HAMILTON TOWNSHIP SCHOOL DISTRICT
MATHEMATICS PERFORMANCE INDICATOR MATRIX
2008-2009

a √ indicates mastery of the Performance Indicator	K	1	2	3	4	5	6	7	8
4.1 NUMBER AND NUMERICAL OPERATIONS									
A. Number Sense									
[meaning of numbers] P1. Read and write numbers from zero to ten; compare and order numbers from zero to ten; and count forward and backward on a number line from zero to ten. **[4.1 (NNO.K) A.1; A.6; B.1b]**	✓								
P2. Read and write numbers from eleven to twenty; compare and order numbers from eleven to twenty **[4.1 (NNO.K) A.2; A.4]**	✓								
P3. Count, read, and write numbers forward and backwards, and starting at any number between 1 and 100. **[4.1 (NNO.1) A.3, A.4]**		✓							
P4. Solve real life situations by counting by 2's, 5's, and 10's . **[4.1 NNO.1) A.5a]**		✓							
P5. Use ordinal number and words to model real-life situations that require ordering (i.e., 1st / first; 2nd / second) **[4.1 (NNO.1) A.1] [4.3 (PA.1) C.1]**		✓							
P6. Represent numbers in a variety of ways such as 5 objects can be 2 red and 3 green or 1 red and 4 green, etc.) **[4.1 (NNO.K) A.9]**	✓								
P7. Generate equivalent forms of the same number using words, number expressions, and models to demonstrate that equal means "the same as." **[4.1 (NNO.1) A.2; B.6] [4.3 (PA.1) C.1]**		✓							
P.8 Represent whole number (ones and tens) using numerals (e.g.38), expand notation (e.g., 3 tens 8 ones), and physical models (e.g., base 10 blocks or rods to represent 10s and units to represent ones); use the first digit in a 2-digit number to indicate closeness to 10 or 100. [**4.1 (NNO.1) A.5b,c]**		✓							
P9. Identify and state the value of a penny, nickel and dime. **[4.1 (NNO.K) A.8; B1a]**	✓								
[meaning of numbers] 1. Represent numbers through hundreds (e.g., planning extravaganza); use the number of students in each class to use ordinals rank each class size, and write parts of various school groups (e.g., boys, girls, etc.) as proper fractions with denominators of 2, 3, 4, 8, and 10. [**4.1 (NNO.2) A.1a,b,c] [4.5 (MP) C.6] [4.5 (MP) E.3]**			✓						
2. Describe four different ways that numbers are used in their lives (e.g., date of birth, weight, number of family members, money for school supplies, number of treats for class, shopping for holiday gifts, etc.) **[4.1 (NNO.2) A.3]**			✓						
3. Organize population data from cities along the eastern seaboard, using numbers up to 999,000; label the place value of a given digit in each number; order the numbers in population from least to greatest; poll the class to determine how many students have visited each city, and write a fraction to represent this number as part of the whole class; for one or more cities, re-write the fraction as a part of a set to show how many girls (and boys) have visited that or those city(ies); finally, place all of the fractions in order on a number line**. [4.1 (NNO.3) A.1] [4.1 (NNO.3) A.2] [4.1 (NNO.3) A.4] [4.1 (NNO.3) A.6] [4.5 (MP) C.3]**				✓					
4. Identify whole numbers as odd or even, given a random array of numbers **[4.1 (NNO.3) A.3]**				✓					
5. Keep a Math Journal, recording where and how whole numbers are encountered outside the classroom (e.g., sports scores, numbers on uniforms; doctor/dentist appointments, blood pressure; sale prices in flyers, music, telephone numbers, weight and height, clothing sizes, pages in a book, etc.); use at least 5 categories to cluster entries **[4.1 (NNO.3) A.5] [4.5 (MP) A.4] [4.5 (MP) B.1] [4.5 (MP) C.4]**				✓					
6. Predict how long it would take to have one million dollars in bank if at the age of 19 years old you began to save $2,000 dollars a year, at an interest rate of 10%. Explain the pattern you see in the savings plan**. [4.1 (NNO.4) A.1a] [4.1 (NNO.4) A2] [4.1 (NNO.4) A.3] [4.5 (MP) A.2] [4.5 (MP) C.5] [4.5 (MP) D.5]**					✓				

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7. Use data from the breakfast for your 4th grade classroom, and determine the total amount of cereals and juice delivered to the four classes that day; write fraction to represent the subset (with denominators that include several of the following: 2, 3, 4, 5, 6, 8, 10, 12, and 16) for the types of cereals and juices; write as fractions and place on a number line from least to greatest. **[4.1 (NNO.4) A.1b] [4.5 (MP) B.1]**					✓				
8. Complete an open-ended problem solving flow chart to reflect the process used to solve problems (e.g. use a different PS strategy each time and then place the completed chart in Math Folder as a reference tool). **[4.5 (MP) A.5]**					✓				
9. Show the relationship between commonly used whole numbers, fractions, and decimals; use real-life items (concrete and pictorial models) to represent how they are related and equal (e.g., football field length is 100 yards, the 50 yard line is ½ of the field, which is 0.50 and 50/100) **[4.1 (NNO.4) A.4] [4.1 (NNO.4) A.5] [4.5 (MP) C.2]**					✓				
10. Survey classmates about which snack they typically choose - - granola bars or fruit; write fractions and decimals to represent what part of the group selected each snack; for each 'favorite,' write a fraction to represent what part of the (e.g.,) fruit group preferred apples, oranges, bananas, etc.; use the chart to explain how fractions represent the division of whole numbers. **[4.1 (NNO.5) A. 1a, b] [4.1 (NNO.5) A. 4] [4.5 (MP) A. 2c, d] [4.5 (MP) A. 3] [4.5 (MP) A.5] [4.5 (MP) A.4] [4.5 (MP) C.2] [4.5 (MP) E.3]**						✓			
11. Compare and order decimals. **[4.1 (NNO.5) A.1b] [4.1 (NNO.5) A.6] [4.5 (MP) C.4]**						✓			
12. Use number theory concepts *primes, factors, and multiples* to solve real-life problems when computing with fractions to determine least common multiple (LCM), least common denominator (LCD), and simplest form **[4.1 (NNO .5) A.5] [4.5 (MP) A. 2a, b] [4.5 (MP) C.1]**						✓			
13. Show that numbers can be less than zero as well as more than zero; identify the signed numbers as *integers* (e.g., Use a chart with a series of temperatures, times collected during cold days of the year (e.g., -21, -24, -18, -11 . . . +1, +7, +11, etc.) **[4.1 NNO.6) A.1a] [4.5 (MP) B2] [4.5 (MP) C.2] [4.5 (MP) E.1a]** [re: text, Ch. 9]							✓		
14. Use a chart that displays various temperatures and weather information to write fractions representing the number of days that the temperature rose above zero; for those days, write a fraction to represent the number of days it snowed; convert the fraction to a decimal. Compare and order the temperatures for different times of the day. **[4.1 (NNO.6) A.1, b, c] [4.1 (NNO.6) A.8] [4.5 (MP) A.3] [4.5 (MP) C.4]**							✓		
15. Solve for an unknown in problems (i.e., that involve prime number, factors, multiples, common multiples, common factors) **4.1 (NNO.6) A.7] [4.5 (MP) C.1]**							✓		
16. Distinguish among fractions, rational numbers, irrational numbers, percents, and whole numbers with exponents by (a) clustering each into the proper category; (b) determining if each is terminating or repeating; (c) finding an equivalent form where one exists; (d) defining each category, and (e) providing an example of how each category is used to solve real-life problems; prepare as a table, and add examples as the year goes along. **[4.1 (NNO.7) A.1a, b, c] 4.1 (NNO.7) A.5] 4.1 (NNO.7) A.6] [4.5 (MP) A.3] [4.5 (MP) C.1] [4.5 (MP) C.2] [4.5 (MP) C.5] [4.5 (MP) E.2]**								✓	
17. Analyze lists of numbers that include fractions, rational numbers, irrational numbers, percents, and whole numbers with exponents (percents greater than 100 and less than 1) to determine if they are in ascending order; if not, re-order them so that they are correct. **[4.1 (NNO.7) A.2] 4.1 (NNO.7) A.3] 4.1 (NNO.7) A.4]**								✓	
18. Distinguish among rational numbers, percents, exponents, roots, absolute values, and numbers represented in scientific notation by: (a) clustering each into the proper category; (b) determining if each is terminating or repeating; (c) finding an equivalent form where one exists; (d) defining each category; and (e) providing an example of how each group is used to solve real-life problems; prepare as a table and add examples as the year goes along. **[4.1 (NNO.8) A.1a, b, c, d, e, f] [4.5 (MP) B.2] [4.5 (MP) B.4] [4.5 (MP) E.2]**									✓
19. Plot, on a number line, a series of irrational and rational numbers, including square roots and π. **[4.1 (NNO.8) A.7]**									✓

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[place value] P8. Represent whole number (ones and tens) using numerals (e.g., 38), expanded notation (e.g., 3 tens 8 ones), and physical models (e.g., base-ten blocks to represent 10s and ones); use the first digit in a 2-digit number to indicate closeness to 10 or 100. **[4.1 (NNO.1) A.5b, c]**		✓							
[place value] 20. Count out an assigned number of chips and add another 25 for five different sums; write the total number, and identify the place value of hundreds, tens, and ones; compare own number to 5 other students' numbers, and order from least to greatest. **[4.1 (NNO.2) A.2] [4.1 (NNO.2) A.5] [4.5 (MP) B.3]**			✓						
21. Make 'change' from a dollar (consisting of 100 pennies) for several items; write the cost of each item and the amount of change due; explain that the 'change' represents a decimal part of a dollar **[4.1 (NNO.3) A.4] [4.5 (MP) A.5] [4.5 (MP) B.1] [4.5 (MP) B.2] [4.5 (MP) D.2] [4.5 (MP) C.2]**				✓					
22. Restore an 'Order' numbers game that has been turned upside down by placing in order, from least to greatest, ten numbers that include whole numbers through millions, fractions, mixed numbers, and decimals through 100ths. **[4.1 (NNO. 4) A.6] [4.5 (MP) C.1]**					✓				
23. Compare numbers (e.g., populations, money to spend, salaries for specific career jobs) of up to 9 digits; explain the size of the digit in relation to place value in a number. **[4.1 (NNO. 5) A.3] [4.5 (MP) A. 2]**						✓			
24. Use real-life situations that involve whole numbers, fractions, and decimals; write equivalent forms of different numbers to show that numbers can be represented in different ways (e.g., 50 out of 100 students went on the field trip; this could also be a fraction of ½, or a decimal of .5 or .50; in addition, the number could be written as 23 girls and 27 boys; or 40 plus 10, etc. **[4.1 (NNO.6) A.6] [4.5 (MP) E.2]**							✓		
25. Analyze lists of numbers that include rational numbers, percents, exponents, roots, absolute values, and numbers represented in scientific notation to determine if they are in ascending order; if not, re-order them so that they are. **[4.1 (NNO.8) A.2] [4.1 (NNO.8) A.3] [4.1 (NNO.8) A.4] [4.5 (MP) C.2]**									✓
[money] P9. Identify and state the value of a penny, nickel and dime. **[4.1 (NNO.K) A.10]**	✓								
P10.Identify coins and their values (penny, nickel, dime, quarter); show two combinations of coins, using at least two different to represent a specific value to $1.00. **[4.1 (NNO.1) A.6, A.7, A.8]**		✓							
[money] 26. Identify a state the value of a penny, nickel, and dime; identify a quarter. Represent the value of at least two types of coins, and state the value of the coins (penny, nickel, dime, quarter) **[4.1 (NNO.2) A.4] [4.5 (MP) C.3]**			✓						
27. Solve problems using currency to purchase clothing, using a sales discount, and a second, special discount; describe in writing the original cost, reduced costs, discount, saving, and the change. **[4.1 (NNO.6) A.2, A.3] [4.5 (MP) A.2; B.1]**							✓		
28. Explain, in writing, how to compute addition and subtraction of decimals **[4.1 (NNO.5) A.2] [4.5 (MP) B.1a] [4.5 (MP) B.2]**						✓			
[ratio / proportion / percent] 29. Complete a chart (as a class) to show the relationship among ratio, proportion and percent, including percents that are between 1 and 100. Give examples of how ratios are used to represent part-to-part, part-to-whole and whole-to-part. Explain in writing the visual/model (e.g., compare a class to the total number of students in the grade level who have pizza versus salad for lunch; the portion of the grade level ordering pizza, etc. **[4.1 (NNO.6) A.4] [4.1 (NN0.6) A.5] [4.5 (MP) A.4] [4.5 (MP) B.1] [4.5 (MP) B.4] [4.5 (MP) C.6] [4.5 (MP) E.3]**							✓		
30. Compare and order numbers, write numbers in words and number form (e.g., numbers that represent distances of the planets from the sun and from the earth from least to greatest) **[4.1 (NNO.6) A.8] [4.5 (MP) A.2]**							✓		
31. Use ratios and proportions to represent quantitative relationships in a variety of ways (i.e., Pattern Blocks, Puzzles/Games, Recipes, and Measurement problems) **[4.1 (NNO.8) A.2] [4.1 (NNO.8) A.3] [4.1 (NNO.8) A.4] [4.1 (NNO.8 D.6] [4.5 (MP) C.2]**									✓

