BENICIA UNIFIED SCHOOL DISTRICT - COURSE OUTLINE

COURSE INFORMATION

SCHOOL SITE	Benicia High School
SUBJECT AREA	Mathematics - c
COURSE TITLE	Geometry in Construction
TRANSCRIPT ABBREVIATION	TBD
COURSE CODE	TBD
LENGTH OF COURSE	1 year (2 semesters)
UC HONORS DESIGNATION?	No
PREREQUISITES	Integrated Math 1
CO-REQUISITES	None
INTEGRATED COURSE WITH CTE?	Yes, Integrated with CTE-Construction
GRADE LEVEL(S)	10-12
BUSD GRADUATION REQUIREMENT?	Yes - alternative course to IM2

COURSE DESCRIPTION

COURSE OVERVIEW	Geometry in Construction integrates California Common Core State Standards in Integrated Mathematics II with Career Technical Education in Construction Technology. Students will learn to contextualize mathematical skills and concepts in geometry through Construction projects. This course requires that the student take a co-taught Geometry in Construction course where both a Mathematics credentialed and CTE-Construction credentialed teacher are assigned.
STANDARDS	CCCSS: Mathematics: Integrated Mathematics II

COURSE CONTENT (add or remove Units below as needed)

UNIT:	DESCRIPTION	ASSIGNMENT/STANDARDS
UNIT 1	**Algebraic & Geometric Relationships:** This unit reviews previously learned concepts including building linear and exponential functions, angle relationships, and triangle theorems. Students extend their understanding of these concepts by completing the construction of balsa wood houses. **Activities**: The activities in this unit include: Construction of balsa wood structures, comparing polygons on blueprints, calculating perimeter and area, and applying functions to problems involving floor plans. Through these activities students will develop understanding of polygon attributes, perimeter & area, growth rates, angle relationships, and triangle theorem.	F.BF.1a, A.SSE.1a, A.SSE.3a, A.APR.1, F.IF.4, G.CO.9, G.CO.10, G.GMD.6 CA
UNIT 2	**Justification and Similarity:** In this unit students will review congruent triangle conditions and write proofs as flow charts. Students will investigate dilation and properties of similar figures. Students will use the properties of similar figures to explore conditions of similar triangles and prove triangles similar. **Activities:** The activities in this unit include: construction of congruent triangles using appropriate tools and congruent conditions, dilating floor plans using scale factor, and constructing wood framed structures from scaled blueprints. Through these activities students will practice using scale factors in the real world. Students will also justify triangle congruence and similarity of their build using mathematics tools.	G.SRT.5, G.CO.9, G.SRT.1a, G.SRT.1b, G.SRT.2, G.SRT.3, G.SRT.4
UNIT 3	**Trigonometry:** In this unit students will investigate slopes of lines and slope angles, developing an understanding of slope ratios as a tool for determining missing side lengths. Students will extend slope ratios to trigonometric functions (sine, cosine, tangent) and their inverses as tools to calculate missing side and angle measurements. **Activities**: The activities in this unit include: analyzing the slope measurements and ratios of stairs on campus, calculating the unknown heights of on campus structures, and applying trigonometric ratios to framing and plumbing parameters within a build project. Through these activities students will develop an understanding utilizing triangles and trig ratios as tools to calculating unknowns of problems involving right triangles.	G.SRT.6, G.SRT.7, G.SRT.8,

