles to find area. (3.MD.7d)	 Find the area by breaking into 2 rectangles.	P

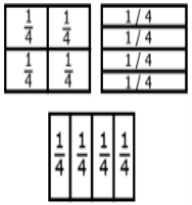
			Resource Topic(s) 7
2nd Quarter			
M.3.4	**Outcome 4: Construct and interpret data on various graphs with several categories.**		
	Students will...		
Local Component Code	**Component**	**Example**	**Priority Component (P) Supporting Component (S**
M.3.4.1	construct and interpret a scaled picture graph. (3.MD.3)	 interpret data from a given graph and construct with given data.	S
M.3.4.2	construct and interpret a scaled bar graph. (3.MD.3)	 Construct a bar graph with given data and answer questions from a given bar graph.	S
M.3.4.3	solve one- and two-step “how many more” and “how many less” problems using information presented in scaled bar graphs. (3.MD.3)	Be able to look at bar graph and answer questions like “how many liked red juice and purple juice” and 2 step problems like “how many more students like yellow and purple than red and orange?”	S

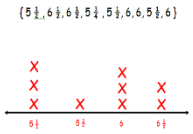
			Resource Topic(s)
2nd Quarter			
M.3.5	**Outcome 5: Demonstrate number sense from ones to the millions place.**		
	Students will...		
Local Component Code	**Component**	**Example**	**Priority Component (P) Supporting Component (S**
M.3.5.1	identify the name of each place value position from the ones to the millions place.	   	S
M.3.5.2	read and write numbers from the ones to the millions place in base ten numerals, expanded form, and number names.	 	S

M.3.5.3	compare and order whole numbers up to the millions place.		S

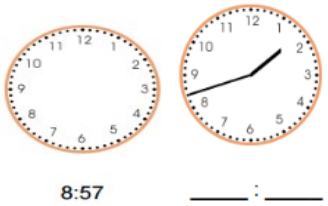
			Resource Topic(s) 8,9,10,11
3rd Quarter			
M.3.6	**Outcome 6: Solve addition and subtraction problems within 1000 in real world situations.**		
	Students will...		
Local Component Code	**Component**	**Example**	**Priority Component (P) Supporting Component (S**
M.3.6.1	round whole numbers less than one thousand to the nearest tens or hundreds, using the understanding of place value. (3.NBT.1)		S
M.3.6.2	add and subtract within 1000 using strategies and algorithms based on place values, properties of operations, and/or the relationship between addition and subtraction. (3.NBT.2)	Variety of strategies and algorithms 178 + 225 = ? **Student 1:** 100+200 = 300 70 +20 = 90 8 + 5 = 13 300 + 90 + 13 = 403 students **Student 2:**	S

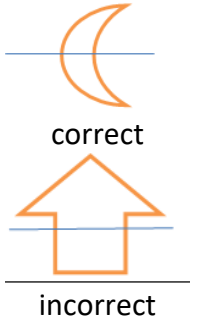
		178 + 200 = 378	
M.3.6.3	compute one-digit whole numbers by multiples of 10 (10-90) such as 9 x 80 or 5 x 60. (3.NBT.3)	50 x 4 = ? Students should think of this as 4 groups of 5 tens or 20 tens 20 tens = 200	P
M.3.6.4	assess the reasonableness of answers using mental computation and estimation strategies through verbal explanation. (3.OA.8)	**274 + 321 = 745** **Student's verbal response:** I figured that 274 is close to 300 and 321 is close to 300, so I added 300 + 300 = 600. The answer should be around 600, so this answer is not reasonable.	P
M.3.6.5	assess the reasonableness of answers using mental computation and estimation strategies through written explanation. (3.OA.8)	**211 + 831 = 1,042** **Student's written response:** I figured that 211 is close to 200 and 831 is close to 800, so I added 800 + 200 = 1,000. The answer should be around 1,000, so this answer is reasonable.	P
M.3.6.6	Identify and explain various arithmetic patterns. (addition) (3.0A.9)	On an addition chart, the sum in each row and column increase by the same amount.	P
M.3.6.7	solve two-step addition and subtraction word problems by representing the unknown quantity with a letter. (3.OA.8)	Mike runs 2 miles a day. His goal is to run 25 miles. After 5 days, how many miles does Mike have left to run in order to meet his goal? Write an equation and find the solution (2 x 5 + m = 25).	P

			Resource Topic(s) 12
3rd Quarter			
M.3.7	**Outcome 7: Develop an understanding of fractions as numbers as well as construct and interpret data on various graphs with several categories.**		
	Students will...		
Local Component Code	**Component**	**Example**	**Priority Component (P) Supporting Component (S**
M.3.7.1	divide shapes into parts with equal areas and express the area of each part as a unit fraction of the whole. (3.G.2)		S
M.3.7.2	demonstrate a fraction 1/b as the quantity formed by 1 part when a whole is partitioned into b equal parts. (3.NF.1)	If a shape is already partitioned, students should be able to correctly label each fractional piece as in 3.6.1. Also if a shape is partitioned and shaded, student should be able to name the shaded as well as the unshaded fractional pieces	P
M.3.7.3	demonstrate a fraction a/b as the quantity formed by a parts of size 1/b. (3.NF.1)	Students should be able to visually distinguish the difference between an equal and unequal fractional model.	P
M.3.7.4	represent a fraction 1/b on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into b equal parts. (3.NF.2a)	Provide students with segments that they label as well as plain lines they are to segment and label themselves.	P
M.3.7.5	represent a fraction a/b on a number line diagram by marking off a lengths 1/b from 0. Recognize that the resulting interval has size a/b and that its endpoint locates the number a/b on the number line. (3.NF.2b)	This could include ½ as your midpoint Introduce real world situations into the problem.	P

M.3.7.6	construct a line plot to show whole numbers, halves and quarters. (3.MD.4)		S
M.3.7.7	identify and measure to the nearest whole, half and quarter inch using a ruler. (3.MD.4)	Each student should have a ruler to practice	S

			Resource Topic(s) 13
3rd Quarter			
M.3.8	**Outcome 8: Analyze fractional components for comparisons and equivalences.**		
	Students will...		
Local Component Code	**Component**	**Example**	**Priority Component (P) Supporting Component (S**
M.3.8.1	identify two fractions as equivalent (equal) if they are the same size and the same point on a number line. (3.NF.3a)	Using number lines or pictures students can try to prove or disprove if two numbers are equal to each other. Remembering that segments on number line or partitions in each shape must be equal.	P
M.3.8.2	generate and explain why two fractions are equivalent. (3.NF.3b)	Using partitioning and understanding of denominators for explanations.	P
M.3.8.3	compare fractions with the same numerator or same denominator with the symbols less than, greater than or equal to and justify your answer. (3.NF.3d)	⅔ = ⅔ 1/10 < 1/5	P
M.3.8.4	rename whole numbers as fractions and recognize fractions that are equivalent to whole numbers. (3.NF.3c)	8/8 = 1 30/1 = 30	P

			Resource Topic(s) 14
4th Quarter			
M.3.9	**Outcome 9: Solve problems involving measurement and estimation of intervals of time, volumes, and masses of objects.**		
	Students will...		
Local Component Code	**Component**	**Example**	**Priority Component (P) Supporting Component (S**
M.3.9.1	tell and write the time to the nearest minute. (3.MD.1)		P
M.3.9.2	measure time intervals in minutes. (3.MD.1)	Use a timeline to teach students to count by hours and then minutes or use clocks and allow students to hop from hour to hour and then minutes to count the amount of time passed.	P
M.3.9.3	solve word problems involving addition and subtraction of time intervals in minutes. (3.MD.1)	Tanya went to daycare at 6:45am. Her mom picked her up at 2:30. How long was she at daycare?	P
M.3.9.4	estimate and measure liquid volumes and masses of objects using grams (g), kilograms (kg), and liters (l). (3.MD.2)	Students need multiple opportunities "massing" classroom objects and filling containers to help them develop a basic understanding of the size and mass of a liter, a gram, and a kilogram.	P
M.3.9.5	solve one-step word problems (+,-,x, ÷) involving masses or volumes in the same unit by using drawings. (3.MD.2)	Selina's teacher has a large container that holds 12 liters of water. He asks Selina to pour the water from that container into 6 smaller beakers for the class to use in a science lab. If Selina uses all of the water from the container and pours it in equal amounts into the 6 beakers, how much water should be in each beaker? Write an equation to represent your work.	P

			Resource Topic(s) 15
4th Quarter			
M.3.10	**Outcome 10: Identify and describe properties of two dimensional shapes.**		
	Students will...		
Local Component Code	**Component**	**Example**	**Priority Component (P) Supporting Component (S**
M.3.10.1	sort triangles, quadrilaterals, pentagons, hexagons, and circles into different categories based on attributes (sides and angles). (3.G.1)	What shapes have 4 sides? What shapes have more than 4 angles? What shapes have no angles?	S
M.3.10.2	explain the similarities and differences of quadrilaterals according to their attributes, and draw examples that do not belong. (3.G.1)	**How are squares and rhombuses similar?** *They are similar because they both have 4 equal sides and 4 angles.* **How are they different?** *They are different because a square has 4 right angles and a rhombus has 0 right angles*	S
M.3.10.3	draw and construct different types of quadrilaterals. (3.G.1)	Student's drawings should be clearly identifiable by the shapes attributes.	S
M.3.10.4	identify line(s) of symmetry in a given shape.	 correct incorrect	S

			Resource Topic(s) 16
4th Quarter			
M.3.11	**Outcome 11: Calculate the area and perimeter of polygons with and without unknown sides and construct plane figures.**		
	Students will...		
Local Component Code	**Component**	**Example**	**Priority Component (P) Supporting Component (S**
M.3.11.1	solve real world problems to find the perimeter of a polygon. (3.MD.8)	Be able to find the perimeter of a classroom or a garden	S
M.3.11.2	solve for the unknown side when the perimeter is given. (3.MD.8)	Students will be given total perimeter and one side length and have to find the missing side(s).	S
M.3.11.3	construct rectangles with the same perimeter and different areas or same area and different perimeters. (3.MD.8)	Given chart paper, students will draw different “gardens” with various given lengths and widths and determine which have same perimeter.	S

Grade 4 Mathematics Curriculum

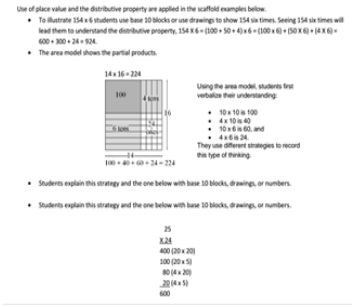
Yorkville CUSD #115

Grade-Level Focus Statement:
Students will apply the four basic operations to fluently solve real world problems using whole numbers. Students will utilize fractional understanding to solve problems. Students will analyze and classify geometric figures based on parallel and perpendicular sides, angle measures, and symmetry.

Numbers & Operations in Base Ten			**Resource Topic 1**
1st Quarter			
M.4.1	**Outcome 1: Students will evaluate numbers in the base ten system.**		
	Students will…		
Local Component Code	**Component**	**Example**	**Priority Component(P) Supporting Component(S)**
M.4.1.1	explain that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right (4.NBT.A.1)	1.) How is the 2 in the number 582 similar to and different from the 2 in the number 528? 2.) 10 × 35 = 350 because the 3 in 350 represents 3 hundreds, which is 10 times as much as 3 tens, and the 5 represents 5 tens, which is 10 times as much as 5 ones. 3.) In the number 344,586, how many times greater is the value represented by the 4 in the ten thousands place than the value represented by the 4 in the thousands place?	P

M.4.1.2	read and write multi-digit whole numbers to the millions place using base-ten numerals, number names, and expanded form. (4.NBT.A.2)	Traditional expanded form is 285 = 200 + 80 + 5. Written form is two hundred eighty-five. However, students should have opportunities to explore the idea that 285 could also be 28 tens plus 5 ones or 1 hundred, 18 tens, and 5 ones.	P
M.4.1.3	compare multi-digit whole numbers to the millions place using <, =, > . (4.NBT.A.2)	1.) In comparing 34,570 and 34,192, a student might say, both numbers have the same value of 10,000s and the same value of 1000s however, the value in the 100s place is different so that is where I would compare the two numbers.	P
M.4.1.4	round whole numbers to any place value using concepts of place value. (4.NBT.A.3)	1.) In order to round 368 to the nearest hundreds place, students can draw a number line between 300 and 400. Determine the halfway point is 350. Where does 368 fall on the number line? Is it closer to 300 or 400? 2.) Round 23,960 to the nearest hundred.	P

Numbers & Operations in Base Ten			**Resource Topic(s) 2-5**
1st Quarter			
M.4.2	**Outcome 2: Students will solve addition, subtraction, multiplication and division problems within 1000 in real world situations.**		
	Students will…		
Local Component Code	**Component**	**Example**	**Priority Component(P) Supporting Component(S)**
M.4.2.1	apply the standard algorithm to real world problems involving multi-digit	Reference place value when “carrying” in addition and “borrowing” in subtraction	P

	addition and subtraction. (4.NBT.B.4)		
M.4.2.2	multiply two-by-two digit numbers and four-by-one digit numbers using strategies based on place value and the properties of operations. (4.NBT.B.5)	Illustrate and explain through the use of equations, arrays, and/or area models. **Do not introduce with standard algorithm.**  Use of place value and the distributive property are applied in the scaffold examples below. • To illustrate 154 x 6 students use base 10 blocks or use drawings to show 154 six times. Seeing 154 six times will lead them to understand the distributive property, 154 X 6 = (100 + 50 + 4) x 6 = (100 x 6) + (50 X 6) + (4 X 6) = 600 + 300 + 24 = 924. • The area model shows the partial products. 14 x 16 = 224 100 4 tens 16 5 tens 4 ones 140 60 24 10 4 100 + 40 + 60 + 24 = 224 Using the area model, students first verbalize their understanding: • 10 x 10 is 100 • 4 x 10 is 40 • 10 x 6 is 60, and • 4 x 6 is 24. They use different strategies to record this type of thinking. • Students explain this strategy and the one below with base 10 blocks, drawings, or numbers. • Students explain this strategy and the one below with base 10 blocks, drawings, or numbers. 25 X 24 400 (20 x 20) 100 (20 x 5) 80 (4 x 20) 20 (4 x 5) 600	P
M.4.2.3	divide up to four-by-one digit numbers using strategies based on place value and the properties of operations. (4.NBT.B.6)	Illustrate and explain through the use of equations, arrays, and/or area models. **Do not introduce with standard algorithm.** A fourth grade teacher bought 4 new pencil boxes. She has 250 pencils and she wants to put the pencils so that each box has the same number of pencils. How many pencils where there be in each box? • Use base ten blocks: Students build 250 with blocks and distribute them into 4 equal groups. Some students may need to trade 2 hundreds for tens but others may easily recognize that 200 divided by 4 is 50. • Using place value: 250 divided by 4 = (200 divided by 4) + (50 divided by 4) • Using multiplication: 4 x 50 = 200, 4 x 10 = 40, 4 x 5 = 20, 50 + 10 + 5 = 65	P

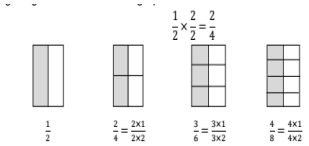
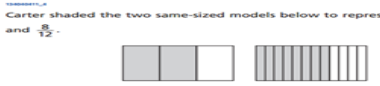
<table>
<tr>
<td>M.4.2.4</td>
<td>explain why an answer is or is not reasonable by using mental computation and estimation strategies, including rounding. (4.OA.A.3)</td>
<td>Your class is collecting bottled water for a service project. The goal is to collect 300 bottles of water. On the first day, Noah brings in 3 packs with 6 bottles in each pack. Susan brings in 6 packs with 6 bottles in each pack. About how many bottles of water still need to be collected?
<table>
<tr>
<td>Student 1
First, I multiplied 3 and 6 which equals 18. Then, I multiplied 6 and 6 which is 36. I know 18 plus 36 is about 50. I’m trying to get to 300. 50 plus another 50 is 100. Then, I need 2 more hundreds, so we still need 250 bottles.</td>
<td>Student 2
First, I multiplied 3 and 6 which equals 18. Then, I multiplied 6 and 6 which is 36. I know 18 is about 20. 36 is about 40. 40 plus 20 equals 60. 300 - 60 = 240, so we will need about 240 more bottles.</td>
</tr>
</table>
</td>
<td>P</td>
</tr>
</table>

Operations & Algebraic Thinking			Resource Topic 6
2nd Quarter			
M.4.3	**Outcome 3: Students will use operations with whole numbers to solve problems.**		
	Students will…		
Local Component Code	**Component**	**Example**	**Priority Component(P) Supporting Component(S)**
M.4.3.1	represent statements of multiplicative comparisons as equations and vise versa. (4.OA.A.1)	5 x 7 = 35 because 35 is five times as many as 7 or 7 times as many fives. Or 35 is five times as many as 7 or 7 times as many fives is the same as 5 x 7 = 35.	S
M.4.3.2	multiply or divide to solve word problems involving multiplicative comparison. (4.OA.A.2)	1.) Use drawings and equations with a symbol for the unknown number to represent the problem. 2.) There are 18 books in the bookcase. There are 6 books on each shelf. How many shelves are there?	S
M.4.3.3	distinguish multiplicative comparison from additive comparison. (4.OA.A2)	When distinguishing multiplicative comparison from additive comparison, students should note that: Additive comparisons focus on the difference between two quantities (e.g., Deb has 3 apples and Karen has 5 apples. How many more apples does Karen have?). A simple way to remember this is, “How many more?” Multiplicative comparisons focus on comparing two quantities by showing that one quantity is a specified number of times larger or smaller than the other (e.g., Deb ran 3 miles. Karen ran 5 times as many miles as Deb. How	S

		many miles did Karen run?). A simple way to remember this is"How many times as many?"	
M.4.3.4	solve multi-step word problems using whole numbers and the four operations in which remainders may need to be interpreted. (4.OA.A.3)	There are 128 students going on a field trip. If each bus held 30 students, how many buses are needed? A: They will need 5 buses although 4 buses will not be completely full.	P

Numbers & Operations in Base Ten			**Resource Topic 7**
2nd Quarter			
M.4.4	**Outcome 4: Students will evaluate numbers in the base ten system through factors and multiples.**		
	Students will…		
Local Component Code	**Component**	**Example**	**Priority Component(P) Supporting Component(S)**
M.4.4.1	identify all factor pairs for a whole number in the range of 1-100 by recognizing that a whole number is a multiple of each of its factors. (4.OA.B.4)	1.) What are the factors of 24? 2.) Jane is making a list of the factors for the number 17. She will use one line in her notebook for each factor. How many lines will she use?	P
M.4.4.2	evaluate numbers 1-100 to determine if they are prime or composite. (4.OA.B.4)	1.) Use rectangle arrays- the number 7 only has two rectangles (7x1 and 1x7) while the number 6 has four rectangles (6x1, 1x6, 2x3, 3x2) 2.) The number 1 is neither prime nor composite because it only has one factor.	S

M.4.4.3	evaluate whole numbers 1-100 to determine if the number is a multiple of a one-digit number. (4.OA.B.4)	1.) List four multiples of 6. 2.) Which of the following numbers is not a multiple of 8? a. 16 b. 24 c. 40 d. 74	S

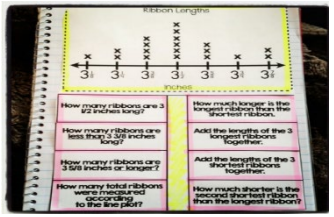
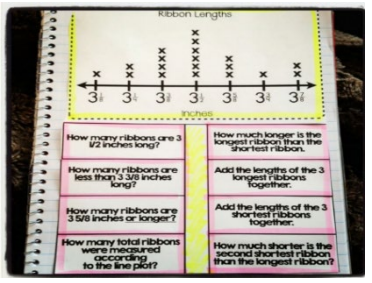
Numbers & Operations: Fractions			**Resource Topic 8**
2nd Quarter			
M.4.5	**Outcome 5: Students will understand fractional equivalence and ordering.**		
	Students will…		
Local Component Code	**Component**	**Example**	**Priority Component(P) Supporting Component(S)**
M.4.5.1	identify and create equivalent fractions by using visual representations. (4.NF.A.1)		P
M.4.5.2	explain why a fraction *a*/*b* is equivalent to a fraction $\left(\frac{a}{b} \times \frac{n}{n}\right)$ by using visual fraction models. (4.NF.A.1)	Carter shaded the two same sized models below to represent the fractions ⅔ and 8/12. 	P

		Carter believed that 2/3 is equivalent to 8/12. Why is he correct or incorrect?	
M.4.5.3	generate and apply a rule for writing equivalent fractions. (4.NF.A.1)	$\left(\frac{a}{b} \times \frac{n}{n}\right) = \frac{a}{b}$ $\left(\frac{a}{b} \div \frac{n}{n}\right) = \frac{a}{b}$ ½ = 3/6 because 1x3= 3 and 2x3 = 6.	S
M.4.5.4	compare fractions with and without common numerators and denominators using the appropriate symbols >, <, and =, and justify the conclusion. (4.NF.A.2)	There are two cakes on the counter that are the same size. The first cake has ½ left. The second has 5/12 left. Which cake has more left? • Use pictures, number lines, benchmark fractions, find common denominators	P

Numbers & Operations: Fractions			**Resource Topic 9**
2nd Quarter			
M.4.6	**Outcome 6: Students will understand addition and subtraction of fractions.**		
	Students will…		
Local Component Code	**Component**	**Example**	**Priority Component(P) Supporting Component(S)**
M.4.6.1	justify decompositions in fractions by showing one whole broken down into the addition of equal parts. (4.NF.B.3b)	3/8 = 1/8 + 1/8 + 1/8	P
M.4.6.2	add and subtract fractions with like denominators. (4.NF.B.3a)	2/8 + ⅝ = ⅞ 2/4 +¼= ¾ 5/12-4/12= 1/12	P

M.4.6.3	solve word problems involving addition and subtraction of fractions, referring to the same whole and having like denominators through use of visual fraction models and equations. (4.NF.B.3d)	⅝ of the tables in the cafe are round. ⅜ are square. How much more of the cafe has round tables? 5/8 - 3/8 = 2/8	P
M.4.6.4	add and subtract mixed numbers with like denominators. (4.NF.B.3c)	When solving the problem 3 ¾ + 2 ¼ , students could do the following:  **Student 1** $3 + 2 = 5 \; and \; \frac{3}{4} + \frac{1}{4} = 1$. **Student 2** $3\frac{3}{4} + 2 = 5\frac{3}{4} + \frac{1}{4} = 6$	P

