



Honors Geometry

Course Number: 2415

Course Level: Honors

Grade: 9-12

Time/Credit: Grades 9 – 12: 1 credit
Senior High –1 block daily

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Central Bucks School District
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Central Bucks School District
K-12 Mathematics Teaching and Learning Principles

1. Investigating, problem-solving, and communicating about mathematics (speaking, reading, writing, representing, and listening) stimulates students' curiosity, builds confidence, and leads students' toward deeper conceptual understanding.
2. Lessons should address students' strengths, interests, and learning styles through differentiated instruction.
3. All students can achieve excellence in mathematics when:
 - instruction is appropriately paced
 - teachers set high expectations
 - students feel supported by their teachers, parents and administrators
4. Students must be actively engaged in learning experiences designed to connect to their prior knowledge.
5. For students to transfer and use knowledge meaningfully teachers need to:
 - a. present new ideas within rich and meaningful contexts
 - help students to make connections to their lives both within and outside of school
6. Mathematics instruction is more effective when teachers incorporate:
 - manipulatives
 - calculators
 - technology
 - real-time data collection devices (motion detectors, temperature probes,...)
7. Assessment should be ongoing, diagnostic, and aligned with instruction.

Documents Considered:

- (2000). Principles and Standards for School Mathematics. Reston, VA: National Council of Teachers of Mathematics.
- Kilpatrick, J., Swafford, J., & Findell, B. (2001). *Adding It Up: Helping Children Learn Mathematics*. Washington, DC: National Academy Press.
- Marzano, R., & Pickering, D. (1997). *Dimensions of Learning*. Alexandria, VA: Association for Supervision and Curriculum Development; Aurora, CO: Mid-continent Regional Educational Laboratory.
- Tomlinson, Carol Ann. (1999). *The Differentiated Classroom: Responding to the Needs of All Learners*. Alexandria, VA: Association for Supervision and Curriculum Development.
- Zemelman, S., Daniels, H., & Hyde, A. (1998). *Best practice: New standards for teaching and learning in America's schools*. Portsmouth, NH: Heinemann

Central Bucks School District
K – 12 Mathematics Program Enduring Understandings

Students will understand that:

The Nature of Mathematics

- Mathematics is a language of carefully defined terms and symbols.
- Mathematics is used to make informed decisions about problems in everyday life.

Numbers and Operations

- There are multiple representations for any number.
- Numbers are classified and compared within our number system.
- Depending on the situation, calculations may be done using mental math or paper-and-pencil calculations using a variety of mathematically sound algorithms.
- Estimates help determine the reasonableness of an answer.
- Expressions are simplified using a predetermined order of operations.

Measurement

- Measurements collected using any tools (except for counting) are estimates with an accepted level of error.
- All measurements consist of exactly three parts: number, unit, and precision.
- Changing one linear dimension in a figure with two or three dimensions will have a different effect on the figure's perimeter, circumference, area, or volume.

Geometry

- Points, lines, and planes are the building blocks of geometry.
- Each geometric figure has a specific naming convention.
- Postulates, theorems, definitions, and properties are used to:
 - justify reasoning in a direct proof
 - establish relationships involving two and three-dimensional figures.
- Logical thinking and critical reasoning skills are important aspects of problem solving.
- A shape's characteristics (dimensionality, side measures, angle measures, faces, edges, area, perimeter and volume) are used for identification.
- The Pythagorean Theorem and trigonometric ratios are used to find missing quantities in right triangles.
- Concepts of congruency and similarity are used to relate and compare 2 and 3- dimensional figures.

Algebraic Concepts

- Algebraic rules and properties determine how expressions are simplified and how equations are solved.
- Problems involving a constant rate of change can be modeled using proportional reasoning.
- Algebraic expressions, equations, inequalities, and functions (linear, absolute value, quadratic, polynomial, exponential, and logarithmic) are used to model relationships between quantities in real-world situations.
- Patterns and functions can be generalized and represented using; verbal models, tables, equations, and graphs.
- Systems of equations are solved both graphically and algebraically and are used to model real-life problems.

Data Analysis and Probability

- Data is collected, organized, and displayed for analysis.
- Interpretations and predictions about data are influenced by the method that data is collected and displayed.
- Probability is used to make informed predictions and inferences.

Central Bucks School District
K – 12 Mathematics Program Essential Questions

The Nature of Mathematics

- What characteristics make mathematics a language?
- When is the correct solution not the answer to a problem?

Numbers and Operations

- How do you know that an answer is reasonable?
- Why are there different number systems?
- How do you determine when to calculate with pencil and paper, find an estimate, or use a calculator?
- What does it mean to be simplified?
- Is there more than one way to simplify an expression?

Measurement

- What does it mean to be accurate?
- How do you measure?
- How does changing a dimension affect a figure's length, area and volume?

Geometry

- Why do all statements need justification?
- What is the logical progression of statements in a proof?
- How are figures classified?
- How do you name a geometric figure and why are standard naming conventions important?
- Why are points, lines, and planes so important in Euclidean geometry?
- How and when is the Pythagorean Theorem used?
- What do similarity and congruency statements tell you about polygons?

Algebraic Concepts

- What does solve mean?
- Is your solution always the appropriate answer to a problem?
- How do expressions and equations differ?
- What makes a relationship linear?
- How can a line be used to make predictions?
- When is it necessary to use a system of equations?
- Why would you represent a pattern/function in different ways?

Data Analysis and Probability

- What is the purpose of collecting data?
- How is data used or abused?
- How do we make predictions based on probability?

Central Bucks School District – Course of Study
Honors Geometry Overview

Desired Results

Course Description:

This course is designed for students who have successfully completed Algebra 1. Honors Geometry covers topics including but not limited to deductive reasoning and proofs, parallel lines and planes, congruence, similarity, quadrilaterals and polygons, right triangles, right triangle trigonometry, circles, areas, volumes, and coordinate geometry. There will be an emphasis on applying algebra to geometric figures and applying geometric concepts to real world scenarios. This course is weighted at .25 as a recognition of the fact that it is more demanding and has more requirements that go beyond those of the standard mathematics course.

Prerequisite: (2812) Accelerated Algebra 1, A- (90% or better) or teacher recommendation, or (2810 or 2915) Algebra 1, A- (90% or better) and teacher recommendation.

Committee Members (Original): Janet Bachelor, Vicki Blasko, Alexis Carp, Ali Coleman, Laura Domzalski, Kari Farrell, Melinda Fuller, Melissa Greenberg, Leanne Jarossy, Dan Mager, Rich Mirable, Rachel Pileggi, Madeline Putterman, Matt Timmins, Frank Woodring, Richard Kratz: K – 12 Mathematics Supervisor

Committee Members (2026 Update): Janet Bachelor, Molly Landis, Dan Mager, Erin Walsh, Brian Novick: K – 12 Mathematics Supervisor

Acceptable Evidence.

Common Summative Assessment 1 Title: Right Triangle Applications

Common Summative Assessment 1 Description: Students are asked to use right triangle trigonometry to solve an application problem.

Common Summative Assessment 2 Title: Area & Perimeter of Plane Figures

Common Summative Assessment 2 Description: Students are asked to calculate area and perimeter of a composite figure and answer application questions.

HS Final Exam and Course Grading – Final Exam: 10%, Marking Period 1 or 3: 45%, Marking Period 2 or 4: 45%

Honors Geometry Pacing Guide

Content	H.S. Days
Unit 1 - Tools of Geometry	12
Welcome, Introductions, Syllabus	1
1-1 Points, Lines, and Planes 0-9 Simplifying Square Roots (no conjugates, no rationalizing denominators) 1-2 Line Segments and Distance (Include Distance Formula; Include Segment Addition Algebra Connections; No Constructions) 1-3 Locating Points and Midpoints (Midpoint Formula Optional) Formative Assessment	4
Remediation and Enrichment	1
1-4 Angle Measure (No Constructions; Include Algebra Connections of Angle Addition) 1-5 Angle Relationships (with Algebra Connections) 1-6 Two Dimensional Figures Formative Assessment	4
Unit 1 Review	1
Unit 1 Summative Assessment	1
Unit 2 – Logical Arguments and Line Relationships	14
0-8 Algebra Skill: Systems of Equations	1
2-1 Part 2 and 2-2 Part 2 Conditional Statements (Conditionals, Converse, Counterexample, and Biconditional) 2-4 Writing Proofs; Postulates; Properties of Equality 2-5 Properties of Congruence; Algebraic Proofs 2-5 Proving Segment Relationships (optional) 2-6 Proving Angle Relationships (optional) Formative Assessment	4
Remediation and Enrichment	1
2-7 Parallel Lines and Transversals 2-8 Slope and Equations of Lines (no point-slope) 2-9 Proving Lines Parallel Formative Assessment	5
Remediation and Enrichment	1
Unit 2 Review	1
Unit 2 Summative Assessment	1
Unit 3 – Triangle Foundations & Similarity	10
Supplement and 5-2 Triangle Classification & Vocabulary Angles of Triangles 5-3 Part 2 Inequalities in One Triangle (Angle-Side Inequalities) 5-5 part 1 The Triangle Inequality Formative Assessment	3
Remediation and Enrichment	1
Algebra Review: Solving Quadratics by Factoring ($a = 1$; Difference of Two Squares); Solving Proportions	2

7-2 Similar Polygons 7-3 AA Similarity (Including Indirect Measurement; Some practice problems in 7-4) 7-4 SSS and SAS Similarity (optional) 7-5 Parallel Lines and Proportional Parts (optional) Formative Assessment	2
Unit 3 Remediation and Enrichment	1
Unit 3 Summative Assessment	1
Unit 4 – Right Triangles and Trigonometry	12
0-9 Square Roots and Simplifying Radicals 8-1 Geometric Mean (optional) 8-2 The Pythagorean Theorem & Its Converse 8-3 Special Right Triangles Formative Assessment	4
Remediation and Enrichment	1
8-4 Trigonometry 8-5 Angle of Elevation and Depression; Applications; Area & Perimeter of Triangles Formative Assessment	4
Remediation and Enrichment	1
Core 1 Unit 4 Review	1
Unit 4 Summative Assessment	1
Unit 5 – Congruent Triangles	8
4-2 Congruent Triangles 4-3 Proving Triangles Congruent – SSS, SAS 4-4 Proving Triangles Congruent – ASA, AAS Formative Assessment	4
Remediation and Enrichment	1
4-5 Proving Right Triangles Congruent (optional) 4-6 Isosceles and Equilateral Triangles 8-6, 8-7 Law of Sines & Law of Cosines (optional) Formative Assessment	1
Unit 5 Remediation and Enrichment	1
Unit 5 Summative Assessment	1
Unit 6 – Quadrilaterals & Polygons Note: Integrate Area and Perimeter from 10-1 and 10-2 throughout the Unit	12
6-1 Angles of Polygons 6-2 Parallelograms 6-3 Tests for Parallelograms (optional) Formative Assessment	3
Remediation and Enrichment	1
6-4 Special Parallelograms: Rectangles 6-5 Special Parallelograms: Rhombi & Squares 6-6 Trapezoids (Kites Optional) Formative Assessment	4
Remediation and Enrichment	1
Core 2	0.5