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32. Identify hidden collections of Pattern Blocks, and create a series of Pattern Block puzzles; use deductive reasoning; work with fractions, ratios, and percents; compare areas of geometric shapes, and use correct terminology to describe mathematical relationships. **[4.1 (NNO.8) A.3] [4.1 (NNO.8) A.5] [4.1 (NNO.8) E.1] [4.5 (MP) E.1]**									✓
B. Numerical Operations									
[meaning of operations / properties] P1. Model and represent addition as combining sets and counting-on in real-world problems; compare the number of objects in two or more sets when one set has one or two more. **[4.1 (NNO.K) A.8; B.1a]**	✓								
P2. Model, represent, and explain addition - - using physical materials (i.e., base-ten blocks, number lines, hundred charts, traveling up and down a number line and distance apart (deleted)), contextual situations, drawing pictures, writing number sentences with conventional symbols - - as combining sets using part + part = whole; use addition strategies (i.e., counting all, counting on, one more and two more, doubles, doubles plus one, make ten, using tens frames and double tens frames, identity property (adding zero), and commutative property (turn-around facts); model multiplication as repeated addition and rectangular arrays. **[4.1 (NNO.1) B.1, B.3, B.4, B.7]**		✓							
P3. Model and represent subtraction as take-away and comparison in real-world problems; compare the number of objects in two or more sets when one set has one or two less. **[4.1 (NNO.K) A.7; B.1a]**	✓								
P4. Model, represent, and explain subtraction as take-away and comparison using physical materials, in contextual situations, drawing pictures, writing number sentences with conventional symbols, and explaining that subtraction of whole numbers yields an answer smaller than the original number (i.e., related addition facts, number lines, touch-points, one or two less, tens frames, and missing numbers. **[4.1 (NNO.1) B2, B3, B8]**		✓							
P5. When solving a real-life problem, join multiple groups with the same number of items (e.g., 3 bags of 2 pieces of candy each); determine the total when the groups are combined. **[4.1 (NNO.K) A.5; A.7; B.2]**	✓								
P6. When solving a real-life problem, divide or share a small set of objects into groups of equal size (e.g., share 6 pieces of candy equally among 3 children). **[4.1 (NNO.K) B.3]**	✓								
P7. Model and represent division as sharing equally in real-life situations, using fractions, words, and models for halves, thirds, and fourths, recognizing fractions as equal parts of a whole. **[4.1 NNO.1) A.9; B.5]**		✓							
P8. Model multiplication as repeated addition and rectangular arrays. **[4.1(NNO.1)B4]**		✓							
[meaning of operations / properties] 1. Demonstrate the concepts of multiplication (as repeated addition) and division (as repeated by subtraction or as equally shared groups) by constructing a multiplication set (such as 4 x 5 = 20) by counting; show that 20 can be divided equally into 4 groups (e.g., 20 ÷ 4 = 5 with 5 objects in each group (refer to text T. E. p. 493 A) **[4.1 (NNO.2) B.2]**			✓						
2. Use 'counting-on' and doubles facts strategies with mental math; use a calculator and paper-pencil to perform addition and subtraction calculations for 2-digit real-life addition and subtraction problems. **[4.1 (NNO.2) B.3] [4.1 (NNO.2) B.4] [4.1 (NNO.2) B.5a,b] [4.1 (NNO.2) B.6]**			✓						
3. Write addition/subtraction and multiplication/division number sentences (e.g.,14 + a = 22; 5 x b = 40) where the inverse operation must be used to solve the problem. **[4.1 (NNO.2) B.8]**			✓						
4. Use manipulatives (e.g., unifix cubes, dry-erase boards) and/or number line to model/demonstrate addition as combining sets/counting-on in various classroom activities and subtraction and comparison in various classroom activities such as the third grade takes a trip; list all of the grade three classes and their total enrollment; estimate how many students are going on the trip, and calculate the exact answer. **[4.1 (NN0.3) B.1a,b,c] [4.5 (MP) C.1] [4.5 (MP) C.6] [4.5 (MP) E.3]**				✓					
5. Model problems with manipulatives to show multiplication as repeated addition (e.g., creating rectangular arrays, drawings, etc.); if the class is going on a field trip and the bus costs $100 for the day; how much will it cost to transport the class on the trip if 265 students are on the trip, and each bus holds 50 students? **[4.1 (NNO.3) B.1b] [4.5 (MP) D.1] [4.5 (MP) E.3]**				✓					

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6. Model problems with manipulatives to show <u>division</u> as repeated subtraction or as equally shared groups through visual displays and drawings; if a bus holds fifty students, and 265 are going on a trip, how many buses are needed? **[4.1 (NNO.3) B.1c] [4.5 (MP) C.3] [4.5 (MP) D.3] [4.5 (MP) E.3]**				✓					
7. Explain addition and subtraction, (joining, separating, and comparing) using manipulatives and compute with 4-digit numbers using paper and pencil, and explain how you got your answer; use an array to show multiplication as repeated addition and show division as repeated subtraction or sharing. **[4.1 (NNO.4) B.1a, b, c] [4.1 (NNO.4) B.3] [4.1 (NNO.4) B.4] [4.5 (MP) B.2] [4.5 (MP) C.2] [4.5 (MP) D.1] [4.5 (MP) E.2]**					✓				
8. Illustrate the inverse operations of addition and subtraction / multiplication and division in real-life problems; draw arrays for tricky multiplication facts and fact families (addition/subtraction) **[4.1 (NNO.4) B.7] [4.1 (NNO.4) B.10] [4.5 (MP) A.5] [4.5 (MP) D.1] [4.5 (MP) E.3]** (See transparency #15 Teaching Tool; also see p. 514 B of teacher's manual)					✓				
9. Analyze problems that have been solved for possible errors; explain the appropriateness of the operations used; check the reasonableness of computations using pencil-paper, mental math, and the calculator; understand, identify, and use properties of operations (i.e., commutative, associative, distributive and identity). **[4.1 (NNO.6) B.1] [4.1(NNO.6) B.6] [4.1 (NNO.6) B.7] [4.5 (MP) A.5] [4.5 (MP) B.1] [4.5 (MP) B.3] [4.5 (MP) B.4] [4.5 (MP) D.1] [4.5 (MP) D.2] [4.5 (MP) D.3] [4.5 (MP)D.4] [4.5 (MP) D.6] [4.5 (MP) F.4] [4.5 (MP) F.5] [4.5 (MP) F.6]**						✓	✓		
10. Solve real-life problems related to addition and subtraction of fractions and decimals (e.g., if classmates share a part of several snacks, what is the total of ___ parts; if one group needs a specified amount, what is the other number? **[4.1 (NNO.5) B.2] [4.5 (MP) C.4]**						✓			
11. Solve real-life problems that require computations with fractions and decimals (e.g., grade point averages, sports statistics, test scores, etc.) **[4.1 (NNO.6) B.2] [4.5 (MP) A.3] [4.5 (MP) C.2] [4.5 (MP) E.2]**							✓		
12. Demonstrate an efficient method to compute division problems with 3-digits divided by 2; create a real-life division problem for other students to solve **[4.1 (NNO.5) B.3] [4.1 (NNO.6) B.3] [4.5 (MP) B. 2]**						✓	✓		
13. Sort relevant from irrelevant information in a story problem, and determine which basic operations are needed; write the problem as an algebraic expression, check the reasonableness of the final answer in relation to the original problem, and decide which method should be used - - paper-pencil, mental math, or calculator **[4.1 (NNO.6) B.1] [4.1 (NNO.6) B.4] [4.1 (NNO.6) B.6]**							✓		
14. Explain how to find squares and cubes of whole numbers **[4.1 (NNO.6) B.5] [4.5 (MP) A.3] [4.5 (MP) B.1] [4.5 (MP) B.4] [4.5 (MP) C.1]**							✓		
[fluency with facts] 15. Recall basic addition and subtraction facts, using a variety of strategies such as fact families, one more / one less, doubles, doubles plus 1 **[4.1 (NNO.2) B.3] [4.5 (MP) C.1]**			✓						
16. Recall basic multiplication and division facts; demonstrate that multiplication is "skip counting" with the numbers 2, 5, and 10 and that division is repeated subtraction by reversing the process using the same number; explain that multiplication and division are 'short cuts' **[4.1 (NNO.3) B.2] [4.1 (NNO.4) B.2] [4.5 (MP) B.1] [4.5 (MP) D.1] [4.5 (MP) C.2]**				✓					
17. Recall basic multiplication and division facts (e.g., flash card test / timed tests); demonstrate that multiplication is "skip counting" (e.g., use multiplication chart and color different patterns)and that division is repeated subtraction ; create a jingle to help remember the tricky facts such as '7 x 6 is 42 and I like you.' **[4.1 (NNO.4) B.2] [4.5 (MP) B.2] [4.5 (MP) C.2]**					✓				
[computation: whole numbers] 18. Compute real-life 2-digit addition and subtraction problems; use reasoning to check answers **[4.1 (NNO.2) B.5a, b] [4.5 (MP) D.4]**			✓						
19. Use a calculator, pencil-paper, or mental math to perform computations for real-life problems, some of which involve addition and subtraction of 3-digit numbers and multiplication of 2-digit number by 1-digit numbers; explain the reasoning used **[4.1 (NNO.3) B.3] [4.1 (NNO.3) B.4a, b, c] [4.5 (MP) D.3] [4.5 (MP) F.1] [4.5 (MP) F.4] [4.5 (MP) F.6]**				✓					

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20. Make accurate computations of whole numbers that involve addition and subtraction of 3-digit numbers; use reasoning to check for accuracy **[4.1 (NNO.4) B.4 a, b] [4.5 (MP) D.4] [4.5 (MP) D.5]**					✓				
21. Demonstrate appropriate procedure for multiplication of two-digit numbers and division of 3-digit by one-digit number [for division: use **D**oes **M**cDonald's **S**ell **C**heesey **B**acon **B**urgers? - - which means (1) Divide, (2) Multiply, (3) Subtract, (4) Compare, (5) Bring Down, (6) Begin Again] **[4.1 (NNO.4) B.4 c, d] [4.5 (MP) C.2]**					✓				
[computation: fractions/decimals/percents] 22. Given $15.00, students will order 3 items from a given menu for lunch; calculate the total, and the change. Students will describe, in writing, how they achieved their results, and if they are reasonable (more than $15.00, less than $15.00 etc.) Students may use calculators, paper and pencil and counters; determine the change due and write with the cents notation; use reasoning to check for accuracy **[4.1 (NNO.3) B.5] [4.1 (NNO.3) B.6] [4.1 (NNO.3) B.7] [4.5 (MP) A.3] [4.5 (MP) D.4] [4.5 (MP) F.1]**				✓					
23. Working with a specified amount of money, determine if there are adequate dollars to make multiple purchases and what the change due would be; use the standard dollar and cents notation, and check the reasonableness of the answer. **[4.1 (NNO.4) B.6] [4.1 (NNO.4) B.8] [4.5 (MP) B.2] [4.5 (MP) D.2] [4.5 (MP) D.6] (see TM p. 128 A; Literature Connection *A Job for Jenny Archer*)**					✓				
24. Explain procedures for addition and subtraction of decimals; use dollar and cents to make multiple purchases to demonstrate this; use reasoning to double check accuracy **[4.1 (NNO.4) B.9] [4.5 (MP) B.1] [4.5 (MP) C.2] [4.5 (MP) D.4] [see TM, p. 130B and Lesson 14, Ch. 3]**					✓				
[mental math/reasonableness of results] 25. Count a stack of counters to establish a reference point; compare this stack of counters to other stacks and make reasonable estimates of the number of counters in the other stacks **[4.1 (NNO.2) B.7]**			✓						
26. Count grid paper squares covering a specific area to establish a reference point; compare this space other spaces, and make reasonable estimates of the number of squares needed; prepare a diagram to show the work **[4.1 (NNO.2) B.7] [4.5 (MP) B.2] [4.5 (MP) D.3] [4.5 (MP) D.6] [4.5 (MP) E.2] [4.5 (MP) E.3]**			✓						
[order of operations] 27. Use order of operations, including parentheses and properties to analyze and simplify numerical expressions involving integers, fractions, and decimals. Explain how the order of operations can impact the result in a problem **[4.1 (NNO.6) B.8] [4.5 (MP) D.1]**							✓		
28. Solve a variety of real-life problems (e.g., purchases, measurement, travel, etc.) related to rational numbers, percents, whole numbers with exponents, and percents greater than 100 and less than 1; use Mental Math to estimate (showing work with paper and pencil), and then use the calculator to obtain the correct answers;; use algebraic order of operations, including appropriate parentheses. **[4.1 (NNO.7) B1] [4.1 (NNO.7) B2] [4.1 (NNO.7) B3] [4.5 (MP) F.4] [4.5 (MP) F.5] [4.5 (MP) F.6]**								✓	
29. Solve a variety of real-life problems (e.g., purchases, measurement, travel, etc.) related to rational numbers, percents, whole numbers with exponents, and percents greater than 100 and less than 1, proportions, roots, absolute value, and numbers written in scientific notation; use Mental Math to estimate (showing work with paper and pencil), and then use the calculator to obtain the correct answers; use algebraic order of operations, including appropriate parentheses. **[4.1 (NNO.8) B.1] [4.1 (NNO.8) B.2] [4.1 (NNO.8) B.4] [4.1 (NNO.8) B.5] [4.5 (MP) A.3] [4.5 (MP) C.3] [4.5 (MP) D.6] [4.5 (MP) F.4] [4.5 (MP) F.5] [4.5 (MP) F.6]**									✓
30. Give the inverse of numbers that contain squares, square roots, cubes, and cube roots to explain the inverse nature of powers and roots. **[4.1 (NNO.8) B.3] [4.5 (MP) C.2]**									✓
31. Solve percentage clues that describe the number of color tiles that are in a paper bag, then write clues to create percentage problems for others to solve; use deductive reasoning; work with percents, fractions, and decimals; use the correct terminology to describe mathematical relationship. **[4.1 (NNO.8) B.4] [4.5 (MP) E.1]**									✓
C. Estimation									
P1. Recognize the number or quantity of sets up to 5 without counting (e.g., recognize the arrangement of dots on a domino as a certain number without counting each dot. **[4.1 (NNO.K) C.1]**	✓								