Numbers & Operations: Fractions			Resource Topic 10
3rd Quarter			
M.4.7	**Outcome 7: Students will extend multiplication concepts to fractions.**		
	Students will…		
Local Component Code	**Component**	**Example**	**Priority Component(P) Supporting Component(S)**
M.4.7.1	explain through visual representation how fraction a/b is a multiple of fraction 1/b. (4.NF.B.4a)	⅔ = ⅓ + ⅓ OR 2 x ⅓	S
M.4.7.2	construct visual fraction models to represent improper fractions as products of a whole number and a fraction. (4.NF.B.4b)	3 x (2/5) = 6 x (1/5) = 6/5 6 x (1/5)= ⅕+ ⅕+⅕+⅕+⅕+⅕ Use fraction pieces to model this.	P
M.4.7.3	solve word problems involving multiplication of a fraction by a whole number using visual fraction models and equations. (4.NF.B.4.c)	Each person at a party will eat 3/8 of a pound of watermelon and 5 people are attending the party. How many pounds of watermelon will be needed?	P

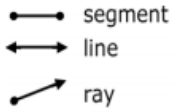
Numbers & Operations: Fractions			Resource Topic 11
3rd Quarter			
M.4.8	**Outcome 8: Students will represent and interpret data on line plots.**		
	Students will…		
Local Component Code	**Component**	**Example**	**Priority Component(P) Supporting Component(S)**
M.4.8.1	make a line plot to display a data set of measurements in fractions of a unit (½, ¼, and ⅛). (4.MD.B.4)		S
M.4.8.2	solve problems involving addition and subtraction of fractions by using information presented in line plots. (4.MD.B.4)		S

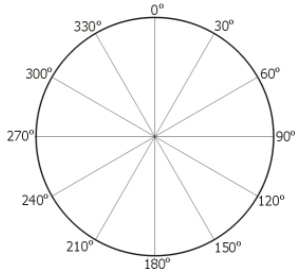
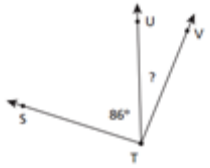
Numbers & Operations: Fractions			Resource Topic 12
3rd Quarter			
M.4.9	**Outcome 9: Students will understand decimal notation for fractions, and compare decimal fractions.**		
	Students will…		
Local Component Code	**Component**	**Example**	**Priority Component(P) Supporting Component(S)**
M.4.9.1	add two fractions with respective denominators of 10 and 100 by converting the fraction with denominator 10 to a fraction with denominator 100. (4.NF.C.5)	3/10 + 4/100 = express 3/10 as 30/100, and add 30/100 + 4/100 = 34/100	P
M.4.9.2	convert between fractions and decimals using a denominator of 10 or 100. (4.NF.C.6)	.5 = 5/10 .07 = 7/100 .23 = 23/100	P
M.4.9.3	compare two decimals up to the hundredths place, using >, <, and =, and justify your conclusion. (4.NF.C.7)	Using grids and other representations, explain why 0.08 is smaller than 0.8.	P

<table>
<tr><td colspan="3">Measurement & Data</td><td rowspan="3">Resource Topic 13</td></tr>
<tr><td colspan="3">3rd/4th Quarter</td></tr>
<tr><td rowspan="2">M.4.10</td><td colspan="2">Outcome 10: Students will solve real world problems involving measurements and conversions.</td></tr>
<tr><td colspan="2">Students will…</td></tr>
<tr><td>Local Component Code</td><td>Component</td><td>Example</td><td>Priority Component(P) Supporting Component(S)</td></tr>
<tr><td>M.4.10.1</td><td>determine the appropriate unit of measure for given objects within one system of measurement including inches, ft, yds, miles, km, m, cm; kg, g; lb, oz; l, ml; hr, min, sec. (4.MD.A.1)</td><td>Examine varying sizes of containers, objects, etc.
Examine various measuring tools (measuring cups, spoons, scales, rulers, meter sticks, etc.)
Make connections between items to be measured and appropriate tools to do so.</td><td>S</td></tr>
<tr><td>M.4.10.2</td><td>convert between measurements and record in a two column table within one system of units in both metric and customary units (in, ft, yds, miles; km, m, cm; kg, g; lb, oz; l, ml; hr, min, sec). (4.MD.A.1)</td><td>1.) Allow students to use rulers or a yardstick to discover the relationships among these units of measurements.
2.) 1 ft is 12 times as long as 1 in (generate conversion table)<table><tr><td>ft</td><td>in</td></tr><tr><td>1</td><td>12</td></tr><tr><td>2</td><td>24</td></tr></table></td><td>S</td></tr>
<tr><td>M.4.10.3</td><td>apply the four operations to word problems involving distances and unit conversions including problems with both simple fractions and decimals. (4.MD.A.2)</td><td>1.) Debbie and 10 friends are planning for a pizza party. They purchased 3 quarts of milk. If each glass holds 8 oz will everyone get at least one glass of milk?</td><td>S</td></tr>
</table>

		2.) Susan has 2 feet of ribbon. She wants to give her ribbon to her 3 best friends so each friend gets the same amount. How much ribbon will each friend get?	
M.4.10.4	apply the four operations to word problems involving money and intervals of time including problems with both simple fractions and decimals. (4.MD.A.2)	1.) A pound of apples costs $1.20. Rachel bought a pound and a half of apples. If she gave the clerk a $5.00 bill, how much change will she get back? 2.) Mason ran for an hour and 15 minutes on Monday, 25 minutes on Tuesday, and 40 minutes on Wednesday. What was the total number of minutes Mason ran?	S
M.4.10.5	apply the area and perimeter formulas of rectangles in real-world and mathematical problems. (4.MD.A.3)	Mrs. Carson's art class made a large rectangular mural. The length of the mural is 9 feet, and the area is 72 square feet. What is the width of the mural?	S
M.4.10.6	apply the four operations to word problems involving liquid volumes and masses of objects including problems with both simple fractions and decimals. (4.MD.A.2)	Mario and his 2 brothers are selling lemonade. Mario brought one and a half liters, Javier brought 2 liters, and Ernesto brought 450 milliliters. How many total milliliters of lemonade did the boys have?	S
M.4.10.7	represent measurement quantities using diagrams. (4.MD.A.2)	Examples include: Ruler, diagram marking off distance along a road with cities at various points, a timetable showing hours throughout the day, or a volume measure on the side of a container.	S

Operations & Algebraic Thinking			Resource Topic 14
4th Quarter			
M.4.11	**Outcome 11: Students will analyze patterns and generate numbers to complete a given rule.**		
	Students will…		
Local Component Code	**Component**	**Example**	**Priority Component(P) Supporting Component(S)**
M.4.11.1	generate a number or shape pattern that follows a given rule. (4.OA.C.5)	1.) Input/output boxes 2.) Use the following rule to make a pattern. Rule: add 9 3.) There are 4 beans in the jar. Each day 3 beans are added. How many beans are in the jar for each of the first 5. Day Operation Beans 0 3x0+4 4 1 3x1+4 7 2 3x2+4 10 3 3x3+4 13 4 3x4+4 16 5 3x5+4 19	S
M.4.11.2	analyze a pattern to determine a given rule for continuing the pattern. (4.OA.C.5)	Input output boxes	S

Geometry			Resource Topic(s) 15,16
4th Quarter			
M.4.12	**Outcome 12: Students will evaluate measurements, angles, and attributes of geometric shapes in mathematical and real world situations.**		
	Students will…		
Local Component Code	**Component**	**Example**	**Priority Component(P) Supporting Component(S)**
M.4.12.1	define and draw points, lines, line segments, rays, angles (right, acute, obtuse, parallel, and perpendicular. (4.G.A.1)	*Drawings in this outcome are sketches and do not require the use of mathematical tools*  Acute Angle- an angle measuring 1 degree through 89 degrees Right Angle- a 90 degree angle Obtuse Angle- an angle measuring 91 degrees through 179 degrees Parallel Lines-lines that never intersect and are equidistant Perpendicular Lines- lines that intersect to form right angles	S
M.4.12.2	define angles as two rays sharing a common endpoint. (4.MD.C.5)	Angles are geometric shapes composed of two rays that are infinite in length. Students can understand this concept by using two rulers held together near the ends. The rulers can represent the rays of an angle. As one ruler is rotated, the size of the angle is seen to get larger.	S

M.4.12.3	describe a “one degree angle” as 1/360th of a full rotation around a center point of a circle. (4.MD.C.5.A)	Students explore an angle as a series of “one-degree turns.” A water sprinkler rotates one-degree at each interval. If the sprinkler rotates a total of 100 degrees, how many one-degree turns has the sprinkler made? 	S
M.4.12.4	describe an angle of *n* degrees as the sum of *n* one-degree angles. (4.MD.C.5.B)	A 5 degree angle is the sum of 5 one-degree angles.	S
M.4.12.5	explain that when an angle is broken into non-overlapping parts, the angle measure of the “whole” is the sum of the angle measure of the parts. (4.MD.C.7)	A lawn water sprinkler rotates 65 degrees and then pauses. It then rotates an additional 25 degrees. What is the total degree of the water sprinkler rotation? To cover a full 360 degrees how many times will the water sprinkler need to be moved?	S
M.4.12.6	solve addition and subtraction problems to find unknown angles on a diagram, in the real world, and in problems without context. (4.MD.C.7)	Using an equation with a symbol for an unknown angle measure 	S
M.4.12.7	measure and construct angles using a protractor. (4.MD.C.6)	Teaching and practice using both half- and full-circle protractors.	S

M.4.12.8	identify and describe the characteristics of a right triangle. (4.G.A.2)	A right triangle is a triangle that has one right angle.	S
M.4.12.9	classify two-dimensional figures based on parallel lines, perpendicular lines, and angles of a specified size. (4.G.A.2)	Name a figure that has two parallel sides and exactly 2 right angles.	S
M.4.12.10	identify and draw single and multiple lines of symmetry in two-dimensional figures. (4.G.A.3)	Give the students experience with many shapes that can be folded to determine if they have symmetry. They can explore block letters of the alphabet. Students can also search magazines to find shapes that are symmetrical. Encourage them to look for multiple lines of symmetry in different shapes.	S

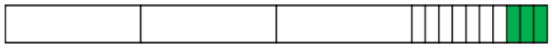
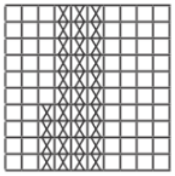
Grade 5 Mathematics Curriculum

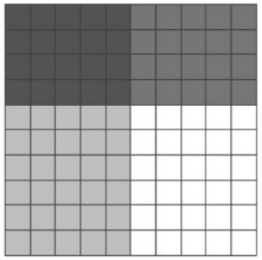
Yorkville CUSD #115

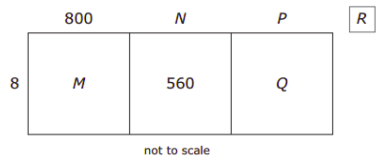
Grade-Level Focus Statement:
Students will apply the four basic operations to fluently solve real world problems using fractions and decimals. Students will investigate properties of geometry and measurement to solve real world and mathematical problems.

Numbers & Operations in Base Ten			**Resource Topic 1**
1st Quarter			
M.5.1	**Outcome 1: Students will evaluate numbers in the base ten system.**		
	Students will…		
Local Component Code	**Component**	**Examples**	**Priority Component(P) Supporting Component(S)**
M.5.1.1	identify numbers from the range of ten thousandths to billions place. (5.NBT.1)	Students should identify each place value in a number such as: 5,345,621,378.982	S
M.5.1.2	use whole-number exponents to denote powers of 10. (5.NBT.2)	10^2 which is 10 x 10 = 100, and 10^3 which is 10 x 10 x 10 = 1,000. Students should have experiences working with connecting the pattern of the number of zeros in the product when you multiply by powers of 10.	P

M.5.1.3	explain that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left. (5.NBT.1)	Kipton has a digital scale. He puts a marshmallow on the scale and it reads 7.2 grams. How much would you expect 10 marshmallows to weigh? Why?	P
M.5.1.4	solve for the product when multiplying a number by powers of ten. (5.NBT.2)	• 36 x 10 = 36 x 101= 360 • 36 x 10 x 10 = 36 x 10^2 = 3600 • 36 x 10 x 10 x 10 = 36 x 10^3 = 36,000	P
M.5.1.5	explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. (5.NBT.2)	2.5 x 10^3 = 2.5 x (10 x 10 x 10) = 2.5 x 1,000 = 2,500 The exponent indicates how many places the decimal point is moving when you multiply by a power of 10. When we multiply by a power of 10 the decimal point moves to the right.	P
M.5.1.6	read and write decimals to the thousandths using base-ten numerals, number names, and expanded form. (5.NBT.3a)	Some equivalent forms of 0.72 are: 72/100, 7/10 + 2/100 7 x (1/10) + 2 x (1/100) 0.70 + 0.02 70/100 + 2/100 0.720 7 x (1/10) + 2 x (1/100) + 0 x (1/1000) 720/1000	P
M.5.1.7	compare and order two decimals based on the digits in each place value, using less than (<), greater than (>), or equal to (=) symbols to record the results of the comparison. (5.NBT.3b)	Comparing 0.25 and 0.17, a student might think, 25 hundredths is more than 17 hundredths. They may also think that it is 8 hundredths more. They may write this comparison as 0.25 > 0.17 and recognize that 0.17 < 0.25 is another way to express this comparison.	P
M.5.1.8	apply concepts of place value to round decimals to any place. (5.NBT.4)	Round 14.235 to the nearest tenth. Students recognize that the possible answer must be in tenths thus, it is either 14.2 or 14.3. They then identify that 14.235 is closer to 14.2 (14.20) than to 14.3 (14.30).	P

Numbers & Operations: Decimals			Resource Topic 2
1st Quarter			
M.5.2	**Outcome 2: Students will add and subtract decimals to the hundredths.**		
	Students will…		
Local Component Code	**Component**	**Examples**	**Priority Component(P) Supporting Component(S)**
M.5.2.1	use concrete models, drawing and strategies to solve decimal addition problems with and without context where the addends do not exceed the hundredths place. (5.NBT.7)	$4 - 0.3 = ?$ 3 tenths subtracted from 4 wholes. The wholes must be divided into tenths. 	P
M.5.2.2	use concrete models, drawing and strategies to solve decimal subtraction problems with and without context where the subtrahends do not exceed the hundredths place. (5.NBT.7)	$0.6 - 0.34 =$ _____ 	P
M.5.2.3	Add and subtract decimals to the hundredths place using the standard algorithm with and without context. (5.NBT.7)	$\begin{array}{r} {\scriptstyle 1\ 1\ 1\ \ } \\ 28.47 \\ +\ 19.56 \\ \hline 48.03 \end{array}$ $\begin{array}{r} 2.40 \\ -\ 1.32 \\ \hline \end{array}$	P

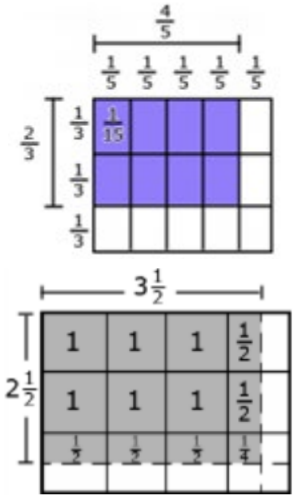
Numbers & Operations: Decimals			Resource Topics 3-6
1st Quarter			
M.5.3	**Outcome 3: Students will evaluate problems involving multi-digit whole number and decimal multiplication and division.**		
	Students will…		
Local Component Code	**Component**	**Examples**	**Priority Component(P) Supporting Component(S)**
M.5.3.1	multiply multi-digit whole numbers fluently (3-digit by 2-digit) using the standard algorithm. (5.NBT.5)	123 x 34. When students apply the standard algorithm, they, decompose 34 into 30 + 4. Then they multiply 123 by 4, the value of the number in the ones place, and then multiply 123 by 30, the value of the 3 in the tens place, and add the two products.	P
M.5.3.2	multiply decimals in which products do not exceed the hundredths place by utilizing concrete models or strategies based on place-value, properties of operations, and the relationship between multiplication and division. (5.NBT.7)	Which product is represented by the model?  A. $0.05 \times 0.04 = 0.002$ B. $5 \times 0.4 = 2$ C. $0.5 \times 0.4 = 0.2$ D. $0.5 \times 0.04 = 0.02$	P

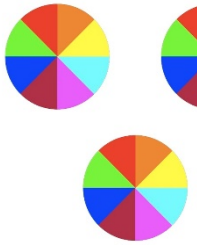
M.5.3.3	compute whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors. (5.NBT.6)	1,716 divided by 16	P
M.5.3.4	explain the division of whole numbers with four-digit dividends and two-digit divisors using equations, rectangular arrays, and area models. (5.NBT.6)	**Teacher's Model for 6,986 ÷ 8**  not to scale	P
M.5.3.5	Divide decimals in which the divisors, nor the dividends exceed the hundredths place by utilizing concrete models or strategies based on place-value, properties of operations, and the relationship between multiplication and division. (5.NBT.7)	Joe has 1.6 meters of rope. He has to cut pieces of rope that are 0.2 meters long. How many can he cut?	P

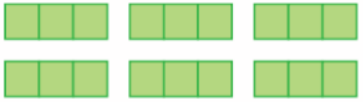
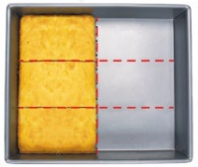
Numbers & Operations: Fractions			**Resource Topic 7**
2nd Quarter			
M.5.4	**Outcome 4: Students will use equivalent fractions as a strategy to add and subtract fractions.**		
	Students will…		
Local Component Code	**Component**	**Example**	**Priority Component(P) Supporting Component(S)**
M.5.4.1	use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. (5.NF.2)	Your teacher gave you ⅕ of the bag of candy. She also gave your friend ⅓ of the bag of candy. If you and your friend combined your candy, you will have ¾ bag of candy. Is this reasonable? Why or why not?	P

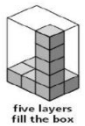
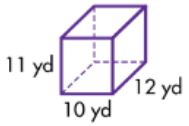
M.5.4.2	add and subtract fractions (including mixed numbers) with unlike denominators by replacing the given fractions with equivalent fractions. (5.NF.1)	1) For ⅓ + ⅙ , a common denominator is 18, which is the product of 3 and 6. This process can be introduced using visual fraction models (area models, number lines, etc.) to build understanding before moving into the standard algorithm. 2) 3 ¼ - ⅙	P
M.5.4.3	solve word problems involving addition and subtraction of fractions and mixed numbers with like and unlike denominators. (5.NF.2)	Jerry was making two different types of cookies. One recipe needed ¾ cup of sugar and the other needed ⅔ cup of sugar. How much sugar did he need to make both recipes?	P

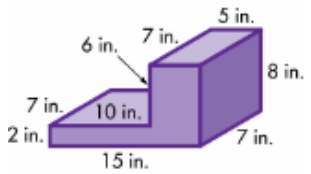
Numbers & Operations: Fractions			**Resource Topic 8**
2nd Quarter			
M.5.5	**Outcome 5: Students will utilize understandings of multiplication to multiply fractions.**		
	Students will…		
Local Component Code	**Component**	**Example**	**Priority Component(P) Supporting Component(S)**
M.5.5.1	multiply a fraction by a fraction, and a fraction by a whole number. (5.NF.4, 5.NF.4a)	*For example, use a visual fraction model to show (⅔) × 4 = 8/3, and create a story context for this equation. Do the same with (2/3) × (4/5) = 8/15. (In general, (a/b) × (c/d) = ac/bd.)*	P
M.5.5.2	explain why multiplying a given number by a fraction greater than one results in a product greater than the given number and why multiplying a given number by a fraction less than one produces a product less than the given number. (5.NF.5b)	Student can make equivalent fractions to interpreting multiplication by *n*/as n/n multiplication by 1 Use models to explain. 	P

M.5.5.3	Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas.		P
M.5.5.4	Solve real world problems involving multiplication of fractions and mixed numbers, e.g. by using visual fraction models or equations to represent the problem. (5.NF.6)	There are 2 ½ bus loads of students standing in the parking lot. The students are getting ready to go on a field trip. 2/5 of the students on each bus are girls. How many busses would it take to carry only the girls?	P

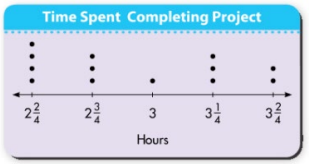
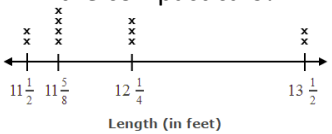
Numbers & Operations: Fractions			Resource Topic 9
2nd Quarter			
M.5.6	**Outcome 6: Students will utilize understandings of division to divide fractions.**		
	Students will…		
Local Component Code	**Component**	**Example**	**Priority Component(P) Supporting Component(S)**
M.5.6.1	solve word problems by interpreting the answer as a fraction or mixed number or the division of the numerator by the denominator. (5.NF.3)	(a/b = a ÷ b) Emily has three equally sized apple pies left and she wants to divide them into eight equal portions. They each get ⅛ of each pie, ⅜  total.	P
M.5.6.2	interpret division of a whole number by a unit fraction, and compute such quotients. (5.NF.7b)	Susan wants to evenly divide 3 pounds of cheese into ⅓ pound increments. How many pieces will she have? What if she had 6 pounds?	P

		 How many $\frac{1}{3}$s are in 3? $3 \div \frac{1}{3} =$ ____ How many $\frac{1}{3}$s are in 6? $6 \div \frac{1}{3} =$ ____	
M.5.6.4	solve real world problems involving division of unit fractions by non-zero whole numbers and non-zero whole numbers by unit fractions. (5.NF.7c)	Use a model. Divide $\frac{1}{2}$ into 3 equal parts $\frac{1}{2} \div 3$  Each part contains $\frac{1}{6}$ of the whole. $\frac{1}{2} \div 3 = \frac{1}{6}$ Each person gets $\frac{1}{6}$ of the cornbread.	P