Unit 6 Review	1.5
Unit 6 Summative Assessment	1
Unit 7 – Circles	7
9-1 Circles & Circumference & Circle Vocabulary 9-2 Measuring Angles & Arcs; Arc Length 10-3 Area of Circle; Sector Area Formative Assessment	5
Remediation and Enrichment	1
9-3 Arcs & Chords 9-4 Inscribed Angles 9-5 Tangents 9-6 Secants, Tangents, and Angle Measures 9-7 Equation of Circles	Optional
Unit 7 Review	0.5
Unit 7 Summative Assessment	0.5
Unit 8: Mixed Area, Surface Areas, & Volume	9
Ch 10 Mixed Area Review 10-4 Regular Polygons (optional) 1-8 Three Dimensional Figures 10-6 Surface Area 11-2 Volume of Prisms and Cylinders 11-3 Volume of Pyramids and Cones 11-4 Spheres Formative Assessment	7
Unit 8 Remediation and Enrichment	1
Unit 8 Summative Assessment	1
Final Exam Review & Final Exam	4
Total	88

NOTE: Additional remediation in standards/content from the grade level (or previous grade level) where the student completes this course will be provided for students when the teacher determines a student has not yet mastered that content. Enrichment opportunities will also be provided to meet the needs of students that acquire an understanding of the content faster than their class peers.

Required Texts and Software

Glencoe Geometry, McGraw-Hill Publishing Company, Copyright 2018

Citation: J. Carter, G. Cuevas, R. Day, C. Malloy, C. Glencoe Geometry, McGraw-Hill Education, Columbus, Ohio, 2018. ISBN: 978-0-07-903994-1

Geometer's Sketchpad (computer software)

Scientific Calculator

Calculator Recommendation

The secondary mathematics department of Central Bucks School district recognizes the use of calculators as a valuable tool for learning in the mathematics classroom. In certain advanced courses graphing calculators with specific capabilities are important for daily classroom performance and are required for advanced placement tests. While no specific brands are endorsed, there are restrictions on the type of calculators allowed on certain classroom tests and final exams. Calculators which do operations with variables, such as the TI-89, TI-92 and HP49G will not be permitted to be used on district final exams, even though they may be used on some nationwide tests. Teachers have discretion as to whether these types can be used for particular classroom-related purposes.

Central Bucks School District – Course of Study – Geometry/Trig

Unit 1 – Tools of Geometry

Desired Results:

Essential Questions:

- Why is it important to use consistent symbols and vocabulary to communicate?
- How are algebraic equations applied to geometric situations?
- How can we determine if a solution is reasonable?

Enduring Understandings:

Students will understand that...

- mathematics is largely about communication. Using appropriate vocabulary and common symbols is essential for this communication.
- geometry & mathematics is everywhere in the world. Skills from these disciplines can be used to solve problems.
- assumptions about figures cannot be made.

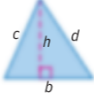
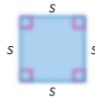
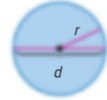
Knowledge:

Students will know...

- Vocabulary: acute angle, adjacent angles, angle, angle bisector, area, base, circumference, collinear, complementary angles, concave, congruent, convex, coplanar, degree, distance, edge, equiangular polygon, equilateral polygon, exterior, interior, intersection, line, line segment, linear pair, midpoint, n-gon, obtuse angle, opposite rays, perfect square, perimeter, perpendicular, plane, point, polygon, radical, ray, regular polygon, right angle, segment bisector, side, space, square root, supplementary angles, undefined term, vertex, vertex of a polygon, vertical angles
- Symbols/Notation:
 - Point: A
 - Line: $\overleftrightarrow{AB}$
 - Plane: ABC or ABCD
 - Angle: $\angle ABC$
 - Angle Measure: $m\angle ABC$
 - Degree: $^{\circ}$
 - Segment: $\overline{AB}$
 - Segment Length: AB
 - Ray: $\overrightarrow{AB}$
 - Perpendicular: $\perp$
 - Congruent: @
- Postulates:
 - Segment Addition Postulate: If B is between A and C, then $AB + BC = AC$.
Note: Textbook (p. 14) refers to this concept as “betweenness of points.”
 - Angle Addition Postulate:
 - If point B lies in the interior of $\angle AOC$, then $m\angle AOB + m\angle BOC = m\angle AOC$.
 - If $\angle AOC$ is a straight angle and B is any point not on line AC, then $m\angle AOB + m\angle BOC = 180$.
Note: The book does not formally introduce this until chapter 2.
- Theorems:
 - Through a line and a point not in the line there is exactly one plane.
 - If two lines intersect, then exactly one plane contains the lines.
 - Vertical Angle Theorem: Vertical angles are congruent.
Note: The book does not formally introduce this as a Theorem until chapter 2.

• **Formulas:**

- Distance Formula: $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
- Optional: Midpoint Formula: $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$
- Introduction to Area & Perimeter/Circumference Formulas (see p. 58)

Key Concept Perimeter, Circumference, and Area			
Triangle	Square	Rectangle	Circle
			
$P = b + c + d$	$P = s + s + s + s$ $= 4s$	$P = \ell + w + \ell + w$ $= 2\ell + 2w$	$C = 2\pi r$ or $C = \pi d$
$A = \frac{1}{2}bh$	$A = s^2$	$A = \ell w$	$A = \pi r^2$
P = perimeter of polygon b = base, h = height	A = area of figure ℓ = length, w = width		C = circumference r = radius, d = diameter

Skills:

Students will be able to...

- draw or list physical representations of the terms point, line, and plane to develop a foundation for Geometry.
- discuss, visualize, and answer questions about fundamental rules relating the building blocks of geometry (point, line, plane, and space).
- classify points as collinear, not collinear, coplanar, and/or noncoplanar.
- use the proper symbols for lines, segments, rays, distances, angles, and angle measures.
- identify the vertex and sides of an angle.
- classify an angle by measure.
- identify and calculate measure of special pairs of angles.
- apply algebra to geometric diagrams to solve for unknowns and measurements (segment addition, angle addition, complementary and supplementary angles, angle bisector, midpoint, special pairs of angles, and vertical angles).
- determine if numeric solutions are logical.
- draw accurate conclusions about geometric situations.
- simplify square roots.
- calculate and apply distance using coordinate geometry.

Standards:

Priority:

CC.2.3.HS.A.11: Apply coordinate geometry to prove simple geometric theorems algebraically.

CC.2.2.HS.A.14: Apply geometric concepts to model and solve real world problems.

CC.2.2.HS.D.5: Use polynomial identities to solve problems.

Supporting:

CC.2.2.HS.D.2: Write expressions in equivalent forms to solve problems.

CC.2.2.HS.D.8: Apply inverse operations to solve equations or formulas for a given variable.

CC.2.2.HS.D.9: Use reasoning to solve equations and justify the solution method.

Acceptable Evidence:

Performance Tasks –

- Geometry Lab – Describing What You See (p. 13)

Acceptable evidence of learning other than Performance Tasks:

Formative Assessment

- Warm-ups & Exit Slips
- Check point assignments for each cycle
- Resources from textbook – remedial practice and enrichment opportunities
- Classwork
- Homework
- Online Applications: Quizizz, Kahoot, Forms, Canvas, Delta Math, IXL, etc.
- ConnectED.McGraw-Hill digital resources
 - Vocabulary
 - Self-check practice
 - Practice Sheet

Assessment, Remediation, & Enrichment after section 1-3 and 1-6

Summative Assessment

- Unit 1 Exam

Suggested Learning Experiences and Instruction

Learning Experiences:

- Emphasize use of proper notation and vocabulary throughout course is critical
- Use physical examples in the room, school, and world to represent points, lines, and planes.
- Use vocabulary flashcards, online flashcards (quizlet), or webquests to reinforce vocabulary; Word Wall, H5P, www.aplusmath.com (flashcard section on left hand side).
- Personalized/Interactive Activities (with immediate feedback): Delta Math, IXL
- For simplifying square roots, if students have a calculator that will simplify for them, require students to show work and/or give a non-calculator assessment on this skill.

Instructional Strategies:

- Use mnemonic devices/phrases to remember key concepts:
 - part + part = whole
 - complementary comes before supplementary alphabetically and numerically.

Differentiation/Intervention/Enrichment Options:

Sections	Study Guide and Intervention	Skills Practice	Practice Worksheet	Word Problem Practice	Enrichment Sheet
0-9	X	X	X	X	X
1-1	X	X	X	X	X
1-2	X	X	X	X	X
1-3	X	X	X	X	X
1-4	X	X	X	X	X
1-5	X	X	X	X	X
1-6	X	X	X	X	X

- Utilize study guide and intervention for students who need more reteaching.
- Skills practice is extra practice for students who need more entry level practice to master the concept.
- Practice worksheet is a standard practice sheet.
- Word problem practice provides additional opportunities for students to engage in solving problems utilizing the skill from the lesson.
- The enrichment sheet provides a higher-level practice opportunity for students demonstrating faster understanding of the concept.

For Language Development

- Create a student-made dictionary that includes terms, definitions, and examples organized by chapter.
- Make flash cards for terms and examples, then mix and match.
- Use the study guide document with clear definitions and vocabulary development opportunities.
- Discuss the Chapter Wrap-Up, encouraging students to use the chapter vocabulary.
- Glencoe Personal Tutor (Spanish).
- Glencoe “Get Ready” vocab in Spanish.

For Advanced Learners

- Teach the optional topics for individual students or groups of students that are demonstrating understanding of the priority and supporting skills. When this course is taught in 8th or 9th grade, you will have an opportunity to teach many more of the optional topics with your students.
- Meet in small groups with students who need enrichment to provide instruction and learning activities on the optional skills followed up by an alternative and more complex assignment.
- Excuse the students from standard practice and use appropriately challenging practice that requires students to apply the concepts in more rigorous ways to challenge their thinking and allow students to go deeper on the same skills.
- Provide more rigorous opportunities for mathematical proof.
- There are many resources available throughout our textbook and digital resources to draw upon for enrichment.
 1. Practice sets from the textbook based on the readiness level to address their individual needs
 2. Application practice
 3. Enrichment projects

Central Bucks School District – Course of Study – Geometry/Trig

Unit 2 – Logical Arguments and Line Relationships

Desired Results:

Essential Questions:

- Why is it important to use consistent symbols and vocabulary to communicate?
- What is the logical progression of statements in a proof?
- Why do all statements need justification?
- How can geometric properties be used to prove relationships?
- When two lines are cut by a transversal, what can be concluded?

