

Mathematics II, Semester B

Credits: 0.5

Course Overview and Goals

Mathematics II, Semester B, is a single-semester course designed to present mathematics as a coherent, useful, and logical subject that makes use of problem-solving skills. You will explore nonrigid transformations of figures in the coordinate plane and use them to establish similarity of polygons. You will explore right triangles, trigonometry, and properties of circles. Finally, you will explore probability and counting methods, including their use in making and evaluating decisions.

By the end of this course, you will be able to do the following:

- ❖ Describe similarity in terms of similarity transformations.
- ❖ Prove theorems involving congruence and similarity.
- ❖ Prove the converse of the Pythagorean theorem.
- ❖ Apply right triangle relationships to solve problems.
- ❖ Prove and apply circle properties and relationships.
- ❖ Construct inscribed and circumscribed circles and tangent lines.
- ❖ Derive the equation of a circle or a parabola on the coordinate plane.
- ❖ Measure and describe plane and solid figures using perimeter, area, surface area, and volume.
- ❖ Calculate probabilities, and apply probability concepts to establish independence and make decisions.
- ❖ Construct and analyze fair decisions and strategies based on probability concepts and methods.

Scope and Sequence

This document outlines the design of CCSS Mathematics II, Semester B, as well as the coverage of the Common Core State Standards: Mathematics within the course.

[Common Core State Standards: Mathematics](#)

UNIT 1: SIMILARITY AND PROOFS (DAYS 1 – 22)

In this unit, you will study properties of dilations and use nonrigid transformations of two-dimensional figures to establish similarity of triangles. You will prove theorems about triangles and parallelograms and apply properties of quadrilaterals and angle relationships to solve problems.

Lesson/CCSS Standards	Lesson Objective
Syllabus and Orientation	Review the Student Orientation and Course Syllabus at the beginning of this course.
Properties of Dilations <i>CCSS.Math.Practice.MP.5,</i> <i>CCSS.Math.Content.HSG-SRT.A.1.a,</i> <i>CCSS.Math.Content.HSG-SRT.A.1.b</i>	Verify experimentally the properties of dilations given by a center and a scale factor.
Similarity and Similarity Transformations <i>CCSS.Math.Practice.MP.8,</i> <i>CCSS.Math.Content.HSG-SRT.A.2</i>	Apply the definition of similarity in terms of similarity transformations to decide whether two given figures are similar.
Triangle Similarity <i>CCSS.Math.Practice.MP.5,</i> <i>CCSS.Math.Content.HSG-SRT.A.3</i>	Investigate triangle similarity using technology.
Using Congruence and Similarity with Triangles <i>CCSS.Math.Content.HSG-CO.C.9,</i> <i>CCSS.Math.Content.HSG-SRT.B.5</i>	Apply congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
Clarifying Big Ideas: Misconceptions in Geometric Proof	Explore what does and does not constitute a geometric proof and think about developing a proof as a logical argument supported by evidence.
Similarity, Proportion, and Triangle Proofs <i>CCSS.Math.Practice.MP.3,</i> <i>CCSS.Math.Content.HSG-SRT.B.4</i>	Prove theorems about triangles using similarity relationships.

Lesson/CCSS Standards	Lesson Objective
Proving Theorems about Parallelograms <i>CCSS.Math.Practice.MP.3,</i> <i>CCSS.Math.Content.HSG-CO.C.11</i>	Prove theorems about sides, angles and diagonals of parallelograms.
Properties of Polygons <i>CCSS.Math.Practice.MP.2,</i> <i>CCSS.Math.Practice.MP.7,</i> <i>CCSS.Math.Content.HSG-SRT.B.5</i>	Apply properties of quadrilaterals and angle relationships in convex polygons to solve problems.

UNIT 2: RIGHT TRIANGLES AND TRIGONOMETRY (DAYS 23 – 33)

In this unit, you will use the Pythagorean theorem to establish relationships between sides and angles in right triangles. You will also apply the Pythagorean theorem and trigonometric ratios to solve mathematical and real-world problems.

