COMMUNITY UNIT SCHOOL DISTRICT 200

Geometry
High School
Intermediate Level – Two Semesters

1. Subject Expectation (State Goal 6) — **The student will demonstrate and apply a knowledge and sense of numbers, including numeration and operations (addition, subtraction, multiplication, division), patterns, ratios and proportions.**

Essential Learning 1 (Learning Standard A)	**Demonstrate knowledge and use of numbers and their representations in a broad range of theoretical and practical settings**

Critical Content	6.A.4	a.	identify and apply the associative, commutative, distributive and identity properties of real numbers, including special numbers such as pi and square roots • apply distance formula and Pythagorean Theorem to express answers in reduced radical form • use algebra skills to find geometric measurements, such as angle measure, segment lengths, perimeter, and area • express the circumference and area of a circle in terms of pi • identify side lengths of special right triangles in reduced radical form • incorporate algebraic properties into geometric proofs

Essential Learning 2 (Learning Standard B)	**Investigate, represent and solve problems using number facts, operations (addition, subtraction, multiplication, and division) and their properties, algorithms and relationships**

Critical Content	6.B.4	a.	select and use appropriate arithmetic operations in practical situations • use arithmetic skills to calculate measures of angles, segment lengths, distance, and midpoints

Essential Learning 3 (Learning Standard C)	**Compute and estimate using mental mathematics, paper and pencil methods, calculators and computers**

Critical Content	6.C.4	a.	determine whether exact values or approximations are appropriate • apply distance formula and Pythagorean Theorem to express answers in reduced radical form

- express the circumference and area of a circle in terms of pi
- use decimal approximations in solving real-life applications

Essential Learning 4 (Learning Standard D)	**Solve problems using comparison of quantities, ratios, proportions and percents**

Critical Content

6.D.3 a. apply ratios and proportions to solve practical problems
- set up proportions to find missing side lengths in similar and/or congruent figures
- recognize the relationship between the ratio of side lengths and the ratio of areas in similar figures

6.D.4 b. solve problems involving recipes or mixtures, financial calculations and geometric similarity using ratios, proportions and percents
- set up proportions to find missing side lengths in similar and/or congruent figures
- recognize the relationship between the ratio of side lengths and the ratio of areas in similar figures

2. Subject Expectation (State Goal 7)

The student will estimate, make, and use measurements of objects, quantities and relationships and determine acceptable levels of accuracy.

Essential Learning 1 (Learning Standard A)	**Measure and compare quantities using appropriate units, instruments and methods**

Critical Content

7.A.4a a. apply units and scales to describe and compare numerical data and physical objects
- use appropriate units to label measurements for length, area, and volume
- use dimensional analysis to convert measurements to appropriate units for real-life applications

7.A.4b b. apply formulas in a wide variety of theoretical and practical real-world measurement applications, involving perimeter, area, volume, angle, time, temperature, mass, speed, distance, density, and monetary values
- apply the appropriate area or volume formula for a given figure
- recognize that the distance formula is a direct extension of the Pythagorean Theorem
- apply the appropriate angle formulas for polygons

Essential Learning 2 (Learning Standard B)	**Estimate measurements and determine acceptable levels of accuracy**

Critical Content

7.B.4 a. estimate and measure the magnitude and directions of physical quantities (e.g., velocity, force, slope) using rulers, protractors and other scientific instruments including timers, calculators

and/or computers
- use slope to determine if two lines are parallel, perpendicular, or oblique
- use slope to solve problems in coordinate geometry

7.B.5 b. estimate perimeter, area, volume, and capacity of irregular shapes, regions, and solids and explain the reasoning supporting the estimate
- determine if an answer is valid for a real-life application
- use mental math to estimate quantities

Essential Learning 3 (Learning Standard C)	**Select and use appropriate technology, instruments and formulas to solve problems, interpret results and communicate findings**

Critical Content

7.C.4a a. make indirect measurements, including heights and distances, using proportions (e.g., finding the height of a tower by its shadow)
- set up a proportion using similar triangles

7.C.4b b. interpret scale drawings and models using maps and blueprints
- use a scale factor to determine the actual size and/or length of an object.

