York Public Schools **Subject Area: Math** **Grade: 12** **Course: Tech Math**

UNITS	STANDARD	OBJECTIVES (What it looks like in the classroom) The learner will...	NUMBER OF DAYS TAUGHT	DATE ASSESSED	ASSESSMENT TYPE	Resources (Materials, websites, auto-visual, print)	LEARNING ACTIVITIES AND VOCABULARY
Basics of Geometry	12.2.5 Measurement: Students will apply the units, systems, and formulas to solve problems	**Measure segments and angles (1)**	**1 week**	**Aug**	**Classroom**	**Textbook**	**Direct Instruction, Guided practice, check for understanding**
Find and Describe Patterns	12.2.4 Spatial Modeling: Students use visualization, special reasoning, and geometric modeling to solve problems	**Make predictions and conjectures based on patterns (1)**	**1 week**	**Aug**	**Classroom**	**Textbook**	**Direct Instruction, Guided practice, check for understanding, create visual interpretations**
Segments and angles	12.2.1 Characteristics: Students will analyze characteristics, properties, and relationships among geometric shapes and objects	**Use properties of equality and congruence (2)**	**1-2 weeks**	**Sept.**	**Classroom**	**Textbook**	**Direct Instruction, Guided practice, check for understanding**
Parallel and Perpendicular Lines	12.2. Characteristics: Students will analyze characteristics, properties, and relationships among geometric shapes and objects	**Use properties of parallel and perpendicular lines (3)**	**2 weeks**	**Oct.**	**Classroom**	**Textbook**	**Direct Instruction, Guided practice, check for understanding**

Triangle Relationships	12.2.1 Characteristics: Students will analyze Characteristics, properties, and relationships among geometric shapes and objects	**Classify triangles and finding their angle measures (4)**	**2-3 weeks**	**Oct.**	**Classroom**	**Textbook**	**Direct Instruction, Guided Practice, check for understanding, create graphic organizers**
Congruent Triangles	12.2.1 Characteristics: Students will analyze Characteristics, properties, and relationships among geometric shapes and objects	**Show triangles are congruent (5)**	**2-3 weeks**	**Nov.**	**Classroom**	**Textbox**	**Direct Instruction, Guided Practice, check for understanding**
Quadrilaterals	12.2.1 Coordinate Geometry: Students will use coordinate geometry to analyze and describe relationships in the coordinate plane	**Use properties of quadrilaterals (6)**	**2-3 weeks**	**Dec.**	**Classroom**	**Textbook**	**Direct Instruction, Guided Practice, check for understanding, create graphic organizers**
Similarity	12.2.1 Spatial Modeling: Students will use visualization, special reasoning, and geometric modeling to solve problems	**Identify and draw dilations (7)**	**1 week**	**Jan.**	**Classroom**	**Textbook**	**Direct Instruction, Guided Practice, check for understanding**

Polygons and Area	12.2.1 Characteristics: Students will analyze characteristics, properties, and relationships among geometric shapes and objects	**Find the circumference and area of polygons (8)**	**1 week**	**Jan.**	**Classroom**	**Textbook**	**Direct Instruction, Guided Practice, check for understanding, create visual interpretations**
Circumference and Area of Circles	12.2.1 Characteristics: Students will analyze characteristics, properties, and relationships among geometric shapes and objects.	**Find the circumference and area of circles (8)**	**1 week**	**Feb.**	**Classroom**	**Textbook**	**Direct Instruction, Guided Practice, check for understanding**
Surface Area and Volume	12.2.5 Measurement: Students will apply the units, systems, and formulas to solve problems	**Find the surface area and volume of solids (9)**	**2-3 weeks**	**March**	**Classroom**	**Textbook**	**Direct Instruction, Guided Practice, check for understanding, 3-D solid manipulation**
Right Triangles	12.2.2 Coordinate Geometry: Students will use coordinate geometry to analyze and describe relationships in coordinate plane	**Find side lengths of special triangles (10)**	**1-2 weeks**	**March**	**Classroom**	Textbook	**Direct Instruction, Guided Practice, check for understanding**