Enduring Understandings:

Students will understand that...

- mathematics is largely about communication. Using appropriate vocabulary and common symbols is essential for this communication.
- geometry & mathematics is everywhere in the world. Skills from these disciplines can be used to solve problems.
- learning geometric proofs helps us with reason logically, defend arguments, and organize our thoughts.
- every statement or conclusion requires justification.
- assumptions about figures cannot be made.
- an algebraic relationship exists between special angle pairs formed by parallel lines and a transversal.

Knowledge:

Students will know...

Vocabulary: (Vocabulary from required sections): conditional statement, hypothesis, conclusion, converse, counterexample, biconditional, postulate, proof, parallel lines, algebraic proof, theorem, two column proof, parallel lines, intersecting lines, skew lines, parallel planes, transversal, alternate interior angles, alternate exterior angles, consecutive interior angles, corresponding angles, perpendicular lines, slope, slope-intercept form (Vocabulary from optional sections): deductive reasoning, inductive reasoning, negation, contrapositive, axiom, flow proof, paragraph proof, informal proof, formal proof

- Rules:
 - Slope Formula: $m = \frac{y_2 - y_1}{x_2 - x_1}$
 - Slope-Intercept: $y = mx + b$
- Symbols:
 - Parallel: //
 - Perpendicular: $\perp$
- Properties:
 - Properties of Equality:
 - Addition Property of Equality: If $a = b$ and $c = d$, then $a + c = b + d$.
 - Subtraction Property of Equality: If $a = b$ and $c = d$, then $a - c = b - d$.
 - Multiplication Property of Equality: If $a = b$, then $ca = cb$.
 - Division Property of Equality: If $a = b$ and $c \neq 0$, then $\frac{a}{c} = \frac{b}{c}$.
 - Substitution Property of Equality: If $a = b$, then either a or b may be substituted for the other in any equation (or inequality).
 - Reflexive Property of Equality: $a = a$.
 - Symmetric Property of Equality: If $a = b$, then $b = a$.
 - Transitive Property of Equality: If $a = b$ and $b = c$, then $a = c$.

- Distributive Property of Equality: $a(b + c) = ab + ac$.
- Properties of Congruence:
 - Reflexive Property of Congruence: $\overline{DE} \cong \overline{DE}$
 - Symmetric Property of Congruence: If $\overline{DE} \cong \overline{FG}$, then $\overline{FG} \cong \overline{DE}$.
 - Transitive Property of Congruence: If $\overline{DE} \cong \overline{FG}$ and $\overline{FG} \cong \overline{JK}$, then $\overline{DE} \cong \overline{JK}$.
- Postulates:
 - Segment Addition Postulate: If B is between A and C, then $AB + BC = AC$.
 - Angle Addition Postulate: If point B lies in the interior of $\angle AOC$, then $m\angle AOB + m\angle BOC = m\angle AOC$
 - A line contains at least 2 points; a plane contains at least 3 noncollinear points; space contains at least 4 points not all in one plane.
 - Through any two points there is exactly one line.
 - Through any three noncollinear points there is exactly one plane.
 - If two points are in a plane, then the line that contains the points is in that plane.
 - If two planes intersect, then their intersection is a line.
 - Corresponding Angles Postulate: If two lines are cut by transversal, then each pair of corresponding angles is congruent.
 - Converse of Corresponding Angles Postulate: If two lines are cut by a transversal so that corresponding angles are congruent, then the lines are parallel.
 - Parallel Postulate: If given a line and a point not on the line, then there exists exactly one line through the point that is parallel to the given line.
 - Perpendicular Postulate: If given a line and a point not on the line, then there exists exactly one line through the point that is perpendicular to the given line.
- Theorems:
 - If two lines intersect, then they intersect in exactly one point.
 - Vertical Angles Theorem: Vertical angles are congruent.
 - Alternate Interior Angles Theorem: If two lines are cut by transversal, then each pair of alternate interior angles is congruent.
 - Consecutive Interior Angles Theorem: If two lines are cut by transversal, then each pair of consecutive interior angles is supplementary.
 - Alternate Exterior Angles Theorems: If two lines are cut by transversal, then each pair of alternate exterior angles is congruent.
 - Alternate Exterior Angles Converse: If two lines in a plane are cut by a transversal so that a pair of alternate interior angles is congruent, then the two lines are parallel.
 - Consecutive Interior Angles Converse: If two lines in a plane are cut by a transversal so that a pair of consecutive interior angles is supplementary, then the lines are parallel.
 - Alternate Interior Angles Converse: If two lines in a plane are cut by a transversal so that a pair of alternate interior angles is congruent, then the lines are parallel.
 - Slopes of Parallel Lines Theorem: Two distinct nonvertical lines have the same slope if and only if they are parallel. All vertical lines are parallel.
 - Slopes of Perpendicular Lines Theorem: Two nonvertical lines are perpendicular if and only if the product of their slopes is -1. Vertical and horizontal lines are perpendicular.
- Additional knowledge, rules, properties, postulates, and theorems used for enrichment (optional):
 - Through a point outside a line, there is exactly one line perpendicular to the given line.
 - Supplement Theorem: If two angles form a linear pair, then they are supplementary angles. (Linear Pair Postulate).
 - Complement Theorem: If the noncommon sides of two adjacent angles form a right angle, then the angles are complementary angles.
 - Congruent Supplements Theorem: Angles supplementary to the same angle or to congruent angles are congruent.

- Congruent Complements Theorem: Angles complementary to the same angle or to congruent angles are congruent.
- Perpendicular lines intersect to form four right angles.
- All right angles are congruent.
- Perpendicular lines form congruent adjacent angles.
- If two angles are congruent and supplementary, then each angle is a right angle.
- If two congruent angles form a linear pair, then they are right angles.
- Perpendicular Transversal Theorem: In a plane, if a line is perpendicular to one of two parallel lines, then it is perpendicular to the other.
- Perpendicular Transversal Converse: In a plane, if two lines are perpendicular to the same line, then they are parallel.
- Distance Between a Point and a Line: The distance between a line and a point not on the line is the length of the segment perpendicular to the line from the point.

Skills:

Students will be able to...

- classify lines as parallel, perpendicular, or neither.
- identify conditional statements, hypothesis, conclusion.
- create converse statements and determine whether they are true or false.
- provide either a counterexample or a biconditional statement.
- solve basic algebra equations in a proof form.
- defend geometric statements using theorems, postulates, and properties.
- defend proof statements using properties, definition, postulates, and theorems.
- write equations of lines given parameters.
- use properties of pairs of lines to identify angle relationships and find angle measures.
- prove that lines are parallel.
- solve systems of linear equations using the substitution method and the elimination method.

Standards:

Priority:

CC.2.3.HS.A.3: Verify and apply geometric theorems as they relate to geometric figures.

Supporting:

CC.2.3.HS.A.11: Apply coordinate geometry to prove simple geometric theorems algebraically.

CC.2.2.HS.D.8: Apply inverse operations to solve equations or formulas for a given variable.

CC.2.2.HS.D.9: Use reasoning to solve equations and justify the solution method.

Acceptable Evidence:

Performance tasks –

- p. 157 #17 – Critique Arguments
- Extend 2-8: Equations of Perpendicular Bisectors (p. 185)
- Preparing for Assessment – Chapter 2 – Performance Task (p. 212)

Acceptable evidence of learning other than Performance Tasks:

Formative Assessment

- Warm-ups & Exit Slips
- Check point assignments for each cycle
- Resources from textbook – remedial practice and enrichment opportunities
- Classwork
- Homework
- Online Applications: Quizizz, Kahoot, Forms, Canvas, Delta Math, IXL, etc.

- ConnectED.McGraw-Hill digital resources
 - Vocabulary
 - Self-check practice
 - Practice Sheet

Assessment, Remediation, & Enrichment after section 2-5 and 2-9

Summative Assessment

- Unit 2 Quizzes and Exam

Suggested Learning Experiences and Instruction

Learning Experiences:

- Introduce proofs using algebraic justifications of statements.
- Uno Activity: Use the game Uno to allow students to explain their moves in the game (defend their move). For example, if there is a red 4 showing and they play a red 7, they can defend this move with “Same Color Rule.” Students can make strings of cards and defend the moves from one card to another in a proof format.
- Introduce geometric proofs by using algebraic justification of statements.
- Progress through introduction of proofs using scaffolding. Provide some reasons and/or statements and have students fill in to develop student understanding of formal geometric proofs.
- Use real world and geometric examples to demonstrate logical statements.
- Use vocabulary flashcards, online flashcards (quizlet), or webquests to reinforce vocabulary; Word Wall, H5P, www.aplusmath.com (flashcard section on left hand side).
- Personalized/Interactive Activities (with immediate feedback): Delta Math, IXL
- Use Parallel Lines Sketchpad or Desmos Activities to learn about special angle relationships

Instructional Strategies:

- Color code special pairs of angles to identify alternate interior, alternate exterior, consecutive interior, and corresponding angles. Color code parallel lines and transversal.
- Emphasize that the special pairs of angles exist with any coplanar lines cut by a transversal, not just parallel lines. The pairs are only congruent or supplementary if the lines are parallel.
- Use real world examples of parallel and perpendicular lines.

Differentiation Options

Sections	Study Guide and Intervention	Skills Practice	Practice Worksheet	Word Problem Practice	Enrichment Sheet
0.8	X	X	X	X	X
2-1	X	X	X	X	X
2-2	X	X	X	X	X
2-4	X	X	X	X	X
2-5	X	X	X	X	X
2-6	X	X	X	X	X
2-7	X	X	X	X	X
2-8	X	X	X	X	X
2-9	X	X	X	X	X

- Utilize study guide and intervention for students who need more reteaching.
- Skills practice is extra practice for students who need more entry level practice to master the concept.
- Practice worksheet is a standard practice sheet.

- Word problem practice provides additional opportunities for students to engage in solving problems utilizing the skill from the lesson.
- The enrichment sheet provides a higher-level practice opportunity for students demonstrating faster understanding of the concept.

