La Cañada High School

Proposed Course Outline – LC Math 2

I.   Course Title – LC Math 2

II.   Grade Level(s) – Grades 9-12

III.   Length/Credit – 1 Year - 10.0 units Second Year Math Graduation Requirement

IV.   Preparations – Completion of LC Math 1 with a C or better or its equivalent

V.   Course Description

This is the second course in a common core based college preparatory math sequence. The fundamental purpose of this course is to formalize and extend students' geometric experiences from the middle grades. This course includes standards from the conceptual categories of Geometry and Statistics and Probability.

In this Geometry course, students explore more complex geometric situations and deepen their explanations of geometric relationships, presenting and hearing formal mathematical arguments. Important differences exist between this course and the historical approach taken in geometry classes. As an example, transformations are emphasized in this course.

In this Geometry course, instruction will focus on six key areas: (1) establishing criteria for congruence of triangles based on rigid motions; (2) establishing criteria for similarity of triangles based on dilations and proportional reasoning; (3) informally developing explanations of circumference, area, and volume formulas; (4) applying the Pythagorean Theorem to the coordinate plane; (5) prove basic geometric theorems; and (6) extending work with probability.

Some of the overarching ideas in the LCM2 course include: (1) the idea of an axiomatic system (e.g., that accepted truths are used to prove other truths), (2) the idea of a viable argument, (3) the idea of definitional thinking, (4) the complementary roles played by synthetic and analytic geometry, and by inductive and deductive reasoning, and (5) the usefulness of Geometry for analyzing the world around us. The Standards for Mathematical Practice will play a prominent role in the course, with students continually developing their ability to reason and argue. Students will solve complex problems, and use tools such as compasses, protractors, and dynamic geometry software.

VI.   Standards Addressed

1. Standards for Mathematical Practices
- Make sense of problems and persevere in solving them.
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Model with mathematics.
- Use appropriate tools strategically.
- Attend to precision.
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning.

2. Congruence   Standards Abbreviation: G-CO
- Experiment with transformations in the plane.
- Understand congruence in terms of rigid motions.
- Prove geometric theorems.
- Make geometric constructions.

3. Similarity, Right Triangles, and Trigonometry   Standard Abbreviation: G-SRT
- Understand similarity in terms of similarity transformations.
- Prove theorems involving similarity.
- Define trigonometric ratios and solve problems involving right triangles.
- Apply trigonometry to general triangles (Laws of Sines and Cosines).

4. Circles   Standard Abbreviation: G-C
- Understand and apply theorems about circles.
- Find arc lengths and area of sectors of circles.

5. Expressing Geometric Properties with Equations   Standard Abbreviation: G-GPE
- Translate between the geometric description and the equation for a conic section.
- Use coordinates to prove simple geometric theorems algebraically.

6. Geometric Measurement and Dimension   Standard Abbreviation: G - GMD
- Explain volume formulas and use them to solve problems.
- Visualize relationships between two-dimensional and three-dimensional objects.

7. Modeling with Geometry   Standard Abbreviation: G- MG
- Apply geometric concepts in modeling situations.

Statistics and Probability
8. Conditional Probability and the Rules of Probability Standard Abbrev.: S-CP
- Understand independence and conditional probability and use them to interpret data.
- Use the rules of probability to compute probabilities of compound events in a uniform probability model.

9. Using Probability to Make Decisions   Standard Abbreviation: S-MD
- Use probability to evaluate outcomes of decisions

    VII.   Brief Course Outline
Essential Course Concepts: Quarter 1: Congruence and Transformations
- Define and notate angle, circle, and various lines based upon undefined notions of point line
- Represent transformations in the plane
- Describe rotations and reflections of various geometric shapes
- Use of geometric descriptions of rigid motion to transform figures
- Explain how the criteria for triangle congruence follow from the definition of congruence
- Prove theorems about lines and angles, triangles, and parallelograms
- Refine understandings of transformations
- Construct various geometric shapes using transformations and dynamic geometry software
- Define a sequence of rigid motion to prove congruence of two figures
- Use coordinates to prove simple geometric theorems algebraically

Common Core State Standards Addressed: G.CO.1, G.CO.9, G.CO.12, G.CO.2, G.CO.3. G.CO.13, G.CO.5, G.CO.4, G.CO.6, G.CO.10, G.CO.11.G-GPE.4

Essential Course Concepts: Quarter 2: Similarity, Right Triangles, and Trigonometry
- Define dilations and identify properties of dilations
- Verify experimentally the properties of dilations given by a center and a scale factor
- Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar
- Prove theorems about triangles
- Use the properties of similarity transformations to establish the Angle-Angle criterion for two triangles to be similar
- Find the point on a directed line segment between two given points that partitions the segment in a given ratio
- Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle
- Explain and use the relationship between the sine and cosine of complementary angles
- Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems

Common Core State Standards Addressed: G.SRT.1, 8.G.3, G.SRT.2, G.SRT.4, G.SRT.3, G.SRT.5, G.GPE.6, G.SRT.6, G.SRT-7

Essential Course Concepts: Quarter 3: Circles, Expressing Geometric Properties with Equations, Trigonometric Functions Analytic Geometry
- Prove all circles are similar
- Identify and describe relationships among inscribed angles, radii, and chords
- Derive using similarity the fact that the length of the arc intercepted by an angle is proportional by an angle is proportional to the radius
- Define the radian measure of the angle as the constant of proportionality
- Derive the formula for the area of a sector
- Convert between degrees and radians
- Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle
- Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers
- Use trigonometric functions to model periodic phenomena with specified amplitude, frequency, and mid-line
- Given a quadratic equation, use the method for completing the square to put the equation into standard form

Common Core Concepts Addressed: G>GPE.1, G,C.1, G.C.5, F.TF.1, G.C.5, G.C.3, G.C.4, G.SRT.6, G-SRT.7, G-SRT.8, G-SRT.9, G-SRT.10, G-SRT.11, F-TF.2, F-TF3, F-TF.4, F-TF.5, F-TF.6, F-TF.7, F-TF.8, F.TF.9, G-GPE.1, G-GPE.2, G-GPE.4, G-GPE.5

Essential Course Concepts: Quarter 4: Geometric Measurements and Dimensions, Modeling with Geometry, Vector Quantities, Statistics and Probability
- Give an informal argument for the formulas for the circumference of a circle, area of a circle, and volume of geometric shapes
- Use dissection arguments, Cavalieri's principle, and informal limit arguments
- Use volume formulas for various geometric shapes
- Identify the shapes of two dimensional cross-sections of three dimensional objects

- Verify experimentally that in a triangle, angles opposite longer sides are larger, sides opposite larger angles are longer, and the sum of any two side lengths is greater than the remaining side length
- Use geometric shapes, their measures, and their properties to describe objects
- Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems
- Apply concept of density based on area and volume in modeling situations
- Apply geometric methods to solve design problems
- Describe events as subsets of a sample space using characteristics of outcomes
- Understand conditional probability
- Construct and interpret two-way frequency tables
- Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations
- Use the rules of probability to compute probabilities of compound events in a uniform probability model
- Use probabilities to make fair decisions

Common Core Concepts Addressed: G.GMD.1, G.GMD.4, G-MG.1, G.MG.2, G.MG.3, G.GPE.3, S-CP.1, S-CP.3, S-CP.4, S-CP.5, S-CP.7, S-MD.6

VIII. Methods of Assessment
Evaluation:
1. **Examinations**: Examinations are a critical component in monitoring comprehension and in preparing students in the development of key critical thinking, operational and computational skills, data analysis, and reading skills. The examinations in this course will follow the district examination policies. Exams will take the form of tests and quizzes given at appropriate instructional periods.
2. **Projects**: Students will be asked to complete both individual and group projects related to key concepts of this course.
3. **Homework**: Students will be assigned homework daily to provide independent practice opportunities in order to strengthen and deepen key concepts. **Homework intensity for this course expects that students will complete homework that will require approximately 60 minutes daily.**
4. **Class Participation**: Class participation will be graded on a weekly basis.
5. **Final Exam**: A final exam will be given at the conclusion of both first and second semester. It will be a comprehensive exam based upon the course of study completed during the year.

Grades:
All work will be assigned a point value, although not all work will receive a letter grade. Grades are based on total points accumulated during each grading period. I have structured the class in such a way to approximate your grade breaking down into the following percentages:

Examinations:	**75%**	**A-/A-= 89.5-100 %**	
Homework:	**10%**	**B-/B/B+ - 79.5-89.4**	
Final Exam:	**15%**	**C-/C/C+ = 69.5- 79.4 %**	
		D-/D/D+ + 59.5 – 69.4 %	
		F = Below 59.5 %	

IX. Materials/Textbook(s)

Geometry, Ray C. Jurgensen, et al. MCDOUGAL LITTLE, 2000.

X.   Seeking "a-f" Approval – Yes/No – Yes, this course will be submitted to the University of California for approval for the 2016-17 academic year in the subject domain "C" for mathematics.

XI.   Seeking AP Class Approval – Yes/No – This course does NOT seek AP approval.

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