

Nebraska City Public Schools

9-12 Math / Learner Wills

12.1.1 By the end of twelfth grade, students will describe and compare the relationships between subsets of real numbers.

TLW recognize and compare rational numbers

TLW add, subtract, multiply and divide rational numbers

TLW identify real numbers subsets of integers, rational numbers, and irrational numbers

TLW demonstrate an understanding of the number system through complex numbers.

TLW recognize all areas of the real and complex number systems.

TLW demonstrate an understanding of the properties of the number systems.

12.1.2 By the end of twelfth grade, students will express the equivalent forms of numbers using exponents, radicals, scientific notation, absolute values, fractions, decimals, and percents.

TLW be able to manipulate and change equivalent forms of numbers, using exponents, radicals, scientific notation, absolute values, fractions, decimals, and percents.

TLW express the equivalent forms of numbers using fractions, decimals and percent; exponents and scientific notation; exponents and radicals; absolute value and standard value.

12.2.1 By the end of twelfth grade, students will solve theoretical and applied problems using numbers in equivalent forms, radicals, exponents, scientific notation, absolute values, fractions, decimals, and percents, ratios and proportions, order of operations, and properties of real numbers.

TLW solve problems involving fractions, decimals and percent; exponents and scientific notation; exponents and radicals; absolute values; ratios and proportions; order of operation; properties of real numbers.

TLW compute problems using equations or formulas using numbers in equivalent forms, radicals, exponents, scientific notation, absolute values, fractions, decimals, and percents, ratios and proportions, order of operations, and properties of real numbers.

12.2.2 By the end of twelfth grade, students will justify solutions to mathematical problems.

TLW solve problems by guess and check method.

TLW use estimation to justify solution.

TLW justify the reasonableness of solutions using estimation, common sense, graph interpretation, and significant digits.

12.2.3 By the end of twelfth grade, students will perform estimations and computations of real numbers mentally, with paper and pencil, and with technology.

TLW perform computation.

TLW perform estimations.

TLW perform computations mentally.

TLW perform computations with pencil and paper.

TLW perform computations with technology.

TLW perform estimations and computations mentally, with paper and pencil, and with technology such as graphing calculators, spreadsheets, and computer programs.

12.3.1 By the end of twelfth grade, students will select and use measuring units, tools, and/or technology and explain the degree of accuracy and precision of measurements.

TLW solve problems using appropriate measuring tools, units, and technology.

TLW demonstrate the ability to use various measuring formulas.

12.3.2 By the end of twelfth grade, students will convert between metric and standard units of measurement, given conversion factors.

TLW convert between metric and standard units of measure, when given the appropriate conversion ratios.

TLW convert between different types of units, i.e. metric to English.

12.4.1 By the end of twelfth grade, students will calculate perimeter and area of two dimensional shapes, and surface area and volume of three dimensional shapes.

TLW calculate perimeter and area of triangles, rectangles, parallelograms, trapezoids, and the circumference and area of circles.

TLW calculate areas and perimeter of polygons and sectors and segments of a circles.

TLW calculate the surface area and volume of rectangular prisms, pyramids, cylinders, cones, and spheres.

12.4.2 By the end of twelfth grade, students will create geometric models to describe the physical world.

TLW use geometric shapes to describe real world situations.

TLW use geometric relationships to describe the physical world to model and solve real world problems.

12.4.3 By the end of twelfth grade, students will evaluate characteristics and properties of two and three dimensional geometric shapes.

TLW classify figures in terms of congruence and similarity and apply these relationships.

TLW classify and compare attributes of two and three dimensional figures determining the effects of changing dimensions on perimeter area and volume.

TLW perform transformations such as translations, rotations, and reflection.

12.4.4 By the end of twelfth grade, students will apply coordinate geometry to locate and describe objects algebraically.

TLW compute the slope of a line.

TLW determine if lines are parallel or perpendicular using their slopes.

TLW determine length and midpoint of a segment.

TLW classify polygons by plotting them on a coordinate plane and calculating slope and lengths.

TLW apply coordinate geometry to locate objects and to describe objects algebraically using midpoint formula, distance formulas, linear, quadratic equations and conic sections.

12.4.5 By the end of twelfth grade, students will apply right triangle trigonometry to find length and angle measures.

TLW use sine, cosine and tangent to solve physical world problems involving right triangles.

TLW be introduced to the trigonometric ratios using right triangles and be able to apply them in algebraic problems.

TLW set up trigonometric fractions, read a trig. chart, or find the missing side of a triangle when given a right triangle.

12.4.6 By the end of twelfth grade, students will apply geometric properties to solve problems.

TLW use perimeter, area, and volume formulas and the Pythagorean theorem to solve real world problems.

TLW find the sum of the angles of a polygon, recognize congruent angles in a triangle, and find the length of the sides of similar triangles, find congruent angles when parallel lines are cut by a transversal.

12.4.7 By the end of twelfth grade, students will apply deductive reasoning to arrive at a conclusion.

TLW use the algebraic properties to justify steps in solving an algebraic equation.

TLW apply direct, indirect, and conditional proofs.

TLW deduce valid conclusions using logic.

TLW use the algebraic properties to justify steps in solving an algebraic equation.

12.5.1 By the end of twelfth grade, students will select a sampling technique to gather data, analyze the resulting data and make inferences.

TLW construct and use simple flow charts.

TLW create frequency tables from collected data.

TLW use appropriate graphs to display data.

TLW calculate and apply measures of central tendency.

TLW use appropriate charts and tables to display collected data.

TLW understand fundamental processes of statistics and probability.

TLW collect, organize, and analyze data in a statistical project.

12.5.2 By the end of twelfth grade, students will write equations and make predictions from sets of data.

TLW understand fundamental processes of statistics and probability.