For Language Development

- Create a student-made dictionary that includes terms, definitions, and examples organized by chapter.
- Make flash cards for terms and examples, then mix and match.
- Use the study guide document with clear definitions and vocabulary development opportunities.
- Discuss the Chapter Wrap-Up, encouraging students to use the chapter vocabulary.
- Glencoe Personal Tutor (Spanish).
- Glencoe “Get Ready” vocab in Spanish.

For Advanced Learners

- Teach the optional topics for individual students or groups of students that are demonstrating understanding of the priority and supporting skills. When this course is taught in 8th or 9th grade, you will have an opportunity to teach many more of the optional topics with your students.
- Meet in small groups with students who need enrichment to provide instruction and learning activities on the optional skills followed up by an alternative and more complex assignment.
- Excuse the students from standard practice and use appropriately challenging practice that requires students to apply the concepts in more rigorous ways to challenge their thinking and allow students to go deeper on the same skills.
- Provide more rigorous opportunities for mathematical proof.
- There are many resources available throughout our textbook and digital resources to draw upon for enrichment.
 1. Practice sets from the textbook based on the readiness level to address their individual needs
 2. Application practice
 3. Enrichment projects

Central Bucks School District – Course of Study – Geometry/Trig

Unit 3 – Triangle Foundations & Similarity

Desired Results:

Essential Questions:

- Why is it important to use consistent symbols and vocabulary to communicate?
- How can triangles be classified based on angle and side properties?
- What are important properties of triangles and how will they help us with higher level mathematics?
- What does a similarity statement say about polygons?
- What information is needed to show similar figures?
- How can similarity be applied to real world applications?

Enduring Understandings:

Students will understand that...

- triangles are a foundational shape and the properties of triangles have far reaching application in mathematics.
- mathematics is largely about communication. Using appropriate vocabulary and common symbols is essential for this communication.
- geometry & mathematics is everywhere in the world. Skills from these disciplines can be used to solve problems.
- assumptions about figures cannot be made.
- similar figures can be used to draw conclusions about sides and angles.
- similarity can be used to model real world applications.

Knowledge:

Students will know...

- Vocabulary: acute triangle, right triangle, obtuse triangle, equiangular triangle, scalene triangle, isosceles triangle, equilateral triangle, exterior angle, median, altitude, perpendicular bisector, scale factor, similar figures, similarity, proportional, cross product, reciprocal, proportional lengths, factoring, quadratic, ratio, solve, difference of two squares, factor
- Notation:
 - Similar: $\sim$
 - Triangle: $\triangle ABC$
- Postulates:
 - AA Similarity Postulate: If two angles of one triangle are congruent to two angles of another triangle, then the triangles are similar.
- Theorems:
 - Triangle Sum Theorem: The sum of the measures of the angles of a triangle is 180.
 - Exterior Angle Theorem: The measure of an exterior angle of a triangle equals the sum of the measures of the two remote interior angles.
 - If one side of a triangle is longer than a second side, then the angle opposite the first side is larger than the angle opposite the second side.
 - If one angle of a triangle is larger than a second angle, then the side opposite the first angle is longer than the side opposite the second angle.
 - The Triangle Inequality: The sum of the lengths of any two sides of a triangle is greater than the length of the third side.
 - The Isosceles Triangle Theorem: The base angles of an isosceles triangle are congruent.
 - Perimeters of Similar Polygons: If two polygons are similar, then their perimeters are proportional to the scale factor between them.
- Corollaries:

- An equilateral triangle is also equiangular.
- An equilateral triangle has three 60° angles.
- The bisector of the vertex angle of an isosceles triangle is perpendicular to the base at its midpoint.
- In a triangle, there can be at most one right angle or obtuse angle.
- The acute angles of a right triangle are complementary.
- Additional knowledge, rules, properties, postulates, and theorems used for enrichment (optional):
 - SAS Similarity Theorem: If an angle of one triangle is congruent to an angle of another triangle and the sides including those angles are in proportion, then the triangles are similar.
 - SSS Similarity Theorem: If the sides of two triangles are in proportion, then the triangles are similar.
 - Triangle Proportionality Theorem: If a line parallel to one side of a triangle intersects the other two sides, then it divides those sides proportionally.
 - Triangle Angle-Bisector Theorem: If a ray bisects an angle of a triangle, then it divides the opposite side into segments proportional to the other two sides.
 - If three parallel lines intersect two transversals, then they divide the transversals proportionally.

Skills:

Students will be able to...

- classify triangles by their sides and their angles.
- use the Triangle Sum Theorem and Exterior Angle Theorem to set up algebraic equations to find missing angle measures.
- identify the legs, base angles, base, and vertex angle of an isosceles triangle to use the Isosceles Triangle Theorem.
- distinguish between the segments drawn in a triangle (altitude, median, perpendicular bisector).
- apply the relationships of a triangle to identify the longest and shortest sides, and largest to smallest angles.
- apply the Triangle Inequality to determine if three given side lengths can create a triangle.
- apply the Triangle Inequality to determine the possible lengths of the third side of a triangle given two sides (greater than difference, less than sum).
- set up and solve algebraic equations involving sides of isosceles and equilateral triangles.
- write similarity statements using proper notation for similar figures.
- find and interpret the scale factor between two figures.
- determine whether figures are similar.
- solve proportions for missing variables.
- use scale factors to set up proportions and calculate unknown measures of similar polygons.
- use proportions to solve for missing sides in similar figures.
- solve application problems involving similar figures.
- solve quadratics by factoring (leading coefficient = 1).
- solve quadratics by factoring using difference of two squares.

Standards:

Priority:

CC.2.3.HS.A.3: Verify and apply geometric theorems as they relate to geometric figures.

CC.2.3.HS.A.5: Create justifications based on transformations to establish similarity of plane figures.

CC.2.2.HS.A.14: Apply geometric concepts to model and solve real world problems.

Supporting:

CC.2.2.HS.D.8: Apply inverse operations to solve equations or formulas for a given variable.

CC.2.2.HS.D.9: Use reasoning to solve equations and justify the solution method.

Acceptable Evidence:

Performance tasks –

- Geometry Lab: Constructing Medians and Altitudes (p. 364)
- Model Maker Chapter 7 Project (Online Textbook Teacher Edition, Chapter 7, Plan and Present tab, chapter projects)

Acceptable evidence of learning other than Performance Tasks:

Formative Assessment

- Warm-ups & Exit Slips
- Check point assignments for each cycle
- Resources from textbook – remedial practice and enrichment opportunities
- Classwork
- Homework
- Online Applications: Quizizz, Kahoot, Forms, Canvas, Delta Math, IXL, etc.
- ConnectED.McGraw-Hill digital resources
 - Vocabulary
 - Self-check practice
 - Practice Sheet

Assessment, Remediation, & Enrichment after section 5-5.1 and 7-3

Summative Assessment

- Unit 3 Quizzes and Exam

Suggested Learning Experiences and Instruction

Learning Experiences:

- Emphasize use of proper notation and vocabulary throughout course is critical
- Use vocabulary flashcards, online flashcards (quizlet), or webquests to reinforce vocabulary; Word Wall, H5P, www.aplusmath.com (flashcard section on left hand side).
- Personalized/Interactive Activities (with immediate feedback): Delta Math, IXL
- Individual Scale Drawing Project: Students select a cartoon image and create a grid. They create a larger grid on graph paper and recreate the cartoon to scale.
- Alternate Group Scale Drawing Project: each student receives a piece of a larger whole picture that has previously been cut into squares. These squares are enlarged using similarity, given a specific scale factor. When they have finished, the class puts the pieces together to create the entire enlarged picture.
- Activity: Students measure their shadow length and height use proportions to estimate heights of tall objects (trees, buildings, etc.). This can also be accomplished using a mirror on the ground acting as the only common vertex for two similar triangles.

Differentiation Options:

Sections	Study Guide and Intervention	Skills Practice	Practice Worksheet	Word Problem Practice	Enrichment Sheet
5-2	X	X	X	X	X
4-1	X	X	X	X	X
5-3	X	X	X	X	X
5-5	X	X	X	X	X
7-2	X	X	X	X	X
7-3	X	X	X	X	X
7-4	X	X	X	X	X
7-5	X	X	X	X	X

- Utilize study guide and intervention for students who need more reteaching.
- Skills practice is extra practice for students who need more entry level practice to master the concept.
- Practice worksheet is a standard practice sheet.
- Word problem practice provides additional opportunities for students to engage in solving problems utilizing the skill from the lesson.
- The enrichment sheet provides a higher-level practice opportunity for students demonstrating faster understanding of the concept.

For Language Development

- Create a student-made dictionary that includes terms, definitions, and examples organized by chapter.
- Make flash cards for terms and examples, then mix and match.
- Use the study guide document with clear definitions and vocabulary development opportunities.
- Discuss the Chapter Wrap-Up, encouraging students to use the chapter vocabulary.
- Glencoe Personal Tutor (Spanish).
- Glencoe “Get Ready” vocab in Spanish.

For Advanced Learners

- Teach the optional topics for individual students or groups of students that are demonstrating understanding of the priority and supporting skills. When this course is taught in 8th or 9th grade, you will have an opportunity to teach many more of the optional topics with your students.
- Meet in small groups with students who need enrichment to provide instruction and learning activities on the optional skills followed up by an alternative and more complex assignment.
- Excuse the students from standard practice and use appropriately challenging practice that requires students to apply the concepts in more rigorous ways to challenge their thinking and allow students to go deeper on the same skills.
- Provide more rigorous opportunities for mathematical proof.
- There are many resources available throughout our textbook and digital resources to draw upon for enrichment.
 1. Practice sets from the textbook based on the readiness level to address their individual needs
 2. Application practice
 3. Enrichment projects

Central Bucks School District – Course of Study – Geometry/Trig

Unit 4 – Right Triangles and Trigonometry

Desired Results:

Essential Questions:

- Why is it important to use consistent symbols and vocabulary to communicate?
- What are important properties of triangles and how will they help us with higher level mathematics?
- How are right triangles applied in real world applications?
- Given two measurements of a right triangle, how can the remaining measurements be determined?

Enduring Understandings:

Students will understand that...

- mathematics is largely about communication. Using appropriate vocabulary and common symbols is essential for this communication.
- geometry & mathematics is everywhere in the world. Skills from these disciplines can be used to solve problems.
- triangles are a foundational shape and the properties of triangles have far reaching application in mathematics.
- assumptions about figures cannot be made.
- sometimes the correct mathematical answer is not the best solution to real-world problems.
- right triangles can be used to model real world applications.
- the Pythagorean Theorem can be used to calculate a missing side length of a right triangle.
- special right triangles result in exact values and trigonometric ratios result in approximations.

Knowledge:

Students will know...

