**Unit descriptions and Essential Vocabulary- Geometry: Concepts & Connections**

Unit 0-Building a Profile of a Learner

This unit, while not a “formal” unit of Geometry is ESSENTIAL to success this year. This unit will be completed during the first two weeks of school. During this unit the teacher will build an understanding of the learner as well as their needs from an educational perspective. The students will build an understanding of the teacher and her expectations as well as gain vital understandings of how the brain learns and grows, an understanding which will guide their learning all year. The following is a basic list of the concepts we will cover during this time:

* Classroom Policies and Procedures
* Profile of a Learner Completion
* What do I need to be successful in this class?
* Personality Assessments
* Metacognition
* Get to know your classmates and teacher
* How do I “grow” my brain?
* Developing a Growth Mindset
* Studies in Achievement
* Use of Effective Study Skills
* Test Taking Skills and Strategies

Unit 1- Exploring Polynomial Expressions through Geometry

This unit develops the structural similarities between the system of polynomials and the system of integers. Students draw on analogies between polynomial arithmetic and base–ten computations, focusing on properties of operations, particularly the distributive property through geometry contexts. Students connect multiplication of polynomials with multiplication of multi– digit integers through geometric contexts. In this unit, students solve problems and interpret the structure of expressions through geometric contexts. Teachers should provide students with a broad range of contextual problems that offer opportunities for performing operations in applicable geometric contexts. The tasks presented in this unit address the G.PAR.2 standard to help students develop a conceptual understanding of the content.

* Binomial Expression
* Integer
* Standard Form of a Polynomial
* Constant Term
* Less Than
* Sum
* Coefficient
* Monomial Expression
* Term
* Difference
* Perimeter
* (Number #) Times
  + Example: two times, three times…
* Expression
* Polynomial
* Trinomial Expression
* Factor
* Quotient
* Twice
* Greater Than
* Ratio
* Variable

Unit 2-Geometric Foundations, Constructions, and Proofs

In this unit, we will revisit earlier studies in elementary, middle grades, and high school by formally exploring the geometric notions of point, line, plane and distance around a circular arc to aid in the development of precise definitions. Students will make geometric constructions to support their understanding of congruence and apply reasoning skills to explain why the constructions work. Students will use their understandings from Algebra: Concepts and Connections to classify quadrilaterals by proving geometric theorems algebraically. Students will use these foundations of geometry to construct arguments and solve geometric problems to model and explain real-life phenomena

* Angle Bisector
* Parallelogram
* Alternate Exterior Angles
* Plane
* Alternate Interior Angles
* Planar Region
* Compass
* Point
* Construction
* Proof
* Corresponding Angles
* Protractor
* Distance Formula
* Ray
* Line
* Same Side/Consecutive Interior Angles
* Line Segment
* Same Side/Consecutive Exterior Angles
* Linear Pairs
* Rectangle
* Midpoint Theorem
* Perpendicular Bisector
* Vertical Angles

Unit 3-Exploring Congruence

In this unit, students will be introduced to transformations in the coordinate plane, describe a sequence of transformations that will map one figure onto another, and describe transformations that will map a figure onto itself. Students will use rigid motion transformations to develop an understanding of congruence and use this to prove theorems involving triangles.

* Congruence
* Similarity
* Translation
* Side-Angle-Side (SAS)
* Reflection
* Angle-Angle-Side (AAS)
* Rotation
* Angle-Side-Angle (ASA)
* Congruence
* Hypotenuse-Leg (HL)
* Symmetry
* Rigid Motion
* Side-Side-Side (SSS)
* Isometry

Unit 4-Investigating Similarity

In this unit, students will explore nonrigid transformations and proportional reasoning to develop a formal understanding of similarity. Students will use the definition of dilation to describe similarity and the criterion for triangles to be similar. Similarity transformations (rigid motions followed by dilations) define similarity in the same way that rigid motions define congruence. These transformations lead to the criterion for triangle similarity that two pairs of corresponding angles are congruent. Students will use this to prove similarity involving triangles.

