| **Required Course Numbers** | | | | | | | | | | | | | | | |
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| **Test Content Categories** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **I. Arithmetic and Algebra (62%)** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **A. Numbers and Operations** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1. Understands operations and properties of the real number system |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| a. solve problems using addition, subtraction, multiplication, and division of rational numbers |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| b. apply the order of operations |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| c. determine whether the properties hold (e.g., commutative, associative, distributive) for given operations on a number system |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| d. compare, classify, and order real numbers |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| e. perform operations involving exponents, including negative exponents |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| f. simplify and approximate radicals |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| g. represent and compare very large and very small numbers (e.g., scientific notation) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 2. Understands the relationships among fractions, decimals, and percents |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| a. convert among fractions, decimals, and percents |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| b. represent fractions, decimals, and percents using various models |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 3. Knows how to use ratio reasoning to solve problems |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| a. apply the concept of a ratio and use ratio language and notation to describe a relationship between two quantities |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| b. compute unit rates |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| c. use ratio reasoning to convert rates |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| d. solve problems involving scale factors |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 4. Knows how to use proportional relationships to solve real-world problems |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| a. recognize and represent proportional and inversely proportional relationships between two quantities |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| b. use proportional relationships to solve multistep ratio and percent problems |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 5. Knows how to use basic concepts of number theory (e.g., divisibility, prime factorization, multiples) to solve problems |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| a. recognize relationships involving prime and composite numbers |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| b. solve problems involving odd or even numbers |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| c. solve problems involving factors, multiples, and divisibility |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 6. Knows a variety of strategies to determine the reasonableness of results |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| a. recognize the reasonableness of results within the context of a given problem |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| b. test the reasonableness of results using estimation |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| c. estimate absolute and relative error in the numerical answer to a problem |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **B. Algebra** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1. Knows how to evaluate and manipulate algebraic expressions, equations, and formulas |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| a. perform arithmetic operations on polynomials |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| b. manipulate and perform arithmetic operations on problems involving rational expressions |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| c. evaluate, manipulate, and compare algebraic expressions involving radicals and exponents, including negative exponents |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| d. use variables to construct and solve equations in real-world contexts |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| e. translate verbal relationships into algebraic equations or expressions |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 2. Knows how to recognize and represent linear relationships algebraically |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| a. determine the equation of a line |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| b. recognize and use the basic forms of linear equations |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 3. Knows how to solve linear equations and inequalities |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| a. solve one-variable linear equations and inequalities algebraically and represent solutions on a number line |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 4. Knows how to represent and solve nonlinear equations and inequalities |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| a. solve one-variable nonlinear equations and inequalities (e.g., absolute value, quadratic) algebraically and represent solutions on a number line |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 5. Knows how to represent and solve systems of equations and inequalities |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| a. represent and solve systems of linear equations and inequalities with two variables algebraically and graphically |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 6. Knows how to recognize and represent simple sequences or patterns (e.g., arithmetic, geometric) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| a. evaluate, extend, or algebraically represent rules that involve number patterns |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| b. describe or extend patterns involving shapes or figures |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| c. explore patterns in order to make conjectures, predictions, or generalizations |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **C. Functions and Their Graphs** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1. Knows how to identify, define, and evaluate functions |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| a. know function notation |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| b. decide whether a given set of conditions represents a function |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| c. evaluate functions for given values (algebraically, graphically, tabular) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 2. Knows how to determine and interpret the domain and the range of a function numerically, graphically, and algebraically |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| a. determine the domain and range of a given table of values |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| b. determine the domain and range from a given graph of a function |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| c. determine the domain and range of a given function |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| d. interpret domain and range in real-world settings |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 3. Understands basic characteristics of linear functions (e.g., slope, intercepts) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| a. determine the slope of a given linear function |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| b. interpret slope as a constant rate of change |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| c. determine the x- and y-intercepts of a given linear function |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| d. interpret the x- and y-intercepts of a given linear function |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 