Lesson/CCSS Standards	Lesson Objective
Pythagorean Triples <i>CCSS.Math.Practice.MP.3,</i> <i>CCSS.Math.Practice.MP.7,</i> <i>CCSS.Math.Content.HSG-SRT.B.4</i>	Prove the converse of the Pythagorean theorem and determine Pythagorean triples.
Special Right Triangles <i>CCSS.Math.Practice.MP.2,</i> <i>CCSS.Math.Content.HSG-SRT.B.5,</i> <i>CCSS.Math.Content.HSG-SRT.C.6,</i> <i>CCSS.Math.Content.HSG-SRT.C.8</i>	Use the relationships between the sides in special right triangles to solve problems.
Clarifying Big Ideas: Identifying Plane Figures	Identify plane shapes in different orientations.
Solving Problems with Right Triangles <i>CCSS.Math.Practice.MP.1,</i> <i>CCSS.Math.Practice.MP.2,</i> <i>CCSS.Math.Practice.MP.4,</i> <i>CCSS.Math.Content.HSF-TF.C.8,</i> <i>CCSS.Math.Content.HSG-SRT.C.6,</i> <i>CCSS.Math.Content.HSG-SRT.C.7,</i> <i>CCSS.Math.Content.HSG-SRT.C.8</i>	Apply the Pythagorean theorem, Pythagorean identity, and trigonometric ratios to solve problems with right triangles.

Lesson/CCSS Standards	Lesson Objective
Unit Activity: Right Triangles and Trigonometry <i>CCSS.Math.Practice.MP.1,</i> <i>CCSS.Math.Practice.MP.4,</i> <i>CCSS.Math.Content.HSG-SRT.B.5,</i> <i>CCSS.Math.Content.HSG-SRT.C.8</i>	Solve real-world problems involving right triangles using similarity properties, the Pythagorean theorem, and trigonometric ratios.

UNIT 3: CIRCLES (DAYS 34 – 52)

In this unit, you will explore properties of circles and relationships between lines, segments, and angles in circles. You will create geometric constructions with circles using basic tools and technology and formulate equations to describe circles and parabolas on the coordinate plane.

Lesson/CCSS Standards	Lesson Objective
Introduction to Circles <i>CCSS.Math.Practice.MP.3,</i> <i>CCSS.Math.Content.HSG-C.A.1</i>	Describe the different parts of a circle and use similarity transformations and properties to prove all circles are similar.
Circle Relationships <i>CCSS.Math.Practice.MP.3,</i> <i>CCSS.Math.Content.HSG-C.A.2</i>	Investigate relationships between lines, segments, and angles in circles.
Clarifying Big Ideas: Congruence, Equality, and Shapes	Examine the differences between congruence and equality.
Arc Length and Area <i>CCSS.Math.Practice.MP.2,</i> <i>CCSS.Math.Content.HSG-C.B.5,</i> <i>CCSS.Math.Content.HSG-GMD.A.1</i>	Extend the concept of similarity to determine arc lengths and areas of sectors of circles.
Circle Constructions <i>CCSS.Math.Practice.MP.5,</i> <i>CCSS.Math.Content.HSG-C.A.3,</i> <i>CCSS.Math.Content.HSG-C.A.4</i>	Construct the inscribed and circumscribed circles of a triangle and a line tangent to a circle and prove properties of angles for a quadrilateral inscribed in a circle.
Equation of a Circle <i>CCSS.Math.Practice.MP.2,</i> <i>CCSS.Math.Content.HSG-GPE.A.1,</i> <i>CCSS.Math.Content.HSG-GPE.B.4</i>	Solve problems involving equations of circles and coordinates.

Lesson/CCSS Standards	Lesson Objective
Equation of a Parabola <i>CCSS.Math.Practice.MP.2,</i> <i>CCSS.Math.Content.HSG-GPE.A.2</i>	Write quadratic functions, graph parabolas, and identify the attributes of parabolas.

UNIT 4: EXTENDING TO THREE DIMENSIONS (DAYS 53 – 72)

In this unit, you will determine perimeter and area of plane figures and then extend your skills to three-dimensional figures as you calculate surface area of prisms, pyramids, cylinders, cones, and spheres. You will also informally prove volume formulas, apply them to solve problems, and explore relationships between measurements in similar and congruent plane and solid figures.