UNIT 4	**Factoring:** In this unit students will develop methods to change quadratic expression as a sum to product form. Students will look for patterns in factoring quadratics and apply quadratic factoring to real world problems. **Activities**: Activities in this unit include: analyzing the framing widths and lengths of construction plan and applying factoring to the design of a construction plan, taking into consideration desired floor area, construction materials, and wall space. Through these activities students will demonstrate their understanding of factoring by applying it to real world problems.	A.SSE.3a, A.SSE.2, A.APR.1
UNIT 5	**Quadratics Functions**: In this unit students will make connections between different representations of quadratic functions. Students will generate multiple representations of quadratic functions. Students will use methods of factoring, completing the square, and quadratic formula to solve quadratic functions. **Activities**: Activities in this unit include, generating and analyzing quadratic models as a method to calculating maximum area, Applying quadratic models to justify the design of a construction project meeting parameters. Through these activities students will utilize the key features of quadratic functions to generate and interpret quadratic models, Students will also utilize tools for solving quadratic functions to solve real world problems.	F.IF.4, F.IF.5, F.IF.7a, F.IF.8, F.IF.8a F.IF.9, A.CED.1, A.CED.2, F.BF.1a, A.SSE.1a, A.SSE.1b,A.SSE.3a, A.REI.4b, N-CN.1, N-CN.2, N.CN.7, N.CN.8+, N.CN.9+ N.RN.3
UNIT 6	**Modeling with Functions:** In this unit students will investigate transforming quadratic functions. Students will apply knowledge of quadratics to solve systems and inequalities. Students will investigate the growth rates of quadratic, exponential, and linear functions. Students will build new functions using pieces of familiar functions. **Activities:** Activities in this lesson include: investigating transformations of functions by changing the parameters of construction management problems, solving systems and inequalities using floor/carpeting and wall/paint problems as a construction manager, and building piecewise functions using construction management material timeframes. Through these activities students will explore how changing parameters effects models, apply systems and inequalities to real world problems related to constructions management, and apply piecewise functions to model solutions.	A.CED.1, A.CED.2, F.IF.4, F.IF.5, F.IF.6, F.IF.7a, F.IF.8a, F.BF.1a, F.BF.3, F.BF.4a, A.SSE.1a, A.SSE.3a, A.SSE.3b, A.REI.7, F.LE.3, F.LE.6
UNIT 7	**Special Triangles and Proofs:** In this unit students will apply pythagorean theorem and properties of similar triangles to discover special patterns in right triangles.	G.SRT.4, G.SRT.8.1 CA, F.TF.8, G.SRT.6, N.RN.1, N.RN.2, A.SSE.3c, F.IF.8b, G.SRT.5,

	Students will analyze the properties of different quadrilaterals and write proofs to justify those properties. **Activities**: Activities in this lesson include: applying special right triangles as a method to constructing right angles, analyzing quadrilaterals within floor plans to justify parallel framing, and applying justifications to the design of a construction project as proof the project has met parameters . Through these lessons students will utilize the tools of special right triangles and provide mathematical justification for the construction of a structure.	G.CO.11, G.CO.9, G.CO.10
UNIT 8	**Polygons and Circles:** In this unit students will use the triangle as a tool for constructing polygons and circles. Students will use triangle properties to discover interior and exterior angles. Students will calculate the area of regular polygons and extend the area/perimeter of regular polygons to develop formulas for area and circumference of circles. Students will extend their understanding of similar figures to circles to solve problems about arcs and sectors. **Activities**: Activities in this unit include: designing and constructing a regular polygon structure, calculating area and perimeter measurements of regular polygons and circles, and justifying the construction of regular polygons by utilizing interior and exterior angles. Through these activities students will apply formulas of area and circumference, calculate area of regular polygons, calculate measurements of arc and sector, justify using angle measurements.	G.CO.10, G.SRT.5, G.C.3, G.SRT.8, G.GMD.5 CA, G.GMD.1, G.C.1,
UNIT 9	**Circles and More:** In this unit students will extend their knowledge of circles and parabolas to writing equations of circles. Students will also investigate the relationships among angles, arcs, and chords in a circle. Students will use those relationships as tools to solve problems. **Activities**: Activities in this unit include: Designing and constructing circle features within construction project, utilizing inscribed angles and lines within a circle to add features to construction. Through these activities students will have to justify their design mathematically, utilizing angle relationships and equations of circles within their justification.	A.REI.7, G.GPE.1, G.GPE.2, G.SRT.5, G.C.2, G.C.5, G.C.3, G.C.4+
UNIT 10	**Solids**: In this unit students will study three-dimensional solids and their volumes. Students will apply their knowledge of similar figures to surface area and volume of three-dimensional figures. Students will expand their	G.GMD.1, G.GMD.3, G.GMD.5 CA

	knowledge to study pyramids, cones, and spheres. **Activities**: The activities in this unit include: Designing a three-dimensional structure and calculating the surface area and volume of a similar three-dimensional structure. Through these activities students will develop an understanding of surface area and volume of different solids. Students will also develop an understanding of ratios of area and ratios of volume.	
UNIT 11	**Probability and Counting**: In this unit students will develop different methods to solve problems of probability. Students will formalize methods for computing probabilities of unions, intersections, and complements of events. Students will calculate expected value in games of chance. Students will explore fundamental counting principle and develop formulas for permutations and combinations **Activities:** Activities in this unit include: Calculating probability of a constructed game, Expected value and game fairness. Through these lessons students will use a constructed game and develop an understanding of the probability of success through two or more events involved in the game. Students will also apply game fairness and expected value to generate appropriate awards for game achievements.	S.CP.1, S.CP.7, S.MD.6+, S.CP.9+, S.MD.7+

COURSE MATERIALS

Textbook/E-book:				
Title	Author	Publisher	Edition	Website
CPM Core Connections Integrated II	Leslie Dietiker, Ph.D.,	CPM Educational Program	2nd edition	ebooks.cpm.org
Other Materials:				