- Vocabulary: Required: right triangle, rationalize, altitude, Pythagorean triple, leg, hypotenuse, 45-45-90, 30-60-90, trigonometry, trigonometric ratio, opposite, adjacent, sine, cosine, tangent, inverse sine, inverse cosine, inverse tangent, angle of elevation, angle of depression, geometric mean (optional)
- when to use Pythagorean Theorem, Special Right Triangles or Trigonometric ratios
- Theorems:
 - Pythagorean Theorem: In a right triangle, the square of the hypotenuse is equal to the sum of the squares of the legs.
 - Converse of the Pythagorean Theorem: If the square of one side of a triangle is equal to the sum of the squares of the other two sides, then the triangle is a right triangle.
 - If the square of the length of the longest side of a triangle is less than the sum of the squares of the lengths of the two shorter sides, then the triangle is acute.
 - If the square of the length of the longest side of a triangle is greater than the sum of the squares of the lengths of the two shorter sides, then the triangle is obtuse.
 - In a 45-45-90 triangle, the hypotenuse is $\sqrt{2}$ times as long as the leg.
 - In a 30-60-90 triangle, the hypotenuse is twice as long as the shorter leg, and the longer leg is $\sqrt{3}$ times as long as the shorter leg.
- Formula:
 - Distance Formula: $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
 - Area of a Triangle ($A = \frac{1}{2}bh$)

- Additional knowledge, rules, properties, postulates, and theorems used for enrichment (optional):
 - Theorem 8.1: If the altitude is drawn to the hypotenuse of a right triangle, then the two triangles formed are similar to the original triangle and to each other.
 - Geometric Mean (Altitude) Theorem: When the altitude is drawn to the hypotenuse of a right triangle, the lengths of the altitude is the geometric mean between the segments of the hypotenuse.
 - Geometric Mean (Leg) Theorem: When the altitude is drawn to the hypotenuse of a right triangle, each leg is the geometric mean between the hypotenuse and the segment of the hypotenuse that is adjacent to that leg.

Skills:

Students will be able to...

- use the Pythagorean Theorem to determine a missing side of a right triangle and use the Converse of the Pythagorean Theorem to determine whether the triangles are right, acute or obtuse.
- apply the distance formula to find the distance between two given points.
- determine the lengths of two sides of a 45-45-90 or 30-60-90 triangle when the length of the third side is known.
- label the sides of a triangle as opposite, adjacent and hypotenuse given an angle.
- determine when to use trig functions and their inverses.
- set up sine, cosine, and tangent ratios.
- solve right triangles. (In other words, find the length of each side and the measure of each angle using various given information. Techniques include: The Pythagorean Theorem, Special Right Triangles, and three trigonometric functions).
- apply trig functions (and angles of elevation and depression) to real world application problems.
- calculate area and perimeter of triangles.

Standards:

Priority:

CC.2.3.HS.A.3: Verify and apply geometric theorems as they relate to geometric figures.

CC.2.3.8.A.3: Understand and apply the Pythagorean Theorem to solve problems.

CC.2.3.HS.A.7: Apply trigonometric ratios to solve problems involving right triangles.

Supporting:

CC.2.2.HS.D.8: Apply inverse operations to solve equations or formulas for a given variable.

CC.2.2.HS.D.9: Use reasoning to solve equations and justify the solution method.

CC.2.3.HS.A.11: Apply coordinate geometry to prove simple geometric theorems algebraically.

Acceptable Evidence:

Performance tasks –

- Coordinate Geometry Connection: p. 581 #30-33
- Multiple Representations: p. 604 #61
- Challenge: p. 604 #62
- Chapter 8 Performance Task: p. 636

Acceptable evidence of learning other than Performance Tasks:

Formative Assessments

- Warm-ups & Exit Slips
- Check point assignments for each cycle
- Resources from textbook – remedial practice and enrichment opportunities
- Classwork
- Homework

- Online Applications: IXL, Quizizz, Kahoot, Forms, Canvas, Delta Math, IXL etc.
- ConnectED.McGraw-Hill digital resources
 - Vocabulary
 - Self-check practice
 - Practice Sheet

Assessment, Remediation, & Enrichment after section 8-3 and 8-5

Summative Assessment

- Unit 5 Quizzes and Exam
- Core Assessment 1

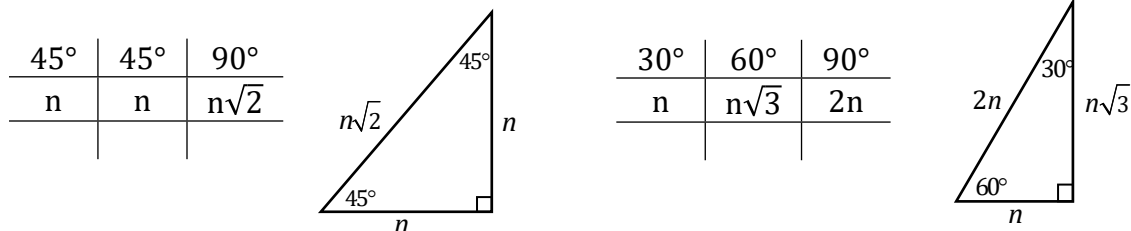
Suggested Learning Experiences and Instruction

Learning Experiences:

- Emphasize use of proper notation and vocabulary throughout course is critical
- Use vocabulary flashcards, online flashcards (quizlet), or webquests to reinforce vocabulary; Word Wall, H5P, www.aplusmath.com (flashcard section on left hand side).
- Personalized/Interactive Activities (with immediate feedback): Delta Math, IXL
- Use <http://www.shodor.org/interactivate/activities/PythagoreanExplorer/> to practice finding the missing side of a right triangle
- Jigsaw Activity: Students can be placed in groups to work through sets of real-world trig application problems. Each group of students is responsible for presenting how to solve the problem to the whole class. A quiz can be given after the presentations.

Instructional Strategies:

- Connect the distance formula and Pythagorean Theorem.
- Emphasize that all 45-45-90 triangles are similar (scale factor/proportions can be used).
- Emphasize that all 30-60-90 triangles are similar (scale factor/proportions can be used).
- Use a chart to organize the 45°-45°-90° and 30°-60°-90° ratios:



- Pneumonic device for trig ratios: SOH-CAH-TOA.
- Pneumonic device for trig ratios: $S_H^O C_H^A T_A^O$

Differentiation Options:

Sections	Study Guide and Intervention	Skills Practice	Practice Worksheet	Word Problem Practice	Enrichment Sheet
0-9	X	X	X	X	X
8-1	X	X	X	X	X
8-2	X	X	X	X	X
8-3	X	X	X	X	X
8-4	X	X	X	X	X
8-5	X	X	X	X	X

- Utilize study guide and intervention for students who need more reteaching.

- Skills practice is extra practice for students who need more entry level practice to master the concept.
- Practice worksheet is a standard practice sheet.
- Word problem practice provides additional opportunities for students to engage in solving problems utilizing the skill from the lesson.
- The enrichment sheet provides a higher-level practice opportunity for students demonstrating faster understanding of the concept.

For Language Development

- Create a student-made dictionary that includes terms, definitions, and examples organized by chapter.
- Make flash cards for terms and examples, then mix and match.
- Use the study guide document with clear definitions and vocabulary development opportunities.
- Discuss the Chapter Wrap-Up, encouraging students to use the chapter vocabulary.
- Glencoe Personal Tutor (Spanish).
- Glencoe “Get Ready” vocab in Spanish.

For Advanced Learners

- Teach the optional topics for individual students or groups of students that are demonstrating understanding of the priority and supporting skills. When this course is taught in 8th or 9th grade, you will have an opportunity to teach many more of the optional topics with your students.
- Meet in small groups with students who need enrichment to provide instruction and learning activities on the optional skills followed up by an alternative and more complex assignment.
- Excuse the students from standard practice and use appropriately challenging practice that requires students to apply the concepts in more rigorous ways to challenge their thinking and allow students to go deeper on the same skills.
- Provide more rigorous opportunities for mathematical proof.
- There are many resources available throughout our textbook and digital resources to draw upon for enrichment.
 1. Practice sets from the textbook based on the readiness level to address their individual needs
 2. Application practice
 3. Enrichment projects

Central Bucks School District – Course of Study – Geometry/Trig

Unit 5 – Congruent Triangles

Desired Results:

Essential Questions:

- What is the purpose of a congruency statement?
- What is the least amount of information needed to verify triangles are congruent?
- What is the relationship between the methods of proving triangles congruent?
- Why is it important to use consistent symbols and vocabulary to communicate?
- What are important properties of triangles and how will they help us with higher level mathematics?
- What information is required to make a unique/distinct triangle?

Enduring Understandings:

Students will understand that:

- two triangles can be classified as congruent using the triangle congruence postulates and theorems.
- congruent triangles can be used to draw conclusions about sides and angles.
- congruent polygons consist of congruent corresponding parts.
- triangles are a foundational shape and the properties of triangles have far reaching application in mathematics.
- mathematics is largely about communication. Using appropriate vocabulary and common symbols is essential for this communication.
- geometry & mathematics is everywhere in the world. Skills from these disciplines can be used to solve problems.
- learning geometric proofs helps us with reason logically, defend arguments, and organize our thoughts.
- assumptions about figures cannot be made.

Knowledge:

Students will know...

- Vocabulary: Congruent Polygons, Corresponding Parts, Corresponding Angles, Corresponding Sides, Included Side, Included Angle, Unique Triangle, Congruent Triangles, Legs of an Isosceles Triangle, Vertex Angle, Base Angles, Ambiguous Case (optional)
- Acronyms: CPCTC, SSS, SAS, ASA, AAS
- Postulates:
 - Side-Side-Side (SSS) Congruence Postulate: If three sides of one triangle are congruent to three sides of another triangle, then the triangles are congruent.
 - Side-Angle-Side (SAS) Congruence Postulate: If two sides and the included angle of one triangle are congruent to two sides and the included angle of another triangle, then the triangles are congruent.
 - Angle-Side-Angle (ASA) Congruence Postulate: If two angles and the included side of one triangle are congruent to two angles and the included side of another triangle, then the triangles are congruent.
- Theorems:
 - The Isosceles Triangle Theorem: If two sides of a triangle are congruent, then the angles opposite those sides are congruent.
 - Converse of Isosceles Triangles Theorem: If two angles of a triangle are congruent, then the sides opposite those angles are congruent.
 - AAS Theorem: If two angles and the non-included side of one triangle are congruent to the corresponding two angles and side of a second triangle, then the two triangles are congruent.
 - Corollaries for Equilateral Triangles
 - A triangle is equilateral if and only if it is equiangular.