Geometry: Three-Dimensional Solids			Resource Topic 10
3rd Quarter			
M.5.7	**Outcome 7: Students will distinguish attributes of three-dimensional shapes and relate volume formulas of rectangular solids to additive and multiplicative principles.**		
	Students will…		
Local Component Code	**Component**	**Example**	**Priority Component(P) Supporting Component(S)**
M.5.7.1	describe how the volume of a solid figure can be measured using unit cubes.(5.MD.3a)	A cube with side length 1 unit, called a "unit cube," is said to have "one cubic unit" of volume, and can be used to measure volume. A solid figure can be packed without gaps or overlaps using *n* unit cubes is said to have a volume of *n* cubic units.	P
M.5.7.2	measure volume using unit cubes, cubic cm, cubic in, cubic ft, and improvised (non-standard) units. (5.MD.4)	Find the volume of this solid figure. 	P
M.5.7.3	compare the volume of a rectangular prism found through stacking the area of the base to the volume (V= B x h) found by multiplying edge lengths. (5.MD.5a)	 (3 x 2) represented by first layer (3 x 2) x 5 represented by number of 3 x 2 layers (3 x 2) + (3 x 2) + (3 x 2) + (3 x 2)+ (3 x 2) = 6 + 6 + 6 + 6 + 6 + 6 = 30 6 representing the size/area of one layer	P
M.5.7.4	apply the formulas V=l x w x h and V= B x h for rectangular prisms to find the volume of right rectangular prisms with whole number edge lengths in the context of solving real world and mathematical problems. (5.MD.5b)	 V= (10 x 12) x11	P

		or V = 10 x 12 x 11	
M.5.7.5	Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real world problems. (5.MD.5c)		P

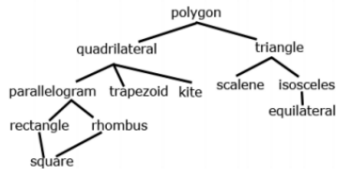
Measurement & Data			**Resource Topic 11,12**
3rd Quarter			
M.5.8	**Outcome 8: Students will convert like measurements within one of two given number systems (Metric, US Customary) and will represent and interpret fractional measurement data.**		
	Students will…		
Local Component Code	**Component**	**Examples**	**Priority Component(P) Supporting Component(S)**
M.5.8.1	convert units in customary system of measurement to solve multi-step, real world problems. (5.MD.1)	(inches, feet, yards, miles)	S
M.5.8.2	convert units in the metric system of measurement to solve multi-step, real world problems. (5.MD.1)	(mm, cm, m, km)	S

M.5.8.3	construct a line plot to display a data set of measurements in fractions of a unit (½ , ¼ , ⅛). (5.MD.2)		S
M.5.8.4	utilize operations on fractions to solve problems involving information presented in line plots. (5.MD.2)	The line plot shows the lengths of different compact cars for sale at an auto mall. If placed end-to-end, what would be the total length of all of the compact cars? 	S

Operations & Algebraic Thinking			**Resource Topic 13**
3rd/4th Quarter			
M.5.9	**Outcome 9: Students will evaluate and write simple expressions containing parentheses, brackets, and braces.**		
	Students will…		
Local Component Code	**Component**	**Example**	**Priority Component(P) Supporting Component(S)**
M.5.9.1	use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols. (5.OA.1)	Evaluate the following numerical expressions. a. $2 \times 5 + 3 \times 2 + 4$ b. $2 \times (5 + 3 \times 2 + 4)$	P

M.5.9.2	write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. (5.OA.2)	47 reduced by 17 = 47-17 3 times the sum of 4 and 6 = 3 (4+6)	P

Geometry: The Coordinate Plane			**Resource Topics 14,15**
4th Quarter			
M.5.10	**Outcome 10: Students will graph points on the coordinate plane to solve real world and mathematical problems.**		
	Students will…		
Local Component Code	**Component**	**Example**	**Priority Component(P) Supporting Component(S)**
M.5.10.1	use a pair of perpendicular number lines, called axes, to define the coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. (5.G.1)	Define origin, x-axis, y-axis, coordinates	S
M.5.10.2	plot (x,y) coordinates in quadrant I. (5.G.1)		S
M.5.10.3	represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation. (5.G.2)		S
M.5.10.4	create multiple ordered pairs from the two patterns, and graph them on Quadrant 1 of the coordinate plane. (5.OA.3)	Bob catches 5 fish the first hour and 3 each hour after. Joe catches 2 the first hour then 4 each hour after. Create a table and graph.	S
M.5.10.5	explain apparent relationships between two linear patterns. (5.OA.3)		S

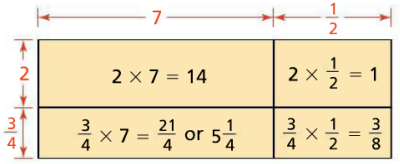
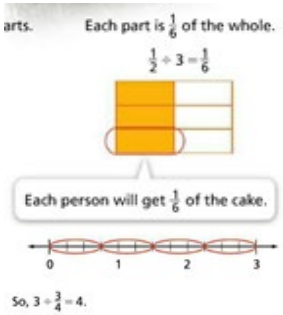
Geometry: Two-Dimensional Shapes			Resource Topic 16
4th Quarter			
M.5.11	**Outcome 11: Students will classify two-dimensional figures based on their properties and solve for the area of rectangles through conceptual and fractional reasoning.**		
	Students will…		
Local Component Code	**Component**	**Examples**	**Priority Component(P) Supporting Component(S)**
M.5.11.1	understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category. (5.G.3)	A square is categorized as a rectangle and a square.	S
M.5.11.2	classify two-dimensional figures in a hierarchy based on properties. (5.G.4)		S

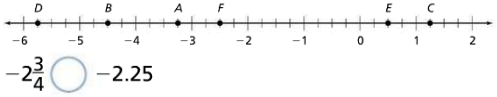
Grade 6 Mathematics Curriculum

Yorkville CUSD #115

Grade-Level Focus Statement:
Students will apply multiplication and division to reason through rate, ratio, and fractional computations. Students will write, interpret, and use expressions and equations. Students will utilize negative integers and apply statistical thinking.

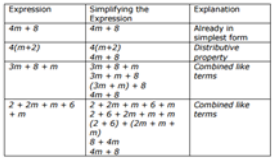
<table>
<tr><th colspan="3">The Number System</th><th rowspan="3">Resource Topic(s)
1</th></tr>
<tr><th colspan="3">1st Quarter</th></tr>
<tr><td rowspan="2">M.6.1</td><td colspan="2">Outcome 1: Students will compute fluently with multi-digit numbers containing decimals.</td></tr>
<tr><td colspan="2">Students will…</td></tr>
<tr><td>Local Component Code</td><td>Component</td><td>Example</td><td>Priority Component(P) Supporting Component(S)</td></tr>
<tr><td>M.6.1.1</td><td>add, subtract, and multiply decimals with and without context. (6.NS.B.3)</td><td>14.1-12.33= 1.77
0.008+0.125+0.15=0.283
3.58×1.25=4.475</td><td>P</td></tr>
<tr><td>M.6.1.2</td><td>divide multi-digit numbers and decimals using the standard algorithm with and without context. (6.NS.B.2, 6.NS.B.3)</td><td>43.25÷12.5=$3.46 55÷10=5.5 Quotients may or may not have a remainder, but remainders must be written as fractions or decimals.</td><td>P</td></tr>
</table>

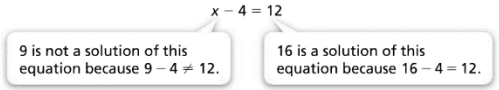
M.6.1.3	use models and/or equations to multiply fractions and mixed numbers with and without context. (6.NS.A.1)	 $7\frac{1}{2} \times 2\frac{3}{4} = \frac{15}{2} \times \frac{11}{4}$ $= \frac{165}{8}$ $= 20\frac{5}{8}$ $14 + 1 + 5\frac{1}{4} + \frac{3}{8} =$ $14 + 1 + 5\frac{2}{8} + \frac{3}{8} = 20\frac{5}{8}$ $5\frac{1}{4}$ is renamed $5\frac{2}{8}$.	P
M.6.1.4	interpret and compute quotients of fractions using visual fraction models and/or equations with and without context. (6.NS.A.1)	 How many ¾ cup servings are in ⅔ of a cup of yogurt?	P

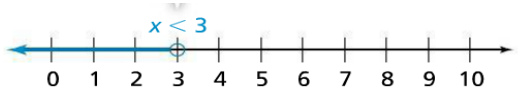
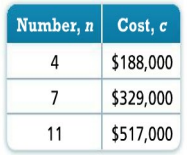
The Number System			Resource Topic(s) 2
1st Quarter			
M.6.2	**Outcome 2: Students will reason about the order and absolute value of rational numbers and about the location of points in all four quadrants of the coordinate plane.**		
	Students will…		
Local Component Code	**Component**	**Example**	**Priority Component(P) Supporting Component(S)**
M.6.2.1	understand, order, and compare positive and negative numbers and relate to quantities in real-world contexts, explaining the meaning of zero. (6.NS.C.5)	Temperatures above and below zero; elevation above and below sea level; credits and debits compared to original balance; positive and negative charge compared to neutral charge	**P**
M.6.2.2	locate and explain opposites on a number line through their position in relation to zero, and identify opposites of opposites as being the number itself. (6.NS.C.6.A)	–(-3) = 3; because they are the same distance from zero –(–(10) =10	**P**
M.6.2.3	represent and compare rational numbers on the number line, recognizing how a number line is partitioned, relating statements of inequality to the relative position of two numbers on a number line diagram, with or without context. (6.NS.C.7ab) (6.NS.C.6.c)	 -4 < -2 because -4 is located to the left of -2 on the number line. -12.55 < -10.45, Sue owes more than Ron OR Ron owes less than Sue.	**P**
M.6.2.4	interpret the absolute value of a rational number as its distance from 0 on the number	For an account balance of -30 dollars, write |-30| = 30 to describe the size of the debt as being $30 away from $0 balance. An account balance less than -30 dollars represents a debt greater than 30 dollars.	**P**

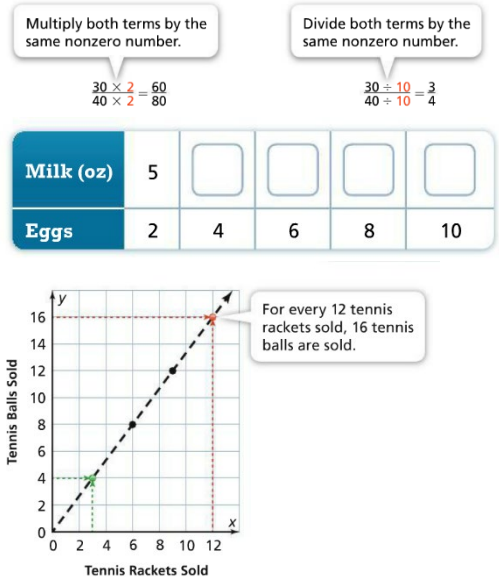
	line, as well as relate absolute value to statements of order (6.NS.7cd)		
M.6.2.5	find and position rational number coordinates on a coordinate plane, relating signs of coordinates to their quadrant location. (6.NS.C.6b)	(6, 4.5) = quadrant 1 (-2, 3.25) = quadrant 2	**P**
M.6.2.6	understand that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes. (6.NS.C.6c)	Reflect the points over the x-axis and find the coordinates of the new points: label the reflection of point A as A', the reflection of B as B', the reflection of C as C', and the reflection of D as D'	**P**
M.6.2.7	solve problems with and without context by graphing points in all four quadrants of the coordinate plane, including the use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate. (6.NS.C.8)	The distance between (-5, 2) and (-9, 2) would be 4 units. This would a horizontal line since the y-coordinates are the same. The distance can be found by using a number line to find the distance between -5 and -9. Students could also recognize that -5 is 5 units from 0 (absolute value) and that -9 is 9 units from 0 (absolute value). Distance could be found by finding the difference between 9 and 5.	**P**
M.6.2.8	graph a polygon with given coordinates and use the (x,y) values to compute the length of a side joining points with the same first coordinate or same second coordinate and apply this technique in solving problems both with and without context. (6.G.A.3)	Graph the polygon A(1,3) B(1, 7) C(9,3) D(9,7). Use the coordinates to justify the length of the side.	**P**

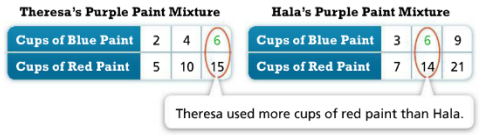
Expressions & Equations			Resource Topic 3
2nd Quarter			
M.6.3	**Outcome 3: Students will write expressions that correspond to given situations, apply the properties of operations to rewrite expressions in equivalent forms, evaluate and interpret expressions.**		
	Students will…		
Local Component Code	**Component**	**Example**	**Priority Component(P) Supporting Component(S)**
M.6.3.1	write and evaluate numbers with exponents, including base numbers that are fractions and decimals. (6.EE.A.1)	You can represent a repeated multiplication expression using an exponent. base $5 \times 5 \times 5 \times 5 = 5^4$ exponent power You can evaluate a power using repeated multiplication. $5^4 = 5 \times 5 \times 5 \times 5 = 625$	P
M.6.3.2	determine the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12, with and without context. Express a sum of 2 whole numbers (1-100) as their greatest common factor multiplied by a sum by utilizing the distributive property, with and without context. (6.NS.B.4)	Strategy: prime factorization	S
M.6.3.3	write and evaluate numerical expressions using order of operations (6.EE.A.1)	$0.2^2 \div [2.4 - (1.3 \div 2)] + 3$	P
M.6.3.4	write algebraic expressions to represent situations, and label parts of an expression (term, coefficient, constant, etc) (6.EE.2a, 6.EE.2b)	8 less than a number f can be written as f - 8 If chocolate is $0.75 a piece and a lollipop is $1.30, it can be expressed as 0.75c + 1.30l.	P

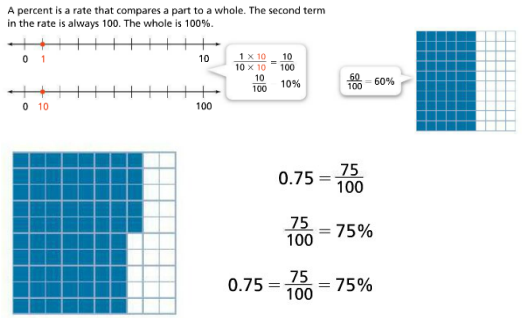
		In 2(8+7), 2 and (8+7) are factors and (8+7) is also a sum.	
M.6.3.5	evaluate expressions when the value for the variable is a whole number, decimal or fraction. (6.EE.A.2c)	Find the value of the expression if a = 7 and b = 3.4; 5a - b + 6	P
M.6.3.6	identify and generate equivalent expressions using the properties of operations and justify using substitution. (6.EE.A.3, 6.EE.A.4)	*3(2 +x) =6 + 3x *3 + y = y + 3 *(4 + 3) + x = 4 + (3 + x)	P
M.6.3.7	use properties of operations to simplify algebraic expressions by combining like terms. (6.EE.A.3, 6.EE.A.4)	https://www.azed.gov/azccrs/files/2013/11/6flipbookedited22.pdf (page 37) 	P

Expressions & Equations			**Resource Topic(s) 4**
2nd Quarter			
M.6.4	**Outcome 4: Students will reason about and solve one-step equations and simple inequalities as well as represent and analyze quantitative relationships between dependent and independent variables.**		
	Students will…		
Local Component Code	**Component**	**Example**	**Priority Component(P) Supporting Component(S)**
M.6.4.1	determine if a value for a variable is a solution by choosing which values from a specified set of rational numbers, if any, make an equation true and verify using substitution. (6.EE.B.5)		**P**

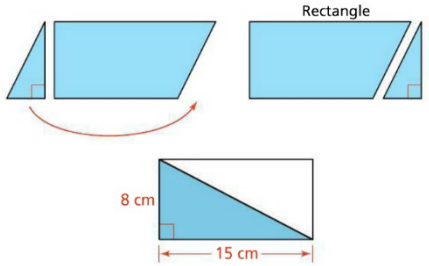
M.6.4.2	write and solve one-step addition and subtraction equations, both with and without context. (6.EE.B.6, 6.EE.B.7)	*x + 4 = 5 *12 = x - 6	**P**
M.6.4.3	write and solve one-step multiplication and division equations, both with and without context. (6.EE.B.6, 6.EE.B.7)	*10x = 90 *x8 = 9	**P**
M.6.4.4	write and solve equations using rational numbers, with and without context. (6.EE.B.6, 6.EE.B.7)	Carmen spent $12.50 for a new notebook and a compass. The notebook cost $6.35. Write and solve an equation to find *c*, the cost of the compass.	**P**
M.6.4.5	write inequalities to represent a constraint or condition, both with and without context, recognizing that inequalities have infinitely many solutions. (6.EE.B.5, 6.EE.B.8)	You must be at least 16 to have a driver's license: $a \geq 16$	**P**
M.6.4.6	represent solutions of inequalities on a number line and write an inequality given a graphed solution(6.EE.B.5, 6.EE.B.8)		**P**
M.6.4.7	identify the independent and dependent variables from a given scenario. (6.EE.C.9)	Identify the independent and dependent variable; the number of hours studying *h* and the score on a test *t*	**P**
M.6.4.8	write an equation from a table that represents two quantities in a given context that change in relationship to each other. (6.EE.C.9)		**P**
M.6.4.9	analyze the relationship between the independent and dependent variables in tables, graphs, and equations (6.EE.C.9)	In a problem involving motion at constant speed, use the equation d = 65t to list and graph ordered pairs of distances and times, and explain the relationship between distance and time.	**P**

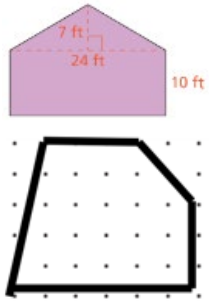
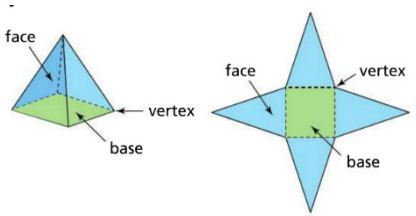
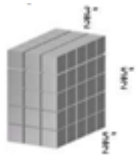
Ratios & Proportional Reasoning			Resource Topic(s) 5
3rd Quarter			
M.6.5	**Outcome 5: Students will connect ratio and rate to whole number multiplication and division and use concepts of ratio and rate to solve problems.**		
	Students will…		
Local Component Code	**Component**	**Example**	**Priority Component(P) Supporting Component(S)**
M.6.5.1	demonstrate the concept of a ratio through using ratio language to describe a relationship between two quantities. (6.RP.A.1)	The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak	**P**
M.6.5.2	generate equivalent ratios with and without the use of a table, display equivalent ratios on a coordinate plane, and compute missing values within a table. (6.RP.A.3a)		**P**

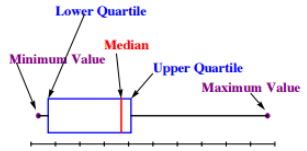
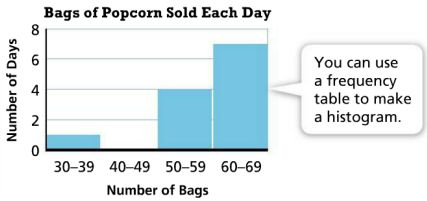
M.6.5.3	compare ratios using tables, tape diagrams, and/or double number lines in order to solve problems. (6.RP.A.3a)		**P**
M.6.5.4	apply and compare the concept of a unit rate by using unit rate language to describe and explain a ratio relationship. (6.RP.A.2)	$\frac{3 \text{ cups}}{4 \text{ cups}} = \frac{¾ \text{ cup}}{1 \text{ cup}}$	**P**
M.6.5.5	solve unit rate problems including those involving unit pricing and constant speed where a given rate is applied or a rate needs to be computed from given data. (6.RP.A.3b)	"We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger."	**P**
M.6.5.6	convert within and between measurement units (customary and metric) through ratio reasoning (6.RP.A.3d)	$\frac{4 \text{ qt} \times 15}{1 \text{ gal} \times 15} = \frac{60 \text{ qt}}{15 \text{ gal}}$	**P**

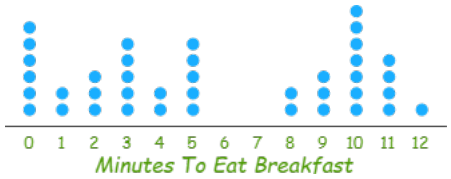
Understand and Use Percentages			Resource Topic(s) 6
3rd Quarter			
M.6.6	**Outcome 6: Students will use reasoning, equivalent rates, and division to find the relationship between percentages, fractions, and decimals.**		
	Students will…		
Local Component Code	**Component**	**Example**	**Priority Component(P) Supporting Component(S)**
M.6.6.1	Understand percent (1 to 100) and how it relates to decimals and fractions (6.RP.A.3c)		**P**
M.6.6.2	understand percent (over 100 and less than 1) and how it relates to decimals and fractions(6.RP.A.3c)	$275\% = \frac{275}{100}$ $\frac{275 \div 25}{100 \div 25} = \frac{11}{4}$ $275\% = \frac{11}{4} = 2.75$ $\frac{1}{5}\% = 0.2\%$ $\frac{0.2}{100} = \frac{2}{1,000}$ or $\frac{1}{500} = 0.002$ $\frac{1}{5}\% = \frac{1}{500} = 0.002$	**P**
M.6.6.3	find a percent of a quantity using equivalent ratios (6.RP.A.3c)	$\frac{\text{part}}{\text{whole}} = \frac{\text{percent}}{100}$ **PERCENT - the number with the percent sign (%).** **PART - the number with the word is.** **WHOLE - the number with the word of.**	**P**

M.6.6.4	solve problems involving finding the whole when given a part and the percent using equivalent ratios. (6.RP.A.3c)	35% of what number is 91?	**P**

Geometry			**Resource Topic(s) 7**
4th Quarter			
M.6.7	**Outcome 7: Students will reason about relationships among shapes to determine area, surface area, and volume.**		
	Students will…		
Local Component Code	**Component**	**Example**	**Priority Component(P) Supporting Component(S)**
M.6.7.1	calculate the area of triangles (right, acute, obtuse) and special quadrilaterals (rectangles, squares, parallelograms, trapezoids, rhombi, and kites) by composing into rectangles, both with and without context. (6.G.A.1)		**S**

M.6.7.2	calculate the area of polygons by decomposing into triangles and rectangles/squares in a problem both with and without context. (6.G.A.1)		**S**
M.6.7.3	represent three-dimensional figures using nets made up of triangles and/or rectangles. (6.G.A.4)		**S**
M.6.7.4	create and utilize nets to find the surface area of prisms and pyramids and solve problems both with and without context. (6.G.A.4)	Use nets to find surface area	**S**
M.6.7.5	apply formulas to find volume of three-dimensional figures in problems both with and without context, showing that volume can be found by using either formula. Explain how to compute the volume of a rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths (6.G.A.2)	 V = *lwh* and V= *Bh*	**S**

Statistics			Resource Topic(s) 8
4th Quarter			
M.6.8	**Outcome 8: Students will develop an understanding of variability and the concept of statistical measures.**		
	Students will…		
Local Component Code	**Component**	**Example**	**Priority Component(P) Supporting Component(S)**
M.6.8.1	recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. (6.SP.A.1)	"How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question.	**S**
M.6.8.2	explain that mean, median, and mode are measures of center, and that range describes how data values vary. (6.SP.A.3, 6.SP.B.5c)	The measures of center summarize all the data with a single number, while measures of variation measures how the data varies with a single number.	**S**
M.6.8.3	construct a boxplot from a given data set by identifying minimum, maximum, median, lower quartile, and upper quartile. (6.SP.B.4)		**S**
M.6.8.4	construct dot plots, frequency tables, and histograms to display numerical data and report the number of observations in the set. (6.SP.B.4, 6.SP.B.5a)		**S**

			
M.6.8.5	compute the measures of variability (range, interquartile range, and mean absolute deviation) of a given data set and explain what each means. (6.SP.B.5b, 6.SP.B.5c)	Mean absolute deviation = average distance from the average	**S**
M.6.8.6	determine an appropriate measure of center and measure of variability using the shape and/or context of the data. (6.SP.B.5c, 6.SP.B.5d)	Five surf shops sell the same pair of flip flops for the following prices: $17.00, $15.50, $15.00, $18.00, $15.00. Find the mean, median, mode of the data to determine which measure of center and which measure of variability best describes the data.	**S**
M.6.8.7	analyze a data distribution by its center, spread, and overall shape. (6.SP.A.2, 6.SP.B.5b)	Discuss clusters, gaps, modes, and outliers	**S**

Grade 7 Mathematics Curriculum

Yorkville CUSD 115

Grade-Level Focus Statement:

Students will develop a unified understanding of rational numbers, formulating equations to solve problems. They will apply their knowledge of ratios to evaluate real world proportional relationships. Students will also describe relationships between two and three-dimensional shapes involving area, surface area and volume.