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P2. Recognize the number in sets without counting, and determine if an answer is reasonable by estimating results. **[4.1 (NNO.1) C.1; C2]**		✓							
1. Estimate the area of a box lid, and check the estimate with square-inch cardboard; write the actual area in square units on the inside of the lid. Draw a shape on a sheet of grid paper; color the squares within the shapes to create a pattern, and write the number of squares of each color under the design. **[4.1 (NNO.2) C.1] [4.1 (NNO.2) C.2] [4.1 (NNO.2) C.3] [4.5 (MP) A.3] [4.5 (MP) D.4] [4.5 (MP) D.5] [4.5 (MP) E.3]**			✓						
2. Given several sets of visual objects (lines of figures, boxes of objects, etc.) students will estimate (by rounding and mental math) which line or box contains the most and the least, etc., without counting. Student will describe, in writing, how they arrived at their answers and how they could use the skill of estimation in real life; count actual number of objects in each set, and use rounding to estimate the sum of both sets. **[4.1 (NNO.3) C.1] [4.1 (NNO.3) C.2] [4.5 (MP) A.1] [4.5 (MP) B.1] [4.5 (MP) D.2] [4.5 (MP) E.3]**				✓					
3. Use manipulatives, or play money to show what a specific number or amount would round to the nearest dollar (e.g., 97 cents rounds to $1.00; 88 cents, one dollar and forty-five cents; one dollar and twenty nine cents); round to nearest ten cents (e.g., nine cents, fourteen cents, seventy-five cents, thirty-six cents); explain when an estimate can be used for money, and when an exact answer is needed; write an estimate for the cost of lunch for one week, then calculate the exact answer; compare and adjust, if necessary, the amount of money needed. **[4.1 (NNO.3) C.3] [4.1 (NNO.3) C.4] [4.5 (MP) A.5] [4.5 (MP) C.1] [4.5 (MP) D.3] [4.5 (MP) D.5] [4.5 (MP. D.6) (text 138-139)**				✓					
4. Solve a real-life problem that involves addition and multiplication, and prepare a written explanation of the steps taken using estimations (e.g., give students an amount of money to spend on holiday gifts; children shop using the catalog) **[4.1 (NNO.4) C.1] [4.5 (MP) A.2]**					✓				
5. Use a variety of methods (e.g., mental math, paper-pencil, calculator, etc.) and explain the strategies (e.g., compatible and compensatory numbers for regrouping, properties, etc.) for computing with whole numbers on a shopping trip given $100 **[4.1 (NNO.4) C.2] [4.1 (NNO.4) C.3] [4.1 (NNO.4) C.4] [4.5 (MP) E.2]**					✓				
6. Estimate the amount of contents in boxes or jars such as marble, candy, erasers etc. Determine if there will be enough for a group of friends to share. Explain in writing how estimation is useful in this type of planning **[4.1 (NNO.5) C.1] [4.1 (NNO.5) C.2] [4.1 (NNO.5) C.3] [4.1 (NNO.5) C.4] [4.5 (MP) A.4] [4.5 (MP) B.2]**						✓			
7. Use real-life situations to make estimations involving whole number and decimals (money) **[4.1 (NNO.5) C.3; C.4]**						✓			
8. Distinguish when an estimate will suffice vs when an exact amount is required (e.g., going to a restaurant, taking a trip to Wildwood, going to a movie and McDonalds, etc.); estimate if one has enough money (within $25.00) for more than one person to make multiple purchases, prepare the bill (writing money amounts) detailing each selection, total amount spent, and the change from $25.00; prepare a written explanation of the event to verify or adjust the estimate **[4.1 (NNO.6) C.1] [4.1 (NNO.6) C.2] [4.1 (NNO.6) C.3] [4.1 (NNO.6) C.4]**							✓		
9. Use equivalent representations of numbers (fractions, decimals, and percents) to estimate the discount or sale price in shopping situations. **[4.1 (NNO.7) C.1] [4.1 (NNO.8) C.2] [4.5 (MP) E.2]**								✓	✓
10. Estimate the size of a large quantity of objects (e.g., population) by applying the concepts of ratio and proportion through the capture – recapture statistical procedure. **[4.1 (NNO.7) A.3] [4.4 (DPDM.7) B.3] [4.5 (MP) C.4]**								✓	
11. Estimate and plot on a number line a series of square and cubed roots. **[4.1 (NNO.8) C.1]**									✓

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4.2 GEOMETRY AND MEASUREMENT									
A. Geometric Properties									
[spatial relationships] 1. Follow clues to locate designated 2-D and 3-D objects around the room (e.g., triangle, cone, cylinder, circle, sphere, cube, square) using directions; list the objects describing location (beside / in front / behind; inside / outside; left / right; on top / below); compare and contrast the objects with regard to size and shape **[4.2 (GM.2) A.1a, 4.2 (GM.2) A.1b] [4.4 (DPDM.2.) D.1] [4.5 (MP) D.5]**			✓						
2. Explain how a series of arranged objects look different from at least three perspectives; describe the sizes, shapes, and orientation of each object in relation to the others (e.g., the bottle is **behind** the eraser in one view but **next to** it from another; the pencil box is **below** the soup can, but it is **above** the square can, etc.) **[4.2 (GM. 3)A.1a, 4.2 (GM.3) A.1b]**				✓					
3. Use a class-designed city-scape or water front that includes buildings of various shapes and sizes (i.e., cubes, cones, cylinders, pyramids, triangular prisms) to describe the relationships among the buildings (i.e., in front of / behind; beside/between, to the left of, behind, in front of; larger/smaller, narrower/wider, etc.) and provide a sketch of how it would look from the side and from the top; identify vertices, edges, faces, sides, angles for each **[4.2 (GM.4) A.1.a, 4.2 (GM.4) A.1b] [4.2 (GM.4) 4.2 (GM.4) A.2a, 4.2 (GM.4)A.2b, 4.2 (GM.4) A.2c] [4.2 (GM. 4) B.3] [4.5 (MP) B.2]**					✓				
[2-D and 3-D shapes] P1. Locate and name (using own vocabulary) 2-D shapes (i.e., circle, square, triangle, rectangle) and 3-D objects (i.e., box/cube, ball shape, can/cylinder, prism, pyramid) in the environment; describe attributes of each and sort shapes and objects into groups based on attributes, explaining how the objects are alike and different; build 2-D and 3-D shapes using paper, tangrams, and blocks. **[4.2(GM.K) A.1.a, b, c, d] [4.3 (PA.K) B.1a, d]**	✓								
P2. Create / design a picture using 2-D shapes (i.e., square, circle, triangle, rectangle); name shapes used and compare the various shapes (4 straight lines vs rounded corners) using attributes such as sides and corners. **[4.2.(GM.1) A.1 a, b; B.1; B.3]**		✓							
P3. Identify 3-D objects (i.e., cylinder, sphere, pyramid, cone, triangular prism, and cube) and their attributes, including shapes of the faces and what they do (stack, roll, slide). **[4.2 (GM.1) A.2]**		✓							
4. Create a geometric figure (e.g., Santa, Sponge Bob) using various 2-D shapes (i.e., circle, square, rectangle, triangle); create a pattern to form a border or frame around the figure **[4.2 (GM.2) A.4] [4.2 (GM.2) B.1] [4.2 (GM.2) B.2] [4.5 (MP) C.6]**			✓						
5. Make a list of items in the classroom that represent 2-D shapes: square, rectangle, circle, triangle, pentagon, hexagon, octagon; give a definition and draw each shape **[4.2 (GM.3) A.2c] [4.5 (MP) B.4]**				✓					
6. Find examples of 2-d shapes (i.e., square, rectangle, circle, triangle, quadrilateral, pentagon, hexagon, octagon) from magazines / catalogs; create a collage representing all shapes and label each section; devise a simple chart for reference **[4.2 (GM.4) A.2c] [4.5 (MP) C.1] [4.5 (MP) E.2] [4.5 (MP) E.3]**					✓				
7. Complete a table to describe the attributes of 3-D objects (i.e., cube, rectangular prism, sphere, cone, cylinder, and pyramid); include the name of the object, number of edges, number of faces, and number of corners; name and draw the 2-D face of each object (e.g., circle for sphere, triangle for pyramid, etc.) **[4.2 (GM.2)A.2a, b, c, d] [4.5 (MP) B.2] [4.5 (MP) E.3]**			✓						
8. Complete a table to describe the attributes of 3-D objects (i.e., cube, rectangular prism, sphere, cone, cylinder, and pyramid); include the name of the object, number of edges, number of faces, number of angles, and number of sides; name and draw the 2-D faces or cross section of each object (e.g., circle for sphere, triangle for pyramid, etc.); compare the attributes of the 2-D and 3-D figures (e.g., square vs cube) **[4.2 (GM. 3) A.2a, b, c] [4.4 (DPDM.3) C.1] [4.5 (MP) A.3] [4.5 (MP) C.2] [4.5 (MP) E.3]**				✓					

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9. Complete a table to describe the attributes of 3-D objects (i.e., cube, rectangular prism, sphere, cone, cylinder, and pyramid); include the name of the object, number of edges, number of faces, angles, and number of sides; name and draw the 2-D face or cross section of each object (e.g., circle for sphere, triangle for pyramid, etc.), and identify whether the object has faces that are quadrilaterals; finally, give examples of each object found in the environment, and identify inclusive relationships (e.g., a square is a rectangle and a cube is a rectangular prism) **[4.2 (GM. 4) A.2] [4.5 (MP) C.6] [4.5 (MP) B.2]**					✓				
10. Analyze an arrangement or picture of 3-D objects (cones, spheres, cylinders, prisms, etc.) to describe the 2-D shapes on each object; determine the position (top/front/side) from which the view is taken **[4.2 (GM. 6) A.6, 4.2 (GM. 6) A.7] [4.5 (MP) B.3] [4.5 (MP) B.4] [4.5 (MP) C.1] [4.5 (MP) C.6]**							✓		
11. Identify a 3-D shape with a given net; identify the edges, faces, and vertices for the 3-D objects **[4.2 (GM. 6) A.5, 4.2 (GM. 6) A.8]**							✓		
[lines / angles / planes]									
12. Use a map (e.g., school or street map) to identify the following terms: lines, line segments, end points, and circles; describe angles as equal to, acute (less than), obtuse (greater than), compared to a right angle; use a highlighter to show the identified terms. **[4.5 (MP) E.1] [4.2 (GM.4) A.4a, b, c]**					✓				
13. Illustrate properties of a circle (i.e., diameter, radius, and center) using pictures of (e.g.,) pizza, pies, round cookies, etc. [**4.2 (GM.4) A.4d]**					✓				
14. Identify parallel, perpendicular, and intersecting lines; use appropriate notations for lines, rays, angles, and line segments using a map of May's Landing **[4.2 (GM.5) A.1a, 4.2 (GM.5) A.1b] [4.5 (MP) B. 1a] [4.5 (MP) A.4]**						✓			
15. Using the straight-edge on a protractor, create an equilateral, scalene, and isosceles triangles; use a protractor to measure the sum of the interior angles as 180 degrees; compare own triangle to other students' to verify that all triangles have 180 degrees for their interior angle measure **[4.2 (GM.5) A.1c] [4.5 (MP) E2] [4.5 (MP) E. 1a] [4.5 (MP) E.3]**						✓			
16. Create a map that includes streets that are lines, rays, angles, and line segments; mark lines that are parallel, perpendicular, and intersecting; use appropriate notations for line, ray, angle, and line segments; use the correct vocabulary to write three questions about the geometric properties illustrated **[4.2 (GM.6) A.1a, 4.2 (GM.6) A.1b] [4.5 (MP) E.1b]**							✓		
17. Create a complex figure of multiple triangles; determine the total measure of all interior angles without making actual calculations **[4.2 (GM.6) A.1c] [4.5 (MP) C.1] [4.5 (MP) C.2]**							✓		
18. Produce diagrams that contain parallel lines cut by transversals with complementary, supplementary, and vertical angles; use another student's drawing to apply the concepts to answer questions about angle measures **[4.2 (GM.8) A.1a, 4.2] [4.2(GM.8)A.1b] [4.5 (MP) B.2] [4.5 (MP) B.3]**									✓
19. Draw the outside views and a cross-section showing the interior of four versions of a new building: one using a sphere, one a cone, one a cube, and one a cylinder; include a deck or porch that seems to slice through the building, an elevator through the center, and multiple floors; explain how the drawings illustrate parallel, perpendicular, and intersecting plane, bisectors and perpendicular bisectors and the intersection of a plane with a cube, cylinder, cone, or sphere; explain the differences in the dimensions / sizes of the various stories above and below the deck **[4.2 (GM.8) A.1c, d, e] [4.5 (MP) C.3] [4.5 (MP) C.6] [4.5 (MP) D.4] [4.5 (MP) E.3]**									✓
[polygons and circles]									
20. Distinguish among several polygons with regard to the number of sides and angle measurement; label each shape with its correct name (e.g., right triangle, rhombus, rectangle, etc.); identify common and distinctive attributes for various polygons; calculate the area of polygons; use computer software to generate drawings of polygons **[4.2 (GM.5) A.2a, b, c, d] [4.2 (GM.5) D.1] [4.5 (MP) B.4] [4.5 (MP) F.5]**						✓			
21. Describe a circle as consisting of all points equidistant from the center; identify the radius, diameter, center by labeling each **[4.2 (GM.5) A.2e]**						✓			
22. Distinguish among several polygons with regard to the number of sides and angle measurement; label each									

