

# Saint Patrick High School

## Curriculum Guide

<b>Department :</b>	Mathematics	<b>Grade and Level:</b>	Sophomore CP
<b>Class:</b>	Geometry	<b>Term (Semester or Year):</b>	Year

<b>Required Text:</b>	• Pearson: Geometry Common Core
<b>Additional Resources (i.e. texts, materials, apps, etc.):</b>	<u>iPad Apps:</u> Sowbie, GoodReader, iBooks, iTunes U, Nearpod, Educreations, Geogebra  <u>Other:</u> Notebook, pencil, TI-83(84), Folder, iPad

### Course Description

This course will enable the college-prep student to learn and understand various topics and relationships within the world of geometry, and relate them to the world outside the classroom. Students will encounter geometric situations that will require the use of algebraic principles learned in their freshman year. Students will become familiar with and apply various geometric axioms and theorems, as well as properties of geometric figures. In addition, students will also learn the foundations of trigonometry, which will be further expounded upon their junior year. Logical thinking will be practiced in formulating basic mathematical skills in problem solving and applying basic geometric concepts. There will be an emphasis on ACT Exam Preparation.

## Unit Themes (Table of Contents)

<b>Theme 1:</b>	Tools of Geometry
<b>Theme 2:</b>	Reasoning and Proof
<b>Theme 3:</b>	Parallel and Perpendicular Lines
<b>Theme 4:</b>	Congruent Triangles
<b>Theme 5:</b>	Relationships Within Triangles
<b>Theme 6:</b>	Polygons and Quadrilaterals
<b>Theme 7:</b>	Similarity
<b>Theme 8:</b>	Right Triangles and Trigonometry
<b>Theme 9:</b>	Transformations
<b>Theme 10:</b>	Area
<b>Theme 11:</b>	Surface Area and Volume
<b>Theme 12:</b>	Circles
<b>Theme 13:</b>	Probability

## Agreed Upon Assessments

Forms of assessments may include but are not limited to....

- Mid-Chapter quiz given midway through each chapter (50 points)
- Unit tests given at the end of each chapter (100 points)
- Student Symposiums

<b>Unit:</b>	1. Tools of Geometry	<b>Duration:</b>	
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G.CO.1 – know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.

G.GPE.4 – Use coordinates to prove simple geometric theorems algebraically

G.GPE.7 – Use coordinate to compute perimeters of polygons and areas of triangles and rectangles

G.GPE. 6 –

N.Q.1 – Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas.

### **Essential Questions:**

- How can you represent a three-dimensional figure with a two-dimensional drawing?
- What are the building blocks of geometry?
- How can you describe the attributes of a segment or angle?

### **Affirmation Statements:**

Students will be able to...:

- Understand geometry is a mathematical system built on accepted facts, basic terms, and definitions
- Use number operations to find and compare the lengths of segments
- Use number operations to find and compare the measures of angles
- Understand special angle pairs help you identify geometric relationships and to use these pairs to find angle measures
- Use formulas to find the midpoint and length of any segment in the coordinate plane
- Understand perimeter and area are two different ways of measuring geometric figures

### **Common Assessments:**

- Mid-chapter quiz
- Unit 1 Test
- Homework given on a nightly basis

<b>Unit:</b> 2. Reasoning and Proof	<b>Duration:</b>
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G.CO.9 – Prove theorems about lines and angles

G.CO.10 – Prove theorems about triangles

G.CO.11 – Prove theorems about parallelograms

### **Essential Questions:**

- How can you make a conjecture and prove that it is true?

### **Affirmation Statements:**

Students will be able to...:

- Observe patterns in some number sequences and some sequences of geometric figures to discover relationships
- Describe some mathematical relationships using a variety of *if-then* statements
- Create a good definition by understanding it can be written as a bi-conditional
- Use deductive reasoning, given true statements, to make a valid conclusion
- Understand that algebraic properties of equality are used in geometry. They can help you solve problems and justify each step you take
- Use given information, definitions, properties, postulates, and previously proven theorems as reasons in a proof

### **Common Assessments:**

- Mid-chapter quiz
- Unit 1 Test
- Homework given on a nightly basis

<b>Unit:</b> 3. Parallel and Perpendicular Lines	<b>Duration:</b>
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G.CO.1 – Know precise definitions of... parallel line

G.CO.9 – Prove theorems about lines and angles

G.MG.3 – Apply geometric methods to solve design problems

G.CO.10 – Prove theorems about triangles

G.GPE.5 – Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems

## Essential Questions:

- How do you prove that two lines are parallel?
- What is the sum of the measures of the angles of a triangle?
- How do you write an equation of a line in the coordinate plane?