7.C.4c c. convert within and between measurement systems and monetary systems using technology where appropriate
- use dimensional analysis to convert measurements to appropriate units for real-life applications

7.C.5b d. determine how changes in one measure may affect other measures
- recognize what happens to the volume and surface area of a solid when one or more sides of the solid are altered
- recognize what happens to the area of a figure when one or more sides of the figure are altered

3. Subject Expectation (State Goal 8)

The student will use algebraic and analytical methods to identify and describe patterns and relationships in data, solve problems and predict results.

Essential Learning 1 (Learning Standard B)	**Interpret and describe numerical relationships using tables, graphs and symbols**

Critical Content

8.B.4a a. represent algebraic concepts with physical materials, words, diagrams, tables, graphs, equations, and inequalities and use appropriate technology
- create algebraic equations or expressions to solve geometric applications

Essential Learning 2 (Learning Standard D)	**Use algebraic concepts and procedures to represent and solve problems**

Critical Content	8.D.4	a.	formulate and solve linear and quadratic equations and linear inequalities algebraically and investigate nonlinear inequalities using graphs, tables, calculators and/or computers • create linear equations to solve for various geometric measurements, including angle measure, segment lengths, and side lengths in figures • create quadratic equations to solve right triangles and distance formula applications involving the coordinate plane

4. Subject Expectation (State Goal 9)

The student will use geometric methods to analyze, categorize, and draw conclusions about points, lines, planes, and space.

Essential Learning 1 (Learning Standard A)	**Demonstrate and apply geometric concepts involving points, lines, planes and space**

Critical Content	9.A.5	a.	use geometric figures and their properties to solve problems in the arts, the physical and life sciences, and the building trades, with and without the use of technology • set up a proportion using similar triangles to indirectly measure distance and height • apply right triangle trigonometry to indirectly measure distance and height

Essential Learning 2 (Learning Standard B)	**Identify, describe, classify and compare relationships using points, lines, planes and solids**

Critical Content	9.B.4	a.	recognize and apply relationships within and among geometric figures • classify triangles based on angle measurements and side lengths • categorize quadrilaterals • set up proportions to find missing side lengths in similar and/or congruent figures • apply properties of special segments in triangles (i.e. medians and altitudes) • classify angles formed by parallel lines cut by a transversal • recognize the relationship between special segments in circles

Essential Learning 3 (Learning Standard C)	**Construct convincing arguments and proofs to solve problems**

Critical Content	9.C.4a	a.	construct and test logical arguments for geometric situations, using technology when appropriate • write conditional statements and determine truth values • use deductive reasoning to reach logical conclusions

- use inductive reasoning to arrive at a plausible generalization

9.C.4c b. develop and communicate mathematical proofs
- algebraic proofs
- segment and angle proofs
- parallel and perpendicular line proofs
- triangle proofs

9.C.5b c. apply physical models, graphs, coordinate systems, networks and vectors to develop solutions in applied contexts (e.g., bus routing, areas of irregular shapes, describing forces and other physical quantities)
- calculate areas of irregular figures

Essential Learning 4 (Learning Standard D)	**Use trigonometric ratios and circular functions to solve problems.**

Critical Content 9.D.4 a. analyze and solve problems involving triangles (e.g., distances which cannot be measured directly) using trigonometric ratios
- apply right triangle trigonometry to indirectly measure distance and height
- use trigonometric ratios to solve right triangles

5. Subject Expectation (State Goal 10) — Collect, organize and analyze data using statistical methods; predict results; and interpret uncertainty using concepts of probability.

Essential Learning 1 (Learning Standard A)	**Organize, describe, and make predictions from existing data**

Critical Content 10.A.4a a. represent and organize data by creating lists, charts, tables, frequency distributions, graphs, scatter plots, and box-plots
- organize information in a proof format