TLW make a scatter plot, determine a regression equation, test validity and make a prediction when given a set of data.

12.5.3 By the end of twelfth grade, students will apply theoretical probability to represent problems and make decisions.

TLW understand fundamental processes of statistics and probability.

12.5.4 By the end of twelfth grade, students will evaluate how transformations on data affect the measures of central tendency and variability.

TLW calculate the effects of transformations on the measures of central tendency and variability.

12.5.5 By the end of twelfth grade, students will interpret data represented by the normal distribution and formulate conclusions.

TLW sketch a normal curve with one and two standard deviations labeled.

TLW interpret information and put it into a normal curve.

12.5.6 By the end of twelfth grade, students will calculate probabilities of independent events.

TLW find the probability of independent events.

TLW compute the number of outcomes and probability of common events.

12.6.1 By the end of twelfth grade, students will graph and interpret algebraic relations and inequalities.

TLW graph equations of horizontal and vertical lines.

TLW graph linear equations.

TLW graph linear inequalities.

TLW apply properties of the number system to algebraic expressions.

TLW graph and equation of a line, rewrite an equation in slope-intercept form.

12.6.2 By the end of twelfth grade, students will solve problems involving equations and inequalities.

TLW solve linear inequalities.

TLW solve linear equations.

TLW use linear inequalities to solve real life problems.

TLW apply and solve algebraic problems involving equations and inequalities and be able to graph and interpret the graphs of algebraic equations and inequalities.

12.6.3 By the end of twelfth grade, students will solve problems involving systems of two equations, and systems of two or more inequalities.

TLW solve systems of two equations.

TLW solve systems of inequalities.

TLW solve systems of linear equations by graphing substitution and linear combinations.

TLW solve real life problems using systems of equations.

TLW demonstrate an understanding of problem solving using systems of equations, inequalities and matrices.

12.6.4 By the end of twelfth grade, students will solve problems using patterns and functions.

TLW identify patterns.

TLW solve functions.

TLW write the equations of a function.

TLW use patterns to solve basic sequences.

TLW apply direct and indirect variations.

TLW interpret, understand, and use functions to solve algebraic problems.

Additional High School Math Learner Will Statements

Calculus

Functions

TLW simplify expressions and solve equations involving real exponents

TLW solve equations involving logarithmic functions

TLW solve equations or simplify

Limits

TLW apply the limit theorems to find the limit of a polynomial

Derivatives

TLW find the derivative of equations definition of a derivative

TLW find the derivative of equations using formulas for differentiation

Applications

TLW graph functions using pts of inflection and max and min values

TLW solve related rate problems

Integration

TLW simplify expression and solve equations involving real exponents

TLW solve equations involving logarithmic functions

TLW solve equations or simplify

Applications

TLW simplify expressions and solve equations involving real exponents

TLW solve equations involving logarithmic functions

TLW solve equations or simplify

Pre Calculus Learner Will Statements

Polynomial Functions

TLW solve problems using prediction equations

- TLW identify and graph special function (direct variation, constant)
- TLW identify, absolute value, and greatest integer functions
- TLW determine the inverse of a function or relation
- TLW identify general shapes of the graphs of polynomial functions
- TLW find factors of polynomials using the Factor Theorem and synthetic division
- TLW solve problems by using more than one strategy
- TLW find the number of positive real zeros, negative real zeros, and complex zeros for a polynomial function
- TLW find zeros of polynomials functions
- TLW graph polynomial functions to find significant points
- TLW find the composition of functions
- TLW graph a function and its inverse

Logarithmic and Exponential Functions

- TLW simplify expressions and solve equations involving real exponents
- TLW solve equations involving logarithmic functions
- TLW solve equations or simplify and evaluate expressions using properties of logarithms
- TLW find common logarithms and antilogarithms
- TLW find natural logarithms of numbers
- TLW solve problems using estimation

Series and Sequence

- TLW find the next number in a sequence
- TLW find arithmetic means
- TLW use the sigma notation to express the sum
- TLW find geometric means
- TLW sigma notation to express the sum
- TLW find the sum of an infinite geometric series
- TLW find specific terms of the binomial expansion

TLW use math induction to prove equations true

Complex Numbers

TLW multiply, divide, find powers and roots of complex numbers in polar form

TLW Apply DeMoivre's Theorem

TLW solve problems involving direct, inverse, and joint variation

TLW locate the asymptotes and sketch the graph of a rational function

TLW solve problems involving direct, inverse, and joint variations

Statistics Learner Will Statements

Probability

TLW predict events based on probability

TLW solve problems by using models

TLW solve problems using the Basic Counting Principle

TLW solve problems using permutations

TLW solve problems involving combinations

TLW find the probability of an event and determine the odds of success or failure

TLW find the probability of two or more independent or dependent events

TLW find the probability of mutually exclusive events or inclusive events

TLW use binomial experiments to find probabilities

Trigonometry Learner Will Statements

Circular Functions

TLW verify identities using the sum, difference, half and double angle formulas

The Trigonometric Functions

TLW find the values of expressions involving all six trigonometric functions

- a) using a calculator
- b) using a Table
- c) using a Unit circle

Graphs of Trigonometric Functions

TLW graph the 6 trigonometric functions and list the domain and range

TLW find the amplitude and period and phase shift for variations of the sine and cosine functions

TLW graph the 6 trigonometric functions with amplitude, period, phase shift and range changes

TLW graph compound trigonometric functions

TLW inverses of trigonometric functions

TLW graph the 6 inverse trigonometric functions and list the domain and range

Applications of Trigonometry

TLW solve trigonometric equations

TLW solve word problems using right triangle trigonometry

TLW solve triangles using the Law of Sines

TLW solve triangles using the Law of Cosines