- Each angle of an equilateral triangle measures 60.
- Additional knowledge, rules, properties, postulates, and theorems used for enrichment (optional):
 - Third Angles Theorem: If two angles in one triangle are congruent to two angles in a second triangle, then the third angles are congruent.
 - HL Theorem: If the hypotenuse and a leg of one right triangle are congruent to the corresponding parts of another right triangle, then the triangles are congruent.
 - LL Theorem: If the legs of one right triangle are congruent to the corresponding legs of another right triangle, then the triangles are congruent.
 - HA Theorem: If the hypotenuse and acute angle of one right triangle are congruent to the hypotenuse and corresponding acute angle of another right triangle, then the two triangles are congruent.
 - LA Theorem: If one leg and an acute angle of one right triangle are congruent to the corresponding leg and acute angle of another right triangle, then the triangles are congruent.
 - Law of Sines: In $\triangle ABC$ if sides with lengths a , b , and c have opposite angles with measures A , B , and C , respectively, then the following is true: $\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$
 - Law of Cosines: In $\triangle ABC$ if sides with lengths a , b , and c are opposite angles with measures A , B , and C , respectively, then the following are true:
 - $a^2 = b^2 + c^2 - 2bc \cdot \cos A$
 - $b^2 = a^2 + c^2 - 2ac \cdot \cos B$
 - $c^2 = a^2 + b^2 - 2ab \cdot \cos C$

Skills:

Students will be able to...

- identify the corresponding parts of congruent figures to determine the measure of an angle or side (CPCTC).
- use SSS, SAS, ASA Postulates or AAS, HL (optional) Theorems to prove two triangles are congruent.
- write congruence statements using proper notation for congruent figures.
- use congruent triangles to prove statements about the figures.

Standards:

Priority:

CC.2.3.HS.A.1: Use geometric figures and their properties to represent transformations in the plane.

CC.2.3.HS.A.2: Apply rigid transformations to determine and explain congruence.

CC.2.3.HS.A.3: Verify and apply geometric theorems as they relate to geometric figures.

Supporting:

CC.2.2.HS.A.14: Apply geometric concepts to model and solve real world problems.

Acceptable Evidence:

Performance Tasks -

- Complex Proof: p. 328 – Real World Examples 4 (Biosphere)
- Apply the Strategy: p. 347 – bottom of page.

Acceptable evidence of learning other than Performance Tasks:

Formative Assessment

- Warm-ups & Exit Slips
- Check point assignments for each cycle
- Resources from textbook – remedial practice and enrichment opportunities
- Classwork
- Homework
- Online Applications: Quizizz, Kahoot, Forms, Canvas, Delta Math, IXL, etc.
- ConnectED.McGraw-Hill digital resources

- Vocabulary
- Self-check practice
- Practice Sheet

Assessment, Remediation, & Enrichment after section 4-4 and 4-6

Summative Assessment

- Unit 5 Quizzes and Exam

Suggested Learning Experiences and Instruction

Learning Experiences:

- Have students draft proofs (example: show the needed support to use SAS) before writing a formal proof.
- Activity: Teacher has a specific triangle drawn (hidden). Students try to draw the triangle after asking the least amount of questions.
- Use vocabulary flashcards, online flashcards (quizlet), or webquests to reinforce vocabulary; Word Wall, H5P, www.aplusmath.com (flashcard section on left hand side).
- Personalized/Interactive Activities (with immediate feedback): Delta Math, IXL

Instructional Strategies:

- Be sure to show students why Angle, Angle, Angle or Side, Side, Angle (or Angle, Side, Side) does not prove triangles are congruent.
- Use color coding, redrawing, and separation of figures to help students visualize congruent triangles.

Differentiation Options

Sections	Study Guide and Intervention	Skills Practice	Practice Worksheet	Word Problem Practice	Enrichment Sheet
4-2	X	X	X	X	X
4-3	X	X	X	X	X
4-4	X	X	X	X	X
4-5	X	X	X	X	X
4-6 (Optional)	X	X	X	X	X
8-6 (Optional)	X	X	X	X	X
8-7 (Optional)	X	X	X	X	X

- Utilize study guide and intervention for students who need more reteaching.
- Skills practice is extra practice for students who need more entry level practice to master the concept.
- Practice worksheet is a standard practice sheet.
- Word problem practice provides additional opportunities for students to engage in solving problems utilizing the skill from the lesson.
- The enrichment sheet provides a higher-level practice opportunity for students demonstrating faster understanding of the concept.

For Language Development

- Create a student-made dictionary that includes terms, definitions, and examples organized by chapter.

- Make flash cards for terms and examples, then mix and match.
- Use the study guide document with clear definitions and vocabulary development opportunities.
- Discuss the Chapter Wrap-Up, encouraging students to use the chapter vocabulary.
- Glencoe Personal Tutor (Spanish).
- Glencoe “Get Ready” vocab in Spanish.

For Advanced Learners

- Teach the optional topics for individual students or groups of students that are demonstrating understanding of the priority and supporting skills. When this course is taught in 8th or 9th grade, you will have an opportunity to teach many more of the optional topics with your students.
- Meet in small groups with students who need enrichment to provide instruction and learning activities on the optional skills followed up by an alternative and more complex assignment.
- Excuse the students from standard practice and use appropriately challenging practice that requires students to apply the concepts in more rigorous ways to challenge their thinking and allow students to go deeper on the same skills.
- Provide more rigorous opportunities for mathematical proof.
- There are many resources available throughout our textbook and digital resources to draw upon for enrichment.
 1. Practice sets from the textbook based on the readiness level to address their individual needs
 2. Application practice
 3. Enrichment projects

Central Bucks School District – Course of Study – Geometry/Trig

Unit 6 – Quadrilaterals & Polygons

Desired Results:

Essential Questions:

- How would you find the sum of the interior angles of a convex polygon without a formula?
- What is the relationship between the number of sides and the measure of each interior/exterior angle of a regular convex polygon?
- How do the properties of special quadrilaterals overlap and how are they distinct?
- Why is it important to use consistent symbols and vocabulary to communicate?

Enduring Understandings:

Students will understand that...

- triangles are a foundational shape and the properties of triangles have far reaching application in mathematics.
- the sum of the interior angles of a convex polygon is directly related to the number of sides.
- the sum of the exterior angles of a convex polygon is independent to the number of sides (it is always 360°).
- special quadrilaterals are classified by the characteristics of their angles and sides.
- assumptions about figures cannot be made
- geometry & mathematics is everywhere in the world. Skills from these disciplines can be used to solve problems.
- mathematics is largely about communication. Using appropriate vocabulary and common symbols is essential for this communication.

Knowledge:

Students will know...

- Vocabulary: diagonal, base, legs of a trapezoid, base angle, polygon, equilateral, equiangular, regular polygon, convex polygon, concave polygon, quadrilateral, pentagon, hexagon, heptagon, octagon, nonagon, decagon, n-gon, parallelogram, rectangle, square, rhombus, trapezoid, isosceles trapezoid, midsegment of a trapezoid
- Theorems:
 - The sum of the measures of the angles of a convex polygon with n sides is $(n - 2)(180)$.
- The sum of the measures of the exterior angles of any convex polygon, one angle at each vertex, is 360.
- Properties:
 - Parallelogram:
 - Opposite sides of a parallelogram are congruent.
 - Opposite angles of a parallelogram are congruent.
 - Consecutive angles are supplementary.
 - Diagonals of a parallelogram bisect each other.
 - Rectangle:
 - The diagonals of a rectangle are congruent.
 - Rhombus:
 - The diagonals of a rhombus are perpendicular.
 - Each diagonal of a rhombus bisects two angles of the rhombus.
 - Trapezoid:
 - Base angles of an isosceles trapezoid are congruent.
 - The midsegment of a trapezoid is parallel to the bases and has a length equal to the average of the base lengths.

- **Formulas:**
 - Area of a Parallelogram: $A = bh$
 - Area of a Rectangle: $A = bh$
 - Area of a Rhombus: $A = bh$ or $A = d_1 \cdot d_2$
 - Area of a Square: $A = bh$ or $A = s^2$
 - Area of a Trapezoid: $A = \frac{1}{2}(b_1 + b_2) \cdot h$
 - Note: Base & Height are always perpendicular.
- **Additional knowledge, rules, properties, postulates, and theorems used for enrichment (optional):**
 - **Ways to Prove that a Quadrilateral is a Parallelogram:**
 - If both pairs of opposite sides of a quadrilateral are congruent, then the quadrilateral is a parallelogram.
 - If one pair of opposite sides of a quadrilateral are both congruent and parallel, then the quadrilateral is a parallelogram.
 - If both pairs of opposite angles of a quadrilateral are congruent, then the quadrilateral is a parallelogram.
 - If the diagonals of a quadrilateral bisect each other, then the quadrilateral is a parallelogram.
 - If two lines are parallel, then all points on one line are equidistant from the other line
 - If three parallel lines cut off congruent segments on one transversal, then they cut off congruent segments on every transversal.
 - A line that contains the midpoint of one side of a triangle and is parallel to another side passes through the midpoint of the third side.
 - The segment that joins the midpoints of two sides of a triangle is parallel to the third side and is half as long as the third side.

Skills:

Students will be able to...

- identify polygons by number of sides.
- classify polygons as convex/concave and regular/irregular.
- determine the sum of the interior and exterior angles of polygons.
- determine the measure of one interior/exterior angle of a regular polygon.
- set up and solve algebraic equations relating to interior and exterior angles of regular and irregular polygons.
- verify that certain quadrilaterals are parallelograms.
- find missing angle measures and side lengths using the properties of all quadrilaterals.
- find missing angle measures and side/diagonal lengths using properties of parallelograms, including special parallelograms.
- use properties (markings) of special quadrilaterals to classify as parallelograms, rectangles, rhombuses, squares, trapezoids, and isosceles trapezoids.
- Calculate the area and perimeter of quadrilaterals.
- Calculate the area and perimeter of composite shapes.

Standards:

Priority:

CC.2.3.HS.A.3: Verify and apply geometric theorems as they relate to geometric figures.

CC.2.2.HS.A.14: Apply geometric concepts to model and solve real world problems.

Supporting:

CC.2.2.HS.D.2: Write expressions in equivalent forms to solve problems.

CC.2.2.HS.D.8: Apply inverse operations to solve equations or formulas for a given variable.

CC.2.2.HS.D.9: Use reasoning to solve equations and justify the solution method.

CC.2.1.HS.F.3: Apply quantitative reasoning to choose and interpret units and scales in formulas, graphs and data displays.

