DESCRIPTION OF MARS/MAC TASKS

MARS/MAC assessments are always given in the spring.

COURSE ONE: ALGEBRA

- **DATA/DATA ANALYSIS and STATISTICS**

1999: **Heart Beat**: analyze data, draw a scatter plot, interpret the scatter plot, and make some predictions

2000: **Rope**: interpret points on a graph showing the relationship between the length of the rope and the weight of the rope

2001: **Airplanes**: plot a scatter graph to compare data and use the scatter plot to estimate values

2002: **Pizza Sales**: plot a scatter graph and use the scatter plot to estimate values

2003: **Snakes**: match given data to one of two different scatter plots

2004: **Population:** interpret a scatter plot and use it to determine calculations for specific questions

2005: **Scatter Diagram**: using test score data, plot the mean and draw a line of best fit then determine which given statements about the data are true or false

2007: **House Prices:** use a graph to compare house prices with monthly mortgage payments and find a formula showing the relationship between the two; interpret and answer questions about the scatter plot data of wages earned and monthly mortgage payments

2009: **Coffee:** read and interpret a graph showing the relationship between number of small cups and number of large cups; set up and solve a system of equations

2010: **Circles and Graphs:** interpret a scatter plot with a direct variation as the line of best fit [relationship between diameter and circumference]; draw a graph of the relationship between radius and circumference; given 5 other relationships, determine which ones are direct variation

2012: **Media Surfacing:** interpret bi-variate data; determine a line of best fit; estimate a functional value from one axis knowing the value of the other axis

2013: **Obstacle Course:** interpret data to determine the better mean and better median time; display the data in a graphic form; support your claim as to the better runner using statistics

- **REASONING**

2005: **Multiples of Three:** test statements to see if they are true, find examples to match a description, and explain or justify your conclusions

2006: **Odd Sums:** work with odd, even and consecutive numbers then make and explain justifications about this work

2007: **Ash's Puzzle:** find numbers that fit given constraints and find rules for sets of numbers

2009: **Soup and Beans:** understand the equality of a balance scale; write equivalent algebraic expressions; use proportional reasoning to "balance" given information on one scale

2010: **Family:** given a set of interrelated clues, reason the relationships of one person to

another

2014: **Representing Digits:** see structure in expressions; look at three-digit numbers, reverse the order of the digits, take the difference and that difference will always be divisible by 11; write an algebraic expression to represent the reversal of the digits; use these two expressions to justify why the difference will always be divisible by 11

• GEOMETRY and MEASUREMENT

1999: **Cakes:** relate diameter and area when enlarging a circle and use ratio and proportion when changing a recipe

2000: **Co-Ordinates:** identify congruent triangles and find the area of a tilted square plotted on a coordinate grid

2001: **B's**: apply rules for circumference and area of circles to a shape **B**

2002: **Making a Puzzle:** using the 12 pentominoes: determine the area of a given rectangle; test a conjecture and explain solutions whether or not some or all of the pentominoes can make a square

2003: **Crisscross Numbers:** use algebra to explain number patterns found in a hundreds chart

2003: **Vacuum Cleaning:** using grid and given length of room and vacuum cord, determine what areas of the room can and cannot be cleaned

2004: **From 2 to 3 Dimensions:** imagine a 3D shape from its 2D net and compare the areas and lengths of the 3D shape with its 2D net

2006: **Swimming Pool**: find the volume of the pool; determine the time it takes to fill the pool; select the graph which best represents the depth of the pool as it fills at a steady rate of one gallon per second

2008: **Expressions**: work with algebraic expressions for areas and perimeters of parallelograms and trapezoids

2009: **Circles and Spheres:** match given formulae with respective graph; explain your matches; solve for one variable in terms of the other

2011: **Shape Sequence:** extend a sequence of rectangle areas; write an algebraic expression for the next rectangle in the sequence

2012: **Rectiles:** determine areas and dimensions of rectangles; use polynomial equations to represent area models; factor polynomials to determine the dimensions of rectangles; model geometric arrangements with algebraic expressions

• ALGEBRA

1999: **Network News:** apply a chain of operations shown as a network; infer generalizations about inverse operations

1999: **Number Grids:** check and prove generalizations about numbers in the hundreds chart

2000: **Speed, Distance, Time:** using 3 different variable representations for speed, distance and time and given the value of one variable, determine the values of the other two variables in terms of the given value

2000: **Building Units:** look for a pattern, write a rule for the number of rods needed to build a unit, use the rule to solve problems

2001: **Party Flags:** given measurement information determine the length of the sides of each flag and the space in between; use this information to express the rule for

the ***nth flag***

2001: **Magic Pentagon:** similar to a magic square; given ***x*** as the corner A, determine the expressions in terms of ***x*** for the other corners in the pentagon; solve the equation and complete the pentagon with numerical values

2002: **Make Half:** solve for values to make fractions of the value 1/2

2002: **Number Machines:** work with number chains and explain your reasoning

2003: **Number Towers:** make and solve equations made from a given number pattern

2004: **Square Patterns:** extend two different patterns using gray and white squares; determine the general rule for any size shape for each pattern

2004: **Fibonacci Sequences:** use the series to solve number problems using algebra

2005: **Magic Squares:** use algebraic expressions in magic square cells find the algebraic magic sum then apply this to a numerical magic squares with missing values