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shape with its correct name (e.g., right triangle, rhombus, rectangle, etc.); identify common and distinctive attributes for various polygons and complete analogies to show comparisons between polygons **[4.2 (GM.6) A.2a, b, c, d] [4.5 (MP) B.4] [4.5 (MP) C.1]**							✓		
23. Apply the properties of polygons to calculate the total area of irregular polygons (e.g., by dividing complex shapes into simple polygons and finding the area of each); explain at least two ways to determine the area of each irregular polygon **[4.2 (GM.7) A.1a] [4.2 (GM.7) A.1b] [4.5 (MP) B.4] [4.5 (MP) C.1] [4.5 (MP) C.2] [4.5 (MP) D.3] [4.5 (MP) D.4]**								✓	
24. Create six different polygons using a coordinate grid; identify them by their different properties, compare similarities, including reflections, rotation, etc.; find the area and record coordinates; use coordinates to read to other students for re-creation of geometric shapes. **[4.2 (GM.7)C.1; C.2] [4.5 (MP) B.1; D.5]**								✓	
25. Calculate the area of a shaded region of complex polygons (e.g., calculating surface area to determine the amount of paint or wall paper when taking out for windows and doors; putting a tiled floor in a larger room; laying border around a carpeted room, etc.) **[4.2 (GM.8) A.3a] [4.2 (GM.8) A.3b]**									✓
26. Analyze the estimates made by shoppers (builders, etc.) for purchasing materials (e.g., tiles, carpet, paint, etc.) to determine the accuracy as per the size of the areas involved. **[4.1 (NNO.8) C.3] [4.5 (MP) A.2] [4.5 (MP) B.3]**									✓
27. Draw a blueprint or floor plan for a multi-sides space (e.g., an octagon, a hexagon, etc.) that will become a patio, den, spare-room, etc.; give the measures of each side (baseboard, border) and the size of each interior angle; explain how each angle was determined, including the sum of the interior angles and a formula for how this was determined; use other multi-sided figures to illustrate the pattern **[4.2 (GM.8) A.3c] [4.5 (MP) B.1] [4.5 (MP) C.3] [4.5 (MP) C.4] [4.5 (MP) E.3]**									✓
28. Demonstrate which of several polygons can and cannot be used to develop a tessellation for a tiled surface (e.g., the multi-sides patio or den); include drawings and an explanation of why or why not for each polygon **[4.2 (GM.8) A.3d] [4.5 (MP) B.4] [4.5 (MP) C.1] [4.5 (MP) D.1]**									✓
[similarity and congruence]									
29. Label pairs of 2-D shapes (placed in different positions) as congruent, and explain why **[4.2 (GM.2) A.1c]**			✓						
30. Label pairs of 2-D shapes (placed in different positions) as congruent, and explain why **[4.2 (GM.2) A.1c] [4.5 (MP) B.1]**				✓					
31. Use a variety of shapes (i.e., circles, squares, rectangles, triangles, kites, or other polygons) to create a picture on grid paper; use three pairs of congruent shapes, two pairs of similar shapes, and two pairs that are neither; use a color code to identify the respective shapes, and explain what makes them congruent, similar, or neither **[4.2 (GM.4) A.3a] [4.5 (MP) C.1] [4.5 (MP) D.2]**					✓				
32. Draw and label two shapes that are congruent, two that are similar but not congruent, and two that are neither congruent nor similar from an assigned shape; explain the distinction among the pairs of shapes using the characteristics of each drawing **[4.2 (GM. 5) A.3, 4.2 (GM. 5) A.4] [4.5 (MP) B.4]**						✓			
33. Identify real-life objects that are congruent, similar, and neither; explain the difference among the three concepts **[4.2 (GM.6) A.3, 4.2 (GM.6) A.4]**							✓		
34. Design a garage on grid paper (using a scale of 1 cm = 1 ft) where the actual dimensions are known for only part of the structure; build the model to scale using Google Sketch-Up, and explain how proportion is used to find the unknown measures **[4.2 (GM.8) A.4 a, b, c] [4.5 (MP) A.2] [4.5 (MP) A.4]**									✓
35. Use net figures to construct 3-D shapes to scale that represent real objects on a map (e.g., water tower -- cylinder; houses – cereal boxes; hotels – milk carton; church – box and cone; etc.); use the 3-D shapes to calculate the surface area and volume for the various shapes **[4.2 (GM.7) A.2b] [4.2 (GM.7) A.2c] [4.2 (GM.7) E.1a]**								✓	
36. Use a picture of a person holding a book and determine the measurement of how tall a person, knowing the measurements of the book; figure the scale dimensions of the book to make unit conversions; or have students work with the height of the teacher to determine the measurement of the book of other objects in the background. **[4.2 (GM. 7) A.2a] [4.2 (GM. 7) D.2] [4.5 (MP) B.1] [4.5 (MP) C.4]**								✓	

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37. Use the Pythagorean Theorem and its converse to solve a real-world problem (e.g., a fire truck and ladder for a tall building; the height of a tree; distance across a lake from a given point, etc.); determine the length of any one of the three sides when two are known (e.g., length of ladder, height of the building, distance of the ladder from the building) **[4.2 (GM.8) A.2] [4.5 (MP) C.1] [4.5 (MP) C.5] [4.5 (MP) D.1]**									✓
[symmetry] 38. Use figures and shapes to show lines of symmetry; explain what line of symmetry means **[4.2 (GM.2) A.3] [4.5 (MP) C.3]**			✓						
39. Give real-life examples (e.g., T-shirt, pants, heart, ball, etc.) of items that illustrate line symmetry; explain why the line of symmetry goes where it does **[4.2 (GM.3) A.3b] [4.5 (MP) B.2] [4.5 (MP) D.2]**				✓					
40. Identify symmetrical upper case letters by places horizontal and vertical lines of symmetry **[4.2 (GM.4) A.3b] [4.5 (MP) B.2]**					✓				
41. Use upper case letters to show horizontal, vertical, and both lines of symmetry by creating vertical words (e.g., HAT); explain and demonstrate which letters have rotational symmetry (e.g., I, H, O, X) **[4.2 (GM.5) A.4]**						✓			
42. Identify objects (e.g., three cards from a deck, three letters of alphabet, or shapes) that show rotational and line symmetry; explain how each object shows rotational and line symmetry **[4.2 (GM.6) A.4]**							✓		
[geometric patterns] 43. Create a space-filling pattern inside the outline of a shape; use a pattern of two 2-D shapes; apply to a greeting card to correspond to a holiday or historic event (use shapes from New Jersey ASK test) **[4.2 (GM.3) A.5] [4.5 (MP) A.4]**				✓					
44. Describe transformations: translations (slides), rotations (turns) and reflections (flips) of objects on grid paper as well as in nature and art. **[4.2 (GM.3) B.1]**				✓					
45. Create a space-filling pattern inside the outline of a shape; use a pattern of four 2-D shapes and colors that involve slides, flips, turns to fill the space; create a tessellation pattern [use tangrams] **[4.2 (GM.4) A.5] [4.2 (GM.4) B.1] [4.2 (GM.4) B.2]**					✓				
[conjectures] 46. Explain how one would determine what size furniture (object / picture) would fit in a room (locker / frame) when given specific dimensions; include an illustration **[4.2 (GM.7) A.3] [4.5 (MP) A.5] [4.5 (MP) B.4] [4.5 (MP) C.4] [4.5 (MP) D.4]**								✓	
47. Design alternate packaging (e.g., bottle, box) to accommodate a specified volume; explain and diagram the change and the difference in the surface area (amount of paper or paint needed to 'cover' the new object) **[4.2 (GM.8) A.5] [4.5 (MP) A.1] [4.5 (MP) A.4] [4.5 (MP) B.4] [4.5 (MP) C.3]**									✓
B. Transforming Shapes									
P1. Place objects over, under, inside, outside, on, beside, between, above, below, on top, upside down, behind, in front of; use the above terms to describe placement of objects. **[4.2 (GM.K) B.1a, b]**	✓								
P2. Follow direction words to locate shapes (e.g., square, circle, triangle, rectangle) and move from one point to another on a grid; describe the distance between shapes using directional words - - near, far, close to, left and right. **[4.2 (GM.1) B.2; C.1]**		✓							
Note: The grade 2 transformations are with #4 in section A									
1. Identify examples of geometric shapes, lines, and angles in the real world (e.g., classroom, playground equipment, honey comb in bee hive, pictures, stained glass windows, painting, etc). **[4.2 (GM.3) B.2] [4.5 (MP) C.3] [4.5 (MP) C.4]**				✓					
2. Place a figure (pattern block) in a quadrant of a coordinate grid; identify the original location (coordinate pairs) of the figure, and perform a translation, reflection, or rotation; explain why the move is a translation, reflection, or rotation; give the coordinate pairs for the new location **[4.2(GM.5) B.1] [4.2 (GM.5) C.1] [4.5 (MP) C.1]**						✓			
3. Analyze structures in nature to identify 2- and 3-D geometrical figures (e.g., cylinders in leaf stems, pyramids in pine cones, circles in flowers, etc.); write a paragraph which describes each 'figure' in terms of its properties (i.e., sides, angles, faces, lines[perpendicular / parallel/ intersecting] **[4.2 (GM.5) B.2] [4.5 (MP) B.4]**						✓			

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4. Identify how a figure has been transformed when given a coordinate grid with two congruent figures by listing the move as a translation, rotation, or reflection; explain why either of the other two moves could or could not yield the same results **[4.2 (GM.6) B.1] [4.5 (MP) B.4] [4.5 (MP) C.2] [4.5 (MP) D.1]**							✓		
5. Analyze 'composite' structures (e.g., in nature, art, architecture, and other environments) that contain several geometric figures contiguous to each other (e.g., rectangular prisms, triangular pyramids, rectangular pyramids, various 2-D shapes, etc.); write an essay which describes the geometric properties of each figure (i.e., sides, angles, faces, lines - - parallel, perpendicular, intersecting) and explain how the figures 'work together' to achieve an overall effect (e.g., shadows in a painting; girders in a bridge; the skeleton of a building, etc.) **[4.2 (GM.6) B.2] [4.5 (MP) C1] [4.5 (MP) A.5] [4.5 (MP) B.4] [4.5 (MP) C.4]**							✓		
6. Place a pattern block on a coordinate plane, trace the block as the pre-image, and label the vertices; perform two different transformations on the figure; draw the image, and label the vertices; trade with classmate, and describe the two transformations performed on the pre-image to achieve the end result **[4.2 (GM.7) B.1a,b,c] [4.2 (GM.7) C.1] [4.2 (GM.7) C.2] [4.5 (MP) B.1]**								✓	
7. Place a pattern block on a coordinate plane, trace the block as the pre-image, and label the vertices; perform three different transformation on the figure; draw the image, and label the vertices; trade with classmate, and describe the three transformations performed on the pre-image to achieve the end result **[4.2 (GM.8) B.1a,b,c] [4.2 (GM.8) C.1] [4.2 (GM.8) C.2] [4.5 (MP) B.1] [4.5 (MP) B.3] [4.5 (MP) D.6]**									✓
8. Identify and create dilations (stretching and shrinking) based on a given scale factor using grid paper or technology **[4.2 (GM.7) B.1d]**								✓	
9. Use Geometer's Sketch Pad to demonstrate transformations with other students' names and various shapes. **[4.2 (GM.7) B.1] [4.5 (MP) F.5]**								✓	
10. Calculate scale factor to identify and create dilations using grid paper or technology **[4.2 (GM.8) B.1d]**									✓
11. Replicate a fractal pattern using a different geometric shape; explain the pattern and how it 'looks' or 'works' differently on the second shape than the original **[4.2 (GM.8) B.2a,b,c,d] [4.5 (MP) B.4]**									✓
C. Coordinate Geometry									
NOTE: there is nothing in Kindergarten for this section, and the grade one item is with transforming shapes above									
1. Use a map (classroom, building, neighborhood), and follow teacher directions to move from one point to another on the map; write directions to get to another location on the map **[4.2 (GM.2) C.1] [4.5 (MP) B.3] [4.5 (MP) C.4]**			✓						
2. Locate and name points in the first quadrant of a coordinate grid to create a design / picture (e.g., letter) **[4.2 (GM.3) C.1]**				✓					
3. Use ordered pairs to draw a picture from start to finish on a coordinate grid; create a picture using a coordinate grid and ordered pairs following the directions to see the final picture. **[4.2 (GM.4) C.1] [4.2 (GM.4) C.2] [4.5 (MP) B.2]**					✓				
4. Create a regular or irregular polygon by plotting at least five points located in the first quadrant on a coordinate grid; label the coordinates of each point; describe the polygon using the properties (i.e., number of sides, type of angles, and name of the shape) **[4.2 (GM.6) C.1] [4.5 (MP) B.1] [4.5 (MP) B.4]**							✓		
Note: the fifth, seventh and eighth grade standards for coordinate geometry are included in the Transformation section									
D. Units of Measurement									
[linear] P1. Measure **length** using objects in the environment (e.g., how many paper clips long is a pencil); and order different lengths; describe, using terms such as longer, shorter, bigger, smaller, more and less. **[4.2 (GM.K) E.1; E.2a]**	✓								
P2. Explain the need for fixed units to measure **length**, using standard (rulers) and non-standard (snap cubes, paper clips, straws) units; estimate and measure **length** using standard and non-standard units (cm, in, ft). **[4.2 (GM.1) D.1; E.2]**		✓							