Acceptable Evidence:

Performance tasks -

- Spreadsheet Lab: Angles of Polygons (p. 432)
- Geometry Software Lab: Parallelograms (p. 442)
- Fashion Forward Chapter 6 Project (Online Textbook Teacher Edition, Chapter 6, Plan and Present tab, chapter projects)

Acceptable evidence of learning other than Performance Tasks:

Formative Assessment

- Warm-ups & Exit Slips
- Check point assignments for each cycle
- Resources from textbook – remedial practice and enrichment opportunities
- Classwork
- Homework
- Online Applications: Quizizz, Kahoot, Forms, Canvas, Delta Math, IXL, etc.
- ConnectED.McGraw-Hill digital resources
 - Vocabulary
 - Self-check practice
 - Practice Sheet

Assessment, Remediation, & Enrichment after section 6.3 and 6.6

Summative Assessment

- Unit 6 Quizzes and Exam
- Core 2

Suggested Learning Experiences and Instruction

Learning Experiences:

- For verifying if a quadrilateral is a parallelogram, give the students a quadrilateral:
 - Then, ask them to determine whether they can say the quadrilateral is a parallelogram based on the markings of the figure (if they say yes, which of the main properties of a parallelogram is supported by the diagram? If they say no, why is this figure not a parallelogram?)
 - For this example, the answer would be “no, because the quadrilateral does not have two pairs of opposite sides congruent”.
- Activity: Students construct various convex polygons with one exterior angle drawn at each vertex. Students cut out the exterior angles and move them to observe that the sum of the exterior angles of any convex polygon is 360.
- See additional resources at:
 - www.mathopenref.com/polygoninteriorangles.html
 - www.mathopenref.com/polygonexteriorangles.html .
- Create a parallelogram using two congruent triangles and color code all corresponding parts. Students will line up the longest sides of the triangles in opposite directions. This will allow observations of the characteristics of parallelograms.
- Activity: Students review side and angle properties of polygons by playing Polygon Capture. (See <http://illuminations.nctm.org/LessonDetail.aspx?ID=L270>).



- Activity: Students construct two congruent triangles and color code all corresponding parts. Students line up congruent triangles to create a parallelogram and discover the properties. (See p. 165c in McDougal Littell Geometry – High School Teacher’s Edition).
- Students can review their knowledge of side and angle characteristics of special quadrilaterals on p. 316 of the Larson, Geometry: An Integrated Approach – Middle School Text.
- Use vocabulary flashcards, online flashcards (quizlet), or webquests to reinforce vocabulary; Word Wall, H5P, www.aplusmath.com (flashcard section on left hand side).
- Personalized/Interactive Activities (with immediate feedback): Delta Math, IXL

Instructional Strategies:

- Derive the formula for the interior angle sum through exploring the number of triangles that can be created by drawing diagonals of a convex polygon from one vertex. Can be done either via Sketchpad or with construction paper.
- Use physical examples of different types of polygons in real life to emphasize understanding.
- Create a chart of the special properties of parallelograms, rectangles, rhombuses, and squares.
- Create Special Quadrilaterals Trifold to help students summarize properties, correctly mark, and identify various examples of parallelograms, rectangles, rhombi, squares, and/or trapezoids. See p. 187 in McDougal Littell Geometry – High School Text
- Use Venn Diagram and tree diagrams to visually relate special quadrilaterals.

Differentiation Options:

Sections	Study Guide and Intervention	Skills Practice	Practice Worksheet	Word Problem Practice	Enrichment Sheet
6-1	X	X	X	X	X
6-2	X	X	X	X	X
6-3	X	X	X	X	X
6-4	X	X	X	X	X
6-5	X	X	X	X	X
6-6	X	X	X	X	X
10-1	X	X	X	X	X
10-2	X	X	X	X	X

- Utilize study guide and intervention for students who need more reteaching.
- Skills practice is extra practice for students who need more entry level practice to master the concept.
- Practice worksheet is a standard practice sheet.
- Word problem practice provides additional opportunities for students to engage in solving problems utilizing the skill from the lesson.
- The enrichment sheet provides a higher-level practice opportunity for students demonstrating faster understanding of the concept.

For Language Development

- Create a student-made dictionary that includes terms, definitions, and examples organized by chapter.
- Make flash cards for terms and examples, then mix and match.
- Use the study guide document with clear definitions and vocabulary development opportunities.
- Discuss the Chapter Wrap-Up, encouraging students to use the chapter vocabulary.
- Glencoe Personal Tutor (Spanish).
- Glencoe “Get Ready” vocab in Spanish.

For Advanced Learners

- Teach the optional topics for individual students or groups of students that are demonstrating understanding of the priority and supporting skills. When this course is taught in 8th or 9th grade, you will have an opportunity to teach many more of the optional topics with your students.
- Meet in small groups with students who need enrichment to provide instruction and learning activities on the optional skills followed up by an alternative and more complex assignment.
- Excuse the students from standard practice and use appropriately challenging practice that requires students to apply the concepts in more rigorous ways to challenge their thinking and allow students to go deeper on the same skills.
- Provide more rigorous opportunities for mathematical proof.
- There are many resources available throughout our textbook and digital resources to draw upon for enrichment.
 1. Practice sets from the textbook based on the readiness level to address their individual needs
 2. Application practice
 3. Enrichment projects

Central Bucks School District – Course of Study – Geometry/Trig

Unit 7 – Circles

Desired Results:

Essential Questions:

- Why is it important to use consistent symbols and vocabulary to communicate?
- How will our prior knowledge help us understand rules in circles?
- How are angles and intercepted arcs of circles related?

Enduring Understandings:

Students will understand that...

- a relationship exists between points, lines, segments, angles, and arcs associated with circles.
- mathematics is largely about communication. Using appropriate vocabulary and common symbols is essential for this communication.
- geometry & mathematics is everywhere in the world. Skills from these disciplines can be used to solve problems.
- assumptions about figures cannot be made.

Knowledge:

Students will know...

- All radii in a circle are congruent.
- Vocabulary: Required: circle, center, radius, chord, diameter, circumference, inscribed, circumscribed, central angle, arc, minor arc, major arc, semicircle, congruent arcs, adjacent arcs, arc length, arc measure, inscribed angle, intercepted arc, tangent, point of tangency, secant, congruent circles, sector of a circle, concentric circles (optional), common tangent (optional)
- Postulate:
 - Arc Addition Postulate: The measure of the arc formed by two adjacent arcs is the sum of the measures of these two arcs.
- Formulas:
 - Radius: $r = \frac{d}{2}$
 - Diameter: $d = 2r$
 - Area of a Circle: $A = \pi r^2$
 - Circumference of a Circle: $C = 2\pi r$
 - Arc Length: $\frac{x}{360} \cdot 2\pi r$
 - Sector Area: $\frac{x}{360} \cdot \pi r^2$
- Additional knowledge, rules, properties, postulates, and theorems used for enrichment (optional):
 - Equation of a Circle: $(x - h)^2 + (y - k)^2 = r^2$
 - If a quadrilateral is inscribed in a circle, then its opposite angles are supplementary.
 - In a plane, a line is tangent to a circle if and only if it is perpendicular to a radius drawn to the point of tangency.
 - If two segments from the same exterior point are tangent to a circle, then they are congruent.
 - If two secants or chords intersect in the interior of a circle, then the measure of an angle formed is one half the *sum* of the measure of the arcs intercepted by the angle and its vertical angle.
 - If a secant and a tangent intersect at the point of tangency, then the measure of each angle formed is one half the measure of its intercepted arc.
 - If two secants, a secant and a tangent, or two tangents intersect in the exterior of a circle, then the measure of the angle formed is one half the *difference* of the measures of the intercepted arcs.

- In the same circle or in congruent circles, two minor arcs are congruent if and only if their central angles are congruent.
- In the same circle or in congruent circles, two minor arcs are congruent if and only if their corresponding chords are congruent.
- If a diameter (or radius) of a circle is perpendicular to a chord, then it bisects the chord and its arc.
- The perpendicular bisector of a chord is a diameter (or radius) of the circle.
- In the same circle or in congruent circles, two chords are congruent if and only if they are equidistant from the center.
- Inscribed Angle Theorem: If an angle is inscribed in a circle, then the measure of the angle equals one-half of the measures of its intercepted arc.
- If two inscribed angles of a circle intercept the same arc (or congruent arcs), then the angles are congruent.
- An inscribed angle of a triangle intercepts a diameter or a semicircle if and only if the angle is a right angle.
- If the vertex of an angle is on the circle, then its measure is one half the measure of the intercepted arc.
- If the vertex of an angle is inside the circle, then its measure is one half of the sum of the measures of the intercepted arcs.
- If the vertex of an angle is outside the circle, then its measure is one half the difference of the measures of the intercepted arcs.

Skills:

Students will be able to...

- identify and use circle vocabulary and notation.
- identify and differentiate between major and minor arcs and semicircles using proper notation.
- apply Pythagorean Theorem and Special Right Triangles to find segment lengths in a circle.
- determine the area and circumference of a circle.
- solve problems by applying theorems involving angles and arcs formed by chords, radii, and tangents (optional).

Standards:

Priority:

CC.2.3.HS.A.3: Verify and apply geometric theorems as they relate to geometric figures.

CC.2.3.HS.A.8: Apply geometric theorems to verify properties of circles.

Supporting:

CC.2.2.HS.D.2: Write expressions in equivalent forms to solve problems.

CC.2.2.HS.D.8: Apply inverse operations to solve equations or formulas for a given variable.

CC.2.2.HS.D.9: Use reasoning to solve equations and justify the solution method.

CC.2.3.HS.A.7: Apply trigonometric ratios to solve problems involving right triangles.

Acceptable Evidence:

Performance tasks -

- Chapter 9 – Performance Task – p. 718
- p. 650 #49
- Buffon's Needle: p. 649 #46
- Error Analysis: p. 659 #57
- Constructing Arguments: p. 659 #58-60

Acceptable evidence of learning other than Performance Tasks:

Formative Assessment

- Warm-ups & Exit Slips

- Check point assignments for each cycle
- Resources from textbook – remedial practice and enrichment opportunities
- Classwork
- Homework
- Online Applications: Quizizz, Kahoot, Forms, Canvas, IXL, Delta Math, etc.
- ConnectED.McGraw-Hill digital resources
 - Vocabulary
 - Self-check practice
 - Practice Sheet

Assessment, Remediation, & Enrichment after section 10-3

Summative Assessment

- Unit 7 Quizzes and Exam

Suggested Learning Experiences and Instruction

Learning Experiences:

- Emphasize use of proper notation and vocabulary throughout course is critical
- Emphasize the application of the Pythagorean theorem, special right triangles, and trigonometry with circles
- Use vocabulary flashcards, online flashcards (quizlet), or webquests to reinforce vocabulary; Word Wall, H5P, www.aplusmath.com (flashcard section on left hand side).
- Personalized/Interactive Activities (with immediate feedback): Delta Math, IXL
- GeoGebra / Geometer's Sketchpad activities (the online textbook provides some of these)
- Desmos Activities - Example: Properties of Tangents to a Circle • Activity Builder by Desmos

Instructional Strategies:

- Emphasize the application of Pythagorean Theorem and Special Right Triangles in circles.