Trigonometry	12.2.1 Characteristics: Students will analyze characteristics, properties, and relationships among geometric shapes and objects	**Find trigonometric ratios of acute triangles (10)**	**1-2 weeks**	**April**	**Classroom**	Textbook	**Direct Instruction, Guided Practice, check for understanding**
Circles	12.2.1 Characteristics: Students will analyze characteristics, properties, and relationships among geometric shapes and objects	**Apply properties of circles and their relationships with angles**	**2-3 weeks**	**May**	**Classroom**	Textbook	**Direct Instruction, Guided Practice, check for understanding**

Nebraska State Accountability-Mathematics (NeSA-M)
Table of Specifications

Grade 11

Number Sense

Gr11 Number System	Highest DOK Level Tested	DOK 1	DOK 2	DOK 3	Item Total
MA 12.1.1 Students will represent and show relationships among real numbers					
MA 12.1.1.a Demonstrate Multiple Equivalent Forms of Irrational numbers	Assested	At	The	Local	Level
MA 12.1.1.b Compare, contrast, and apply the properties of numbers and the real number system, including the rational, irrational, imaginary and complex numbers	Assested	At	The	Local	Level
Gr11 Operations	Highest DOK Level Tested	DOK 1	DOK 2	DOK 3	Item Total
MA 12.1.2 Students will demonstrate the meaning and effects of arithmetic operations with real numbers					
MA 12.1.2.a Use drawings, words, and symbols to explain the effects of such operations as multiplication and division, and computing positive powers and roots on the magnitude of quantities	Assested	At	The	Local	Level
MA 12.1.2.b USe drawings,words and symbols to explain the distance between two numbers on the number line is the absolute value of their difference	Assested	At	The	Local	Level
Gr11 Computation	Highest DOK Level Tested	DOK 1	DOK 2	DOK 3	Item Total
MA 12.1.3 Students will compute fluently and accurately using appropriate strategies and tools					
MA 12.1.3.a Compute accurately with real numbers	1	1-2	0	0	1-2
MA 12.1.3.b Simplify exponential expressions	2	0	1-2	0	1-2
MA 12.1.3.c Multiply and divide numbers using scientific notation	Assessed	At	The	Local	Level

MA 12.1.3.d Select, apply and explain the method of computation when problem solving using real numbers	Assessed	At	The	Local	Level
Gr11 Estimation	Highest DOK Level Tested	DOK 1	DOK 2	DOK 3	Items Total
MA. 12.1.4 Students will estimate and check reasonableness of answers using appropriate strategies and tools.					
Ma 12.1.4.a Use estimation methods to check the reasonableness of real number computations and decide if the problem calls for an approximation or exact number	2	0-1	1-2	0	1-3
MA 12.1.4.b Distinguish relevant from irrelevant information, identify missing information and either find what is needed or make appropriate estimates	Assested	At	The	Local	Level
GEOMETRIC/MEASUREMENT CONCEPTS					
Gr11 Characteristics	**Highest DOK Level Tested**	**DOK 1**	**DOK 2**	**DOK 3**	**Item Total**
MA 12.2.1 Students will analyze characteristics, properties, and relationships among geometric shapes and objects					
12.2.1.a Identify and explain the necessity of and give examples of definitions and theorems	Assested	At	The	Local	Level
MA. 12.2.1.b Analyze properties and relationships among classes of two and three dimensional geometric objects using inductive reasoning and counterexamples	Assested	At	The	Local	Level
MA 12.2.1.c State and prove geometric theorems using deductive reasoning	Assested	At	The	Local	Level
MA 12.2.1.d Apply geometric properties to solve problems	2	0-1	3-4	0	3-5
MA 12.2.1.e Identify and apply right triangle relationships	2	0-1	2-4	0	2-5
MA 12.2.1.f Recognize that there are geometries, other than Euclidean geometry, in which the parallel postulate is not true	Assested	At	The	Local	Level
MA 12.2.1.g Know the definitions and basic properties of a circle and use them to prove basic theorems and solve problems	Assested	At	The	Local	Level
Gr11 Coordinate Geometry	**Highest DOK Level Tested**	**DOK 1**	**DOK 2**	**DOK 3**	**Item Total**