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1. Compare and order the **length** of four objects (e.g., pencils, Twizzler candy, pieces of string, etc.), and select appropriate tool and unit (standard and non-standard units) to measure the length of two of the objects (inch, foot, yard; centimeter, meter); estimate the measure of the remaining objects; measure and adjust estimate as needed; explain how measures could be unfair / inaccurate / different if there were not a uniform unit of measure (e.g., two erasers worth of Twizzler candy compared with two pencils worth of Twizzler candy) **[4.2 (GM.2) D.1, 4.2 (GM.2) D.2, 4.2 (GM.2) D.3a] [4.2 (GM.2) D.4] [4.5 (MP) B.4] [4.5 (MP) D.3] [4.5 (MP) D.5]**			✓						
[weight] P3. Measure **weight** using objects in the environment; compare and order different weights and describe using the terms: heavier and lighter. **[4.2 (GM.K) E.1]**	✓								
P4. Explain the need for fixed units to measure **weight**, using standard (scales); estimate and measure **weight** using standard units. **[4.2 (GM.1) D.1; E.1]**		✓							
2. Compare and order the **weight** of four objects (e.g., a box of crayons, a math book, a shoe, etc..), and select appropriate tool and unit (standard and non-standard units) to measure the weight of two of the objects (pound, kilogram); estimate the measure of the remaining objects; measure and adjust estimate as needed; explain how measures could be unfair / inaccurate / different if there were not a uniform unit of measure (e.g., pre-measured items such as coffee beans, sand, rice, etc.) **[4.2 (GM.2) D.1] [4.2 (GM.2) D.2] [4.2 (GM.2) D.3b] [4.2 (GM.2) D.4] [4.5 (MP) B.2] [4.5 (MP) D.1] [4.5 (MP) D.5]**			✓						
[capacity] P5. Measure **volume** using objects in the environment, and order different capacities; describe using terms more and less; determine how many small containers it takes to fill one big container. **[4..2 (GM.K) E.1; E.2b]**	✓								
P6. Explain the need for fixed units to measure **capacity**, using standard (cups, pints, quarts, gallons, liters) and non- standard (any container) units; estimate and measure **capacity** using standard and non-standard units. **[4.2 (GM.1) D.1; E.3]**		✓							
3. Compare and order the **capacity** of four objects (e.g., glue bottle, milk/juice/pop container, soup can, etc.), and select appropriate tool and unit (standard and non-standard units) to measure the capacity of two of the objects (cups, pint, quart, liter); estimate the measure of the remaining objects; measure and adjust estimate as needed; explain how measures could be unfair / inaccurate / different if there were not a uniform unit of measure (e.g., bath tub/fish tank, tall skinny glass/short fat glass, different shapes of shampoo bottles) **[4.2 (GM.2) D.1] [4.2 (GM.2) D.2] [4.2 (GM.2) D.3c] [4.2 (GM.2) D.4] [4.5 (MP) D.3] [4.5 (MP) D.5]**			✓						
[length / weight / volume] 4. Identify different attributes of everyday objects (e.g., pencil case, work box, etc.), and describe how they can be measured (i.e., length, area, and perimeter) using appropriate standard units; estimate then measure length of an object to the nearest half and quarter inch, centimeter, or decimeter; calculate the area to the square inch or/and centimeter **[4.2 (GM.3)D.1] [4.2 (GM.3)D.2a, b, c, d] [4.2 (GM.3)D.3] [4.2 (GM.3) D.4] [4.5 (MP) C.1]**				✓					
5. Identify different attributes of everyday objects (e.g., pencil case, work box, etc.), and describe how they can be measured (i.e., weight) using appropriate standard units; estimate then measure the weight of an object to the nearest ounce. **[4.2 (GM.3)D.1] [4.2 (GM.3)D.2a, b, c, d] [4.2 (GM.3)D.3] [4.2 (GM.3) D.4] [4.5 (MP) C.1]**				✓					
6. Identify different attributes of everyday objects (e.g., pencil case, work box, etc.), and describe how they can be measured (i.e., capacity) using appropriate standard units; estimate then measure the capacity of an object in fluid ounces, cups, gallons, and milliliters. **[4.2 (GM.3)D.1] [4.2 (GM.3)D.2a, b, c, d] [4.2 (GM.3)D.3] [4.2 (GM.3) D.4] [4.5 (MP) C.1]**				✓					

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7. Plan a trip that begins at school and travels to a designated destination; include an estimate of the distance to the destination in miles or kilometers; select appropriate tool (car odometer) to find actual calculations **[4.2 (GM.3) D.2a] [4.2 (GM.3) D.3] [4.5 (MP) A.1] [4.5 (MP) C.5]**				✓					
8. Identify different attributes of everyday objects (e.g., pencil case, work box, etc.), and describe how they can be measured (i.e., length, weight, area, perimeter, capacity) using appropriate standard units; estimate then measure length of an object to the nearest half, quarter, and eighth inch, centimeter, or decimeter; area to the square inch or/and centimeter; weight to the nearest ounce and gram; and capacity in fluid ounces, cups, gallons, and milliliters, cubic inches and cubic centimeters **[4.2 (GM.4)D.1] [4.2 (GM.4)D.2a, b, c, d, e] [4.2 (GM.4)D.4] [4.2 (GM 4)E.3]**					✓				
9. Calculate the size of a shipping crate (length, width, height, volume) to accommodate multiple boxes of various sizes; calculate the weight and determine the cost to ship to a specified destination (e.g., next day air, 3-day ground, etc.), using commercial shipping charts (UPS, FedEx, US postal service) **[4.2 (GM.7) D.1] [4.5 (MP) F2] [4.5 (MP) F.3] [4.5 (MP) A.3] [4.5 (MP) C.3] [4.5 (MP) E.1c]**								✓	
10. Use snap cubes to find the volume and surface area of regular and irregular shaped prisms with the same height and base. **[4.2 (GM.7) E.2]**								✓	
11. Create and compare the volume of a 3-D pyramid and prism shaped popcorn box, using popcorn to estimate the relationship; assign a dollar amount to each and determine which is the better buy. **[4.2 (GM.7) E.2]**								✓	
12. Determine surface area using nets of rectangular prism and irregular shaped solids with snap cubes (Wrapping Paper) **[4.2 (GM.7) E.1]**								✓	
[unit conversions] 13. Measure given objects for length, weight, and capacity in a given unit (ounces, inches, centimeters, grams, etc.); convert within the same system to a given unit (ounces to pounds; inches to feet or yards; centimeters to decimeters and meters; grams to kilograms) **[4.2 (GM.5) D.2]**						✓			
14 Use a display created to scale to find lengths of the sides of objects that have triangles, rectangles, squares, parallelograms, and trapezoids; find the distance between objects and convert measures from the scaled display to reflect actual measures; select appropriate units and tools to measure angles, and determine perimeter, area, surface area, and volume of selected objects on the display; relate objects listed in metric measure to measure in standard units; compare objects in display to objects in current lives. Prepare a journal entry describing the display in terms of the various shapes, the measurements, and placement in each section. **[4.2 (GM.6)D.1] [4.2 (GM.6)D.2] [4.2 (GM.6) D.3] [4.2 (GM.6) D.4] [4.2 (GM.6) D.5,] [4.2 (GM.6) E.2] [4.5 (MP) C5] [4.5 (MP) A.5] [4.5 (MP) B.4] [4.5 (MP) C.4]**							✓		
[units in different systems] 15. Relate common equivalents between the Metric system and U.S. customary system (e.g., kilometers to miles; liters to quarts; meters to yards; etc.) **[4.2 (GM.5) D.3] [4.5 (MP) C.2]**						✓			
[estimating measures with referents] 16. Develop personal referents to approximate standard units of measure (e.g., paper clip, knuckle, and thumb nail for inch and centimeters; length of arm for a yard, two computer disks weigh about one ounce, a pound of coffee, etc.); use these to estimate the length and weight of common objects, and determine the actual measure of each; include a simple table for future use **[4.2 (GM.4)D.3] [4.2 (GM.4)D.4] [4.5 (MP) D.4] [4.5 (MP) D.5] [4.5 (MP) E.2] [4.5 (MP) E.3]**					✓				
17. Measure the exact distance from point A to B in the room (or elsewhere in the school); estimate another point C that is the same distance as point A to point B; record the estimate, measure the distance to confirm or adjust the estimate (final measure needs to be within six inches). **[4.2 (GM.5)D.4]**						✓			
[complex measurements] 18. Explain why different answers are obtained in measurement when one uses non-terminating or repeating decimals like 1/3 or pi to (e.g.,) calculate the measure for the area of a circle; divide a 10 foot board into 3								✓	

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equal parts; compare the calculation of area for a square with an inscribed circle and the extra pieces using 3.14 and the calculator key for pi) **[4.2 (GM.7) D.3] [4.5 (MP) A.5] [4.5 (MP) B.1] [4.5 (MP) C.1] [4.5 (MP) C.2] [4.5 (MP) D.2]**									
19. Complete a county project where the square miles of various municipalities within the county are given; calculate the total area and convert from US standard to Metric measure; calculate the total population of all municipalities and determine the population density; mark the radius of municipalities that are five miles from the county seat; convert from US standard to Metric and vice versa to determine travel distance, rate, and time to drive from one location to another; calculate gas mileage, and determine the air pressure needed in tires **[4.2 (GM.8) D.1] [4.2 (GM.8) D.2] [4.2 (GM.8) D.3, 4.2 (GM.8) D.4] [4.2 (GM.8) D.5] [4.2 (GM.8) D.6] [4.5 (MP) A.3] [4.5 (MP) E.1c]**									✓
[time] P7. Identify units of time by naming days of the week and months of the year; compare day to week and week to month, and month to year in terms of longer / shorter. Describe (show or tell) what we do first, next, and last and recall what we did / will do yesterday, today, tomorrow. **[4.2 (GM.K) D.1; E.3 a, b, c]**	✓								
P8. Tell time to the hour and relate time to real-life activities **[4.2 (GM.K) E.4]**	✓								
P9. Recognize / tell time to the hour and half-hour on a digital and analog clock; look at a picture or draw a picture indicating the time of day and season in which the event might occur, telling whether it is morning, afternoon, or night. **[4.2 (GM.1) D.2; D.3]**		✓							
20. Compare and order the time of four events (e.g., time for lunch; time to tie shoe; time for Reading block, etc.), and select appropriate unit of time (second, minute, hour, day, week, month, year) to express the measurement of time for two of the events; estimate the amount of time for the remaining events; measure and adjust estimate as needed **[4.2 (GM.2) D.1] [4.2 (GM.2) D.3d] [4.2 (GM.2) D.4] [4.5 (MP) C.1] [4.5 (MP) C.5] [4.5 (MP) D.6]**			✓						
21. Determine time elapsed in a T.V. schedule over the course of one week. (e.g., time elapsed between given times - - if you left for school at 8:00 A.M., and arrived at 8:30 A.M., how much time has elapsed? If you started a class at 11:45 A.M., and it ends at 1:30 P.M., how much time has elapsed? - - how much time has passed - - if it takes 30 minutes to get to school and you must be there by 7:45 A.M., what time would you need to leave?) **[4.2 (GM.4) D.5] [4.5 (MP) B.1] [4.5 (MP) C.5]**					✓				
[temperature] 22. Compare and order the temperatures over a period of time (e.g., days, weeks, etc.), and select appropriate tool and unit (degrees Celsius and degrees Fahrenheit) to measure the temperature; record data in a table **[4.2 (GM.2) D.1] [4.2 (GM.2) D.3e] [4.5 (MP) C.5] [4.5 (MP) E.1] [4.5 (MP) F.1] [4.5 (MP) F.4] [4.5 (MP) F.6]**			✓						
E. Measuring Geometric Objects									
[area and perimeter] 1. Use both standard (e.g., ruler) and non-standard (e.g., paper clip, pencil, cubes, square/grid paper) to measure the perimeter of a common object (e.g., table top, shoe sole, book cover, etc.); use squares to find the area of the object **[4.2 (GM.2) E.1] [4.2 (GM.2) E.2] [4.5 (MP) E.2]**			✓						
2. Create a symmetrical design (e.g., a wall hanging or mural on grid paper, consisting of basic shapes (e.g., squares, triangles, and rectangles); determine the area and perimeter of each shape and the total design; label with appropriate units (square inches and square centimeters) **[4.2 (GM.3) A.2c] [4.2 (GM.3) E.1] [4.2 (GM.3) E.2] [4.2 (GM.3) A.3b] [4.2 (GM.3) D.2b] [4.5 (MP) B.4]**				✓					
3. Distinguish between area and perimeter after placing 2-D objects (bedroom furniture) using a bedroom floor plan; calculate the area and perimeter of the bedroom in standard units (inches / feet) **[4.2 (GM.4) E.1] [4.2 (GM.4) E.2]**					✓				
4. Calculate the perimeter and area of various shapes; show how two shapes with the same area can have different perimeters and vice versa (e.g., two rectangles have an area of 36 square feet; one measures 3 ft. x 12 ft, and the other measures 4 ft. z 9 ft.) **[4.2 (GM.5)E.2] [4.2 (GM.5) E.3] [4.5 (MP) C.2] [4.5 (MP) C.4] [4.5 (MP) E.3]**						✓			
5. Calculate the circumference and area of selected circles (on paper and /or around the room) using the appropriate formulas **[4.2 (GM.6) E.2b] [4.5 (MP) E.1c]**							✓		

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6. Use a set of familiar 3-D objects (e.g., Pringle cans, paper rolls, Kleenex boxes, cereal boxes, film cans, etc.) to discover how to calculate surface area, and generate the formulas; use (e.g.,) sand and cubic units to discover the capacity of each 3-D object, and generate the formulas for volume in cubic units **[4.2 (GM.6) E.3] [4.5 (MP) C.1]**							✓		
7. Draw several different rectangles that have the same total perimeter; calculate the area for each shape; use the drawing to explain and illustrate how shapes (e.g.,) flower beds, dog runs, floor areas, play areas, etc. can have the same perimeters but different areas and vice versa **[4.2 (GM.6) E.4] [4.5 (MP) C.2]**							✓		
8. Use grid paper to approximate the area of familiar objects (e.g., one's hand or bottom of foot, desk top, book cover, calculator, etc.) **[4.2 (GM.6) E.5] [4.2 (GM.5.E.4] [4.5 (MP) D. 5a, b]**						✓	✓		
9. Develop and apply multiple strategies to solve problems involving the area and perimeter of 2-D geometric figures that combine triangles, rectangles, and circles or parts of circles (e.g., how much fencing is needed for a city play ground; how much of a specific color is needed for trapezoids on a quilt; how much grass is needed to plant inside an oval racetrack, etc.) **[4.2 (GM.7) E.1a] [4.5 (MP) A.2] [4.5 (MP) C.2]**								✓	
10. Use regular and irregular geometric shapes to estimate the area in various units of measure (i.e., centimeters, millimeters, inches, etc.) using grids of various sizes **[4.2 (GM.7) E.1b]**								✓	
11. Use Geometry Sketch Pad to create irregular geometric figures by combining triangles, rectangles, and circles or parts of circles; estimate the area and perimeter using grids of various sizes; check figures to verify or adjust estimation **[4.2 (GM.8) E.1a,b] [4.5 (MP) A.4] [4.5 (MP) A.5]**									✓
12. Construct 2-D figures; dilate the figures by given ratios; determine the perimeter and area of each figure; explain the effect of the dilation on the perimeter and the area of each. **[4.2 (GM.8) E.1c]**									✓
13. Demonstrate the relationship between a cone and cylinder as well as a pyramid and prism in terms of the volume (i.e., cone and pyramid are one-third the volume of a cylinder and prism) **[4.2 (GM.7) E.2] [4.2 (GM.8) E.2] [4.5 (MP) D.3]**								✓	✓
14. Identify and explain how perimeter changes as blocks are added to a shape (using pattern blocks); collect and organize data, recognize and use patterns to make predictions, and write algebraic expressions to generalize patterns. **[4.2 (GM.7)E.1] [4.3 (PA.7) A.1] [4.5 (MP) A.1]**								✓	
15. Calculate perimeters of shapes that can be made using different combinations of pattern blocks and explain the relationship between the compactness of a shape and its perimeter (Perimeter search) **[4.2 (GM.7) E.1] [4.5 (MP) A.1]**								✓	
16. Calculate the area of various geometric shapes using grids (i.e., triangle, trapezoid, circle, etc.) **[4.2 (GM.7) E.1]**								✓	
17. Design a playground, park, or garden containing various shapes (i.e., triangles, circles, parallelograms, etc.); find the area of the playground, park, etc. and how much sod is needed to cover grassy areas. **[4.2 (GM.7) A.3;D.1; E.1]**								✓	
18. Use Geometer's Sketch Pad to determine the area of Christmas trees (trapezoid, rectangles, etc.) **[4.2 (GM.7) A.1; E.1]**								✓	
19. Construct a mobile for each 3-D shape (i.e., pyramid, prism, cone, and sphere) that shows dilations of one-half, one, and two; use formulas to compute surface area and volume of each; explain the effect of the dilation on surface area and volume for each 3-D shape **[4.2 (GM.8) E.3a, b, c] [4.2 (GM.8) E.4] [4.5 (MP) B.1]**									✓
4.3 PATTERNS AND ALGEBRA									
A. Patterns									
P1. Identify, create, extend, and copy sequences of sounds, shapes, motions, and numbers from 1-10 by using physical materials; verbally describe the pattern created. **[4.3 (PA.K) A.1; A.2; C.1]**	✓								
P2. Identify, extend, describe verbally, and create repeating and growing patterns of shapes and numbers. **[4.3 (PA.1) A.1; A.2]**		✓							