Number Sense: Rational Numbers			Resource Topic(s) 1
1st Quarter			
M.7.1	**Outcome 1: Students will analyze and solve problems using rational numbers in number sentences and with real world applications.**		
	Students will…		
Local Component Code	**Component**	**Examples**	**Priority Component(P) Supporting Component(S)**
M.7.1.1	describe situations with the additive inverse property where opposite quantities combine to make zero, and relate integers, their opposites and their absolute values. (7.NS.A.1.A, 7.NS.A.1.B)	Alexis walks 6 floors down in the parking garage-6 and then 6 floors back up 6. 6 and -6 are opposites and combine to make zero. She walks the same distance down and then back up but in opposite directions.	P
M.7.1.2	convert a rational number to a decimal using long division to determine if the number terminates or repeats. (7.NS.A.2.D)	Without calculator	P
M.7.1.3	calculate sums using rational numbers with and without real-world contexts, utilizing number sentences, horizontal, and vertical number lines. (7.NS.A.1.B, 7.NS.A.1.D, 7.NS.A.3)	Understand p + q as the number located a distance |q| from p, in the positive or negative direction depending on	P

		whether q is positive or negative. Ex: -5 + (-7) is solved by starting at- 5 and then moving 7 units to the left.	
M.7.1.4	calculate differences using rational numbers with and without real-world contexts, utilizing number sentences, horizontal, and vertical number lines. (7.NS.A.1.C, 7.NS.A.1.D)	Understand subtraction of rational numbers as adding the additive inverse. Ex: 5 - 7 or 5 + (-7) = -2, so 5 is 7 units away from -2.	P
M.7.1.5	calculate products and quotients using rational numbers with and without real-world contexts. (7.NS.A.2.A, 7.NS. A.2.B, 7.NS.A.2.C, 7.NS.A.3)	Without calculator	P
M.7.1.6	calculate sums, differences, products, and quotients using rational numbers involving real world situations, assessing the reasonableness of answers using mental computation and estimation. (7.NS.A.1.D, 7.NS.A.2.C, 7.NS.A.3)	Without calculator	P

Ratios & Proportional Relationship			**Resource Topic 2**
1st Quarter			
M.7.2	**Outcome 2: Students will analyze proportional relationships to solve problems with and without context.**		
	Students will…		
Local Component Code	**Component**	**Examples**	**Priority Component(P) Supporting Component(S)**

M.7.2.1	compute unit rates associated with ratios of fractions, including ratios of lengths, areas, and other quantities measured in like or different units. (7.RP.A.1)	Ex: A person walks ½ mile in ¼ hour, compute the unit rate as a complex fraction... ½ divided by ¼ = 2 miles per hour.	P
M.7.2.2	determine whether two quantities form proportional relationships, by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin. (7.RP.A.2.A)	Make sure to hit that ratios exist for each point in the graph. See Flip Book 7.RP.2 Examples.	P
M.7.2.3	identify the constant of proportionality (unit rate) from tables, graphs, equations, diagrams and verbal descriptions. (7.RP.A.2.B)	Give the equation y=75x and have the students state the constant of proportionality	P
M.7.2.4	generate proportional relationships using equations and function tables. (7.RP.A.2.C)	Write an equation in y=kx form Fill in a table that has a proportional relationship	P
M.7.2.5	explain what a point (x,y) on the graph of a proportional relationship means, focusing on (0,0) and (1,r) where r is the unit rate. (7.RP.A.2.D)	Fruit and Nut example from Flip Book	P

Percents		**Resource Topic 3**
2nd Quarter		
M.7.3	**Outcome 3: Students will use proportional relationships to solve multi-step percent problems.**	
	Students will…	

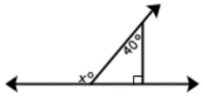
Local Component Code	Component	Examples	Priority Component(P) Supporting Component(S)
M.7.3.1	utilize a percent proportion to find an unknown part, whole or percent. (7.RP.A.2C), (7.RP.A.3)	Laura's phone had a fully charged battery. With normal usage, it will last 18 hours. How much time is left on Laura's phone battery with 12% battery life remaining? (Other contexts: tips, taxes, fees and commissions)	P
M.7.3.2	understand the relationship between proportional reasoning and percent through writing and interpreting the results of a percent equation. (7.RP.A.2C), (7.RP.A.3)	part = percent whole	P
M.7.3.3	solve real-world problems with percent increase/decrease and percent error problems. (7.RP.A.3)	new = percent change original	P
M.7.3.4	relate percent increase/decrease to percent markup and percent markdown. (7.RP.A.3)	markup/markdown = percent markup/markdown original price	P
M.7.3.5	identify the parts of interest problems and how the values are related and used to calculate simple interest. (7.RP.A.3)	I = Prt	P

Expressions & Equations: Expressions			Resource Topic(s) 4
2nd Quarter			
M.7.4	**Outcome 4: Students will apply properties of operations to manipulate linear expressions with real world applications.**		
	Students will:		
Local Component Code	**Component**	**Examples**	**Priority Component(P) Supporting Component(S)**
M.7.4.1	write and evaluate algebraic expressions which include rational numbers. (7.EE.B.3)	Evaluate 0.5f - 2.3g if f = 12 and g = 2	
M.7.4.2	expand and simplify expressions using the distributive property. (7.EE.A.1)	Ex: Is this equivalent? 2(3a - 2 + a)= 8a - 4 why/why not?	P
M.7.4.3	factor linear expressions using the greatest common factor. (7.EE.A.1, 7.EE.A.2)	Ex: -6x - 18 - 12y = -6(x + 3 + 2y)	P
M.7.4.4	add and subtract linear expressions. (7.EE.A.1, 7.EE.A.2)	Ex: (2.4m - 125) + (1.8b - 92.4) = 2.4m + 1.8b + 217.4 Ex: (5j - 2q + ⅖) - (4 - 3j -½q)= 8j - 1½q - 3⅖	P
M.7.4.5	rewrite expressions in different forms (in a real world context) to demonstrate how quantities are related. (7.EE.A.2)	Ex: Finding a 20% discount is the same as finding 80% of the cost. Ex: a + 0.05a=1.05a (increase by 5% is the same as multiplying by 1.05)	P

Expressions & Equations: Equations			Resource Topic(s) 5
2nd Quarter			
M.7.5	**Outcome 5: Students will solve equations and inequalities with real world applications.**		
	Students will…		
Local Component Code	**Component**	**Examples**	**Priority Component(P) Supporting Component(S)**
M.7.5.1	write and solve multi-step linear equations involving real world applications. (7.EE.B.4, 7.EE.B.4.A)	Ex: *3x + 2 = 17 and p(x + q) = r*	P
M.7.5.2	compare an algebraic solution to an arithmetic solution, identifying the sequence of operations used in each approach. (7.EE.B.4.A)	Ex: The perimeter of a rectangle is 54 cm and length is 6 cm. What is the width? Identify similarities and differences in each approach. <u>Arithmetic Method</u> <u>Algebraic Method</u> (54 - 12) ÷ 2 2w + 2(6) = 54	P
M.7.5.3	solve and graph inequalities on a number line, including problems with real world situations. (7.EE.B.4.B)	Ex. You are in an art contest and you bought a canvas for $27 dollars. You can't spend more than $50 or you will be disqualified. What is the most you can spend after the canvas?	P
M.7.5.4	write and interpret inequalities including problems with real world situations. (7.EE.B.4.B)	Same as above with the exception of answering with words instead of graphing.	P

Geometry	Resource Topic(s) 8
3rd Quarter	

M.7.6	**Outcome 6: Students will analyze the relationships between geometric figures by drawing, constructing, and solving problems with real life applications.**		
	Students will…		
Local Component Code	**Component**	**Examples**	**Priority Component(P) Supporting Component(S)**
M.7.6.1	solve problems involving scale drawings of geometric figures creating a scale drawing at a different scale. (7.G.A.1)	Give two drawings that are similar and have students set up and solve an equation that will give scale factor Recreate a figure using a scale factor < 1 and > 1	S
M.7.6.2	draw geometric shapes with given conditions using a ruler, protractor, technology, and freehand, focusing on triangles constructed from angles or sides. (7.G.A.2)	Draw a triangle with angles that are 60 degrees.	S
M.7.6.3	construct triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle. (7.G.A.2)	Is it possible to draw a triangle with a 90 angle and one leg that is 4 inches long and one leg that is 3 inches long? If so, draw one. Is there more than one such triangle?	S
M.7.6.4	apply the formulas for the area and circumference of a circle to solve problems. (7.G.B.4)	The seventh grade class is building a mini golf game for the school carnival. The end of the putting green will be a circle. If the circle is 10 feet in diameter, how many square feet of grass carpet will they need to buy to cover the circle? How might you communicate this information to the salesperson to make sure you receive a piece of carpet that is the correct size?	S
M.7.6.5	describe the relationship between the formulas for area of a circle and circumference of a circle. (7.G.B.4)	Students measure the circumference and diameter of several circular objects in the room (clock, trash can, door knob, wheel, etc.). Students organize their information and discover the relationship between circumference and diameter by noticing the pattern in the ratio of the measures.	S

M.7.6.6	write and solve simple equations for an unknown angle in a figure by applying knowledge about supplementary, complementary, vertical, and adjacent angles in a multi-step problem. (7.G.B.5)	Write and solve an equation to find the measure of angle *x*.  	S

Geometry			**Resource Topic(s) 8**
3rd Quarter			
M.7.7	**Outcome 7: Students will solve real life and mathematical problems involving area, surface area and volume.**		
	Students will…		
Local Component Code	**Component**	**Examples**	**Priority Component(P) Supporting Component(S)**
M.7.7.1	solve problems using the area of polygons (triangles, quadrilaterals), both with and without context. (7.G.B.6)	Mikey is making a brick patio in his backyard. The patio is rectangular shaped. The dimensions are 10ft x 15ft. If it takes 4.5 brick pavers to cover a square foot, how many brick pavers is Mikey going to have to purchase?	S
M.7.7.2	describe two-dimensional figures created by slicing three-dimensional figures, focusing on right rectangular pyramids and right rectangular prisms. (7.G.A.3)	Draw a 3-D figure with a plane slicing through it and then draw the slice. Relate the shape as similar congruent or different to the base of the 3-D figure	S

M.7.7.3	solve problems using the surface area of cubes and right prisms both with and without context. (7.G.B.6)	A simple ranch home is in the shape of a rectangular prism. You have to cover the frame in plywood. Plywood costs .004 per square in. How much would it cost to cover the frame?	S
M.7.7.4	solve problems using the volume of cubes and right prisms both with and without context. (7.G.B.6)	You have a cubed shaped pool. Your treating the water with chemicals. 3 oz of chlorine will treat 100 cubic feet of water. How much chlorine do you need to treat?	S

Probability			**Resource Topic(s) 7**
4th Quarter			
M.7.8	**Outcome 8: Students will create and analyze probability models for simple and compound events.**		
	Students will…		
Local Component Code	**Component**	**Examples**	**Priority Component(P) Supporting Component(S)**
M.7.8.1	identify that the probability of a simple event is a number between 0 and 1 that this value expresses the likelihood of the event occurring. (7.SP.C.5)	Use the ratio favorable/total to show that the ratio can never be negative (less than 1) and favorable can never exceed total (greater than 1).	S

M.7.8.2	approximate the probability of a chance event by collecting data on the chance process (theoretical probability) and predict the approximate relative frequency given the probability. (7.SP.C.6)	When rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times.	S
M.7.8.3	develop a uniform probability model and use it to find probabilities of events, and compare experimental probabilities to theoretical models and explain discrepancies. (7.SP.7, 7.SP.C.7a)	Probability of choosing vanilla from a blind choice of 4 types of ice cream. Use your model to determine the probability.	S
M.7.8.4	develop a probability model and use it to compare probabilities of events that may not be uniform. (7.SP.C.7b)	Find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies?	S
M.7.8.5	identify that the probability of a compound event is the fraction of the outcomes in the sample space for which the outcome occurs. (7.SP.C.8.A)	A bag contains 5 marbles. There is one red, two blue, and two purple marbles. If marbles are drawn without replacement, what is the sample space for this situation? How is the sample space used to find the probability of drawing one blue marble, followed by another blue marble?	S
M.7.8.6	represent sample spaces for compound events using organized lists, tables, and tree diagrams and identify the outcomes in the sample space that compose the event. (7.SP.C.8.B)	Create a diagram, list, or table to solve: A pizza company has three different styles of crust. Two types of cheese and 5 different ingredients. What are the possible outcomes? What's the probability of the next pizza ordered being a deep dish, with mozzarella and sausage?	S
M.7.8.7	design a simulation to generate frequencies for compound events. (7.SP.C.8.C)	Use random digits as a simulation tool to approximate the answer to the question: If 40% of donors have type A blood, what is the probability that it will take at least 4 donors to find one with type A blood? OR Use a dice and a coin to determine a one topping pizza having gluten free crust and pepperoni from 2 types of crust and 6 available ingredients.	S

Statistics			Resource Topic(s) 6
4th Quarter			
M.7.9	**Outcome 9: Students will analyze and draw inferences using statistical data.**		
	Students will…		
Local Component Code	**Component**	**Examples**	**Priority Component(P) Supporting Component(S)**
M.7.9.1	analyze a situation to determine that random sampling tends to produce representative samples and support valid inferences. (7.SP.A.1)	The week before election day 5000 people were surveyed to determine who they are going to vote for to be the president of the united states. 38 % of those people said they would vote democrat. On election day, out of the 3,000,000 people who voted 1,118,067 voted democratic. Was the sample method used random?	S
M.7.9.2	draw inferences about a population, generating multiple samples of the same size to gauge the variation in estimates or predictions. (7.SP.A.2)	Ex: Estimate the mean word length in a book by randomly sampling words from the book.	S
M.7.9.3	assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability. (7.SP.B.3)	Ex: the mean height of basketball players is 10 cm. Greater than the mean height of soccer players.	S
M.7.9.4	compare two populations using measures of center and measures of variability and draw inferences. (7.SP.B.4)	Ex: Measures of Center (mean, mode, median), Measures of Variability (range, mean absolute deviation, interquartile range)	S

Grade 8 Mathematics Curriculum

Yorkville CUSD 115

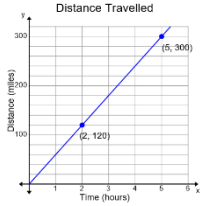
Grade-Level Focus Statement:
Students will model linear relationships using functions and equations, and will apply concepts and formulas related to distance, angles, similarity, and congruence in order to analyze two-dimensional figures.

Number Sense			**Resource Topic(s): 1**
1st Quarter			
M.8.1	**Outcome 1: Students will demonstrate that numbers are both rational and irrational.**		
	Students will...		
Local Component Code	**Component**	**Example**	**Priority Component(P) Supporting Component(S)**
M.8.1.1	convert repeating decimals into rational numbers. (8.NS.1)	Using an equation write 0.41 as a fraction. Using an equation write 1.436 as an improper fraction or mixed number.	S
M.8.1.2	identify rational and irrational numbers including common irrational numbers such as 2. Classify a set of numbers as perfect squares, perfect cubes, or neither. (8.NS.1, 8.EE.2)	Classify the given numbers as rational or irrational. 8, 3.2346743423… , 2 3, 16, -6	S

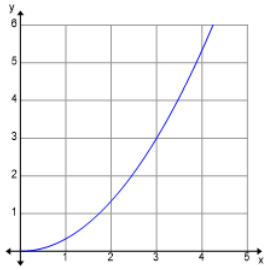
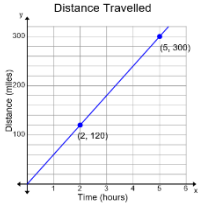
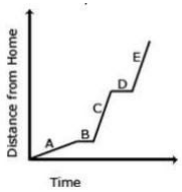
M.8.1.3	estimate rational and irrational numbers including comparison on the number line and conversions to a decimal. (8.NS.1, 8.NS.2)	Approximate 12 to the nearest tenth and plot on a number line. Is 4.55 or 4.6 a better estimate for 21? Compare the numbers using < , >, or =. 47 and 6.84523...	S
M.8.1.4	evaluate perfect squares and perfect cubes without a calculator. (8.EE.2)	Evaluate each root. Show all work. 16 3-64 A square has an area of 81 in2. Find the side lengths of the square. The volume of a box is 343 ft3. What is the width of the box?	P
M.8.1.5	use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$. (8.EE.2)	Solve for the given variable. x2= 576 y2= 75 a3= -2197 x= 24 y = 75 a = -13 Maria is building a square platform. If the area of the platform is 64 ft2, what is the side length? Use the Area formula, A = s2, and show all work.	P
M.8.1.6	apply the properties of integer exponents to generate equivalent numerical expressions. (8.EE.1)	Simply. Write all solutions with positive exponents. 4347 -60 3-6 2324	P

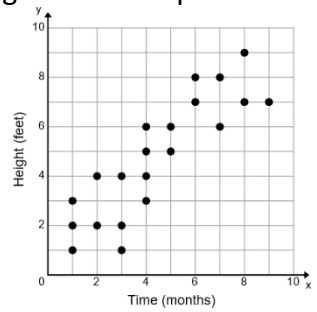
<table>
<tr><td colspan="3">Analyze and Solve Linear Equations</td><td rowspan="3">Resource Topic(s):
2</td></tr>
<tr><td colspan="3">1st Quarter</td></tr>
<tr><td rowspan="2">M.8.2</td><td colspan="2">Outcome 2: Students will solve linear equations with one variable while determining the number of solutions that exist; and demonstrate the connections between proportional relationships, lines, and linear equations through graphing.</td></tr>
<tr><td colspan="2">Students will...</td></tr>
<tr><td>Local Component Code</td><td>Component</td><td>Example</td><td>Priority Component(P) Supporting Component(S)</td></tr>
<tr><td>M.8.2.1</td><td>solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and combining like terms. (8.EE.7a, 8.EE.7b)</td><td>Solve for the given variable.
0.8n + 0.6n = 42
3y + 15 = 4y + 12
1 3(3x-9)= 2(x+3)+x</td><td>P</td></tr>
<tr><td>M.8.2.2</td><td>determine whether a given equation has one solution, no solution, or infinitely many solutions. (8.EE.7a)</td><td>Identify the number of solutions for each linear equation.<table><tr><th>Equation</th><th>No Solution</th><th>One Solution</th><th>Infinitely Many Solutions</th></tr><tr><td>$7x + 21 = 21$</td><td></td><td></td><td></td></tr><tr><td>$12x + 15 = 12x - 15$</td><td></td><td></td><td></td></tr><tr><td>$5(x + 5) = 5x + 25$</td><td></td><td></td><td></td></tr></table></td><td>P</td></tr>
<tr><td>M.8.2.3</td><td>construct examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. (8.EE.7a)</td><td>Write an equation with no solution.