MA 12.2.2 Students will use coordinate geometry to analyze and describe relationships in the coordinate plane					
MA 12.2.2.a Use coordinate geometry to analyze geometric situations	2	0-1	2-3	0	2-4
MA 12.2.2.b Apply the midpoint formula	Assessed	At	The	Local	Level
MA 12.2.2.c Apply the distance formula	2	0-1	1-2	0	1-3
MA 12.2.2.d Prove special types of triangles and quadrilaterals	3	0	0-1	1-2	1-3
Gr11 Transformations	Highest DOK Level Tested	DOK 1	DOK 2	DOK 3	Items Total
MA 12.2.3 Students will apply and analyze transformations					
MA 12.2.3.a Explain and justify the effects of simple transformations on the ordered pairs of two-dimensional shapes	Assessed	At	The	Local	Level
MA 12.2.3.b Perform and describe multiple transformations	Assessed	At	The	Local	Level
Gr11 Spatial Modeling	Highest DOK Level Tested	DOK 1	DOK 2	DOK 3	Items Total
MA 12.2.4 Students will use visualization, spatial reasoning, and geometric modeling to solve problems					
MA 12.2.4.a Sketch and draw appropriate representatives of geometric objects using ruler, protractor, or technology	Assessed	At	The	Local	Level
MA 12.2.4.b Use geometric models to visualize, describe, and solve problems	2	0-1	2-3	0	2-4
Gr11 Measurement	Highest DOK Level Tested	DOK 1	DOK 2	DOK 3	Items Total
MA 12.2.5 Students will apply the units, systems and formulas to solve problems					
MA 12.2.5.a Use strategies to find surface area and volume of complex objects	Assessed	At	The	Local	Level
MA 12.2.5.b Apply appropriate units and scales to solve problems involving measurement	Assessed	At	The	Local	Level
MA 12.2.5.c Convert between various units of area ad volume, such as square feet to square yards	Assessed	At	The	Local	Level
MA 12.2.5.d Convert equivalent rates	2	1-2	1-2	0	2-4

MA 12.2.5.e Find arc length and area of sectors of circle	Assessed	At	The	Local	Level
MA 12.2.5.f Determine surface area and volume of three-dimensional objects	Assessed	At	The	Local	Level
MA 12.2.5.g Know that the effect of a scale factor K on length, area and volume is to multiply each k, k 2 and k 3, respectively	Assessed	At	The	Local	Level
Gr11 Relationships	Highest DOK Level Tested	DOK 1	DOK 2	DOK 3	Items Total
MA 12.3.1 Students will generalize, represent, and analyze relationships using algebraic symbols					
MA 12.3.1.a Represent, interpret, and analyze functions with graphs, tables, and algebraic notation, and convert among these representations	3	0	2-3	1-2	3-5
MA 12.3.1.b Identify domain and range of functions represented in either symbolic or graphical form	Assessed	At	The	Local	Level
MA 12.3.1.c Identify the slope and intercepts of a linear relationship from an equation or graph	2	0-1	2-3	0	2-4
MA 12.3.1.d Identify characteristics of linear and non-linear functions	3	0	2-3	1-2	3-5
MA 12.3.1.e Graph linear and non-linear functions	Assessed	At	The	Local	Level
MA 12.3.1.f Compare and analyze the rate of change by using ordered pairs, tables, graphs, and equations	3	0	1-2	1-2	2-4
MA 12.3.1.g Graph and interpret linear inequalities	Assessed	At	The	Local	Level
MA 12.3.1.h Represent, interpret, and analyze functions and their inverses	Assessed	At	The	Local	Level
MA 12.3.1.i Determine if a relationship is a function	Assessed	At	The	Local	Level
Gr11 Modeling in Context	Highest DOK Level Tested	DOK 1	DOK 2	DOK 3	Item Total
MA 12.3.2 Students will model and analyze quantitative relationships					
Ma 12.3.2.a Model contextualized problems using various representations	Assessed	At	The	Local	Level
MA 12.3.2.b Represent a variety of quantitative relationships using linear equations and one variable inequalities	3	0	0	2-4	2-4
MA 12.3.2.c Analyze situations to determine the type of algebraic relationships	Assessed	At	The	Local	Level