4. Understands the relationships among functions, tables, and graphs |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| a. determine and interpret the x- and y-intercepts of any given function |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| b. select an equation that best represents a |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| graph (e.g., linear, quadratic, absolute value, simple exponential) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| c. determine the graphical properties and sketch a graph given an equation of a linear, quadratic, absolute value, or simple exponential function |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 5. Knows how to analyze and represent functions that model given information |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| a. develop a model (e.g., graph, equation, table) of a given set of conditions |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| b. evaluate whether a particular mathematical model (e.g., graph, equation, table) can be used to describe a given set of conditions |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **II. Geometry and Data (38%)** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **A. Geometry and Measurement** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1. Knows how to solve problems involving perimeter, area, surface area, and volume |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| a. calculate and interpret perimeter and area of geometric shapes |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| b. calculate and interpret surface area and volume of geometric shapes |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| c. use two-dimensional representations of three-dimensional objects to visualize and solve problems |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 2. Understands the concepts of similarity and congruence |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| a. use similarity and congruence to solve problems with two-dimensional and three-dimensional figures |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 3. Understands properties of lines (e.g., parallel, perpendicular, intersecting) and angles |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| a. solve problems involving parallel, perpendicular, and intersecting lines |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| b. apply angle relationships (e.g., supplementary, vertical, alternate interior) to solve problems |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 4. Understands properties of triangles |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| a. solve problems that involve sides (e.g., Pythagorean theorem) and angles |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| b. solve problems that involve medians, midpoints, and altitudes |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| c. solve problems involving special triangles (e.g., isosceles, equilateral, right) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 5. Understands properties of quadrilaterals (e.g., rectangle, rhombus, trapezoid) and other polygons |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| a. know geometric properties of various quadrilaterals (e.g., parallelogram, trapezoid) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| b. know relationships among quadrilaterals |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| c. solve problems involving angles and diagonals |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| d. solve problems involving polygons with more than four sides |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 6. Understands properties of circles |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| a. solve problems involving circumference and area of a circle |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| b. solve problems involving diameter or radius of a circle |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| c. solve basic problems involving central angles, tangents, arcs, and sectors |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 7. Knows how to interpret geometric relationships in the xy-plane (e.g., transformations, distance, midpoint) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| a. use coordinate geometry to represent and examine the properties of geometric shapes (e.g., Pythagorean theorem, area of rectangle) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| b. determine the distance between two points |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| c. determine the midpoint of a line segment given its endpoints |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| d. interpret and solve problems involving transformations |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 8. Understands systems of measurement (e.g., metric, customary) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| a. solve measurement and estimation problems involving time, length, temperature, volume, and mass in both U.S. customary and metric systems, where appropriate |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| b. convert units within each system |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 9. Is familiar with how geometric constructions are made |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| a. identify formal geometric constructions made with a variety of tools and methods (e.g., copying a segment, bisecting an angle, constructing parallel and perpendicular lines) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **B. Probability, Statistics, and Discrete Mathematics** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1. Knows how to interpret and analyze data presented in various forms |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| a. analyze and interpret various displays of data (e.g., box plots, histograms, scatter plots, stem-and-leaf plots) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| b. draw conclusions based on graphical displays (e.g., misleading representation of data, line of best fit, interpolation) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 2. Knows how to represent data in various forms |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| a. construct circle graphs, bar graphs, line graphs, histograms, scatter plots, double bar graphs, double line graphs, stem-and-leaf plots, box plots, and line plots/dot plots |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| b. choose an appropriate graph based on data |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 3. Knows how to develop, use, and evaluate probability models |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| a. use counting techniques, including the counting principle, to answer questions involving a finite sample space |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| b. solve probability problems involving independent and dependent events |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| c. solve problems using geometric probability |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 4. Understands concepts associated with measures of central tendency and dispersion (spread) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| a. solve for the mean and weighted average of a given set of data |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| b. determine and interpret mean, median, and mode in a variety of problems |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| c. determine and interpret common features of a data set (e.g., range and outliers) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| d. choose an appropriate measure of central tendency to represent a given data set |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 5. Knows how to model and solve problems using simple diagrams, flowcharts, or algorithms |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| a. construct, use, and interpret simple diagrams (e.g., Venn diagrams, flowcharts) to solve problems |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| b. apply a given algorithm to solve a problem |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |