10th Grade Correlation Benchmarks and Indicators Mathematics

Number, Number Sense and Operations Standard

A. Use scientific notation to express large numbers and numbers less than one.

B. Identify subsets of the real number system.

C. Apply properties of operations and the real number system and justify when they hold for a set of numbers.

D. Connect physical, verbal and symbolic representations of integers, rational numbers and irrational numbers.

- 1. Connect physical, verbal and symbolic representations of irrational numbers; e.g., construct v2 as hypotenuse or on a number line.
- _____2. Explain the meaning of the *n* th root.
- _____ 3. Use fractional notation and computations to represent and solve problem situations involving arrangements.

E. Compare, order and determine equivalent forms of real numbers.

F. Explain the effects of operations on the magnitude of quantities.

G. Estimate, compute and solve problems involving real numbers, including ratio, proportion and percent, and explain solutions.

H. Find the square root of perfect squares, and approximate the square root on non-perfect squares.

I. Estimate, compute and solve problems involving scientific notation, square roots and numbers with integer exponents.

4. Approximate the nth root of a given number greater than zero between when consecutive integers is an integer; e.g., 4th root of 50 is between 2 and 3.

Measurement Standard

A. Solve increasingly complex non-routine measurement problems and check for reasonableness of results.

- 1. Explain how a small error in measurement may lead to a large error in calculated results.
- _____ 2. Calculate relative error.
- 3. Explain the difference between absolute error and relative error in measurement.
- 4. Give examples of how the same absolute error can be problematic in one situation but not in another; e.g., compare "accurate to the nearest foot" when measuring the height of a person versus when measuring the height of a mountain.

B. Use formulas to find surface area and volume for specified three-dimensional objects accurate to a specified level of precision.

C. Apply indirect measurement techniques, tools and formulas as appropriate, find perimeter, circumference and area of circles, triangles, quadrilaterals and composite shapes, and to find volume prisms, cylinders, and pyramids.

D. Use proportional reasoning and apply direct measurement techniques, including right triangle trigonometry and properties of similar triangles, to solve problems involving measurement and rates.
5. Determine the measures of central and inscribed angles and their associated major and minor arcs.

E. Estimate and compute various attributes, including length, angle measure, area, surface area and volume, to a specified level of precision.

F. Write and solve real-world, multi-step problems involving money, elapsed time and temperature and verify reasonableness of solutions.

Geometry and Spatial Sense Standard

A. Formally define geometric figures.

____1. Formally define and explain key aspects of geometric figures, including:

- a) interior and exterior angles of polygons;
- b) segments related to triangles (median, altitude, midsegments);
- c) points of concurrency related to triangles (centroid, incenter, orthocenter, circumcenter);

d) circles (radius, diameter, chord, circumference, major arc, minor arc, sector, segment, inscribed angle).

_____2. Recognize and explain the necessity for certain terms to remain undefined, such as point, line and plane.

6. Identify the reflection and rotation symmetries of two- and three-dimensional figures.

10. Solve problems involving chords, radii and arcs within the same circle.

B. Describe and apply the properties of similar and congruent figures; and justify conjectures involving similarity and congruence.

C. Recognize and apply angle relationships in situations involving intersecting lines, perpendicular lines and parallel lines.

_____10. Solve problems involving chords, radii and arcs within the same circle.

D. Use coordinate geometry to represent and examine the properties of geometric figures.

E. Draw and construct responsibilities of two- and three-dimensional geometric objects using a variety of tools, such as straightedge, compass and technology.

- 4. Construct right triangles, equilateral triangles, parallelograms, trapezoids, rectangles, rhombuses, squares and kites, using compass and straightedge or dynamic geometry software.
- 5. Construct congruent figures and similar figures using tools, such as compass, straightedge, and protractor or dynamic geometry software.
- 7. Perform reflections and rotations using compass and straightedge constructions and dynamic geometry software.

F. Represent and model transformations in a coordinate plane and describe the results.

- 8. Derive coordinate rules for translations, reflections and rotations of geometric figures in the coordinate plane.
 - 9. Show and describe the results of combinations of translations, reflections and rotations (compositions); e.g., perform compositions and specify the results of a composition as the outcome of a single motion, when applicable.

G. Prove or disprove conjectures and solve problems involving two-dimensional and three-dimensional objects represented within a coordinate system.

H. Establish the validity of conjectures about geometric objects, their properties and relationships by counter-example, inductive and deductive reasoning, and critiquing arguments made by others.

3. Make, test and establish the validity of conjectures about geometric properties and relationships using counterexample, inductive and deductive reasoning, and paragraph or two-column proof, including: a. prove the Pythagorean Theorem;

b. prove theorems involving triangle similarity and congruence;

- c. prove theorems involving properties of lines, angles, triangles and quadrilaterals;
- d. test a conjecture using basic constructions made with a compass and straightedge or technology.

_10. Solve problems involving chords, radii and arcs within the same circle.

I. Use right triangle trigonometric relationships to determine lengths and angle measures.

Patterns, Functions and Algebra Standard

A. Generalize and explain patters and sequences in order to find the next term and the nth term.

B. Identify and classify functions as linear or nonlinear, and contrast their properties using tables, graphs or equations.

1. Define function formally and with f(x) notation.

2. Describe and compare characteristics of the following families of functions; square root cubic, absolute value and basic trigonometric functions; e.g., general shape, possible number of roots, domain and range.

C. Translate information from one representation (words, table, graph or equation) to another representation of a relation or function.

D. Use algebraic representations, such as tables, graphs, expressions, functions and inequalities, to model and solve problem situations.

- 3. Solve equations and formulas for a specified variables; e.g., express the base of a triangle in terms of the area and height.
 - 4. Use algebraic representations and functions to describe and generalize geometric properties and relationships.
- 5. Solve simple linear and nonlinear equations and inequalities having square roots as coefficients and solutions.
- 6. Solve equations and inequalities having rational expressions as coefficients and solutions.
- _____ 4.4.2 Solve real-world problems that can be modeled using linear, quadratic, exponential or square root functions.

E. Analyze and compare functions and their graphs using attributes, such as rates of changes, intercepts and zeros.

F. Solve and graph linear equations and inequalities.

10. Solve real-world problems that can be modeled, using linear, quadratic, exponential or square root functions.

G. Solve quadratic equations with real roots by graphing, formula and factoring.

- 8. Graph the quadratic relationship that defines circles.
- 10. Solve real-world problems that can be modeled, using linear, quadratic, exponential or square root functions.

H. Solve systems of linear equations involving two variables graphically and symbolically.

_____7. Solve systems of linear inequalities.

___11. Solve real-world problems that can be modeled, using systems of linear equations and inequalities.

I. Model and solve problem situations involving direct and inverse variation.

J. Describe and interpret rates of change from graphical and numerical data.

- 9. Recognize and explain that the slopes of parallel lines are equal and the slopes of perpendicular lines are negative reciprocals.
 - 12. Describe the relationship between slope of a line through the origin and the tangent function of the angle created by the line and the positive x-axis.

Data Analysis and Probability Standard

A. Create, interpret and use graphical displays and statistical measures to describe data; e.g., box-and-whisker plots. Histograms, scatterplots, measures of center and variability.

- 2. Represent and analyze bivariate data using appropriate graphical displays (scatterplots, parallel box-andwhisker plots, histograms with more than one set of data, tables, charts, spreadsheets) with and without technology.
- _____ 3. Display bivariate data where at least one variable is categorical.
- 4. Identify outliers on a data display; e.g., use interquartile range to identify outliers on a box-and-whisker plot.
 - _6. Interpret the relationship between two variables using multiple graphical displays and statistical measures; e.g., scatterplots, parallel box-and-whisker plots, and measures of center and spread.

B. Evaluate different graphical representations of the same data to determine which is the most appropriate representation for an identified purpose.

C. Compare the characteristics of the mean, median and mode for a given set of data, and explain which measure of center best represents the data.

_____1. Describe measures of center and the range verbally, graphically and algebraically.

D. Find, use and interpret measures of center and spread, such as mean and quartiles, and use those measures to compare and draw conclusions about sets of data.

6. Interpret the relationship between two variables using multiple graphical displays and statistical measures; e.g., scatterplots, parallel box-and-whisker plots, and measures of center and spread.

E. Evaluate the validity of claims and predictions that are based on data by examining the appropriateness of the data collection and analysis.

F. Construct convincing arguments based on analysis of data and interpretation of graphs.

G. Describe sampling methods and analyze the effects of method chosen on how well the resulting sample represents the population.

5. Provide examples and explain how a statistic may or may not be an attribute of the entire population; e.g., intentional or unintentional bias any be present.

H. Use counting techniques, such as permutations and combinations, to determine the total number of options and possible outcomes.

I. Design an experiment to test a theoretical probability, and record and explain results.

J. Compute probabilities and compound events, independent events, and simple dependent events.

_____7. Model problems dealing with uncertainty with area models (geometric probability).

K. Make predictions based on theoretical probabilities and experimental results.

8. Differentiate and explain the relationship between the probability of an event and the odds of an event, and compute one given the other.