



Department: Mathematics

Course Name: Math for Technical

Course Description: Mathematical applications related to skilled trades such as plumbing, electrical, construction, HVAC, automotive and design. Independent units are dedicated to mathematical skills and concepts that translate to real-world job skills. Guest speakers and application projects will be utilized throughout the course.

Prerequisite: Successful completion of Algebra II.

UNIT # 1	
Unit Title: Literal Equations and Formulas	
Unit Description: Students will be able to manipulate literal equations and formulas in appropriate applications.	
LEARNING GOALS	
<p>Enduring Understanding(s):</p> <ul style="list-style-type: none"> Multiple representations of a single equation are possible. Equations that have the same solution set are equivalent 	<p>Essential Question(s):</p> <ul style="list-style-type: none"> What form of a given equation would be most useful in working with a specific real-world situation?
<p>Content and Skills: <i>Students will be able to:</i></p> <ul style="list-style-type: none"> Rewrite equations in equivalent forms Interpret meaning of formulas in the context of a real-world situation Determine most appropriate form of a literal equation for a real-world task Apply formulas to solve for unknowns in technical applications 	
<p>Standards Addressed: CCSS.MATH.CONTENT.HSA.SSE.A.1 Interpret expressions that represent a quantity in terms of its context. CCSS.MATH.CONTENT.HSA.CED.A.1 Create equations and inequalities in one variable and use them to solve problems. <i>Include equations arising from linear and quadratic functions, and simple rational and exponential functions.</i> CCSS.MATH.CONTENT.HSA.CED.A.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. CCSS.MATH.CONTENT.HSA.CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. <i>For example, rearrange Ohm's law $V = IR$ to highlight resistance R.</i> CCSS.MATH.CONTENT.HSN.Q.A.1</p>	

Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

CCSS.MATH.CONTENT.HSN.Q.A.2

Define appropriate quantities for the purpose of descriptive modeling.

CCSS.MATH.CONTENT.HSN.Q.A.3

Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

UNIT # 2

Unit Title: Measurement and Dimensional Analysis

Unit Description:

Students will be able to appropriately and accurately find measurements of quantities and convert between multiple units, using multiple formats.

LEARNING GOALS

Enduring Understanding(s):

- Multiple units are used to measure an individual quantity (i.e. length, area, volume, etc.)
- In any equation involving real-world units, each value or term has units which make the equation true

Essential Question(s):

- What units are most appropriate for a given task, and how do professionals know which to use?

Content and Skills:

Students will be able to:

- Convert between appropriate units using dimensional analysis
- Measure units and make calculations to an appropriate level of accuracy
- Appropriately convert between standard, scientific, and engineering notation using proper prefixes
- Use ratios and proportions to create similar figures with appropriate scale factor
- Test for similarity and apply to real-world problems
- Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.
- Understand the concept of a unit rate a/b associated with a ratio $a:b$ with $b \neq 0$, and use rate language in the context of a ratio relationship.
- Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.

Standards Addressed:

CCSS.MATH.CONTENT.HSG.SRT.A.2

Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.

CCSS.MATH.CONTENT.HSG.MG.A.1

Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).*

CCSS.MATH.CONTENT.HSG.GPE.B.7

Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.

CCSS.MATH.CONTENT.HSN.Q.A.1

Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

CCSS.MATH.CONTENT.HSN.Q.A.2

Define appropriate quantities for the purpose of descriptive modeling.

CCSS.MATH.CONTENT.HSN.Q.A.3

Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

UNIT # 3

Unit Title: Applied Geometric Concepts

Unit Description:

Students will use area, volume, trigonometry, and proportional reasoning to investigate real-world problems involving measurement.

LEARNING GOALS

Enduring Understanding(s):

- Common area formulas are used to break up complex polygonal regions into manageable spaces
- Several trigonometric relationships are used to solve for unknown angles and side lengths involving triangular regions
- Proportional reasoning is used to help model with a scale factor and to convert units of measurement

Essential Question(s):

- What is the best geometric approximation that can be used for this real-world situation?

Content and Skills:

Students will be able to:

- Calculate areas and volumes in a given real-world situation with desired accuracy
- Find appropriate mathematical models that can be used
- Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.
- Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas $V = lwh$ and $V = bh$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.
- Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.
- Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

Standards Addressed:

CCSS.MATH.CONTENT.HSG.GMD.A.3

Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.

CCSS.MATH.CONTENT.HSG.MG.A.1

Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).*

CCSS.MATH.CONTENT.HSG.MG.A.2

Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).*

CCSS.MATH.CONTENT.HSG.MG.A.3

Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).

CCSS.MATH.CONTENT.HSG.GPE.B.7

Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.

UNIT # 4

Unit Title: Applied Mathematical Modeling

Unit Description:

Students will create solutions to real-world situations involving appropriate measurements, scale drawings, and justification for their thinking. Students will justify their reasoning for presentation to an appropriate audience.

LEARNING GOALS

Enduring Understanding(s):

- Mathematicians use scale drawings and models to create accurate previews of a final desired outcome.
- In a real-world situation, justification should include possible sources of error, reasoning for decision making, and appropriate reflection.

Essential Question(s):

- Why is the proposed solution acceptable given the goals and constraints of the project?

Content and Skills:

Students will be able to:

- Scale models and drawings to the appropriate size using proportions
- Justify answers through detailed explanations and mathematical proof
- Develop an appropriate model for a complex situation
- Apply mathematical model to illuminate a problem or situation.

Standards Addressed:

CCSS.MATH.CONTENT.HSG.CO.A.1

Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.

CCSS.MATH.CONTENT.HSG.CO.D.12

Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). *Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.*