MA 12.3.2.d Model contextualized problems using various representations for non-linear functions	Assessed	At	The	Local	Level
Gr11 Procedures	HIghest DOK Level Tested	DOK1	DOK 2	DOK 2	Items Total
MA 12.3.3 Students will represent and solve equations and inequalities					
MA 12.3.3.a Explain/apply the reflexive, symmetric, and transitive properties of equality	Assessed	At	The	Local	Level
MA 12.3.3.b Simplify algebraic expressions involving exponents	1	1-3	0	0	1-3
MA 12.3.3.c Add and subtract polynomials	1	1-3	0	0	1-3
MA 12.3.3.d Multiply and divide polynomials	1	1-3	0	0	1-3
MA 12.3.3.e Factor polynomials	Assessed	At	The	Local	Level
MA 12.3.3.f Identify and generate equivalent forms of linear equations	1	1-3	0	0	1-3
MA 12.3.3.g Solve linear equations and inequalities including absolute value	Assessed	At	The	Local	Level
MA 12.3.3.h Identify and explain the properties used in solving equations and inequalities	Assessed	At	The	Local	Level
Ma 12.3.3.i Solve quadratic equations	Assessed	At	The	Local	Level
MA 12.3.3.j Add, subtract and simplify rational expressions	Assessed	At	The	Local	Level
MA 12.3.3.k Multiply, divide, and simplify rational expressions	Assessed	At	The	Local	Level
MA 12.3.3.l Evaluate polynomial and rational expressions and expressions containing radicals and absolute values at specified values of their variables	Assessed	At	The	Local	Level
MA 12.3.3.m Derive and use the formulas for the general term and summation of finite arithmetic and geometric series	Assessed	At	The	Local	Level
MA 12.3.3.n Combine functions by composition, as well as by addition, subtraction , multiplication, and division	Assessed	At	The	Local	Level
MA 12.3.3.o Solve an equation involving several variables for one variable in terms of the other	Assessed	At	The	Local	Level
MA 12.3.3.p Analyze and solve systems of two linear equations in two variables algebraically and graphically	Assessed	At	The	Local	Level
DATA ANALYSIS PROBABILITY CONCEPTS					

Gr11 Display and Analysis	Highest DOK Level Tested	DOK 1	DOK 2	DOK 3	Item Total
MA 12.4.1 Students will formulate a question and design a survey or an experiment in which data is collected and displayed in a variety of formats, then select and use appropriate statistical methods to analyze the data					
MA 12.4.1.a Interpret data represented by the normal distribution and formulate conclusions	Assessed	At	The	Local	Level
MA 12.4.1.b Compute, identify, and interpret measures of central tendency (mean, median, mode) when provided a graph or data set	Assessed	At	The	Local	Level
MA 12.4.1.c Explain how sample size and transformations of data affect measures of central tendency	Assessed	At	The	Local	Level
MA 12.4.1.d Describe the shape and determine the spread (variance, standard deviation) and outliers of a data set	2	0	2-3	0	2-3
MA 12.4.1.e Explain how statistics are used or misused in the world	Assessed	At	The	Local	Level
MA 12.4.1.f Create scatter plots, analyze patterns, and describe relationships in paired data	Assessed	At	The	Local	Level
MA 12.4.1.g Explain the impact of sampling methods, bias, and the phrasing of questions asked during data collection and the conclusion that can rightfully be made	Assessed	At	The	Local	Level
MA 12.4.1.h Explain the difference between randomized experiment and observational studies	Assessed	At	The	Local	Level
Gr11 Predictions and Inferences	Highest DOK Level Tested	DOK 1	DOK 2	DOK 3	Item Total
MA 12.4.2 Students will develop and evaluate inferences to make predictions					
MA 12.4.2.a Compare data set and evaluate conclusions using graphs and summary statistics	Assessed	At	The	Local	Level
MA 12.4.2.b Support inferences with valid arguments	Assessed	At	The	Local	Level
MA 12.4.2.c Develop linear equations for linear models to predict unobserved outcomes using regression line and correlation coefficient	Assessed	At	The	Local	Level
MA 12.4.2.d Recognize when arguments based on data confuse correlation with caution	Assessed	At	The	Local	Level
Gr11 Probability	Highest DOK	DOK 1	DOK 2	DOK 3	Item

	Level Tested				Total
MA 12.4.3 Students will apply and analyze concepts of probability					
MA 12.4.3.a Construct a sample space and a probability distribution	Assessed	At	The	Local	Level
MA 12.4.3.b Identify dependent and independent events and calculate their probabilities	2	1-2	1-2	0	2-4
MA 12.4.3.c Use the appropriate counting techniques to determine the probability of an event	2	1-2	0-1	0	1-3
MA 12.4.3.d Analyze events to determine if they are mutually exclusive	2	0-1	1-2	0	1-3
MA 12.4.3.e Determining the relative frequency of a specified outcome of an event to estimate the Probability of the outcome	Assessed	At	The	Local	Level

TECHNICAL MATHEMATICS

PREREQUISITES: Teacher recommendation and successful completion of Geometry or Geometry Concepts

COURSE DESCRIPTION: This course begins the development of math skills for success in specific vocational/technical fields. Major emphasis is placed on problem solving and actual on-the-job applications.