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1. Identify and extend geometric and numeric patterns, and describe the pattern using words and/or symbols; indicate what the 10th item (shape or number) in the series would be **[4.3 (PA.2) A.1 a, b, c, d] [4.5 (MP) B.2] [4.5 (MP) E.3]**			✓						
2. Write a number sentence or expression to describe a numeric or geometric pattern (e.g., ☐ ☐ △ △ △ ☐ ☐ △ △ △ ☐ ☐ △ △ △; 2 + ☐ = 6 + ☐ = 10 = ☐ = 14) **[4.3 (PA.3)A.1 a]**				✓					
3. Create a numeric whole number pattern by adding, subtracting, multiplying, or dividing by a fixed unit; identify and extend a numeric pattern created by another student (e.g., 5, 8, 11… or 800, 400, 200 …) **[4.3 (PA.3) A.1 b] [4.5 (MP) B.3]**				✓					
4. Recognize, describe, extend, and create patterns for problem-solving situations using words, number sentences / expressions, graphs, tables, and variables to model the pattern; recognize when certain information is not needed to solve the problem. **[4.3 (PA.4) A.1 a] [4.5 (MP) C.1] [4.5 (MP) E.3]**					✓				
5. Create four whole number patterns that grow or shrink by adding, subtracting, multiplying, or dividing by a fixed number. **[4.3 (PA.4) A.1 c]**					✓				
6. Recognize, describe, extend and create patterns. **[4.3 (PA.4) A.1 d]**					✓				
7. Predict which arrangement will yield the most money - - a dollar per day doubled for ten days, or $500? Use a chart or table to illustrate and describe the pattern as a means to support or refute the choice. **[4.3 (PA.5) A.1a] [4.3 (PA.5) B.2] [4.3 (PA.5) C. 2a] [4.5 (MP) E. 1b, c, d] [4.5 (MP) C.1] [4.5 (MP) C.5]**						✓			
8. Analyze and extend recursive patterns, and create a new pattern (e.g., quilt, floor design, mosaic, etc.) using the pattern created, determine what the *n*th row will be, and explain your reasoning **[4.3 (PA.6) A.1c] [4.5 (MP) B.2] [4.5 (MP) C.1]**							✓		
9. Given the first seven numbers in Fibonacci's Sequence, extend the sequence to the next five steps and explain how the sequence works **[4.3 (PA.6) A.1c] [4.5 (MP) C.1] [4.5 (MP) D.1]**							✓		
10. Use given data on three students, where the total is known and one student's data are unknown and represented by a variable (e.g., test scores, race time, time doing homework, number of siblings, etc.) to develop an algebraic expression, equation, and inequality (using appropriate symbols ≤, ≥, ≠) (e.g., for test scores - - 78 ≤ 83≤ x; knowing that Kate had the highest score in the class) that includes the student whose data are unknown. **[4.3 (PA.6) A.1a, b] [4.3 (PA.6) D.4] [4.5 (MP) A.3]**							✓		
11. Use a problem scenario that contains a pattern; use a table, equation, or graph to identify the pattern to complete a task (e.g., Joe wants to buy a video game that costs $50.00; he starts with $.25, and he doubles his money each week; how long will it take for Joe to have enough money to buy the game?); create another pattern to accomplish the same task in less time or over a greater period of time. **[4.3 (PA.6) A.1a,b] [4.5 (MP) A1] [4.5 (MP) C.1] [4.5 (MP) E.1b]**							✓		
12. Use a problem scenario that contains a pattern; use a table, equation, or graph to identify the pattern to complete a task (e.g., Joe wants to buy a video game that costs $50.00; he starts with $.25, and he doubles his money each week; however, he must spend $.10 per week on school supplies; how long will it take for Joe to have enough money to buy the game?); create an algebraic expression to show the output for a specific input (i.e., how much money Joe would have in the 7th week). **[4.3 (PA.7) A.1a,b] [4.5 (MP) A.3] [4.5 (MP) B.1] [4.5 (MP) C.1] [4.5 (MP) C.2] [4.5 (MP) E.1b]**								✓	

a √ indicates mastery of the Performance Indicator	K	1	2	3	4	5	6	7	8
13. Use a problem scenario that contains a pattern; use a table, equation, or graph to identify the pattern to complete a task (e.g., Sally decides to buy a quad ATV for $2,000; she already has $300 in a savings account; if she baby sits two hours each day after school and twice as long on Saturdays, and she earns $6.00 per hour, how much will she have after six weeks?); create a table and an algebraic equation to represent how much money she still needs to earn. **[4.3 (PA.8) A.1a,b] [4.5 (MP) A.3] [4.5 (MP) A.5] [4.5 (MP) C.1] [4.5 (MP) E.1a]**									✓
14. Create a pattern that involves circles; each circle is 1 ½ times larger than the one before; if the first circle has a radius of 1.25 inches; give the pattern for the area of the first five circles, and give an algebraic expression for the area of the *n*th circle. **[4.3 (PA.7) A.1c] [4.5 (MP) C.1] [4.5 (MP) C.2]**								✓	
15. Distinguish between several numeric sequences as arithmetic or geometric; define each type of sequence, and generate the tenth term in each sequence **[4.3 (PA.8) A.1c, d] [4.5 (MP) C.1]**									✓
16. Use a graphing calculator to generate arithmetic and geometric sequences as per a formula [text; p. 635] **[4.3 (PA.8) A.1e] [4.5 (MP) C.1]**									✓
B. Functions and Relationships									
P1. Identify / explain how objects can be classified in more than one way and explain what attribute was used to sort objects; order 3 objects by attributes such as time, size, color, shape, etc. **[4.3 (PA.K) B.1 b, c, d]**	✓								
P2. Sort, classify, and order objects by two or more attributes, such as color, shape, size, etc.; explain how objects were sorted **[4.3 (PA.1) B.1]**		✓							
1. Explain what happens to a number that goes into a function machine and comes out as a different number using the context of a real-life situation (e.g., six students get off the bus to go into a museum and now there are 14 students in the museum; how many students were already in the museum? - - or the reverse using subtraction); write an open number sentence involving addition or subtraction to show when the result is unknown or a part is unknown. **[4.3 (PA.2) B.1] [4.3 (PA.2) C.2] [4.1 (NNO.2) B.1] [4.5 (MP) A2] [4.5 (MP) A.3] [4.5 (MP) A.5] [4.5 (MP) D.4]**			✓						
2. Use an input-output chart and manipulatives to demonstrate a given function; Susan is 5 years old, and her brother is three years older; on her 9th birthday, how old will her brother be?) **[4.3 (PA.3) B.1]** <table><tr><td>x</td><td>x + 3</td></tr><tr><td>5</td><td>8</td></tr></table>				✓					
3. Reverse a function table to solve a problem where data are missing from the table. **[4.3 (PA.4) B.1c] [4.5 (MP) A3]**					✓				
4. Analyze data in two input-output tables to identify the rule and determine the output numbers. **[4.3 PA.4.B.1a, b] [4.5 (MP) D.2]**					✓				
5. Create a function table to represent a real-world scenario involving at least two operations; write an expression to represent the function; write or orally explain what was done (e.g., you buy movie tickets at $7.00 each, with a coupon for $1.00 off the total purchase. Using a function table, identify and graph the coordinates on a coordinate grid. <table><tr><th>(x)</th><th>(y)</th></tr><tr><td>**n**</td><td>**7n - $1**</td></tr><tr><td></td><td></td></tr></table> **[4.3 (PA.5) B.1] [4.3 (PA.5) B.2] [4.3 (PA.5) C.1a, b] [4.3 (PA.5) C.2a] [4.5 (MP)F.4] [4.5 (MP) B.2]**						✓			
6. Graph daily temperatures and wind speed for five days, using bar and line graphs; explain the change across the five days; use calculators to verify /validate solutions. **[4.3 (PA.5) C.2a, b] [4.5 (MP)F. 6] [4.5 (MP) A.4]**						✓			
7. Analyze given graphs to determine relationship between the variables (i.e., linear or not; inverse or decrease). **[4.3 (PA.6) B.1]**							✓		

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8. Prepare a series of function tables to show two variables (e.g., faster speed, less time spent; more time spent with video games, less time outdoors; more homework completed, higher grades or points scored, etc.); graph the two variables for each, and explain the relationship between the variables. **[4.3 (PA.7) B.1] [4.3 (PA.7) C.1] [4.3 (PA.8) C.1] [4.5 (MP) C.1]**								✓	✓
9. Use tangrams to apply properties of transformations to explore reflections, rotations, and translations in a game context (Flip Flop Around) **[4.2 (GM.7) B.1]**								✓	
10. Complete a function table that contains linear functions, and graph each on a coordinate grid; identify the slope as being positive, negative, zero, or undefined. **[4.3 (PA.8) B.1a, b] [4.5 (MP) D.3]**									✓
11. Develop a function table and graph each function, distinguishing each function as linear or exponential; explain the difference between the two types, and give a real-life example of where each is used (e.g., linear: the relationship of hours studied and points earned on a test; exponential: banking interest). **[4.3 (PA.8) B.2] [4.5 (MP) B.1] [4.5 (MP) B.4] [4.5 (MP) F.2] [4.5 (MP) F.3]**									✓
C. Modeling									
Note: the modeling standards for Kindergarten and grade One are reflected in other sections of the matrix									
1. Match pictures to temperatures on a thermometer to show how we dress for different activities across the year related to the weather; create a chart **[4.3 (PA.2) C. 1] [4.5 (MP) C.4] [4.5 (MP) E.1]**			✓						
2. Develop an addition or subtraction word problem; solve the problem (e.g., Mrs. Weiner has three cats; Sam has four cats; how many cats do they have? **[4.3 (PA.2) C. 2] [4.5 (MP) A4] [4.5 (MP) C.2]**			✓						
3. Recognize and describe quantity changes in pictographs, bar graphs, and tables; write two open number sentences - - one with addition and one with subtraction; compare data using symbols for less than, greater than, and equal to. **[4.3 (PA.3) C. 1] [4.4 (DPDM.3) A. 2] [4.1 (NN0.3) A. 6] [4.5 (MP) E.1b] [4.5 (MP) E. 1d] [4.5 (MP) A.3] [4.5 (MP) E.3]**				✓					
4. Explain changes in 'My Household Bills;' explain the reasons for highs and lows in account balances; write number sentences that compare balances in the three recorded months using the symbols for less than, greater than, and equal to **[4.3 (PA.4 C. 1a] [4.3 (PA.4) C. 1b] [4.5 (MP) B.2]**					✓				
5. Construct and solve simple open sentences with one operation that reflect scenarios about the class (e.g., 24 students in a class; 17 buy lunch, etc.); write a number sentence to show the total, the buyers, and those with bag lunches (e.g., 24 = n + 17 or 24 – 17 = n); other examples might be birthdates, shoe sizes, male/female, heights, right or left-handedness; use reasoning to check accuracy **[4.3 (PA.4) C. 2] [4.5 (MP) D.4] [4.5 (MP) D.6]**					✓				
6. Draw freehand sketches of graphs that model data from real phenomena, and use such graphs to make predictions and interpret events (e.g., changes in temperature across several months; more rapid versus slower plant growth given different quantities of water/sunlight; letter grades and amount of time spent studying; etc.); from at least one graph, identify two facts that are shown one question that the data raise, and make a prediction about how the graph would look if extended by 'x' months (or designated period of time). **[4.3 (PA.6) C.2a, b, c] [4.5 (MP) B.4]**							✓		
7. Represent specific real-life situations involving patterns, relationships between two variables, and linear functions (e.g., heart rate and age; hours studied to points earned, etc.); use variables to represent unknown quantities; use any of the following: tables, graphs, verbal rules, algebraic expressions, equations, and inequalities **[4.3 (PA.6) C.1]**							✓		