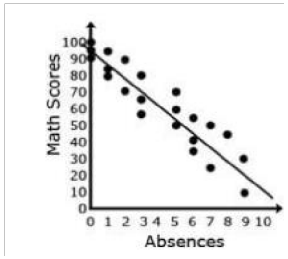
GIven the equation, find a value for a and b that will result in the identified number of solutions.
3(2x + 5) = ax + b
a. One Solution
a = ____ , b = _____</td><td>P</td></tr>
</table>

		b. No Solution a = _____ , b = _____ c. Infinitely Many Solution a = _____ , b = _____	
M.8.2.4	compare two different proportional relationships when given a table, graph, or verbal description. (8.EE.5)	The graph represents the cost of Cheerios cereal. A 13 oz. box of Kellogs cereal costs $3.55. Which cereal cost more per ounce? 	P
M.8.2.5	graph proportional relationships and interpret the unit rate as the slope. (8.EE.5)	Graph the equation y = -3x. Find the slope of the line represented in the graph. What does it mean in this problem? 	P
M.8.2.6	graph slope-intercept form equations. Explain why slope is the same between any two distinct points on a non-vertical line using similar triangles. (8.EE.5, 8.EE.6)	Graph the equation: y = 2x -6	P

<table>
<tr><td colspan="3">Functions</td><td rowspan="3">Resource Topic(s):
3</td></tr>
<tr><td colspan="3">2nd Quarter</td></tr>
<tr><td rowspan="2">M.8.3</td><td colspan="2">Outcome 3: Students will determine if a given relation is a function and will find the rate of change of a linear function.</td></tr>
<tr><td colspan="2">Students will...</td></tr>
<tr><td>Local Component Code</td><td>Component</td><td>Example</td><td>Priority Component(P) Supporting Component(S)</td></tr>
<tr><td>M.8.3.1</td><td>examine a relation that is presented graphically, verbally, in an equation, or a table to determine if it is a function. (8.F.1)</td><td>Determine if the given relation is a function. Explain your reasoning.
{(3, 2), (2, 6), (4, 9), (7, 20)}</td><td>P</td></tr>
<tr><td>M.8.3.2</td><td>compare properties of two functions represented in different ways such as algebraically, graphically, numerically in tables or by verbal description. Compare and contrast the similarities and differences of linear and nonlinear equations when given a table, graph, or verbal description. (8.F.2, 8.F.3)</td><td>Two linear functions are provided. Compare the properties (rate of change and initial value) of each function.
<table><tr><th>x</th><th>y</th></tr><tr><td>-1</td><td>-6</td></tr><tr><td>0</td><td>-3</td></tr><tr><td>1</td><td>0</td></tr><tr><td>2</td><td>3</td></tr></table>
$y = 2x + 4$
Explain how the two relations compare.</td><td>P</td></tr>
</table>

		<table><tr><th>x</th><th>y</th></tr><tr><td>0</td><td>5</td></tr><tr><td>1</td><td>10</td></tr><tr><td>2</td><td>15</td></tr><tr><td>3</td><td>20</td></tr></table>  Identify the given functions as linear or nonlinear.	
M.8.3.3	construct a function to model a linear relationship between two quantities when given a table, ordered pairs, or verbal description. Interpret the rate of change (slope) and initial value (y-intercept) of linear functions, in terms of the situation it models and in terms of its graph and/or table values. (8.F.4)	Write an equation that represents the given linear function. <table><tr><td>x</td><td>-2</td><td>0</td><td>1</td><td>3</td></tr><tr><td>y</td><td>8</td><td>2</td><td>-1</td><td>-7</td></tr></table> Interpret the rate of change and initial value for the given function. 	P
M.8.3.4	describe the relationship between two quantities by analyzing a graph. (8.F.5)	In which interval is the function increasing, decreasing or constant? 	P
M.8.3.5	sketch a graph that exhibits the qualitative features of a function that has been described verbally or in writing. (8.F.5)	Carla rode her bike to her grandmother's house. For the first 5 minutes, Carla steadily increased her pace. Then she maintained a constant speed for a period of time. As she approached her grandma's house she quickly slowed down. Then stopped when she reached her grandma's house. Sketch a graph to represent the scenario.	P

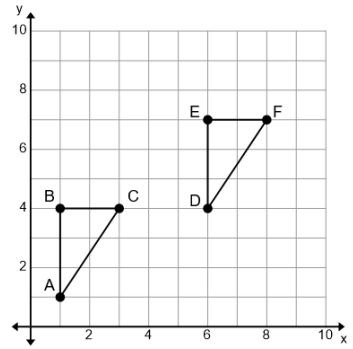
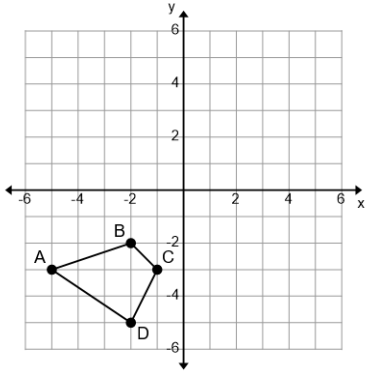
<table>
<tr><td colspan="3">Statistics</td><td rowspan="4">Resource Topic(s):
4</td></tr>
<tr><td colspan="3">2nd Quarter</td></tr>
<tr><td rowspan="2">M.8.4</td><td colspan="2">Outcome 4: Students will evaluate patterns of association in bivariate data to make inferences.</td></tr>
<tr><td colspan="2">Students will...</td></tr>
<tr><td>Local Component Code</td><td>Component</td><td>Example</td><td>Priority Component(P) Supporting Component(S)</td></tr>
<tr><td>M.8.4.1</td><td>construct and interpret scatter plots for bivariate measurement data to investigate patterns of association (clustering, outliers, positive or negative association, linear and nonlinear association) between two quantities. (8.SP.1)</td><td>Data for 10 students’ math and science scores are provided in the chart. Construct a scatter plot for the data. Then, answer the following questions.
<table><tr><td>Math Scores</td><td>89</td><td>93</td><td>68</td><td>78</td><td>92</td><td>88</td><td>76</td><td>70</td><td>82</td><td>79</td></tr><tr><td>Science Scores</td><td>83</td><td>89</td><td>92</td><td>82</td><td>92</td><td>94</td><td>71</td><td>73</td><td>85</td><td>73</td></tr></table>What is the trend of the data? Does the association appear to be linear or nonlinear? Are there any outliers in the data?</td><td>S</td></tr>
<tr><td>M.8.4.2</td><td>fit a straight line for a scatter plot that suggests a linear association and informally assess the model fit by judging the closeness of the data points to the line (line of best fit). (8.SP.2)</td><td>Draw a trend line for the given scatter plot.
 
</td><td>S</td></tr>
</table>

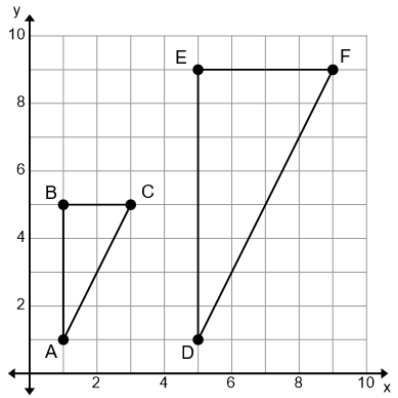
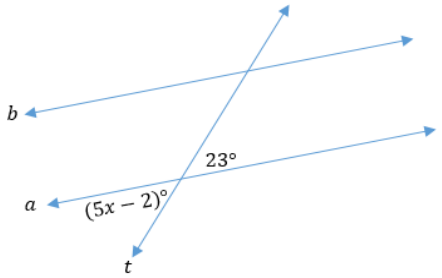
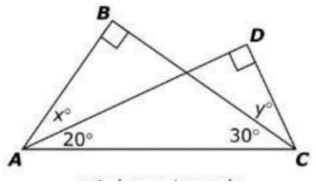
<table>
<tr><td></td><td></td><td>Describe the association (positive, negative, or no) and its strength of the scatter plot.</td><td></td></tr>
<tr><td>M.8.4.3</td><td>solve problems in context of bivariate measurement data, interpreting the slope and intercept by using the equation of a linear model. (8.SP.3)</td><td>Construct the linear equation that represents the line of best fit for the given scatter plot.
 
</td><td>S</td></tr>
<tr><td>M.8.4.4</td><td>construct and interpret a two-way table summarizing data, including patterns of association, on two categorical variables collected from the same subjects. (8.SP.4)</td><td>Jacob surveyed 25 adults to ask whether they had at least one child under the age of 18 and whether they had at least one pet. This table shows the results of the survey. Use the data to create a two-way frequency table.
<table>
<tr><th rowspan="2">Adult</th><th colspan="2">At least one child under age 18</th><th colspan="2">At least one pet</th></tr>
<tr><th>Yes</th><th>No</th><th>Yes</th><th>No</th></tr>
<tr><td>1</td><td>✓</td><td></td><td>✓</td><td></td></tr>
<tr><td>2</td><td></td><td>✓</td><td></td><td>✓</td></tr>
<tr><td>3</td><td>✓</td><td></td><td>✓</td><td></td></tr>
<tr><td>4</td><td></td><td>✓</td><td></td><td>✓</td></tr>
<tr><td>5</td><td></td><td>✓</td><td></td><td>✓</td></tr>
<tr><td>6</td><td></td><td>✓</td><td></td><td>✓</td></tr>
</table></td><td>S</td></tr>
<tr><td>M.8.4.5</td><td>use relative frequencies calculated for rows or columns to describe possible association between the two variables in a two-way table (8.SP.4)</td><td>Is there evidence of an association between the type of dwelling and garage parking? Explain.
<table>
<tr><th colspan="2" rowspan="2"></th><th colspan="3">Garage Parking</th></tr>
<tr><th>Yes</th><th>No</th><th>Total</th></tr>
<tr><td rowspan="3">Type of Dwelling</td><td>House</td><td>42%</td><td>33%</td><td>75%</td></tr>
<tr><td>Condo</td><td>18%</td><td>7%</td><td>25%</td></tr>
<tr><td>Total</td><td>60%</td><td>40%</td><td>100%</td></tr>
</table></td><td>S</td></tr>
</table>

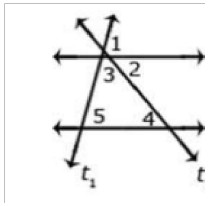
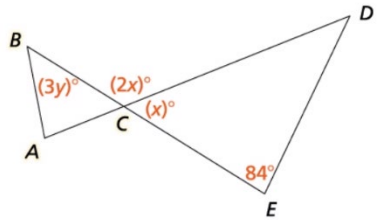
Systems of Equations			Resource Topic(s): 5
3rd Quarter			
M.8.5	**Outcome 5: Students will solve and interpret systems of linear equations algebraically and graphically.**		
	Students will...		
Local Component Code	**Component**	**Example**	**Priority Component(P) Supporting Component(S)**
M.8.5.1	estimate the number of solutions of two linear equations in two variables. (8.EE.8b)	What can you determine about the number of solutions of the given system? 3x+y = -3 y = -3x +3	P
M.8.5.2	solve systems of two linear equations in two variables by graphing the equations. Show that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs. (8.EE.8a, 8.EE.8b)	Solve the system by graphing. If the system has one solution, name it. y - 1 = - 5 4x y + 1 4x = -3	P
M.8.5.3	solve real-world and mathematical problems leading to two linear equations in two variables algebraically through the method of substitution. (8.EE.8b)	Solve the system using substitution. y = x + 4 2x + 4y = 28 Site A charges $6 a month and $1.25 for each move. Site B charges $2 for each movie and no monthly fee. At what month will both sites cost the same? How much will it cost when they are the same?	P

M.8.5.4	solve real world and mathematical problems leading to two linear equations in two variables algebraically through the method of elimination. (8.EE.8b)	Solve the system using elimination. 2x + 4y = 6 2x + 6y = -4	P

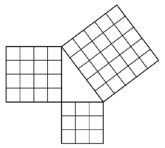
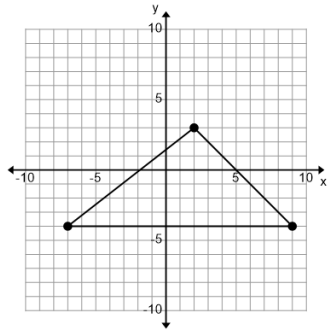
Similarity and Congruence			**Resource Topic(s): 6**
3rd Quarter			
M.8.6	**Outcome 6: Students will prove two-dimensional figures are similar or congruent using transformations on the coordinate system and find missing angle measures using properties of angles.**		
	Students will...		
Local Component Code	**Component**	**Example**	**Priority Component(P) Supporting Component(S)**
M.8.6.1	describe the properties of rotations, reflections, and translations with experimentation of lines, segments, and angles. (8. G.1)	How does a rotation affect the properties of a two-dimensional figure?	P
M.8.6.2	prove two-dimensional figures are congruent using a sequence of rotations, reflections, and translations. (8.G.2)	Is ABCcongruent to DEF? Explain.	P

			
M.8.6.3	describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. (8.G.3)	Quadrilateral ABCD is shown on the coordinate grid. The figure is reflected over the x-axis to form A'B'C'D'. What are the coordinates of A'B'C'D'. 	P
M.8.6.4	prove two-dimensional figures are similar using a sequence of rotations, reflections, dilations, and translations. (8.G.4)	Describe the sequence of transformations that shows ABCis similar to DEF.	P

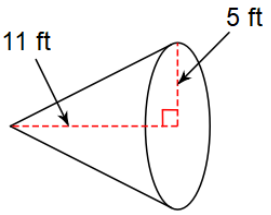
			
M.8.6.5	find missing angles when parallel lines are cut by a transversal. (8.G.5)	What must x equal if line a is parallel to line b? 	P
M.8.6.6	solve for missing angle measures of a triangle using angle-sum and exterior-angle relationships. (8.G.5)	What are the values of x and y?  Lines l and m are parallel. If the measure of angle 1 is 60° and the measure of angle 3 is 40°, find the measure of angles 4 and 5.	P

			
M.8.6.7	apply the angle-angle criterion to find missing angles. (8.G.5)	ABCEDC. Find the value of x and y. 	P

Understand and Apply the Pythagorean Theorem			**Resource Topic(s): 7**
4th Quarter			
M.8.7	**Outcome 7:Students will use the properties of triangles to find missing side lengths.**		
	Students will...		
Local Component Code	**Component**	**Example**	**Priority Component(P) Supporting Component(S)**
M.8.7.1	explain a proof of the Pythagorean Theorem.. (8.G.6)	The sides of the three shown squares form a right triangle. Would any three squares form the sides of a right triangle? Explain.	P

			
M.8.7.2	apply the converse of the Pythagorean Theorem to determine if three given sides will form a right triangle. (8.G.6)	Do the given measures create a right triangle? 7 feet, 8 feet, 10 feet	P
M.8.7.3	solve unknown side measurements of a triangle using the Pythagorean Theorem in real world problems in two and three dimensions. (8.G.7)	Jim is going to place an 8 foot ladder to reach a 17 foot high roof. How far away from the wall should Jim place the base of the ladder?	P
M.8.7.4	apply the Pythagorean Theorem to find the distance between two points in the coordinate system. (8.G.8)	What is the distance between (0, 0) and (8,15) on the coordinate plane? What is the perimeter of the given triangle? 	P

<table>
<tr><td colspan="3">Exponents</td><td rowspan="4">Resource Topic(s): 1 & 8</td></tr>
<tr><td colspan="3">4th Quarter</td></tr>
<tr><td rowspan="2">M.8.8</td><td colspan="2">Outcome 8: Students will apply properties of exponents to generate equivalent expression and solve problems in scientific notation</td></tr>
<tr><td colspan="2">Students will...</td></tr>
<tr><td>Local Component Code</td><td>Component</td><td>Example</td><td>Priority Component(P) Supporting Component(S)</td></tr>
<tr><td>M.8.8.1</td><td>convert and estimate through comparison extreme quantities in scientific notation. Translate scientific notation that is generated by technology to written form. (8. EE.3, 8.EE.4)</td><td>How does the Gross Domestic Product (GDP) of Canada compare to that of the United States?
<table><tr><td colspan="2">Gross Domestic Product</td></tr><tr><td>Canada</td><td>$1,785,387,000,000,000</td></tr><tr><td>USA</td><td>$17,348,075,000,000,000</td></tr></table>James used a calculator to multiply large numbers. How can he write the number on her calculator screen, shown below, in standard form.
4.602E17</td><td>P</td></tr>
<tr><td>M.8.8.2</td><td>add, subtract, multiply and divide with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. (8.EE.4)</td><td>Solve. Express the solution in scientific notation.
1.275x105· 2.476x104</td><td>P</td></tr>
<tr><td>M.8.8.3</td><td>apply scientific notation to real world problems. (8.EE.3)</td><td>There are approximately 1,020,000,000 cars in the world. The number of cars in the United States is approximately 239,800,000. Compare the number of cars in the world to that in the United States.</td><td>P</td></tr>
</table>

M.8.8.4	solve real world problems involving volume of cylinders, cones and spheres. (8.G.9)	Find the volume of the cone.  	S

vv

Algebra I Curriculum

Yorkville CUSD

115

Grade-Level Focus Statement:

Students will analyze relationships between linear, quadratic, and exponential functions, as well as systems of equations. They will interpret and apply their results through writing appropriate functions to model given situations.

Ratios & Proportional Relationships	
1st Semester	
M.A1.1	**Outcome 1: Students will write and solve equations and inequalities in order to describe relationships.**

	Students will…		
Local Component Code	**Component**	**Examples**	**Priority Component(P) Supporting Component(S)**
M.A1.1.1	Identify parts of an expression/equation/function such as, terms, variables, constant, and coefficients. (A.SSE.1.a)	Expression: Equation: **Identify the parts**: Identify the coefficient, variable, constant and number of terms. Coefficient(s) _____ Variables _____ Constant _____ Terms _____	P
M.A1.1.2	Solve equations in one variable including equations that result in one solution, no solution, or infinitely many solutions. (A.CED.1)(A.REI.1)(A.REI.3)(A.CED.3)		P
M.A1.1.3	Write an equation that models a real world situation and interpret the solution in the context of the problem, including conversions of unit of measurements. (A.CED.1)(A.REI.3)(A.CED.3)(N.Q.2) (N.Q.3)	George wants to save $84. He has $24 already saved, and makes $5 per hour. Write an equation to represent the situation. If George worked 15 hours, would he reach his goal of saving $87? Explain your reasoning.	P

M.A1.1.4	Solve inequalities (including compound inequalities) in one variable and graph the solution set on a number line. (A.CED.1)(A.REI.3)(A.CED.3)	Solve for x: 2/3x + 9 < 18 Graph:	P
M.A1.1.5	Write an inequality (including compound inequalities) that models a real world situation and determine whether or not the solution satisfies the context of the inequality. (A.CED.1)(A.REI.3)(A.CED.3)(N.Q.2)(N.Q.3)	Mr. Jones spends $15 per day on groceries. He is trying to budget his money for the week, and knows he wants to spend between $75 and $105. How many days will Mr. Jones be able to budget for?	P
M.A1.1.6	Solve for a specific variable given an equation or formula.(A.CED.4)	Solve for x: $\frac{4x + 2y}{3} = 16$	P

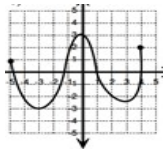
Functions

<table>
<tr><th colspan="4">1st Semester</th></tr>
<tr><td rowspan="2">M.A1.2</td><td colspan="3">Outcome 2: Students will graph, use function notation, analyze and interpret functions in context.</td></tr>
<tr><td colspan="3">Students will…</td></tr>
<tr><td>Local Component Code</td><td>Component</td><td>Example</td><td>Priority Component(P) Supporting Component(S)</td></tr>
<tr><td>M.A1.2.1</td><td>Calculate and interpret the average rate of change of a function (from a graph, table, or a set of ordered pairs with or without context) over a specified interval. (F.IF.6.)</td><td>The table shows the number of people in millions who were below the poverty level in the U.S. Find the average rate of change between 1986-1990 and 19902000 and answer the questions below.

Find the rate of change for the interval of 1986-1990:

<table><tr><td>Year</td><td>1986</td><td>1990</td><td>2000</td></tr><tr><td>Number (millions)</td><td>32.37</td><td>33.59</td><td>36.43</td></tr></table></td><td>P</td></tr>
<tr><td>M.A1.2.2</td><td>Write a function/equation from a table, two points, a graph, or real world context. (F.BF.1.a, F.IF.2, F.IF.5)</td><td>Write a function rule for the given table in slope intercept form.