Differentiation Options:

Sections	Study Guide and Intervention	Skills Practice	Practice Worksheet	Word Problem Practice	Enrichment Sheet
9-1	X	X	X	X	X
9-2	X	X	X	X	X
10-3	X	X	X	X	X
9-4	X	X	X	X	X
9-5	X	X	X	X	X
9-6	X	X	X	X	X
9-7	X	X	X	X	X

- Utilize study guide and intervention for students who need more reteaching.
- Skills practice is extra practice for students who need more entry level practice to master the concept.
- Practice worksheet is a standard practice sheet.
- Word problem practice provides additional opportunities for students to engage in solving problems utilizing the skill from the lesson.
- The enrichment sheet provides a higher-level practice opportunity for students demonstrating faster understanding of the concept.

For Language Development

- Create a student-made dictionary that includes terms, definitions, and examples organized by chapter.
- Make flash cards for terms and examples, then mix and match.
- Use the study guide document with clear definitions and vocabulary development opportunities.

- Discuss the Chapter Wrap-Up, encouraging students to use the chapter vocabulary.
- Glencoe Personal Tutor (Spanish).
- Glencoe “Get Ready” vocab in Spanish.

For Advanced Learners

- Teach the optional topics for individual students or groups of students that are demonstrating understanding of the priority and supporting skills. When this course is taught in 8th or 9th grade, you will have an opportunity to teach many more of the optional topics with your students.
- Meet in small groups with students who need enrichment to provide instruction and learning activities on the optional skills followed up by an alternative and more complex assignment.
- Excuse the students from standard practice and use appropriately challenging practice that requires students to apply the concepts in more rigorous ways to challenge their thinking and allow students to go deeper on the same skills.
- Provide more rigorous opportunities for mathematical proof.
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 3. Enrichment projects

Central Bucks School District – Course of Study – Geometry/Trig

Unit 8 – Mixed Area, Surface Areas, & Volume

Desired Results:

Essential Questions:

- Why is it important to use consistent symbols and vocabulary to communicate?
- How does changing the dimension(s) of a plane figure affect the area?
- How will our prior knowledge help us work with Area and Perimeter of Plane Figures and Surface Areas and Volumes of Solids?
- What does the surface area and volume of a solid represent?
- How does changing the dimension(s) of a solid affect the surface area and volume?
- When is the mathematical answer not a correct solution to a real-world application?
- When is it appropriate to adjust formulas for real world applications?
- When would you use surface area versus volume to solve a real-world application?

Enduring Understandings:

Students will understand that...

- mathematics is largely about communication. Using appropriate vocabulary and common symbols is essential for this communication.
- changing the dimensions of a plane figure affects the perimeter and area.
- sometimes the correct mathematical answer is not the best solution to real-world problems.
- there is a connection between three dimensional solids and two-dimensional figures.
- volume represents the space contained in the inside of a three dimensional solid, and surface area represents the sum of the areas of the solid's faces.
- changing the dimensions of a solid affects the volume and surface area.
- formulas and calculations are adjusted to correctly model real-world applications.
- geometry & mathematics is everywhere in the world. Skills from these disciplines can be used to solve problems.
- assumptions about figures cannot be made.

Knowledge:

Students will know...

- Vocabulary: polyhedra, prism, base, lateral face, lateral edge, lateral area, total area, surface area, volume, vertex, pyramid, slant height, cylinder, cone, hemisphere, sphere, composite figure, center of a regular polygon (optional), radius of a regular polygon (optional), apothem (optional), central angle of a regular polygon (optional),
- Other Rules:
 - Perimeter is measured in linear units.
 - Area is measured in square units.
 - Volume is measured in cubic units.
 - Base (b) and Height (h) in a plane figure are always perpendicular.
- Symbols:
 - b: base length of a plane figure
 - h: length of the height of a plane figure
 - s: side length of a square
 - d_1 & d_2 : the lengths of the diagonals of a rhombus
 - L.A: lateral surface area
 - T.A: total surface area

- V: volume
- B: area of the base of a solid
- P: perimeter of the base of a solid
- l: slant height
- r: radius

- Formulas:

- Square
 - $A = s^2$
- Rectangle
 - $A = bh$
- Parallelogram
 - $A = bh$
- Triangle
 - $A = \frac{1}{2}bh$
- Rhombus
 - $A = \frac{1}{2}d_1d_2$ or $A = bh$
- Trapezoid
 - $A = \frac{1}{2}h(b_1 + b_2)$
- Rectangular Solid/Right Prism:
 - Lateral Area: $LA = ph$
 - Surface Area: $TA = LA + 2lw$
 - Volume: $V = lwh$
- Regular Pyramid:
 - Lateral Area: $LA = \frac{1}{2}Pl$
 - Surface Area: $TA = \frac{1}{2}Pl + B$
 - Volume: $V = \frac{1}{3}Bh$
- Right Cylinder:
 - Lateral Area: $LA = 2\pi rh$
 - Surface Area: $TA = LA + 2\pi r^2$
 - Volume: $V = \pi r^2 h$
- Right Cone:
 - Lateral Area: $LA = \pi rl$
 - Surface Area: $TA = \pi rl + \pi r^2$
 - Volume: $V = \frac{1}{3}\pi r^2 h$
- Sphere:
 - Surface Area: $TA = 4\pi r^2$
 - Volume: $V = \frac{4}{3}\pi r^3$

Skills:

Students will be able to...

- calculate area and perimeter of plane figures.
- calculate lateral surface area, total surface area, and volume of solids.

- solve application problems using area and perimeter/circumference of plane figures and surface areas/volume of solids and interpret results to meet the requirements of the real-life application problem.
- identify plane figures and solids.
- apply knowledge from the rest of the course to figures and solids.
- Determine the area/perimeter of a composite figure/shaded region.
- State and apply properties of similar polygons (ratios of lengths, perimeters, and areas).
- Identify pieces of plane figures and solids (example: slant height, radius).

Standards:

Priority:

- CC.2.3.HS.A.3: Verify and apply geometric theorems as they relate to geometric figures.
 CC.2.3.HS.A.12: Explain volume formulas and use them to solve problems.
 CC.2.3.HS.A.13: Analyze relationships between two-dimensional and three-dimensional objects.
 CC.2.3.HS.A.14: Apply geometric concepts to model and solve real world problems.

Supporting:

- CC.2.1.HS.F.3: Apply quantitative reasoning to choose and Interpret units and scales in formulas, graphs and data displays.
 CC.2.2.HS.D.2: Write expressions in equivalent forms to solve problems.
 CC.2.2.HS.D.8: Apply inverse operations to solve equations or formulas for a given variable.

Acceptable Evidence:

Performance Tasks -

- p. 852 – Chapter 11 Performance Task
- p. 833 – Extend 11-5 – Geometry Lab Navigational Coordinates
- p. 757 #20
- p. 808 #42

Acceptable evidence of learning other than Performance Tasks:

Formative Assessment

- Warm-ups & Exit Slips
- Check point assignments for each cycle
- Resources from textbook – remedial practice and enrichment opportunities
- Classwork
- Homework
- Online Applications: Quizizz, Kahoot, Forms, Canvas, IXL, Delta Math, etc.
- ConnectED.McGraw-Hill digital resources
 - Vocabulary
 - Self-check practice
 - Practice Sheet

Assessment, Remediation, & Enrichment as time allows/as needed.

Summative Assessment

- Unit 8 Quizzes and Exam

Suggested Learning Experiences and Instruction

Learning Experiences:

- In online textbook – Geometry Tool 3-D Figures (Chapter 11)
- p. 795 – Introduce Volume formula with stacks of cards

- Use 3-D Models while introducing vocabulary and formulas
- Volume or Surface Area? • Activity Builder by Desmos
- Application Project: Students create a scale drawing of a room in their home and calculate various home improvement costs. Students write explanations of their problem-solving process.
- Application Project: Students complete application problems regarding maximizing area and minimizing cost.
- Jigsaw Application Activity: In groups of 3-4 students work on area and perimeter real world application problems. Students will present an explanation of their problem to the class. Students can use PowerPoint or a poster as a visual. Students take a quiz after the presentations to ensure understanding.
- Use vocabulary flashcards, online flashcards (quizlet), or webquests to reinforce vocabulary; Word Wall, H5P, www.aplusmath.com (flashcard section on left hand side).
- Personalized/Interactive Activities (with immediate feedback): Delta Math, IXL

Instructional Strategies:

- Emphasize the application of Pythagorean Theorem and Special Right Triangles in calculating area of plane figures.
- Use 3-D models while introducing formulas and vocabulary.
- Use physical examples of different types of solids in real life to emphasize understanding.

Differentiation Options:

Sections	Study Guide and Intervention	Skills Practice	Practice Worksheet	Word Problem Practice	Enrichment Sheet
Various Chapter 10	X	X	X	X	X
10-4	X	X	X	X	X
1-8	X	X	X	X	X
10-6	X	X	X	X	X
11-2	X	X	X	X	X
11-3	X	X	X	X	X
11-4	X	X	X	X	X

- Utilize study guide and intervention for students who need more reteaching.
- Skills practice is extra practice for students who need more entry level practice to master the concept.
- Practice worksheet is a standard practice sheet.
- Word problem practice provides additional opportunities for students to engage in solving problems utilizing the skill from the lesson.
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For Language Development

- Create a student-made dictionary that includes terms, definitions, and examples organized by chapter.
- Make flash cards for terms and examples, then mix and match.
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For Advanced Learners

- Teach the optional topics for individual students or groups of students that are demonstrating understanding of the priority and supporting skills. When this course is taught in 8th or 9th grade, you will have an opportunity to teach many more of the optional topics with your students.

- Meet in small groups with students who need enrichment to provide instruction and learning activities on the optional skills followed up by an alternative and more complex assignment.
- Excuse the students from standard practice and use appropriately challenging practice that requires students to apply the concepts in more rigorous ways to challenge their thinking and allow students to go deeper on the same skills.
- Provide more rigorous opportunities for mathematical proof.
- There are many resources available throughout our textbook and digital resources to draw upon for enrichment.
 1. Practice sets from the textbook based on the readiness level to address their individual needs
 2. Application practice
 3. Enrichment projects