* Angle Bisector
* Pythagorean Theorem
* Center of Dilation
* Rigid Motion
* Congruence
* Scale Factor
* Dilation
* Similar
* Function Notation
* Similarity
* Midsegment Similarity
* Transformation
* Proof
* Theorem
* Proportionality Transformation

Unit 5-Right Triangle Trigonometry

In this unit, students will explore right triangle trigonometry in geometric contexts. Students will use concepts of similarity, from Unit 4, to develop relationships in right triangles to understand right triangle trigonometry, using sine, cosine, and tangent. Students will investigate the relationships between the sine and cosine of complementary angles and use them to solve problems. Students will use the trigonometric ratios and the Pythagorean Theorem to solve application problems involving right triangles to find missing sides and angles.

* Adjacent Side
* Opposite Side
* Angle of Depression
* Right Angle
* Angle of Elevation
* Similar Triangles
* Complementary Angles
* Sine
* Cosine
* Tangent
* Hypotenuse
* Trigonometric Ratio
* Ninety Degree Angle (90° Angle)
* Trigonometry

Unit 6-Making Sense of Circles

In this unit, students will examine and apply theorems involving circles and explore the concept of radian measure and special right triangles. Students will examine and apply theorems involving angle relationships formed by chords, secants, tangents and radii of circles. Students will use similarity to derive the length of an arc is proportional to the radius and derive the area of sectors of circles. Students will graph and write equations of circles in standard form. Students will extend their understanding of arc length in circles and begin exploring angles within the unit circle as a fraction of the circumference all the way around the unit circle. They will fluently convert between degrees and radians. Students will use special right triangles concepts to define the value of the sine, cosine, and tangent and understand the x (cosine), y (sine), and r (1) values of each angle measure found at all terminal angles that are multiples of 30° (𝜋 6 ), 45° ( 𝜋 4 ) and 60° ( 𝜋 3 ) around the unit circle, and will be able to find the sine, cosine, and tangent at all of these radians measures, as well.

* Arc
* Inscribed Angle
* Arc Length
* Inscribed Circle
* Arc Measure
* Major Arc
* Central Angle
* Minor Arc
* Chord
* Point of Tangency
* Circumcenter
* Secant Line
* Circumference
* Secant Segment
* Circumscribed Circle
* Sector
* Inscribed
* Tangent Line

Unit 7-Modeling with Equations and Measurement

In this unit, students will explore equations and measurement in geometric contexts as models for real-life phenomena developing informal arguments and solving problems involving volume. The learning plans included in this unit will provide opportunities for students to develop informal arguments for geometric formulas and solve contextual problems involving volume.

* Base
* Irregular Object
* Cavalieri’s Principle
* Oblique
* Solid Cone
* Prism
* Cylinder
* Pyramid
* Density
* Right Solid
* Geometric Properties
* Sphere
* Height
* Volume

Unit 8-Investigating Probability and Statistics

In this unit, students will calculate, model, and interpret probabilities of compound events. Students will calculate permutations and combinations within real-world contexts and develop probability distributions based on the entire sample space. Students will calculate the expected value of a probability distribution and understand it to be the mean of that probability distribution. Using expected value, students will make decisions about risk vs. reward in real-world situations such as games of chance and insurance. Students will organize real-life data in two-way frequency tables. They will explore two-way frequency tables to develop an understanding of probabilities for unions and intersections. Students will use the two-way frequency tables to find probabilities.

* Addition Rule
* Measures of Variability
* Chance
* Multiplication Rule
* Combination
* Permutation
* Complement
* Probability
* Compound Event
* Probability Distribution
* Conditional Probability
* Sample Space
* Empirical Probability
* Subset
* Expected Value
* Theoretical Probability
* Experimental Probability
* Two-way Frequency Tables
* Intersection
* Union

Unit 9-Culminating Capstone Experience

The Capstone Experience in mathematics is a culminating activity for the year designed to integrate and reflect upon the overall mathematics learning for the course. Students explore the content and make connections to the mathematics they previously learned by tying together all the learning that happened throughout the year.