Honors Algebra: Write the equation of parallel and perpendicular lines.</td><td>P</td></tr>
</table>

M.A1.2.3	Write the domain (input) and range (output) of graphs using inequality notation. (F.IF.1, F.IF.5)	Find the domain and range for the following graph: 	P
M.A1.2.4	Identify key features including slope, y-intercept, x-intercept, domain, range, and end behavior by graphing a linear equation in slope intercept form by hand ~~and~~ technology with and without context. (F.IF.7.a, A.REI.10)	Graph the equation . Identify slope, domain, range, and end behavior of the graph.	P
M.A1.2.5	Graph the solutions to a linear inequality in two variables as a halfplane (excluding the boundary in the case of a strict inequality). Determine whether or not the solution satisfies the context of the inequality. (A.REI.12)	Graph $x - 3y > 6$ Is the point (3,2) a solution to the inequality?	P
M.A1.2.6	Graph a linear piecewise functions and identify key features including range, x-intercept(s), y-intercept, domain, range, and end behavior. (F.IF.7b, F.IF.4)	Graph the following piecewise function: $(x) = \{2x + 5\,,\ x < 3\ \ -4x - 7,\ \ x \geq 3$	S

Absolute Value

1st Semester			
M.A1.3	**Outcome 3: Students will solve and graph absolute value equations and inequalities.** **Students will…**		
Local Component Code	**Component**	**Examples**	**Priority Component(P) Supporting Component(S)**
M.A1.3.1	Graph and write an absolute value function by hand or graphing calculator in order to identify key features including vertex, vertical translation, horizontal translation, domain, range, and end behavior. ((F.IF.7.b) (F.BF.3)	Graph $y = \frac{1}{2}\|x - 2\| + 5$. Identify the vertex, vertical translation, horizontal translation, domain, range, and end behavior	S
M.A1.3.2	Graph and write an absolute value inequality by hand or a graphing calculator in order to identify key features including vertex, vertical translation, and horizontal translation. (F.IF.7.b)	Graph $y < 3\|x - 4\| + 4$. Identify the vertex, vertical translation, and horizontal translation	S
M.A1.3.3	Solve absolute value equations in one variable. (A.CED.1)(A.REI.3)	Solve for x. $4 + 8\|x + 3\| = 28$	P
M.A1.3.4	Solve absolute value inequalities in one variable and graph the solution set on a number line. (A.CED.1)(A.REI.3)	Solve for x. $4 + 8\|x + 3\| < 28$ Graph: ⟷	S

Solving Systems of Linear Equations and Inequalities Graphically			
1st Semester			
M.A1.4	**Outcome 4:** Students will write, solve and apply systems of linear equations and inequalities graphically.		
	Students will…		
Local Component Code	**Component**	**Examples**	**Priority Component(P) Supporting Component(S)**
M.A1.4.1	Use slope intercept form to determine whether a system has no solution, one solution, or infinitely many solutions by analyzing the slopes and y-intercepts.	Two ships are docked at an island located at the point of intersection of the lines given by the equations. $4x - 2y = -6 \quad and \quad 6x + y = 7$ Will their paths ever cross?	P
M.A1.4.2	Graph a system of two linear equations to determine the solution. (A.REI.11)	Graph the following system of equations and label the solution as one-solution (ordered pair), no solution, or infinitely many. $2x + 3y = 12$ $y = \frac{4}{3}x - 2$	P
M.A1.4.3	Solve and graph systems of linear inequalities. Explain that the solution set for	Graph the following system of inequalities. Is (3,7) a viable solution? $5x + 2y < 4$	P

	a system of linear inequalities is the intersection of the shaded regions of both inequalities and check points in the shaded region to verify the solution. (A.REI.12)	$y \geq \frac{-1}{2}x - 8$	P
M.A1.4.4	Create and solve systems of equations (in two or more variables) to represent relationships between quantities in a real world situation by graphing. (A.CED.2)(A.REI.11)	Eugene and Jimmy are selling pies for a school fundraiser. Customers can buy cherry pies and blackberry pies. Eugene sold 5 cherry pies and 6 blackberry pies for a total of $128, Jimmy sold 4 cherry pies and 12 blackberry pies for a total of $232. What is the cost of each of one cherry pie and one blackberry pie?	P
M.A1.4.5	Create and solve systems of inequalities (in two variables) to represent relationships between quantities in a real world situation by graphing. (A.CED.2)(A.REI.11)	Laura is buying ice cream for her daughter's birthday. She is going to buy Banana Split ice cream and Cookies and Cream ice cream. The Banana Split ice cream costs $4 a pint and the Cookies and Cream ice cream costs $8 a pint. Laura does not want to spend more than $56 and she needs at least 10 tubs of ice cream. Graph the system of inequalities to find the solution area. Give two combinations that can be purchased?	P
M.A1.4.6	Apply linear programming and interpret solutions as viable or nonviable in a modeling context. (A.CED.3)	ABC Toy Company makes toy trucks and cars, but can only produce up to 50 toys each day. Trucks take 4 hours to make and cars take 2 to make. The company can only spend 120 hours producing these toys. They sell each truck for $30 and each car for $20. Determine the combination of toys to maximize the company's profit. Is making 15 trucks and 35 cars a viable production plan for the ABC Toy Company?	S

Solving Systems of Linear Equations and Inequalities Algebraically

1st Semester			
M.A1.5	**Outcome 5: Students will write, solve and apply systems of linear equations algebraically.**		
	Students will…		
Local Component Code	**Component**	**Examples**	**Priority Component(P) Supporting Component(S)**
M.A1.5.1	Solve a system of two linear equations algebraically using substitution. (A.REI.5)	Solve the following system using substitution. $\begin{cases} 3x + y = 8 \\ 4x + 3y = 1 \end{cases}$	P
M.A1.5.2	Solve a system of two linear equations algebraically using elimination. (A.REI.5)	Solve the following system using elimination. $\begin{cases} 5x + 4y = -30 \\ 3x - 9y = -18 \end{cases}$	P
M.A1.5.3	Create and solve systems of equations (in two or more variables) to represent relationships between quantities in a real world situation. (A.REI.6)	You and your friend are having a competition to see who can save the most money. You start with only $2 but save $3 per day. Your friend starts with $6 but only puts away $2 per day. Determine after how many days will you both have the same amount of money saved? How much money will you both have saved?	P

Exponents and Radicals			
2nd Semester			
M.A1.6	**Outcome 6:** Students will differentiate between various types of exponent properties, including problems with integer, rational (fractional), and variable exponents		
	Students will…		
Local Component Code	**Component**	**Examples**	**Priority Component(P) Supporting Component(S)**

M.A1.6.1	Apply properties of exponents to simplify expressions involving integer, rational, and variable exponents. (N.RN.1)	$\left(\frac{2p^2q^3}{3q^3}\right)^4$ $(3x^{\frac{1}{2}}y^{\frac{3}{8}})\,(-2x^{\frac{3}{2}}y^{\frac{1}{8}})$ $(5a^xb^{2y})^2 \cdot 3b^yc^0$	P
M.A1.6.2	Simplify radical expressions, including both numerical and variable radicands. (N.RN.2)	$-3\sqrt{507} = -39\sqrt{3}$ $-3\sqrt{507x^5y^8} = -39x^2y^4\sqrt{3\ x}$ Honors Algebra: Simplify radicals with indexes greater than 2.	P
M.A1.6.3	Add, subtract, multiply, and divide radical expressions.		S
M.A1.6.4	Apply knowledge of exponents and their properties to evaluate exponential and radical expressions. (F.IF.8)	Evaluate each expression for $a = -2, b = 16,$ and $c = 0$	S

Polynomials and Factoring	
2nd Semester	
M.A1.7	**Outcome 7:** Students will simplify and factor polynomials.

	Students will…		
Local Component Code	**Component**	**Examples**	**Priority Component(P)** **Supporting Component(S)**
M.A1.7.1	Identify a monomial, binomial, trinomial, leading coefficient, degree of a polynomial, ascending/descending order, standard form, constant, and conjugates. Write a polynomial in standard form.		P

M.A1.7.2	Add and subtract polynomials with more than one variable with or without context. (A.APR.1)	$(4x^2y^3 - 3x^3y^5 + 9) - (-5x^2y^3 - 6x^3y^5)$ Perimeter Problems	P

M.A1.7.3	Multiply polynomials with more than one variable with or without context.(A.APR.1)	Monomial times a binomial Binomial times a binomial Binomial times a trinomial Area Problems	P
M.A1.7.4	Factor by grouping with four terms. (A.SSE.2)	Write the expression in standard form and factor. $-6 + 44x^3 - 4x^2 + 66x$ Note: Algebra 1 Honors will include word problems dealing with situations such as volume and determining missing dimensions. Honors: The volume of a rectangular prism is $80x^3 + 224x^2 + 60x$. Determine the possible expressions for the length, width, and height of the prism.	P

M.A1.7.5	Factor trinomials by grouping. (A.SSE.2)	Factor by grouping: $a^2 + 7a + 12$ $a^2 + 4a + 3a + 12$ $a(a + 4) + 3(a + 4)$ $(a + 3)(a + 4)$	P
M.A1.7.6	Factor using difference of two squares. Include problems with more than 1 variable and problems that require the use of GCF and differences of two squares and/or difference of two squares performed twice. (A.SSE.2)	$(x^4 - 16)$ $(x^2 + 4)(x^2 - 4)$ $(x^2 + 4)(x + 2)(x - 2)$	P

M.A1.7.7	Factor polynomial that requires more than one factoring method. (A.SSE.2) **Only honors will factor a trinomial with a degree of four that can be factored again using difference of two squares	$2a^3 + 11a^2 + 12a$ $a(2a^2 + 11a + 12)$ $a(2a^2 + 8a + 3a + 12)$ $a(2a(a + 4) + 3(a + 4))$ $a(2a + 3)(a + 4)$ $a^4 - 7a + 12$ $a^4 - 4a^2 - 3a^2 + 12$ $a^2(a^2 - 4) + 3(a^2 - 4)$ $(a^2 - 3)(a^2 - 4)$ $(a^2 - 3)(a - 2)(a + 2)$	S

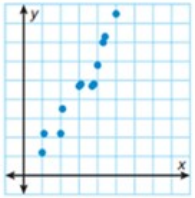
Quadratic Functions			
2nd Semester			
M.A1.8	**Outcome 8:** Students will distinguish methods of solving quadratic equations in order to compare and contrast those methods and find solutions for both single equations and systems.		
	Students will…		
Local Component Code	**Component**	**Examples**	**Priority Component(P) Supporting Component(S)**
M.A1.8.1	Solve quadratic equations by factoring and apply the zero product property. (A.REI.4b) (A.SSE.3a)	$a^2 + 7a + 12 = 0$ $a^2 + 4a + 3a + 12 = 0$ $a(a + 4) + 3(a + 4) = 0$ $(a + 3)(a + 4) = 0$ $(a + 3) = 0 \;\; (a + 4) = 0$ $a = -3 \;\; a = -4$	P

M.A1.8.2	Solve quadratic equations without a linear term (bx) using square roots. (A.REI.4b)	$5x^2 + 8 = 48$ $5x^2 = 40$ $x^2 = 8$ $x = \pm 2\sqrt{2}$ $(x + 7)^2 = 24$ $x = -7 \pm 2\sqrt{6}$	P
M.A1.8.3	Solve quadratic equations by completing the square when a=1.(A.RE1.4b)(A.SSE.3b)		P
M.A1.8.4	Solve quadratic equations by using the quadratic formula. (A.REI.4b)		P
M.A1.8.5	Solve quadratic equations by determining an appropriate method to solve. (A.REI.4b)		P
M.A1.8.6	Graph quadratic equations in standard form and identify key features: intercepts, vertex, minimum/maximum, solutions, end behavior, horizontal shifts, and vertical shifts. (F.IF.7a)	Note: Honors Algebra 1 will discuss, identify, and graph compressions and expansions in quadratic equations.	P

M.A1.8.7	Graph quadratic equations in vertex form and identify key features: intercepts, vertex, minimum/maximum, solutions, end behavior, horizontal shifts, and vertical shifts. (F.IF.7a)	Note: Honors Algebra 1 will discuss, identify, and graph compressions and expansions in quadratic equations.	P
M.A1.8.8	Graph quadratics equations to solve real world problems. (F.IF.4)		P

Exponential Functions			
2nd Semester			
M.A1.9	**Outcome 9:** Students will create functions and interpret differences between types of functions, including linear and exponential, and will manipulate exponential functions through translation.		
	Students will…		
Local Component Code	**Component**	**Examples**	**Priority Component(P) Supporting Component(S)**
M.A1.9.1	Write and compare a geometric sequence and arithmetic sequences and evaluate for a given term. (F.IF.3)(F.BF.2)		P

M.A1.9.2	Identify linear and exponential functions from a graph, table, equation, or word problem. (F.LE.1a, F.LE.1b)	<table><tr><th>x</th><th>y</th></tr><tr><td>9</td><td>2</td></tr><tr><td>3</td><td>-2</td></tr><tr><td>-3</td><td>-6</td></tr><tr><td>-9</td><td>-10</td></tr></table> Linear or Exponential? Reason: Equation: Determine the value of y:	P
M.A1.9.3	Create and solve exponential growth and decay functions given a graph, a description of a relationship/real world context, or a table. (F.LE.1c, F.LE.2, F.LE.5)	You invest \$3500 in an investment that earns $7\frac{3}{8}\%$ interest, compounded annually. Exponential or Linear:_____ Equation: _____ How much will the investment be worth after 5 years?_____ Note: Honors Algebra 1 students will also construct and solve exponential functions involving compound interest (i.e. semi-annually, monthly, quarterly). Honors students will complete multi-step problems involving writing multiple exponential functions.	P
M.A1.9.4	Graph exponential functions given an equation, table, or real world context and identify y - intercept and end behavior. (F.IF.7e)	Graph $y = 2 * 0.4^x$ and identify the end behavior and y-intercepts.	P
M.A1.9.5	Identify and describe vertical and horizontal translations of an exponential parent function from a graph and an equation. (F.BF.3)	Given the parent function of $y = 2(.9)$, write an equation for the translated function with a horizontal shift of 7 units to the right and vertical shift of 14 units up. Note: Honors Algebra 1 students will also discuss vertical stretching and shrinking with graphs of exponential functions along with reflections over x and y axis.	P

Linear Modeling			
2nd Semester			
M.A1.10	**Outcome 10:** Students will summarize, represent, and interpret data on two categorical and quantitative variables. Students will interpret these linear models and measure how well data fits the relationships.		
	Students will…		
Local Component Code	**Component**	**Examples**	**Priority Component(P) Supporting Component(S)**
M.A1.10.1	Analyze data on a scatter plot to determine if a linear, non-linear, or non-existent correlation exists. Describe how the variables are related using positive correlation, negative correlation, or nonexistent correlation. (S.ID.6)	Match each situation with a scatterplot that models it best. Age of a car vs. number of miles traveled  	P
M.A1.10.2	Distinguish between correlation and causation. (S.ID.9)	In the given situation, determine if there is a positive, negative, or no correlation. If there is, tell whether the correlation reflects causation, and explain your reasoning. The amount you smoke and the risk of getting cancer	S

M.A1.10.3	Compute (using technology) and interpret the correlation coefficient of a linear fit. (S.ID. 8)	Find correlation coefficient using technology to determine strength and direction. Determine which correlation coefficient represents the strongest or weakest situation in a given set.	P
M.A1.10.4	Fit a linear function for a scatter plot that suggests a linear association. (S.ID.6c)	Two brothers are taking turns throwing a football into the air. Use the data to find the line of best fit. Using the line of best fit, to determine the height of the football after 2 minutes.	P
M.A1.10.5	Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. (S.ID.7)	An airline provides the mileage and airfare to certain destinations from Baltimore, Maryland. What is the equation of the line of best fit? Interpret the meaning of the slope and y-intercept according the context.	P
M.A1.10.6	Fit data (linear, quadratic, or exponential) and use that fit to solve problems with context. (S.ID.6a)	A biologist collects data of a type of bacteria. Determine which model (linear, quadratic, or exponential) best represents the data by comparing their coefficients of determination. Write a function that models the data.	P

M.A1.10.7	Using a model that fits data in a scatterplot, compare values predicted (residuals) by the model to the values given in the data set. (S.ID.6b)	Using the line of best fit, determine the predicted value and residual value for the height of the football. Create a residual plot. Does it suggest a linear regression would be more appropriate for the data or a non-linear regression would be more appropriate?	S

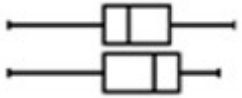
Geometry Curriculum
Yorkville CUSD 115

Grade-Level Focus Statement:
Students will analyze complex geometric situations using proofs, properties, theorems, and formulas. Students will also apply core concepts and methods of statistics.

Statistics

Semester 1

M.G.1	**Outcome 1: Students will summarize, represent, and interpret data on a single count or measurement variable.**		
	Students will…		
Local Component Code	**Component**	**Examples**	**Priority Component(P) Supporting Component(S)**
M.G.1.1	Calculate and interpret the following for quantitative variables using technology: mean, median, mode, range, and standard deviation.	**Include problems that involve calculate a missing value given the mean John took five math tests during the first marking period, and his average (arithmetic mean) was 85. If his average after the first three tests was 83, what was the average of his fourth and fifth tests?	P
M.G.1.2	Describe the shape, center, and variability of a distribution based on a dot plot, histogram, or box plot and describe the advantages of each type.(S.ID.1)	Given a set of data, what are strengths and weaknesses of presenting the data in a certain type of plot for students in a class, teachers, and parents? **Which display can be used to find how many days had a high temperature below 8, degree, C?**	P

M.G.1.3	Compare two or more different data sets (box plot, histogram, or table of data) in terms of centers (mean, median) and spread (interquartile range, standard deviation) . (S.ID.2)	The box plots show the distribution of scores on a district writing test of two classes at a school. Which class performed better? Justify your conclusion. 	~~P~~
M.G.1.4	Describe the effect on mean and median when removing an outlier or increasing an outlier. (S.ID.3)		P
M.G.1.5	Summarize and interpret categorical data for two categories in two-way frequency tables by calculating the joint, marginal, and conditional frequencies. (S.ID.5)	Given a two-way frequency showing the number of high school students taking an AP class in a subject by grade level, create a relative frequency table and a row conditional frequency table. What is the marginal frequency of students taking a math AP class? According to the row conditional frequency table, do more males or females choose to take English AP classes? Is there an association between being female and taking a foreign language AP class?	P

Probability

Semester 1

M.G.2	**Outcome 2: Students will organize data in order to calculate and explain independent and conditional probabilities.**	
	Students will…	
Local Component Code	**Component**	**Priority Component(P) Supporting Component(S)**
M.G.2.1	define events as subsets of a sample space (the set of outcomes) using characteristics (categories) of the outcome, or as unions, intersections, or complements of other events (“or,” “and,” “not”). (S.CP.1)	P

M.G.2.2	apply the addition rule P(A or B) = P(A) + (B) – P(A and B), and interpret the answer in terms of the model. (S.CP.7)	P
M.G.2.3	construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. (S.CP.4) use the two-way table as sample space to calculate probabilities (S.CP.4)	P
M.G.2.4	use the two-way table as sample space to calculate conditional probabilities. (S.CP.4) find the conditional probability of A given B as the fraction of B's outcomes that also belong to A, and interpret the answer in terms of the model. (S.CP.6)	P
M.G.2.5	recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. (S.CP.5)	P
M.G.2.6	explain why two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent. (S.CP.2)	S
M.G.2.7	interpret independence of A and B through explaining how the conditional probability A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B. (S.CP.3)	S

Geometry Foundations

Semester 1

M.G.3	**Outcome 3: Students will apply definitions of geometric terms, distance and midpoint formulas, and the concepts of lines.**	
	Students will…	
Local Component Code	**Component**	**Priority Component(P) Supporting Component(S)**
M.G.3.1	Identify parts of slope intercept form. Find the slope between two ordered pairs. Write an equation in slope intercept form given a point, slope, or two points. (HSA.CED.A.2)	S

M.G.3.2	use definitions of parallel and perpendicular lines to determine if the slopes indicate whether the lines are parallel, perpendicular, or neither. (G.GPE.5)	P
M.G.3.3	Fluently solve a solve systems of linear equations in two variables. (HSA.REI.C.6)	S
M.G.3.4	find the distance between two points using the distance formula on a coordinate plane. (G.GPE.7)	P
M.G.3.5	use coordinates of the vertices to compute perimeters of polygons and areas of triangles and rectangles. (G.GPE.7)	S

Special Angles		
Semester 1		
M.G.4	**Outcome 4: Students will apply and prove geometric theorems and definitions to algebraic problems involving special angles.**	
	Students will…	
Local Component Code	**Component**	**Priority Component(P) Supporting Component(S)**
M.G.4.1	identify and solve problems involving special angle and segment relationships. (Include: angle bisectors, angle bisectors of triangles, complementary angles, supplementary angles, vertical angles) (G.CO.1)	P
M.G.4.2	identify and apply precise definitions of parallel line angle pairs. Use theorems to determine the relationship between pairs of angles formed by parallel lines and solve for missing angle measurements. (G.CO.1)	P
M.G.4.3	prove theorems about parallel lines. (G.CO.9)	S

Triangles and Congruence		
Semester 1		
M.G.5	**Outcome 5: Students will apply and prove geometric theorems and definitions to algebraic problems involving triangles. Students will also use properties of congruence to identify and prove congruent triangles and identify the type of triangles on the coordinate plane.**	
	Students will…	
Local Component Code	**Component**	**Priority Component(P) Supporting Component(S)**
M.G.5.1	apply the triangle angle sum and exterior angle theorems to find missing angle measures. (G.CO.10)	P
M.G.5.2	apply the properties and theorems of Isosceles and Equilateral Triangles. (G.CO.10)	P
M.G.5.3	given three coordinates determine if they are the vertices of an isosceles, right, or equilateral triangle by using the distance, midpoint, or slope formula. (G.GPE.4)	P
M.G.5.4	identify and use medians (centroids), altitudes (orthocenter), perpendicular bisectors to solve problems. (G.CO.10)	S
M.G.5.5	show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent. (G.CO.7)	S
M.G.5.6	identify which triangle congruence theorem(s) (SSS, SAS, ASA, AAS, and HL) could be used to prove two triangles congruent. (G.CO.8)	S
M.G.5.7	use congruence criteria for triangles to prove relationships and to show triangle congruence. (G.SRT.5)	S

Similarity		
Semester 2		
M.G.6	**Outcome 6: Students will understand similarity in terms of similarity transformations and prove theorems involving similarity to apply geometric concepts in modeling situations.**	
	Students will…	
Local Component Code	**Component**	**Priority Component(P) Supporting Component(S)**
M.G.6.1	use proportions to identify similar polygons and solve problems using the properties of similar polygons. (G.SRT.2)	P
M.G.6.2	identify similar triangles using the AA Similarity Postulate and the SSS and SAS Similarity Theorems. (G.SRT.3)	P
M.G.6.3	use similar triangles to solve problems. (G.SRT.5)	P
M.G.6.4	use proportional parts within triangles. (G.SRT.4)	P
M.G.6.5	use proportional parts with parallel lines to use theorems to solve problems (G.SRT.4)	P
M.G.6.6	recognize and use proportional relationships of corresponding angle bisectors, altitudes, and medians of similar triangles and use the triangle bisector theorem. (G.SRT.4) (G.SRT.5)	S
M.G.6.7	interpret scale models and use scale factors to solve problems by applying geometric models. (G.MG.3)	P
M.G.6.8	verify experimentally the properties of dilations given by a center and a scale factor. (G.SRT.1)	P

Trigonometry		
Semester 2		
M.G.7	**Outcome 7: Students will apply similarity in right triangles to understand right triangle trigonometry, with particular attention to special right triangles and the Pythagorean theorem.**	
	Students will…	
Local Component Code	**Component**	**Priority Component(P) Supporting Component(S)**
M.G.7.1	solve for missing side lengths and determine if a triangle with given sides is a right triangle by using the Pythagorean Theorem and its converse. (G.SRT.8)	P
M.G.7.2	explain why by similarity, side ratios in special right triangles have certain properties, and use these properties to solve for missing sides in right triangles. (G.SRT.8)	P
M.G.7.3	explain why by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles, and use these trigonometric ratios to solve right triangles. (G.SRT.6)	P
M.G.7.4	explain the relationship between the sine and cosine of complementary angles, describing why they are equal. (G.SRT.7)	P
M.G.7.5	solve right triangles in applied problems involving angles of elevation and depression by using trigonometric ratios, and use these angles to find the distance between two objects. (G.SRT.8)	P

Angles and Arcs of Circles		
Semester 2		
M.G.8	**Outcome 8: Students will apply theorems involving circles in order to solve problems, both with and without context.**	
	Students will…	
Local Component Code	**Component**	**Priority Component(P) Supporting Component(S)**
M.G.8.1	use theorems about chords, diameters and radii to find circumference and areas. (G.C.2)	P
M.G.8.2	use theorems and formulas to determine arc lengths.	P
M.G.8.3	find the area of a sector. (G.C.5)	P
M.G.8.4	find the measure of central and inscribed angles. (G.C.2)	P
M.G.8.5	use properties of secants and tangents to solve problems for angle measures and arcs. (G.C.2)	P

Segments and Equations of Circles		
Semester 2		
M.G.9	**Outcome 9: Students will apply theorems involving circles in order to solve problems, both with and without context.**	
	Students will…	
Local Component Code	**Component**	**Priority Component(P) Supporting Component(S)**
M.G.9.1	use properties of chords, secants, and tangents to solve problems for segments.(G.C.2)	P
M.G.9.2	write the equation of a circle given criteria. (G.GPE.1)	P
M.G.9.3	complete the square to find the center and radius of a circle given by an equation. (G.GPE.1)	P
M.G.9.4	prove or disprove that a point lies on a circle given an origin and a point on the circle. (G.GPE.4)	S

Geometric Modeling: Volume		
Semester 2		
M.G.10	**Outcome 10: Students will model the development of the volume formula of three dimensional shapes and apply their knowledge of two-dimensional shapes to consider the shapes of cross-sections.**	
	Students will…	
Local Component Code	**Component**	**Priority Component(P) Supporting Component(S)**
M.G.10.1	use volume formulas for cylinders, pyramids, cones, and spheres to solve problems. (G.GMD.3)	P
M.G.10.2	demonstrate and explain how area and volume scale under similarity transformations. (G.GMD.1)	P

Quadrilaterals		
Semester 2		
M.G.11	**Outcome 11: Students will apply and prove geometric theorems and definitions to algebraic problems involving Quadrilaterals.**	
	Students will…	
Local Component Code	**Component**	**Priority Component(P) Supporting Component(S)**

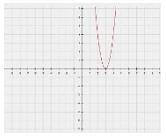
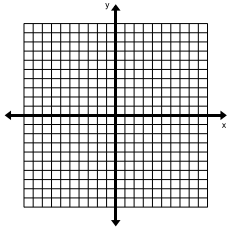
M.G.11.1	use theorems about parallelograms to solve for missing angles, side lengths, and segments. (G.CO.11)	P
M.G.11.2	use theorems about rhombus, rectangles, and squares to solve for missing angles, side lengths, and segments. (G.CO.11)	P
M.G.11.3	use theorems about trapezoids and kites to solve for missing angles, side lengths, and segments. (G.CO.11)	P
M.G.11.4	apply properties of special quadrilaterals to classify quadrilaterals. (G.GPE.4)	P
M.G.11.5	apply properties of special quadrilaterals to classify quadrilaterals on a coordinate plane. (G.GPE.4)	P

Algebra 2

Yorkville CUSD 115

Focus: Students will utilize methods for solving, recognizing, and manipulating logarithmic, higher order polynomial, rational, and radical functions with emphasis on real world applications for problem solving.