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8. Calculate the number of items (e.g., colored tiles) needed for designs in a sequence without actually creating each design; create a unique sequence of designs based on given patterns; look for patterns in numbers and designs; collect and analyze data; use patterns to make predictions with algebraic expressions to generalize patterns. **[4.3 (PA.7) A.1; C.2] [4.5 (MP)C.2; E.1]**								✓	
9. Apply the formula for compound interest to calculate the amount of money one would have over a designated period of time (e.g., Alexis deposited $400.00 in a savings account at age 12; if she earns 2% each year, how much would be in her account by the time she is 16?); create a table or graph to illustrate the growth, and include an explanation of how this works. **[4.3 (PA.7) C.2b] [4.5 (MP) A.3] [4.5 (MP) B.4] [4.5 (MP) C.1] [4.5 (MP) C.3] [4.5 (MP) D.1]**								✓	
10. Use various sets of data to represent real-life situations that involve relationships; model these relationships using algebra tiles, tables, graphs, algebraic expressions, equations, inequalities (e.g., gross pay, deductions, net pay; age height). **Note:** students need to do all of the representations with the various scenarios. **[4.3 (PA.8) C.2a] [4.3 (PA.8) D.4]** [See *Question Quest: Level D*; p. 79].									✓
11. Calculate the population growth for 8th grade in Mays Landing if there are 360 students now, and the population of school-age children increases by 6% each year; how many eighth graders would there be in each of the next 5 years? Create a table to show the growth, and explain the process used to obtain the answer. **[4.3 (PA.8) C.2b]**									✓
D. Procedures									
P1. Solve open number sentences using a variety of basic addition strategies: commutative property; counting all; counting on; one more/two more; doubles; doubles plus one; make tens; use ten frames and double ten frames; use identity property(zero). **[4.3 (PA.1) D.1; 4.1 (NNO.1) B.7]**		✓							
1. Write an addition or multiplication number sentence to represent a word problem using turn-around facts (commutative property). **[4.3 (PA. 2)D .1a] [4.5 (MP) C.1]**			✓						
2. Write an addition and/or multiplication number sentence to represent a word problem using the order property (commutative property) **[4.3 (PA. 3) D .1a] [4.5 (MP) C.1] [4.5 (MP) C.2]**				✓					
3. Use test scores for two students who have the identical scores on two different assignments (e.g., student #1 has 75 and 93; student #2 has a 93 and75); show how they have the same grade (commutative property); write number sentences using the symbols <, >, = to compare individual test scores **[4.3 (PA. 4) D .1a, D.2]**					✓				
4. Use a 3-step process to add a series of three or more numbers: i.e., (a) look for 10s; (b) look for doubles; (c) solve (e.g., 7 + 3 + 4 = ___; 6 + 6 + 2 + = ___) (associative property) **[4.3 (PA. 2)D .1c]**			✓						
5. Use parentheses to group numbers in a series of three or more to simplify by addition and/or multiplication problems (associative property) **[4.5 (MP) C.2]**				✓					
6. Write equations and inequalities for real-world situations using the symbols <, >, = (e.g., Joan weighs the same amount as Sarah; Joan's weight = Sarah's weight; or Joan weighs > Kerry but < Bill; explain the method of 'proof' or reasoning for the correct answer **[4.3 (PA.3) D.2] [4.5 (MP) B.4] [4.5 (MP) D.3]**				✓					
7. Use test scores for two students who have the same scores on three different assignments (e.g., student #1 has 75, 93, and 98; student #2 has 93, 75, and 98); show how they have the same grade (associative property) **[4.3 (PA. 4) D .1c] [4.5 (MP) C.1]**					✓				

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8. Write multiplication number sentences to represent word problems for the multiplication properties of order and grouping as well as the identity element (multiplying a number by 1 yields the number) and zero (e.g., order: three rows with eight students in each row; if we had eight rows, how many students in each row? Grouping: 24 students bought five lunches at $1.75/lunch; how much money did they spend?); explain how the order and grouping properties work by comparing their work to another student's work who solved the problem differently - - how can both be right? **[4.3 (PA. 4) D .1a, b, d, e] [4.3 (PA. 4) D .1c] [4.5 (MP) B.1, B.2]**					✓				
9. Demonstrate that adding or subtracting zero to a number does not change the result (e.g., if four students are standing in a group and no other students join, how many are there in all? If you have five nickels in a can, and none are removed, how many nickels are there?, etc.) (identity property) **[4.3 (PA. 2)D .1b] [4.5 (MP) B.2]**			✓						
10. Demonstrate that multiplying a number by one does not change the result (e.g., if you have one tub with eight items in it, I have 8(8 x 1 = 8); if we take the same tub and put 16 items in it, we have 16 (16 x 1); demonstrate that multiplying a number by zero always equals zero (e.g., if three tubs have no objects (3 x 0 = 0). **[4.3 (PA. 3) D .1b, c] [4.5 (MP) C.6]**				✓					
11. Solve linear equations with manipulatives that involve whole numbers only and a variable on one side of the equation. **[4.3 (PA. 5) D .1] [4.5 (MP) C. 6] [4.5 (MP) B.3]**						✓			
12. Solve simple linear equations with variables on one or both sides of the equation using physical models or paper/pencil (e.g., balance scales: $x + 37 = 98$; pencil/paper: $2x + 9 = 3x = 7$). **[4.3 (PA. 6) D.1a,b] [4.5 (MP) A.3]**							✓		
13. Graph, on a number, line solutions to word problems including those involving money (e.g., bank balance, debits, credits); use contrasting colors to denote positive and negative outputs. **[4.3 (PA.7) D.1a, b] [4.3 (PA. 8) D.1a, b]**								✓	✓
14. Analyze several solved problems and numerical expressions - - some of which contain errors in the application of the **Distributive and/or Reciprocal Properties** - - determine (i.e., underline, highlight) if there were an error in the properties and explain what to do to make the correction (e.g., attempting to divide a recipe in half where there are fractional measures, and the person actually ends up doubling some measures by mistake). **[4.3 (PA. 6) D.2a,b] [4.3 (PA.6) D.3] [4.5 (MP) B.3]**							✓		
15. Solve multi-step word problems using linear equations; represent the solution in a graph or table (e.g., one must order clock movement at a given price for each movement, where there is a flat charge for shipping; explain why certain math processes were not used in the calculations (how do the various processes differ) of the shipping rate; explain what *x* represents in the equation written. **[4.3 (PA.7) D.2 a,b] [4.5 (MP) B.1] [4.5 (MP) B.4]**								✓	
16. Use a graph of average monthly temperatures for a four-month period to write and evaluate an expression to find the average temperature over the four-month period. (p. 73 #32 a, b) **[4.3 (PA.7) D.3a]**								✓	
17. Use substitution of values into a formula (e.g., interest, area of a figure, miles per gallon, distance, volume) to solve a word problem. [**4.3 (PA.7) D.3b]**								✓	
18. Analyze several solved problems and numerical expressions - - some of which contain errors in the application of the **Order of Operations, numbers, equations and inequalities: additive and multiplicative inverse**- - determine (i.e., underline, highlight) if there were errors in the properties and explain what to do to make the correction (e.g., attempting to divide a recipe in half where there are fractional measures, and the person actually ends up doubling some measures by mistake). **[4.3 (PA7) D.4] [4.5 (MP) C.2] [4.5 (MP) D.6]**								✓	

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19. Analyze several solved problems and numerical expressions - - some of which contain errors in the application of the **Additive Inverse, Multiplicative Inverse, Addition and Multiplication Properties of Equality, Addition and Multiplication Properties of Inequalities, Order of Operations, and Distributive Property** - - determine (i.e., underline, highlight) if there were an error in the properties and explain what to do to make the correction (e.g., attempting to divide a recipe in half where there are fractional measures, and the person actually ends up doubling some measures by mistake). **[4.3 (PA. 8) D.5a, b, c, d] [4.3 (PA. 8) D. 4a,b]**									✓
20. Solve simple linear equalities from a word problem (e.g., if an elevator holds 2,500 pounds, how many 185 pound people can it safely hold?); represent the solution on a number line. **4.3 (PA. 8) D.2 a, b] [4.3 (PA. 8) D.3]**									✓
4.4 DATA ANALYSIS, PROBABILITY, AND DISCRETE MATHEMATICS									
A. Data Analysis / Statistics									
P1. Gather and sort data in response to questions posted by the teacher or students (e.g., what is your favorite color, what is your favorite food, how many valentine hearts of a certain type are in a package, how many of each color or M&M's are in a pack, how many of each letter of lucky charms are in a pack, etc.); arrange data in a graph (floor / table) according to attributes such as size, color, shape; select the category that has the most or fewest objects; explain the rules of counting for each, citing that each item can be counted once and order does not change the number. **[4.4 (DPDM.K) A.1; A.2; C.1; 4.1 (NNO.K) A.3]**	✓								
P2. Identify multiple categories and sort data according to attributes **[4.4 (DPDM.1) A.1; C.1]**		✓							
P3. Collect and organize data into charts using tally marks, and display the data in picture graphs with units of 1 and bar graphs with intervals of 1. **[4.4 (DPDM.1) A.2; A.3]**		✓							
P4. Read and interpret charts, picture graphs, and bar graphs using units and intervals of one; identify the main ideas, draw conclusions, and make predictions answering questions related to the information (e.g., which category has the most, how many more in one category than another, how many in two categories combined, etc.). **[4.4 (DPDM.1) A.4; A.5; A.6]**		✓							
1. Gather data about favorite food (e.g., ice cream flavor); record and organize the data to construct pictures, tally chart, pictograph, bar graph, Venn Diagram; order the data from smallest to largest (e.g., least favorite ice cream to most), and identify the most frequent response (mode). **[4.4 (DPDM.2) A.1a] [4.4 (DPDM.2)A.2a,b] [4.5 (MP) A1] [4.5 (MP) C.6] [4.5 (MP) E.1] [4.5 (MP) E.3]**			✓						
2. Given a choice of 4-5 topics (e.g., types of books, music, movies, T.V. shows, sports, etc.), collect data, organize, and display data in an appropriate format; generate three questions and one inference from the data. **[4.4 (DPDM.3) A.1] [4.4 (DPDM.3) A.2] [4.5 (MP) A.2] [4.5 (MP) A.4] [4.5 (MP) B.1] [4.5 (MP) F.1] [4.5 (MP) F.4] [4.5 (MP) F.6]**				✓					
3. Collect data on some personal aspect (e.g., number of minutes spent reading beyond Reading class; amount of time watching T.V; amount of time spent riding your bike; amount of rainfall or snowfall; amount of time spent playing video games; number of brothers and sisters; different kinds of sneakers; age of four different adults); organize the data and present in an appropriate display - - pictograph, bar graph, line plot, line graph, table - - ; compute the mean, identify the mode (most frequent), and identify the median (middle number. **[4.4 (DPDM.4) A.1] [4.4 (DPDM.4) A.2a, b] [4.5 (MP) A.1] [4.5 (MP) D.6] [4.5 (MP) F.1] [4.5 (MP) F.4] [4.5 (MP) F.6]**					✓				
4. Develop an hypothesis and relevant research questions as to student (or adult) preferences; design a survey, administer it to a designated number of subjects, compile the results in a table, display in a bar graph and circle graph; annotate the display, indicating the range, median, and mean of the data collected, and list three valid inferences that can be drawn from the data and three questions raised by the data; explain how the actual results compare to the original hypothesis. **[4.4 (DPDM.5) A.1] [4.4 (DPDM.5) A.2a] [4.4 (DPDM.5) A.2b] [4.4 (DPDM.5) A.3] [4.5 (MP) A2] [4.5 (MP) F. 1] [4.5 (MP) F. 2] [4.5 (MP) F. 3] [4.5 (MP) A.4] [4.5 (MP) E.3]**						✓	✓		

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5. Determine the outliers, first quartile and third quartile and mean, median, and mode of a set of data; illustrate or explain that although the box and whisker plot divides the data into four equal sized groups, the range of the data values in each quartile will probably be different (e.g., survey data on a topic about which the students have a sincere interest such as sports, a controversial topic, etc.) **[4.4 (DPDM.7) A.1] [4.5 (MP) E1.d]**								✓	
6. Display information using various graphs; compare using numerical measures of central tendency and make inferences from the data (e.g., collect and analyze temperatures from different countries with varying climates - - for instance, New Jersey, USA; Kuwait City, Kuwait; London, England). **[4.4 (DPDM.7) A.1; A.2; B.4] [4.5 (MP) B.1, B.3; C.4; F.1]**								✓	
7. Analyze random samplings with replacement to predict the distribution of a collection of items (e.g., a bag of colored tiles); analyze recorded data, compare the data to what is known about the possible collection; draw conclusions about the collection (students will be required to experiment using sample space with replacement; collect and organize data; use proportional reasoning; describe the connection between making predictions and the size of the sample.) **[4.4 (DPDM.7) A.1; A.2; B.2; B.3] [4.5 (MP) A.1]**								✓	
8. Collect data from a sampling of students in the school with regard to shoe size, height in inches, number of hours spent on homework, etc, and use the data to create various representations (box and whisker plots, scatter plots, graphs, etc.; find the median and mean for the data set and predict how the data would look if first grade students were added to the survey set. How would the measures of central tendency be impacted? **[4.4 (DPDM.P) A.1 a, b] [4.4 (DPDM.8) A.4] [4.5 (MP) B.4] [4.5 (MP) E.1d] [4.5 (MP) F.1]**									✓
9. Use data displays (from #7 above) to formulate at least two generalizations, which they will explain or support; evaluate generalizations made by other students and cite evidence of you comments in the data. **[4.4 (8) A.2] [4.5 (MP) B.1] [4.5 (MP) B.4]**									✓
10. Use student data (e.g., shoe size and height) to create a scatter plot; draw the line of best fit on the scatter plot (this is in book in 11-7 and in Connecting Math). **[4.4 (DPDM.8) A.3]**									✓
11. Collect data on classroom preferences, and use data to find appropriate representations of the data. **[4.4 (DPDM.P) A.1 a, b] [4.4 (DPDM.8) A.4] [4.5 (MP) B.4] [4.5 (MP) E.1d] [4.5 (MP) F.1]**									✓
B. Probability									
P1. Describe reasonableness or likelihood of simple events occurring as possible / impossible, more likely / less likely (when using spinners, number cubes, drawing a colored chip from a bag, etc.) **[4.4 (DPDM.1) B1]**		✓							
1. Conduct probability experiments using spinners, dice, and colored marbles in a bag; chart/graph the results from each experiment, and describe the certainty of an event happening as 'certain,' 'impossible,' 'more likely,' 'less likely,' or 'equally likely' to occur; state the likelihood of getting a certain result (e.g., a number on a spinner with five is one out of five; the probability of drawing a red marble from a bag of three red and four blue marbles is three out of seven, etc.) **[4.4 (DPDM.2) A.1.6] [4.4 (DPDM.2) B.1] [4.4 (DPDM.2) B.2a, b] [4.5 (MP) B1] [4.5 (MP) A.3]**			✓						
2. Select from three spinners with two colors to play a game (if the spinner lands on your color, you earn a point, and if it lands on your friend's color, s/he wins the point); explain why you chose the spinner and whether the spinner you chose is fair by showing the likelihood of getting a certain result; create a different spinner that you think is fair, and say what you think will happen with the new spinner (e.g., it will land on red and blue an equal number of times); test the prediction over several trials to see what happens [note: use page 515 in text] **[4.4 (DPDM) 3.B.1] [4.4 (DPDM.3) B.2 a, b] [4.5 (MP) B2] [4.5 (MP) D.5]**				✓					
3. Determine the probability of obtaining a certain outcome in a "chance" situation (e.g., drawing a certain color from a bag; flipping a coin; spinning a spinner, etc.); use a table to help you make your calculation. How does the table help you solve the problem? (note: teacher manual page 555) **[4.4 (DPDM.4) B.1a] [4.4 (DPDM.4) B.3a] [4.5 (MP) B3] [4.5 (MP) B4]**					✓				