2005: **Fraction Sequences:** extend a given sequence of fractions then calculate and compare decimal values

2006: **Printing Tickets**: use graphs and formulae to determine the better deal in a cost analysis problem

2006: **Graphs:** match lines on a graph to the correct written equation

2007: **How Old Are They?:** translate written words into algebraic expressions; write and solve an equation for an age problem

2007: **Two Solutions**: find solutions to equations and inequalities

2008: **Sidewalk Patterns:** extend a geometric pattern and look for pattern/mathematical relationships between white, gray and total number of blocks

2009: **Words and Equations:** match word situations with two equations

2010: **The Trip:** write equations; solve a system of equations

2010: **Driving:** match stories about distance, rate, and time to graphs with no labels; make a graph from a given distance, rate, time situation; make comparisons between two different direct variations and their corresponding graphs

2011: **Meal Out:** use algebra to represent a real situation; solve an algebraic equation; test solutions to verify correctness of work

2011: **Fencing:** use algebra to represent a real situation using an appropriate method, i.e., system of equations

2012: **Cycle Shop:** model a situation using systems of equations; determine unknowns using multiple constraints; solve equations

2013: **Number Lines of Inequalities:** match inequality number line graphs to the appropriate numerical inequalities; write a set of inequalities to meet the conditions of the given number line graph; draw a number line graph to represent two given inequalities; write a set of inequalities such that the solution set is all real numbers

2013: **Speeding Ticket:** determine how far a speeding car will travel in one minute; determine the time it will take for the speeding car to reach an exit that is 3.4 miles ahead; write an expression to show the time a chasing police officer has been traveling to catch the speeding car; determine the average speed the police officer must travel to catch the speeding car before the exit

2014: **Summer Job:** compare three different summer jobs by writing equations given their constraints; determine which job earns the largest salary after working only 9 weeks vs. which job would earn the most after the entire 12 weeks

2014: **The Basketball Game:** write equations to represent different given scenarios; solve this system of equations to answer the questions

- **FUNCTIONS**

1999: **Swimming Race:** interpret a graph and work with speed, distances and time

2000: **Courthouse Steps**: extend a pattern and find a generalized rule

2001: **Trapezoidal Numbers**: extend and check a pattern; use values in a table to derive a formula; extrapolate from a graph

2002: **Toothpick Stairs:** extend and check patterns for perimeter toothpicks and interior toothpicks and determine a generalized rule for each

2003: **Conference Tables:** extend a pattern which begins with 4 tables and 12 people at size #1; find a rule for the number of tables for each size number; find a rule for the number of people for each size number; work backwards from 72 people

2004: **Graphs**: match four descriptions, equations, and graphs to each other

2005: **Vacations**: match four savings plans for a vacation to a graph, justify your match, match to an algebraic equation, write the missing equation and then write a description for a new and different equation

2006: **Patchwork Quilt**: extend a table for a pattern using white and black hexagons; work backwards from 66 white hexagons; determine a general rule to determine the number of white hexagons needed for ***n*** black hexagons

2007: **Graphs**: identify a given linear and quadratic graph; use the graph to answer questions; add another linear equation to the graph and answer questions about that equation

2008: **Sorting Functions:** match the graph, equation, rule and table which are equivalent representations for four situations

2008: **Buying Chips and Candy:** identify parts of a linear equation, write a linear equation, solve a pair of linear equations and determine is a given value is satisfies the constraints of the problem

2008: **Functions:** work with graphs and equations of linear and non-linear functions

2009: **Quadratic:** use a rule; change a rule into an algebraic expression; solve quadratics using graphs; solve quadratics using factoring or the quadratic formula; use algebra to prove equality

2010: **Quadratic Graphs:** match a quadratic graph to its graphical representation; understand transformations from one equation to another graphically based upon a "parent" quadratic graph and equation; solve a quadratic equation algebraically and graphically

2011: **Linear Graphs:** match a linear equation to its appropriate graph [4 of them]; draw the the graph of the equation not used; select an equation which could represent the speed of someone walking and explain why; select an equation that could represent conversion between two different monetary currencies

2011: **Understanding Graphs:** given a table, match a graph with an equation with a math fact and a statement of what these matching representations show mathematically

2012: **Represent'n**: determine attributes of functions from graphs; match graphs to their functions and tables; complete given tables; match and determine functions to geometric relationships

2012: **The Aussie Fir Tree:** visualize, extend, and describe a growing pattern; determine a solution to a polynomial relationship; determine an algebraic equation that models the growth of a quadratic function; verify the inverse relationship of the polynomial equation

2013: **Katie's Pattern:** extend a geometric pattern; determine the functional rule between the pattern number and the number of tiles; use the inverse relationship to explain why there can be no pattern number with 184 tiles; explain why the number of tiles in the pattern will always be even

2013: **Consuelo's Graph:** find the vertex, zeroes, and function of a given parabola on a Cartesian Co-ordinate Plane; given a function, draw a graph of this linear function; determine and show where the points of intersection are for the parabola and this line

2014: **Tran's Triangular Pattern:** interpret, extend, draw, find the area of, and write a functional rule for the number of black unit triangles and the area of white space in the triangular pattern

2014: **Olympic Event:** in the context of an Olympic track meet, calculate and interpret the average rate of change over a specified interval and determine an explicit expression, a recursive process, or steps for calculations from this context