<table>
<tr><th colspan="4">Graphing Quadratic Functions and Relations</th></tr>
<tr><th colspan="4">Semester 1</th></tr>
<tr><td rowspan="2">M.A2.1</td><td colspan="3">Outcome 1: Students will create, interpret, analyze and construct quadratic functions to solve problems.</td></tr>
<tr><td colspan="3">Students will…</td></tr>
<tr><td>Local Component Code</td><td>Component</td><td>Examples</td><td>Priority Component(P) Supporting Component(S)</td></tr>
<tr><td>M.A2.1.1</td><td>graph quadratic functions and show key features of the graph such as vertex, zeros/solutions, maximum or minimum value, and axis of symmetry. Write a quadratic function from its graph in equivalent forms. (F.IF.7a, F.IF.8a)</td><td>Graph and answer all the questions below.
<table><tr><td>Solution(s)</td><td></td></tr><tr><td>Vertex</td><td></td></tr><tr><td>Axis of Symmetry</td><td></td></tr><tr><td>Circle which is represented in your graph.</td><td>Maximum
Minimum</td></tr><tr><td>What is the max/min value?</td><td></td></tr></table>$f(x)=$ x^2+3x-5 $f(x)=$ $(x+2)^2-7$</td><td>P</td></tr>
</table>

<table>
<tr>
<td>M.A2.1.2</td>
<td>apply horizontal and vertical translations, reflections, as well as horizontal and vertical expansions and compressions to write a quadratic function given a graph or verbal descriptions. (F.IF.8, F.BF.3)</td>
<td>Write the verbal description for the graph, and equation.
$y=-3(x+4)^2+5$
 
Write the equation for the graph with the following description.
Reflected over the x-axis
Vertical expansion by 4
Horizontal translation right 2 Vertical translation down 1</td>
<td>P</td>
</tr>
<tr>
<td>M.A2.1.3</td>
<td>solve systems of equations and inequalities consisting of two quadratics or a quadratic and a linear function graphically and interpret solutions as viable or non-viable. (A.CED.3)</td>
<td>Find the solution set by graphing the quadratic inequalities and determine the points of intersection.
$y \leq x + 2$ and $y >$
$(x-1)^2 - 3$
 
Solutions:
_____</td>
<td>P</td>
</tr>
<tr>
<td>M.A2.1.4</td>
<td>compare characteristics of two quadratic functions each represented in a different way algebraically, graphically, numerically in tables, or by verbal descriptions. (F.IF.9)(A.CED.1)</td>
<td>and contrast the two given quadratics.
_____ _____
<table>
<tr><th>x</th><th>y</th></tr>
<tr><td>-1</td><td>-7</td></tr>
<tr><td>1</td><td>-3</td></tr>
<tr><td>2</td><td>2</td></tr>
</table>
$f(x) =$_____
$g(x) = -(x-3)^2 - 3$
Describe the transformation required to translate $g(x)$ onto $f(x)$:</td>
<td>P</td>
</tr>
</table>

			The distance the vertex of $f(x)$ is from the $x-$ axis: _____	= > <	The distance the vertex of $g(x)$ is from the $x-$ axis: _____	
			$f(2) =$ _____	= > <	$g(2) =$ _____	
			Axis of symmetry for $f(x)$: _____	= > <	Axis of symmetry for $g(x)$: _____	
			$y-$ $intercept\ for\ f(x)$: _____	= > <	$y-$ $intercept\ for\ g(x)$: _____	

Solving Quadratic Functions and Relations			
Semester 1			
M.A2.2	**Outcome 2: Students will solve quadratic functions and quadratic systems with complex solutions.**		
	Students will…		
Local Component Code	**Component**	**Examples**	**Priority Component(P) Supporting Component(S)**
M.A2.2.1	solve quadratic equations by factoring and using the square root property. Create a quadratic function given the solutions. (A.APR.4, A.SSE.2, A.SSE.3a, F.IF.8a)	Solve by factoring: $3x^2 + 10x = 8$ Write a quadratic equation in standard form with the given solutions: $-\frac{2}{5}, 2$	P

M.A2.2.2	add, subtract, multiply and divide with complex numbers and solve quadratic equations utilizing the square root property including complex solutions. (N.CN.1, N.CN.2, N.RN.3)	Simplify: $(2+i)+(4-3i)$ Simplify: $(3+2i)(1-2i)$ Simplify: $\frac{4-i}{2+3i}$ Solve the equation: $2x^2+26=-50$	P
M.A2.2.3	solve quadratic equations by using the Quadratic formula including complex solutions. (N.CN.7)	Given the quadratic equation: $2x^2+5x-8=-13$ Find the value of the discriminant. Describe the number and type of roots. Solve using the quadratic formula: $2x^2=7x-2$	P
M.A2.2.4	Solve quadratic equations in realworld applications and explain the reasoning for your choice. (N.CN.7)	A ball is thrown into the air vertically with a velocity of 40 feet per second. The height above the ground t seconds after release is modeled by $h(t)=-16t^2+40t+5$, where h represents the height in feet and t represents the time in seconds. In how many seconds after its release will the ball hit the ground?	P
M.A2.2.5	solve systems of equations and inequalities consisting of two quadratics or a quadratic and a linear function algebraically. (A.CED.3)	Solve the systems of equations: $\begin{cases} y=x^2+2x-11 \\ y=4x-3 \end{cases}$ $\begin{cases} y=3x^2+8x-3 \\ y=x^2-9 \end{cases}$	P

Operations with Polynomials

Semester 1

M.A2.3

Outcome 3: Students will write, interpret, graph and solve higher order polynomial functions by applying algebraic theorems.

Students will…

Local Component Code	Component	Examples	Priority Component(P) Supporting Component(S)
M.A2.3.1	write a polynomial function in standard form given factors, zeros, or data points by hand and using technology and understand equivalent statements about polynomials (F.IF.8, A.APR.1)	1.Write a polynomial function in standard form with the zeros at $-\frac{1}{2}$, $2i$ and $-2i$. 2. The table shows the distance a seismic wave produced by an earthquake travels from the epicenter. Find a polynomial function to model the set of data below. Round to the nearest tenth. **Travel Time (min)**: 1, 2, 5, 7, 10, 12, 13 **Distance (km)**: 400, 800, 2500, 3900, 6250, 8400, 10000 Polynomial Function: _____ Use the model to determine approximately how far away from the epicenter a seismic wave will be felt 8.5 minutes after an earthquake occurs. Estimate: _____ 3.Write three equivalent statements for 7 is a solution to a polynomial equation. (ex. -1 is a solution, -1 is an intercept, -1 is a zero, and (x+1) is a factor)	P
M.A2.3.2	rewrite rational expressions by performing division of polynomials. (A.APR.6)	**le the following polynomials.** 1. $(6x^3+2x^2-12x-4)\div(3x+1)$ 2. $(x^4-5x^2+4x+10)\div(x+2)$	P
M.A2.3.3	draw a sketch given any combination of the following features: intercepts, intervals where the function is increasing, decreasing, positive or negative, relative maximums and minimums, and end behavior. (F.IF.4, F.IF.7c)	1. 2. Sketch a cubic with positive and negative regions listed: Positive: $-1<x<2$ and $x>4$ Negative: $x<-1$ and $2<x<4$ Sketch 3. the graph of a cubic with end behavior: $x\to -\infty$ as $y\to-\infty$; $x\to +\infty$ as $y\to +\infty$ Using the graph below sketch a cubic with increasing and decreasing regions listed: Increasing: $-2<x<2$; Decreasing: $x<-2$ and $x>2$	P

M.A2.3.4	Given a precise graph identify the following features : intercepts, intervals where the function is increasing, decreasing, positive or negative, relative maximums and minimums, symmetries (y-axis and rotational), odd or even, and end behavior. (F.IF.4, F.IF.7c)	Graph the following polynomial, then identify the indicated characteristics of the polynomial function: Intercepts, Max/Min,Increasing, Decreasing, Positive, Negative, End Behavior. $y = x^3 - 6x^2 + 8x$	P
M.A2.3.5	solve special polynomial equations with real and imaginary roots by applying the sum and difference of two cubes, quadratic methods to quartics, and graphing. (A.CED.1)	Solve: $8x^3 - 1 = 0$. *Show all work!* Solve: $x^4 + 11x^2 + 18 = 0$. *Show all work!* Solve: $4x^4 + 33x^2 - 27 = 0$. *Show all work!*	P
M.A2.3.6	apply the Remainder, Rational, Irrational, and Imaginary Root Theorems and the Fundamental Theorem of Algebra to solve polynomial equations with complex roots. (A.APR.2, A.APR.3, N.CN.9, F.IF.7c)	1. Find $(x) = x^3 + 7x^2 + 4x$, when $x = -2$. What conclusions can you draw? $P(-2) =$ _____, so _____ 2. Use the Rational Root Theorem to list all possible roots for the polynomial equation. Then find the actual roots. $\mathbf{2x^3 + 14x^2 + 2x + 14 = 0}$ 3. Find a least degree polynomial equation with rational coefficients that has the roots $\mathbf{3 + 2i}$ and $\mathbf{-2}$.	S

Inverse and Radical Functions

Semester 1

M.A2.4	**Outcome 4: Students will create, interpret, analyze and derive inverse and radical functions and relations.**		
	Students will…		
Local Component Code	**Component**	**Examples**	**Priority Component(P) Supporting Component(S)**
M.A2.4.1	evaluate functions and combine standard function types using composition, addition, subtraction, multiplication and division, listing	**Let $(x) = x + 2$ and $g(x) = x^2 + 3x + 2$. All answers should be in standard form. List any restrictions when necessary.** 1. Find $(f + g)(x)$ 2. Find $(f - g)(x)$ 3. Find $(f \cdot g)(x)$	**P**
	restrictions where appropriate. Apply functions to Real-World context. (F.BF.1b, F.IF.6)	4. Find $(g \circ f)(x)$ 5. Find $(g \circ f)(3)$ 6. Find $\frac{g(x)}{f(x)}$ 7.Suppose Mrs. Jones offers to give the whole class a bonus if everyone passes the next math test. She will (1) give everyone a 10 point bonus and (2) increase everyone's grade by 10% of their score. Let x represent the original test scores. Do all calculations with a grade of 75. a.Write a function $b(x)$ to represent the score with the bonus points. b.Write a function $p(x)$ to represent the score with the percent increase. c.Use a composition function to find the final grade if the bonus is applied **before** the percent increase. d.Use a composition function to find the final grade if the percent increase is determined **before** the bonus is given. e.Does the order in which the bonuses are given make a difference in the overall test score? If yes, what is the difference, if not, explain why. 8.A craftsman makes and sells violins. The function $(x) = 1000 + 700x$ represents his cost (in dollars) to produce x violins. The function $(x) = 5995x$ represents the income (in dollars) from selling x violins. [hint: $P(x) = I(x) - C(x)$] (3 points) a.Write an simplify a function to determin the profit. b.Find (30), the profit earned when he makes and sells 30 violins.	**P**

M.A2.4.2	graph square and cube root functions and inequalities by hand and using technology to identify minimum/maximum, or point of inflection, translations, reflections, expansion, compression, domain, and range. (F.IF.7b, F.BF.3)	Graph $y < -\frac{1}{2}\sqrt{x-3}+1$. State the domain and range and describe any transformations. Graph $y = 2\sqrt[3]{x+1}-4$. State the domain and range and describe any transformations.	P
M.A2.4.3	write equations and inequalities when given a graph of a radical function. (F.IF.7b, F.BF.3)	Write the square root function represented by the graph.	P
M.A2.4.4	write and graph the inverses for linear, quadratic, rational, and radical functions and determine the domain and range of the function and its inverse. Also, determine whether the inverse is a function. (F.BF.4a)	Find the inverse of the function. Then graph the original function and determine if the inverse is a function given $(x) = \frac{1}{2}x - 3$.	P
M.A2.4.5	verify that the inverse is a function and that two functions are inverses of each other. (F.BF.4b)	Determine whether the pair of functions are inverse functions. Write "yes" or "no" and give an explanation $f(x) = 4x + 6$ $g(x) = \frac{x-6}{4}$	P

Solving and simplifying Radical Functions			
Semester 1			
M.A2.5	**Outcome 5: Students will simplify and solve radical functions.**		
	Students will…		
Local Component Code	**Component**	**Examples**	**Priority Component(P) Supporting Component(S)**
M.A2.5.1	simplify radical expressions. (A.SSE.2)	Simplify : $\sqrt[3]{54x^{17}y^{12}}$ Simplify: $-2\sqrt{6x^3y^3}\cdot 4\sqrt{3x^4}$ y	P

M.A2.5.2	add and subtract radical expressions. (A.SSE.2)	Simplify : $5\sqrt{72}+3\sqrt{98}-2\sqrt{50}$	P
M.A2.5.3	multiply radical expressions. (A.SSE.2)	Simplify: $(2\sqrt{5}-2\sqrt{2})(3\sqrt{5}+4\sqrt{2})$	P
M.A2.5.4	divide radical expressions. (A.SSE.2)	Rationalize the denominator: $\sqrt[3]{\frac{3}{4x}}$ Rationalize the denominator: $\frac{\sqrt{2}-5}{7-\sqrt{2}}$	P
M.A2.5.5	rewrite expressions involving radicals and rational exponents. (N.RN.1, N.RN.2, A.SSE.3c)	1. Write in radical form and **simplify**: $x^{\frac{5}{2}}$ 2. Write the radical in exponential form: $\overline{\sqrt[4]{4xy^3}}$ 3. Evaluate: 64^{-1_3} 4. Simplify the expression: $x^{\frac{7}{4}} \cdot x^{\frac{5}{4}}$ 5. Simplify the $\left(\frac{\sqrt{2}}{\sqrt[4]{2}}\right)^3$ expression: 6. Simplify the expression: $x^{-\frac{3}{4}}$	P
M.A2.5.6	solve and graph radical equations and inequalities, recognizing extraneous solutions. (A.REI.2)	1.Solve and check for extraneous solutions: $3(3x-1)^{\frac{1}{3}}-3=3$ $\quad \sqrt{x+12}=\sqrt{x}-2$ $\quad \sqrt{2x+4}+1\leq 9$ 2.Solve and check for extraneous solutions: 3.Solve and check for extraneous solutions:	P

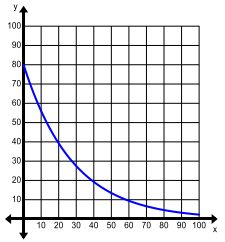
Rational Functions

Semester 2

Local Component Code	Component	Examples	Priority Component(P) Supporting Component(S)
M.A2.6	**Outcome 6: Students will create, interpret, analyze, and construct rational functions to solve problem** **Students will…**		
M.A2.6.1	simplify, multiply and divide rational expressions. (A.APR.6)	1. Simplify : $\frac{5x^3y^3}{5z} \cdot \frac{14z}{2y}$ 2. Simplify : $\frac{2y^2-72}{3y+18} \div \frac{y^2+9y+9}{y^2-4y-21}$	P
M.A2.6.2	add and subtract rational expressions. (A.APR.6)	3. Find the difference and state any restrictions : $\frac{2}{x-1} - \frac{x-3}{x^2-4} - \frac{1}{x+2}$ 4. Simplify : $\frac{2^{x-1}+1}{2^{x-1}}$	P
M.A2.6.3	solve rational equations identifying excluded values (A.CED.1, A.REI.2)	5. Solve and check for extraneous solutions : $\frac{x}{x^2-16} = \frac{3}{x-4}$ Solve and check for extraneous solutions : $\frac{6}{x+4} - \frac{7}{x} = \frac{5}{x-6}$	P
M.A2.6.4	solve rational inequalities identifying excluded	7. Solve and check for extraneous solutions : $\frac{2}{3x} + \frac{5}{6x} > \frac{3}{4}$	S
M.A2.6.5	solve distance and work problems involving rational equations and inequalities. (A.CED.1, A.REI.2)	8. Peter can paint a house in 14 hours. Melanie can paint the same house in 16 hours. How long would it take if they worked together? Lilia's speed in still water is 12 mph. Lilia swims 3 miles upstream in the same amount of time she swims 6 miles downstream. What is the speed of the current?	S
M.A2.6.6	graph using technology to analyze graphs based on the parent function $\frac{1}{x}$ and identify domain and		

	x range, asymptotes, vertical and horizontal translations, compressions, expansions, and reflections. (A.CED.2, F.BF.3)		S
M.A2.6.7	use technology to graph rational functions, identifying zeroes, horizontal and vertical asymptotes, holes, and end behavior. (A.CED.2, F.IF.9)	13. Graph $y = \frac{2x}{x-3}$ and identify the asymptotes, x-intercept, end behavior, and holes.	P

Exponential and Logarithmic Functions			
Semester 2			
M.A2.7	**Outcome 7: Students will construct and compare exponential and logarithmic models to solve problems.**		
	Students will…		
Local Component Code	**Component**	**Examples**	**Priority Component(P) Supporting Component(S)**
M.A2.7.1	graph exponential functions by hand and using technology: identify intercepts, end behavior, domain and range, and translations. (F.IF.7.e)	Graph the function. State the domain and range, end behavior, intercept(s), asymptote, any translations and if the graph is an example of growth or decay. 1. $f(x) = 2(3)^{x+1} - 3$	P

M.A2.7.2	analyze and interpret exponential graphs in realworld context. (F.IF.8.b)	2. The population of a bird species decreases at a rate of 3.5% per year. You have counted 80 of the birds in the habitat you are studying. a.Classify the function as either exponential (circle one): **Growth Decay** b.What does the $x-$ axis represent? c.What does the $y-$ axis represent? d.Write a function that models the change in the bird population. e.Determine the number of years until the population is 30 birds. f.Predict the population of birds after 110 years. 	P

M.A2.7.3	solve exponential equations and inequalities. (A.CED.1, F.LE.5)	**ɛach equation or inequalit -thousandth if necessary. (4 points each)** 1. $8^{c+1} = 16^{2c+3}$ 2. $9^{x-2} > (\frac{1}{27})^{x}$	**S**
M.A2.7.4	solve exponential equations with application to growth, decay, and compound interest. Create an exponential function given data and use this function to make a prediction. (A.CED.1, F.LE.5)	3. The population of worms before it rained was 250. After three days of rain, the population increased to1500. te an exponential Wri tion to model the ulation of worms. Estimate population of worms after ays of rain. 4. You invest $630 into your savings account that earns an interest of 1.25% compounded monthly. How much is in your account after 10 years.	S
M.A2.7.5	convert between logarithms and exponential. (F.IF.7.e, F.BF.3)	1. Write in exponential form: $\log_{2}16^{-1} = -4$ 2. Write in logarithmic form: $10^{2} = 100$	P

M.A2.7.6	graph logarithmic functions with a base greater than 1 by hand and using technology: identify intercepts, end behavior, domain, range and translations. (F.IF.7.e, F.BF.3)	Graph the function. State the domain and range, end behavior, intercept(s), asymptote, and any translations 1. $f(x) = \log\ x+4$	P

Outcome 8: Solving Logarithmic Functions

Semester 2

M.A2.8	**Outcome 8: Students will construct and compare exponential and logarithmic models to solve problems.**		
	Students will…		
Local Component Code	**Component**	**Examples**	**Priority Component(P) Supporting Component(S)**
M.A2.8.1	solve logarithmic equations and	**Solve each equation or inequality.** 1.Evaluate each expression. Show ALL work!	
	inequalities. (A.SSE.2, A.CED.1)	a. $\log_4 256$ b. $\log_2 \frac{1}{8}$ $\log_{27} x = \frac{5}{3}$ 4. $\log_2(x^2-18) = \log_2(-3x)$ 5..$\log_3(3x-4) \leq \log_3(x+2)$ 2. 3. $\log_5 x < 3$	P
M.A2.8.2	apply the properties of logarithms to solve exponential equations and inequalities. (A.CED.1) (F.LE.4)	**Use the properties of logarithms to write the following as a single logarithm** 1. $3\log_6 x - 4\log_6 3$ 2. $2\log_2 5 + \log_2 4 + 3\log_2 x$ **Solve each equation or inequality. Round to the nearest ten-thousandth if necessary.** 3. $2\log_3 6 - 2\log_3 x = \log_3 3$ 4. $\log_4 x + \log_4(x-4) = \log_4 5$ 5. $5^{x-2} = 62$ 6. $7^{3x-1} \geq 21$	P
M.A2.8.3	evaluate expressions involving the natural base and natural logarithms and solve exponential equations and inequalities using natural logarithms. (A.SSE.2)	**Write an equivalent exponen garithmic equation.** 1. $\ln(4x) = 9.6$ 2. $e^{-5x} = 0.2$ **Use the properties of logarithms to wr ite the following as a single logarithm.** 3. $2\ln x + 2\ln 4$ 4. $4\ln 8 - \ln 16$ **Solve each equation or inequality.** $e^{5x}+4 > 34$ $\ln(4x-1) < 2$ 5. $2e^x - 1 = 11$ 6. 7. $\ln x + \ln 2x = 2$ 8.	S

M.A2.8.4	use exponential and logarithmic functions to solve problems involving exponential growth and decay and problems with continuously compounded interest. (F.IF.8.B, F.LE.4)	1.Suppose you deposit $700 into an account paying 3% annual interest compounded continuously. a.What is the balance after 8 years? b.How long will it take the balance in your account to reach at least $1200? c.How much would have to be deposited in order to reach a balance of $1500 after 12 years? 2.There are initially 1000 bacteria in a culture. The number of bacteria doubles each hour. The number of bacteria N present after t hours is $N = 1000(2)$. How long will it take the culture to increase to 50,000 bacteria? 3.The Murray family bought a house 10 years ago. The house is now worth $185,000. Assuming a steady rate of growth of 4.8%, what was the original purchase price for the Murray's home?	S

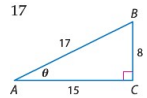
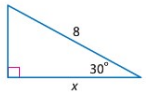
Trigonometric Functions

Semester 2

M.A2.9

Outcome 9: Students will extend the domain of trigonometric functions using the unit circle.