II. COURSE OBJECTIVES

Upon completion of the course, the students will be able to

1. Apply basic arithmetic properties
2. Apply measurement concepts to real-world applications
3. Apply ratios and proportions to problem-solving for technical applications
4. Apply formula manipulations and evaluation for problem solving for unknown values
5. Apply geometric formulas and concepts to problem solving of technical applications
6. Apply right triangle relationships to problem solving of technical applications

III. STUDENT LEARNING OUTCOMES

Upon completion of this course, the student will be able to:

1. Apply basic arithmetic to technical applications
2. Find and convert measurements
3. Compare quantities in ratio from and by solving both direct and inverse proportions
4. Analyze and manipulate formulas for problem with unknown values
5. Identify and apply perimeter, area, and volume formulas for two-dimensional and three dimensional figures
6. Solve right triangles

IV. CONTENT/TOPICAL OUTLINE

A. Basic Arithmetic
    a. Review of operations with whole numbers, fractions, and decimals
    b. With and without technology
B. Percent
    a. Convert between fractions, decimals, and percents
    b. Solve percent problems for base, percent, or amount given two of the quantities
    c. Apply percents to real world applications, ie. sales tax, discount, tolerance, commision
C. Ratios, Proportions, INverse & Direct Variation
D. Measurement System
    a. English to English conversions for length, area, volume, and weight
        i. The minimum expectation is that the conversions listed are memorized:
            1. Inches, Feet, Yards

        a. Ounces, Pounds, Ton
        b. Fluid ounces, Cups, Pints, Quarts, Gallons
    b. Metric to metric conversions for length, area, volume, and weight, and weight
        i. The minimum expectation is that the metric prefixes from Kilo- to Milli- are memorized
    c. Metric to English conversions, and vice versa, for length, area, volume, and weight
        i. The minimum expectation is that the following conversations are memorized
            1. 1 inch= 2.44 Centimeters
            2. 1 Pound= 2.2 Kilograms
            3. 1 Quart= 1.06 Liters
E. Significant Digits, Precision, Accuracy
F. Measuring Tools
    a. Measure with a variety of tools, including the ruler, tape measure, caliper, and micrometer
    b. Read a Vernier scale on micrometers and calipers
G. Scientific Notation
    a. Convert between standard notation and scientific notation
    b. Multiply and divide numbers in scientific notation
H. Exponential Notation and Square Roots
I. Operations with Integers
    a. With and without technology
J. Order of Operations
    a. Include square roots and powers
K. Alebra
    a. Translate an English phrase to a mathematical equation
    b. Isolate a variable in an equation
    c. Solve one and two-step equations
    d. Manipulate and evaluate formulas
L. Geometry
    a. Classify angles
    b. Measure angles with a protractor
    c. Determine the values of angels in relationships with a transversal
    d. Identify polygons, ie. triangles, quadrilaterals, pentagons, hexagons
    e. Calculate area and perimeter of basic shapes, ie. squares, rectangles, parallelograms, triangles, circles
    f. Calculate volume of basic solids, ie. prisms, cubes, cones, cylinders, pyramids, and spheres
    g. Calculate area and volume of irregular shapes consisting of the basic shapes
        i. A reference sheet with formulas will be provided
M. Right triangle Trigonometry
    a. Apply the Pythagorean Theorem

b. Find the sine, cosine, and tangent of an angle
c. Solve right triangles for all sides and angles
d. Solve real world applications involving right triangles
    i. Definitions of the sine, cosine, and tangent ratios are to be memorized

V. INSTRUCTIONAL MATERIALS:

A. Required Textbook
    a. Mathematics for the Trades: A guide approach; 9th ed.; Carman and Saunders, Person Publishing ISBN 978-0-906708-2

B. Supplemental Materials
    a. TI-30 XS Multiview Scientific Calculator
    b. Measuring tools or online simulators (tape measure, micrometer, caliper and other measuring tools)