Lesson/CCSS Standards	Lesson Objective
Perimeter and Area <i>CCSS.Math.Practice.MP.1,</i> <i>CCSS.Math.Practice.MP.4,</i> <i>CCSS.Math.Practice.MP.5,</i> <i>CCSS.Math.Practice.MP.6</i>	Estimate and determine perimeter and area of two-dimensional figures.
Surface Area of Prisms, Cylinders, and Spheres <i>CCSS.Math.Practice.MP.1,</i> <i>CCSS.Math.Practice.MP.4</i>	Determine the surface area of a prism, cylinder, or sphere.
Surface Area of Pyramids and Cones <i>CCSS.Math.Practice.MP.1,</i> <i>CCSS.Math.Practice.MP.4</i>	Determine the surface area of a pyramid, cone, or composite figure.
Clarifying Big Ideas: Relationships in Three-Dimensional Figures	Recognize and make use of relationships shown in three-dimensional figures.
Explaining Volume Formulas <i>CCSS.Math.Practice.MP.3,</i> <i>CCSS.Math.Practice.MP.5,</i> <i>CCSS.Math.Content.HSG-GMD.A.1</i>	Justify the volume formulas of a cylinder, a pyramid, and a cone.
Using Volume Formulas <i>CCSS.Math.Practice.MP.6,</i> <i>CCSS.Math.Content.HSG-GMD.A.3</i>	Apply volume formulas for prisms, cylinders, pyramids, cones, and spheres to solve problems.

Lesson/CCSS Standards	Lesson Objective
Relationships Between Lengths, Areas, and Volumes <i>CCSS.Math.Practice.MP.2,</i> <i>CCSS.Math.Practice.MP.8,</i> <i>CCSS.Math.Content.HSG-SRT.A.1.b,</i> <i>CCSS.Math.Content.HSG-GMD.A.3</i>	Explain the relationships between lengths, areas, and volumes of similar figures and how the scale factor of similar figures translates between dimensions.
Unit Activity: Extending to Three Dimensions <i>CCSS.Math.Practice.MP.4,</i> <i>CCSS.Math.Content.HSG-GMD.A.3</i>	Apply area and volume concepts to model real-world situations.

UNIT 5: PROBABILITY (DAYS 73 – 90)

In this unit, you will use sample space, two-way frequency tables, permutations, and combinations to evaluate simple and compound probabilities, including conditional probabilities. You will then use these probabilities to establish dependence or independence and make fair decisions.

Lesson/CCSS Standards	Lesson Objective
Sample Space and Venn Diagrams <i>CCSS.Math.Content.HSA-CP.A.1,</i> <i>CCSS.Math.Content.HSA-CP.B.6,</i> <i>CCSS.Math.Content.HSA-CP.B.7</i>	Describe events as subsets of a sample space and use the sample space to evaluate probabilities.
Conditional Probability <i>CCSS.Math.Content.HSA-CP.A.2,</i> <i>CCSS.Math.Content.HSA-CP.A.3,</i> <i>CCSS.Math.Content.HSA-CP.A.5,</i> <i>CCSS.Math.Content.HSA-CP.B.6,</i> <i>CCSS.Math.Content.HSA-CP.B.7,</i> <i>CCSS.Math.Content.HSA-CP.B.8</i>	Examine and calculate probabilities for independent and dependent events.
Two-Way Frequency Tables <i>CCSS.Math.Practice.MP.1,</i> <i>CCSS.Math.Content.HSA-CP.A.4,</i> <i>CCSS.Math.Content.HSA-CP.A.5,</i> <i>CCSS.Math.Content.HSA-MD.B.7</i>	Construct two-way frequency tables of data and use the tables to approximate probabilities and determine independence.

Lesson/CCSS Standards	Lesson Objective
Fair Decisions <i>CCSS.Math.Content.HSA-MD.B.6,</i> <i>CCSS.Math.Content.HSA-MD.B.7</i>	Apply probability concepts to make and analyze decisions.
Permutations and Combinations <i>CCSS.Math.Content.HSA-CP.B.9</i>	Use permutations and combinations as counting techniques to solve practical problems.
Unit Activity: Probability <i>CCSS.Math.Content.HSA-CP.B.9</i>	Use counting principles to calculate probabilities and interpret the results.

Course Map

You will achieve course level objectives by completing each lesson's instruction, assignments, and assessments. For a detailed look at how the materials meet these objectives, review the [course map for Semester B](#).