Students will…

Local Component Code	Component	Examples	Priority Component(P) Supporting Component(S)
M.A2.9.1	find values of trigonometric functions and apply trigonometric functions to find missing angles and/or side measures in right triangles. (F.TF.3) (G.SRT.8)	Find the value of the six trigonometric functions for angle θ  If $\sin B = \frac{5}{8}$, find the exact values of the five remaining trigonometric functions for B. Use a trigonometric function to find the value of x. Round to the nearest tenth if necessary 	S

M.A2.9.2	draw and find angles in standard position. Convert between degree measures and radian measures for all values in the unit circle. (F.TF.1)	Draw an angle with the given measure in standard position a. 215° b. −40° Rewrite the degree measure in radians and the radian measure in degrees. a. 120° b. $-\frac{3}{8}\pi$	S
M.A2.9.3	use the properties of periodic functions to evaluate trigonometric functions. Determine the reference angle for an angle in standard position on the unit circle. (F.TF.2)	The terminal side of θ in standard position contains the point at $(-3, -4)$. Find the exact values of the six trigonometric functions of θ. Sketch each angle, then find its' reference angle	S
M.A2.9.4	find values of trigonometric functions based on the unit circle. (F.TF.2)	Given the Unit Circle. Find the values for trigonometric functions given the degree or radian measure.	S

Statistics

Semester 2

M.A2.10	**Outcome 10: Students will understand and evaluate random processes underlying statistical experiments and make inferences and justify conclusions from sample surveys, experiments, and observational studies.**		
	Students will…		
Local Component Code	**Component**	**Examples**	**Priority Component(P) Supporting Component(S)**
M.A2.10.1	define populations, population parameter, random sample, and inference. Explain why randomization is used to draw a sample that represents a population well. Recognize that statistics involves drawing conclusions about		S

	a population based on the results obtained from a random sample of the population.(S.IC.1)		
M.A2.10.2	decide if a specified model is consistent with results from a given data-generating process, e.g. using simulation. (S.IC.2)	For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model.	S
M.A2.10.3	recognize the concept of sampling variation (differences in results among sample surveys), experiments, and observational studies; explain how randomization relates to each. (S.IC.3)		S
M.A2.10.4	use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling. (S.IC.4)		S
M.A2.10.5	use data from a randomized experiment to compare two treatments; use simulations to decide if difference between parameters is significant. (S.IC.5)		S
M.A2.10.6	evaluate reports based on data. (S.IC.6)		S

Pre-Calculus Curriculum

Yorkville CUSD 115

Grade-Level Focus Statement:

Students will compare and contrast advanced algebraic and trigonometric functions by using appropriate tools, methods, and measurement. Students will create and analyze the graphical representations of these functions.

Graphing Functions		
M.PC.1	**Outcome 1: Students will graph functions and determine properties of those functions visually, algebraically, and technologically.**	
	Students will…	
Local Component Code	**Component**	
M.PC.1.1	determine types of symmetry visually and by using algebraic tests.	
M.PC.1.2	construct appropriate graphs for linear, quadratic, cubic, piecewise, step, square root, and absolute value functions, and identify the domain and range of those functions.	
M.PC.1.3	transform parent functions to create new functions, compare and contrast the original and the new functions, dissect equations to determine appropriate transformations, and identify the domain and range of the functions.	

M.PC.1.4	classify types of discontinuity in a function visually and by using algebraic tests.	

M.PC.1.5	identify and describe end behavior of polynomial functions.	
M.PC.1.6	identify and state the intervals where polynomial functions are increasing or decreasing.	
M.PC.1.7	locate, calculate, and classify extrema.	
M.PC.1.8	find and graph the inverse of a function and verify that two functions are inverses of each other.	
M.PC.1.9	graph rational functions by identifying the asymptotes, intercepts, and the behavior near the asymptotes and verify graphs using technology.	
Rational & Radical Expressions & Equations		
M.PC.2	**Outcome 2: Students will solve polynomial functions, rational equations and inequalities, radical equations and inequalities, and then decompose.**	
	Students will…	
Local Component Code	**Component**	

M.PC.2.1	identify characteristics of polynomials, determine roots of polynomial equations, and construct a polynomial equation given the roots.	
M.PC.2.2	interpret a graph of a polynomial equation to classify the roots.	
M.PC.2.3	solve quadratic equations by factoring, graphing, and the quadratic formula.	
M.PC.2.4	apply the factor and remainder theorems to determine roots and factors of polynomial functions, and remainders when	
	dividing polynomials.	
M.PC.2.5	create a list of possible rational roots then determine the actual roots using algebra and technology.	
M.PC.2.6	approximate roots of polynomial functions using technology.	
M.PC.2.7	solve rational equations, solve and graph rational inequalities, and eliminate any extraneous solutions.	
M.PC.2.8	decompose rational expressions.	

Exponential Expressions & Equations	
M.PC.3	**Outcome 3: Students will simplify, evaluate, and graph exponential expressions, equations, and inequalities with rational and irrational exponents, and model real-world situations using common and natural logarithms.**

	Students will…	
Local Component Code	**Component**	
M.PC.3.1	graph exponential functions.	
M.PC.3.2	apply exponential functions using growth and decay models both with and without context.	
M.PC.3.3	evaluate exponential function using the number *e*.	
M.PC.3.4	evaluate logarithmic expressions, solve logarithmic equations and inequalities.	
M.PC.3.5	graph logarithmic functions.	
M.PC.3.6	find common logarithms of numbers and solve equations and	
	inequalities using common logarithms.	
M.PC.3.7	find natural logarithms of numbers and solve equations and inequalities using natural logarithms.	
M.PC.3.8	model real-world data with exponential and logarithmic functions.	

Trigonometric Functions & Triangles		
M.PC.4	**Outcome 4: Students will represent angles in terms of degrees and relative position on the coordinate plane and find the areas and solutions of oblique triangles.**	
	Students will…	
Local Component Code	**Component**	
M.PC.4.1	express the sine, cosine and tangent values for reference angles on the unit circle. (PC.F.TF.3+)	
M.PC.4.2	determine, compare, and contrast the values of the six trigonometric functions of an angle in standard position given a point on its terminal side.	
M.PC.4.3	solve oblique triangles with the Law of Sines and the Law of Cosines.	
M.PC.4.4	identify the ambiguous case for oblique triangles, determine the number of solutions, and solve these triangles.	
M.PC.4.5	calculate the area of oblique triangles.	

Graphing Trigonometric Functions & Their Inverses		
M.PC.5	**Outcome 5: Students will graph and analyze trigonometric functions and their inverses.**	
	Students will…	
Local Component Code	**Component**	
M.PC.5.1	compute arc length using radian measure.	
M.PC.5.2	find the area of a sector using radian measure.	
M.PC.5.3	calculate angular displacement, angular velocity, and linear velocity using appropriate formulas and dimensional analysis.	
M.PC.5.4	graph sine, cosine, tangent, cotangent, secant, and cosecant functions, and use the unit circle to explain the symmetry and periodicity of the functions. (PC.F.TF.4+)	
M.PC.5.5	analyze the properties of trigonometric functions, including amplitude, period, phase shift, and vertical shift, to compare and contrast with their parent functions.	
M.PC.5.6	write equations for a trigonometric function given its properties.	
M.PC.5.7	model real world data using trigonometric functions, use the inverse functions to solve trigonometric equations that arise, and evaluate the solution using technology. (PC.F.TF.7+)	

M.PC.5.8	graph and write inverse trigonometric relations restricting the function to a domain on which it is always increasing or always decreasing. (PC.F.TF.6+)	

Trigonometric Identities		
M.PC.6	**Outcome 6: Students will use trigonometric identities to verify and form other identities and solve trigonometric equations.**	
	Students will…	
Local Component Code	**Component**	
M.PC.6.1	categorize and use reciprocal, quotient, Pythagorean, symmetry, and opposite angle identities.	
M.PC.6.2	use trigonometric identities to verify other identities.	
M.PC.6.3	prove and apply the sum and difference identities for sine, cosine, and tangent. (PC.F.TF.9+)	
M.PC.6.4	define and apply the double- and half-angle identities.	
M.PC.6.5	solve trigonometric equations using identities.	

Vectors		
M.PC.7	**Outcome 7: Students will add, subtract, and multiply vectors in two- and three-dimensions (glasses optional) and apply vectors to inner-products, cross-products and parametric equations.**	
	Students will…	
Local Component Code	**Component**	
M.PC.7.1	define vectors as quantities having both magnitude and direction and use appropriate symbols to represent them. (PC.N.VM.1+)	
M.PC.7.2	represent geometric vectors and the sum, difference, and scalar multiplication of geometric vectors as directed line segments, and determine their magnitude and direction. (PC.N.VM.1+, PC.N.VM.4.a+, PC.N.VM.5.a+)	
M.PC.7.3	represents geometric vectors using ordered pairs, add, subtract, and multiply vectors algebraically, and determine their magnitude and direction. (PC.N.VM.2+, PC.N.VM.4.a+, PC.N.VM.4.b, PC.N.VN.c+. PC.N.VM.5.b+)	
M.PC.7.4	add, subtract and multiply vectors in three-dimensions, and determine their magnitude.	
M.PC.7.5	calculate second-order and third-order determinants.	

M.PC.7.6	calculate inner-products and cross-products to justify perpendicularity. (PC.N.VM.11+)	
M.PC.7.7	solve problems involving velocity and other real-world quantities that can be represented by vectors using right triangle trigonometry (using conversion formulas).	
	(PC.N.VM.3+)	
M.PC.7.8	write and graph vector and parametric equations of lines.	

Polar Coordinates & Equations		
M.PC.8	**Outcome 8: Students will define polar coordinates, graph polar and rectangular coordinates, graph polar equations, write and use complex numbers in polar form.**	
	Students will…	
Local Component Code	**Component**	
M.PC.8.1	graph both points in polar coordinates and determine the distance between two points in polar coordinates.	
M.PC.8.2	graph polar equations.	
M.PC.8.3	convert between polar and rectangular coordinate points and equations.	

M.PC.8.4	graph complex numbers in the complex plane in rectangular and polar form. (PC.N.CN.4+)	
M.PC.8.5	convert complex numbers from rectangular form to polar form and vice versa and explain why they represent the same number. (PC.N.CN.4+)	
M.PC.8.6	find the conjugate of a complex number; use conjugates to find moduli and quotients of complex numbers. (PC.N.CN.3+)	

M.PC.8.7	find the products and quotients of complex numbers in polar form.	
M.PC.8.8	determine and write powers and roots of complex numbers in polar form using De Moivre's Theorem.	
Sequences & Series		
M.PC.9	**Outcome 9: Students will investigate sequences and series, finite and infinite, determine their convergence or divergence, prove formulas for series using mathematical induction, and expand binomials.**	
	Students will…	
Local Component Code	**Component**	
M.PC.9.1	find the *n*th term and arithmetic means of an arithmetic sequence as well as the sum of *n* terms of an arithmetic sequence.	

M.PC.9.2	find the *n*th term and geometric means of a geometric sequence as well as the sum of *n* terms of a geometric sequence.	
M.PC.9.3	use a sigma notation.	
M.PC.9.4	find the limit of the terms of an infinite sequence and the sum of an infinite geometric series.	
M.PC.9.5	determine whether a series is convergent or divergent.	
M.PC.9.6	approximate trigonometric values and logarithms of negative numbers by using series, and use Euler's Formula to write the exponential form of a complex number.	
M.PC.9.7	use the Binomial Theorem to expand binomials.	
M.PC.9.8	use mathematical induction to prove the validity of mathematical statements.	

Introduction to Statistics Curriculum

Yorkville CUSD 115

Grade-Level Focus Statement:

Students will apply methods of data collection, create graphical and numeric representations of data, and will analyze and interpret data results in order to make inferences about the world.

Surveys & Sampling		
M.IS.1	**Outcome 1: Students will be able to create and administer a well-designed sample survey, identifying sources of error, bias, as well as applying proper sampling techniques.**	
	Students will…	
Local Component Code	**Component**	
M.IS.1.1	explain the purpose for conducting observational studies (specifically sample surveys) using appropriate terminology (variable, categorical, quantitative, sample, population, statistic, parameter).	
M.IS.1.2	select and apply a method of data collection (SRS, systematic, stratified, cluster, census), using random digit selection (with	
	and without technology) when appropriate.	
M.IS.1.3	explain bias, variability, calculate margin of error for specific sample size, and calculate sample size for a given margin of error.	

M.IS.1.4	identify types of sampling errors (voluntary response, convenience sampling, and undercoverage) and be able to take necessary precautions to reduce or avoid such errors.	
M.IS.1.5	create survey questions with appropriate wording and purposeful design (open vs. closed).	
M.IS.1.6	identify types of nonsampling errors (nonresponse, wording of question, processing errors) and be able to take necessary precautions to reduce or avoid such errors.	
M.IS.1.7	apply steps I and II of the 4-step statistical problem solving process.	

Visual Representations of Univariate Data		
M.IS.2	**Outcome 2: Students will create and interpret visual representations of univariate data.**	
	Students will…	
Local Component Code	**Component**	
M.IS.2.1	create and interpret graphs of categorical data (bar graphs, pie charts) and recognize and explain their misuse.	

M.IS.2.2	create and interpret graphs of quantitative data (dotplot, boxplot, stemplot, histogram) and recognize and explain their misuse.	
M.IS.2.3	calculate numerical summaries of quantitative data (mean, standard deviation, 5-number summary, IQR) and interpret/summarize them in the context of the scenario.	
M.IS.2.4	use a density curve (Normal and Standard Normal) as an approximation of a histogram by using $\bar{x}$ and s.	
M.IS.2.5	perform calculations from percentiles to z-scores and vice versa (using z-table or technology) from normal distributions and interpret those values in the context of the scenario.	
M.IS.2.6	apply z-score calculations and percentiles to contextual situations, including comparison of individuals in different data sets, 95% confidence, and margin of error.	
M.IS.2.7	compare univariate distributions (categorical and quantitative) using numerical summaries and graphical representations.	
M.IS.2.8	interpret results of surveys, including *who, when, population, sampling technique, sample size, response rate, and questions asked*.	

Visual Representations of Bivariate Data		
M.IS.3	**Outcome 3: Students will create and interpret scatter plots and other visual representations of bivariate data.**	
	Students will…	
Local Component Code	**Component**	
M.IS.3.1	create and read scatter plots from a set of bivariate data, identifying explanatory and response variables and the direction of the relationship (positive or negative).	
M.IS.3.2	read and interpret line graphs as the plotting of a variable over time, identifying key features such as seasonal variation.	
M.IS.3.3	identify lurking variables as confounding or common response and their interrelationship.	
M.IS.3.4	calculate the correlation coefficient for a given set of data by hand and using technology.	
M.IS.3.5	find the equation of the least-squares regression line using technology and interpret the meaning of the y-intercept (a) and the slope (b) in the context of the problem.	
M.IS.3.6	calculate a residual for points in a scatter plot by hand and create a residual plot using technology.	

M.IS.3.7	analyze scatter plots using DFSU approach (direction, form, strength, unusual features).	

Experimental Design & Ethics		
M.IS.4	**Outcome 4: Students will design an experiment utilizing the basic principles of experimental design and ethical standards.**	
	Students will…	
Local Component Code	**Component**	
M.IS.4.1	describe experiments using appropriate terminology (subjects, treatment, multiple treatments, explanatory variable, response variable, lurking variable, placebo, control, blinding, double-blinding, clinical trials), and identify key differences between experiments and observational studies.	
M.IS.4.2	identify potential issues with experimentation (including nonadherers, refusals, and dropouts) and develop methods to reduce the impact of such issues.	
M.IS.4.3	use the principles of a random comparative experiment to outline an experiment (in words or using the tree-diagram approach).	
M.IS.4.4	identify situations that necessitate the use of a matched pair design or a block design, and implement such a design appropriately.	

M.IS.4.5	recognize and apply the logistics of ethics (IRB review, informed consent, and confidentiality) and explain the need for each principle.	
M.IS.4.6	discuss the moral implications of clinical trials, and be able to defend either side of a moral debate (e.g. Tuskegee syphilis study, Milgram shock experiment).	
M.IS.4.7	prove causation without experiments (strong association, consistent association, higher dose = stronger response, cause precedes effect in time, alleged cause is probable).	

Statistical Probability		
M.IS.5	**Outcome 5: Students will identify misconceptions of probabilities, use simulation to approximate probabilities, and calculate simple, compound, and conditional probabilities.**	
	Students will…	
Local Component Code	**Component**	
M.IS.5.1	identify and explain common misconceptions about probabilities such as the “Law of Averages,” the “What a Small World” phenomenon, and human misperception of risk.	

M.IS.5.2	define and use basic terminology and notation, including random, probability, event, sample space, probability model, and outcome.	
M.IS.5.3	use simulation to model chance occurrences.	
M.IS.5.4	model chance occurrences, including conditional probability, using two-way tables, Venn diagrams, and tree diagrams.	
M.IS.5.5	apply the rules of probability (basic rules, addition rule, multiplication rule) to solve problems in context.	
M.IS.5.6	explain the difference between disjoint (mutually exclusive) and independent events.	

Probability Distributions	
M.IS.6	**Outcome 6: Students will construct and apply probability distributions.**
	Students will…

Local Component Code	**Component**	
M.IS.6.1	create and interpret probability distributions, and create and interpret accompanying visual representations (tables and histograms) of those distributions.	

M.IS.6.2	use random variables and proper notation to accurately describe probability scenarios.	
M.IS.6.3	calculate expected value and standard deviation of a random variable, as well as the “Law of Large Numbers” as it applies to expected value.	
M.IS.6.4	create and accurately interpret a sampling distribution as a distribution of samples (proportions), and describe why a sampling distribution follows Normal model.	
M.IS.6.5	apply z-scores to a Normal sampling distribution; calculate a given sample’s z-score, and use that standardized score to calculate likelihood/probability of its occurrence (using both a z-table and technology).	
M.IS.6.6	apply multiplication counting principle and factorial to a variety of real-world problems.	
M.IS.6.7	evaluate counting situations as permutations or as combinations, and apply appropriate calculations to each situation.	
M.IS.6.8	interpret whether or not a setting is binomial (“BINS” – Binary? Independent? Number? Success?), and use the binomial theorem to perform calculations.	
M.IS.6.9	create and interpret binomial probability distributions (tables and histograms), and use appropriate formulas to calculate expected value and standard deviation.	

Statistical Inference		
M.IS.7	**Outcome 7: Students will apply statistical inference to appropriate situations.**	
	Students will…	
Local Component Code	**Component**	
M.IS.7.1	summarize statistical inference as a process to draw conclusions about a population, from a sample; understand $\hat{p}$ as a sample estimate for p and $\underline{x}$ as a sample estimate for μ, and that any calculated value from a sample is a "statistic," and the corresponding population value is a "parameter."	
M.IS.7.2	calculate standard deviation, margin of error, critical values, and confidence intervals for a sampling distribution.	
M.IS.7.3	perform a significance test to calculate probabilities given that an assumption is true.	
M.IS.7.4	write hypotheses and calculate p-values for significance tests, as well as whether or not a p-value is statistically significant at a particular α-level.	
M.IS.7.5	use the PHANTOMS mnemonic (Parameters, Hypothesis, Assumptions, Name the test, Test statistic, Obtain p-value, Make Decision, and State Conclusion) for hypothesis testing.	

M.IS.7.6	use the PANIC mnemonic (Parameter, Assumptions, Name the interval, Interval, Conclusion in context) for confidence intervals.	
M.IS.7.7	recognize and explain the misuse of inference.	