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4. State a likely outcome for multiple coin tosses or 'flips' on a spinner with four colors; complete multiple tests to show that the likelihood of obtaining a certain outcome does not depend on the results of previous trials; write a fraction to show the probability of getting a certain result; explain that the predicted (theoretical) is different from the actual (experimental) results (e.g., toss of a coin - - theoretical is 50-50; experimental - - results show 4 heads in a row). **[4.4 (DPDM.4) B.1a, b] [4.4 (DPDM.4) B.2] [4.4 (DPDM.4) B. 3a, b, c] [4.5 (MP) C4] [note: you can use the book: *Spaghetti and Meatballs for All* by Marilyn Burns]**					✓				
5. Determine the possible number of sums obtained by rolling two dice or spinning a spinner; guess which sums are most likely to occur; roll the dice a prescribed number of times (e.g., 50); record in a table (e.g., frequency chart); interpret the probabilities illustrated by the table, and describe how close the actual results came to the estimate, and label with a 1 for certainty or 0 for impossible occurrence on next roll. **[4.4 (DPDM.5) B.1] [4.4 (DPDM.5) B.2] [4.4 (DPDM.5) B.3] [4.5 (MP) D4] [4.5 (MP) D6]**						✓			
6. Use a spinner with four numbered sections to determine the probability of spinning a 1 and the probability of not spinning a 1; show how the two probabilities are complementary (e.g., the probability of spinning a one is 1 out of 4, and the probability of not spinning a one is 3 out of 4; together, they equal 1). **[4.4 (DPDM.6) b.1a, d]**							✓		
7. Use dice, spinners, or cards to determine the probability of compound events such as first rolling a 1 and then rolling a 2; explain how you multiply the probability of the first times the probability of the second (1/6 x 1/6 = 1/36) to show the likelihood of obtaining two independent events (multiplication rule) **[4.4 (DPDM.6) B.1b] [4.4 (DPDM.6) B.3] [4.5 (MP) B.1]**							✓		
8. Given a bag with four colors, determine theoretical probability of drawing a certain color; conduct experiment, and record the results; compare the obtained/actual results to the theoretical probability. Indicate whether the probability of obtaining a result is certain (1) or impossible (0). **[4.4 (DPDM.6) B.1c] [4.4 (DPDM.6) B.2a.b] [4.4 (DPDM.6) B.4]**							✓		
9. Use a bag of colored chips/papers where the distribution of colors is uneven, and explain how having more of one color than another would impact the likelihood of drawing a certain color from the bag; if the draws are set up as a game, and multiple people draw from the same bag, show how the order of who draws first impacts the results for those who follow. Provide a written explanation as to the fairness (if a color is not returned, the second and third players have a greater chance to draw a certain color than did the first person; if colored pieces are returned, all players have the same change to draw a certain color). **[4.4 (DPDM) B.3] [4.4 (DPDM.6) B.5] [4.5 (MP) B.1]**							✓		
10. Create probability game that requires the players to interpret probabilities as ratios, percents, and decimals; each game must have one of the following (spinner, dice, calculator, computer); the player must make predictions based on experimental and theoretical probabilities, and determine if the game is fair (fairness and expected value) **[4.4 (DPDM.7) B.1; B.2; B.3] [4.5 (MP) C.1; C.2]**								✓	
11. After playing several probability-based games (card games, spinner games, die, etc.), answer questions regarding the fairness of the game and how the outcome of the game can be affected by altering the set-up of the game. **[4.4 (DPDM.7) b.4] [4.5 (MP) B.4] [4.5 (MP) C.3] [4.5 (MP) D.5]**								✓	
12. Conduct probability experiments with bags of colored marbles, and chart the results; these experiments will be identified as single (what is the likelihood of drawing a red marble from the bag?), compound (if there is a 20% chance of drawing a red marble, and a 35% chance of drawing a green marble, what is the likelihood of drawing both a red and a green at the same time), and conditional events (what is the probability of drawing two marbles from the bag, without replacement, that are both red) state the probabilities in ratios, percents, and decimals. **[4.4 (DPDM.8) B.1] [4.4 (DPDM.8) B.2] [4.4 (DPDM.8) B.3] [4.4 (DPDM.8) B.4]**									✓
13. Make predictions based on probability experiments; compare theoretical and experimental probability in the experiments. **[4.4 (DPDM.8) B.5] [4.5 (MP) D.2] [4.5 (MP) D.4]**									✓

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14. Use a chart showing the number of letter tiles in a Scrabble game to answer questions about the probability of drawing certain letter, and predict how the level of fairness would be impacted by changing the general directions (e.g., each person competing takes one tile at a time up to 7; or each player can trade in a tile each time he takes a turn); play three games to verify or refute your prediction. **[4.4 (DPDM.8) B.6] [4.5 (MP) D.5]**									✓
C. Discrete Mathematics: Systematic Listing and Counting									
1. Sort and classify 2-dimensional shapes according to their attributes using a Venn Diagram. **[4.4 (DPDM.2) C.1] [4.5 (MP) D2]**			✓						
2. Generate all possibilities in simple counting situations such as how many outfits can be made from 2 pants/3 shirts; sandwiches made of 2 breads/3 meats; pizzas with 2 toppings from sausage, pepperoni, green pepper, mushrooms, and olives; make a chart **[4.4 (DPDM.2) C.2] [4.5 (MP) E.2]**			✓						
3. Use manipulatives or drawings to show how objects can be counted several ways (e.g., ways to make 25¢ = 5 nickels; 2 dimes and 1 nickel; 25 pennies; 2 dimes and 5 pennies, etc.); list 3 conclusions that can be drawn re: "real-life" (e.g., a group of 25 students can go on Disney rides in several combinations **[4.4 (DPDM.3) C.2] [4.5 (MP) C.3] [4.5 (MP) D.1]**				✓					
4. Create an organized list or chart to plan the seating for people at 375 tables that hold 4, 6, and 8 people; determine how many tables would have to be rented to seat all people at the same time, with no table having more than one empty seat **[4.4 (DPDM.4) C.2] [4.5 (MP) E.3]**					✓				
5. Create a classification system for a group of different objects (e.g., in the classroom; clock face, books, tables of different shapes, posters, containers, other furniture) that reflect different shapes and purposes; explain the relationships among items in a category; use a graphic organizer to compare and contrast different categories; and note items that are in more than one category **[4.4 (DPDM.4) C.1] [4.5 (MP) B.2] [4.5 (MP) D.2]**					✓				
6. Diagram the number of possibilities / combination (tree diagram, organized list) when given a specified number of various objects (e.g., 4 shirts, 2 pants, and 3 skirts); use the diagram/chart to identify fundamental counting principle to determine the number of possible combinations (e.g., with the shirts, pants, and skirts) **[4.4 (DPDM.5 C1, 2] [4.5 (MP) C3] [4.5 (MP) D3] [4.4 (DPDM.6) C.1] [4.4 (DPDM.6) C.2a]**						✓	✓		
7. Using the numbers 1-9, determine how many combinations are possible for a 4-digit license plate number (the calculations would look like - - 9 x 8 x 7 x 6) {note: this is using the concept of permutations and factorials } **[4.4 (DPDM.6) C.2b, c]**							✓		
8. List the possible combinations of two elements chosen from a given set - - how many handshakes are there among ten people if everyone shakes each person's hand once (first person shakes 9 people's hands; second person shakes 8; third person shakes 7, etc; add each person's handshakes to get the total) **[4.4 (DPDM.6) C.3] [4.5 (MP) A.3]**							✓		
9. Determine how many different way four items (e.g., names, shapes, colors, and numbers) can be ordered (see p. 540 in text) **[4.4 (DPDM.7) C.1] [4.5 (MP) E.2] [4.5 (MP) E.3]**								✓	
10. Create a 3-way Venn diagram (e.g., compare membership data of three school clubs); site commonalities among the clubs and contrasts among them. **[4.4 (DPDM.7) C.2]**								✓	
11. Create Venn diagrams with three attributes (e.g., there are 15, 20, and 25 students respectively in the chess club, the debate team, and the engineering society; how many different students belong to the three clubs if there are six students in chess and debate, seven students in chess and engineering, and eight students in debate and engineering, and two students in all three?; using three types of music and preference data on students) **[4.4 (DPDM.8) C.3] [4.5 (MP) C.4]**									✓
12. Apply the multiplication principle of counting: permutations of ordered situations with replacement (number of possible license plates) vs ordered situations without replacement (number of possible slates of three class officers from a 23 student class) **[see text p. 489; Technology Lab for Ch. 9]** **[4.4 9DPDM.8) C.1a, b, c]**									✓

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13. Apply techniques of systematic listing, counting, and reasoning (e.g., in a variety of 'brain teasers' and word problems. **[4.4 (DPDM.7) C.3] [4.4 (DPDM.8) C.3] [4.5 (MP) D.5]**								✓	✓
D. Discrete Mathematics: Vertex-Edge Graphs and Algorithms									
1. Use only/no more than 3 colors to color a simple map (of the class, school, neighborhood) on grid paper; label the map as to what the colors represent showing that the corners (vertices) are points and sides (edges) of the grid are straight lines **[4.4 (DPDM.2) D.2] [4.4 (DPDM.2) D.4]**			✓						
2. Use map of the Hess Estates (aerial view), and show the location of buildings as vertices and the edges as paths (roads) to move among locations; color the map using the fewest number of colors possible. **[4.4 (DPDM.3) D.2] [4.4 (DPDM.3) D.3] [4.5 (MP) C.4]**				✓					
3. Use a map of a city and plan routes to take the shortest path to a destination, making several stops along the way. **[4.4 (DPDM.4) D.3]**					✓				
4. Create a graph using data (e.g., class data, data from newspaper, Internet, etc.) and use the smallest number of colors to present the data to another class. **[4.4 (DPDM.4) D.4]**					✓				
5. Predict the outcome of a game based on the first 2-3 moves; explain the reasoning used **[4.4 (DPDM.2) D.3] [4.5 (MP) C.3] [4.5 (MP) D.3] [4.5 (MP) D.5]**			✓						
6. Devise multi-step directions to add, subtract, multiply and divide simple sets of numbers to solve practical problems (e.g., I have 37 pieces of candy; divide this into 8 equal groups; add 3 to the remainder, etc.); exchange papers with other students to follow the directions; describe the importance of following directions precisely **[4.4 (DPDM.3) D.1] [4.5 (MP) A.4] [4.5 (MP) D.2]**				✓					
7. Develop a game and the directions for the game where 2 players make mathematical calculations to win (e.g., 37 + _ = 49; this allows you to move 5 spaces forward if answer is correct; if wrong, you move back 3 spaces); write the rules and how to win the game. **[4.4 (DPDM.4) D.1] [4.4 (DPDM.4) D.2]**					✓				
8. Develop a strategy, and express as a set of directions, that will allow a certain student to win a game where a pair of students playing has a set number of objects such as toothpicks or cubes (e.g., 12) laid out between them; the students take turns removing the objects; the student to remove the last object wins the game. **[4.4 (DPDM.5) D.1] [4.5 (MP) A.4] [4.5 (MP) D.1] [4.5 (MP) E.1] [4.5 (MP) D.5] [4.4 (DPDM.6) D.1]**						✓	✓		
9. Use a treasure hunt map with a pirate ship and several locations, to determine the shortest route to the treasure that stops at specified sites along the way. Show on the map how to get from one place to the next **[4.4 (DPDM.6) D.2] [4.4 (DPDM.6) D.3]**							✓		
10. Find the shortest network connecting three sites on a coordinate grid map of Mays Landing (e.g., schools, a specific WaWa, Lake Lenape). **[4.4 (DPDM.7) D.1a]**								✓	
11. Use a coordinate grid map of Mays Landing to trace the shortest route between two given sites (e.g., the Fire House to Davies School. **[4.4 (DPDM.7) D.1b]**								✓	
12. Uses the coordinate grid map of Mays Landing, plot the shortest circuit for a visiting tour bus that is visiting local historical sites (e.g., Courthouse, cemetery, churches, etc.) **[4.4 (DPDM.7)D.1d]**								✓	
13. Use a coordinate grid map of Atlantic County, find the shortest network connecting the middle schools in the county. **[4.4 (DPDM.8) D.1]**									✓
14. Use a street map of a local housing development to find the shortest route covering every street in the development to install fiber optic cable. **[4.4 (DPDM.8) D.1b]**									✓
15. Use a map of the school building to find the shortest route from one given classroom to another. **[4.4 (DPDM.8) D.1c]**									✓
16. Use a map of Hamilton Mall to find the shortest circuit that visits a list of specific stores. **[4.4 (DPDM.8) D.1d]**									✓
17. Use the computer to input data to solve a problem (e.g., the number of routes for a delivery truck visiting *n* sites is *n!*, so finding the shortest circuit by examining all circuits would overwhelm the capacity of any compute, now or in the future even if n is less than 100). **[4.4 (DPDM.8) D.1e]**									✓
4.5 MATHEMATICAL PROCESSES (THESE ARE WOVEN INTO THE CONTENT STRANDS)									