## Affirmation Statements:

Students will be able to...:

- Identify relationships between figures in space
- Identify angles formed by two lines and a transversal
- Prove theorems about parallel lines
- Use properties of parallel lines to find angle measures
- Determine whether two lines are parallel
- Relate parallel and perpendicular lines
- Use parallel lines to prove a theorem about triangles
- Find measures of angles of triangles
- Graph and write linear equations
- Relate slope to parallel and perpendicular lines

## Common Assessments:

- Mid-chapter quiz
- Unit 1 Test
- Homework given on a nightly basis

<b>Unit:</b> 4. Congruent Triangles	<b>Duration:</b>
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G.SRT.5 – Use congruence

G.CO.12 –

G.CO.10 – Prove theorems about triangles

G.CO.13

## Essential Questions:

- How do you identify corresponding parts of congruent triangles?
- How do you show that two triangles are congruent?
- How can you tell whether a triangle is isosceles or equilateral?

## Affirmation Statements:

Students will be able to...:

- Recognize congruent figures and their corresponding parts
- Prove two triangles congruent using the SSS and SAS postulates
- Prove two triangles congruent using the ASA and AAS Theorem
- Use triangle congruence and corresponding parts of congruent triangles to prove that parts of two triangles are congruent
- Use and apply properties of isosceles and equilateral triangles
- Prove right triangles congruent using the Hypotenuse-Leg Theorem
- Identify congruent overlapping triangles
- Prove two triangles congruent using other congruent triangles

## Common Assessments:

- Mid-chapter quiz
- Unit 1 Test
- Homework given on a nightly basis

<b>Unit:</b>	5. Relationships Within Triangles	<b>Duration:</b>	
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G.CO.10 – Prove theorems about triangles

G.CO-12

G.SRT.5 – Use congruence

G.CO.9 – Prove theorems about lines and angles

G.C.3 – Construct the inscribed and circumscribed circles of a triangle

## Essential Questions:

- How do you use coordinate geometry to find relationships within triangles?
- How do you solve problems that involve measurements of triangles?
- How do you write indirect proofs?

## Affirmation Statements:

Students will be able to...:

- Use properties of mid-segments to solve problems
- Use properties of perpendicular bisectors and angle bisectors
- Identify properties of perpendicular bisectors and angle bisectors

- Identify properties of medians and altitudes of a triangle
- Use indirect reasoning to write proofs
- Use inequalities involving angles and sides of triangles
- Apply inequalities in two triangle

### **Common Assessments:**

- Mid-chapter quiz
- Unit 1 Test
- Homework given on a nightly basis

<b>Unit:</b>	6. Polygons and Quadrilaterals	<b>Duration:</b>	
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G.SRT.5 – Use congruence... criteria to solve problems and prove relationships in geometric figures

G.CO.11 – Prove theorems about parallelograms.

Theorems include: Opposite sides are congruent, opposite angles are congruent; the diagonals of a parallelogram bisect each other.

The diagonals of a parallelogram bisect each other and its converse.

Rectangles are parallelograms with congruent diagonals.

G.GPE.7 – Use coordinates to compute perimeters of polygons

G.GPE 4 – Use coordinates to prove simple geometric theorems algebraically

### **Essential Questions:**

- How can you find the sum of the measures of polygon angles?
- How can you classify quadrilaterals?
- How can you use coordinate geometry to prove general relationships?

### **Affirmation Statements:**

Students will be able to...:

- Find the sum of the measures of the interior angles of a polygon
- Find the sum of the measures of the exterior angles of a polygon
- Use relationships among sides and angles of parallelograms
- Use relationships among diagonals of parallelograms
- Determine whether a quadrilateral is a parallelogram
- Define and classify special types of parallelograms
- Use properties of diagonals of rhombuses and rectangles

- Determine whether a parallelogram is a rhombus or rectangle
- Verify and use properties of trapezoids and kites
- Classify polygons in the coordinate plane
- Name coordinates of special figures by using their properties
- Prove theorems using figures in the coordinate plane

### **Common Assessments:**

- Mid-chapter quiz
- Unit 1 Test
- Homework given on a nightly basis

<b>Unit:</b>	7. Similarity	<b>Duration:</b>	
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G.SRT.5 – Use similarity criteria for triangles to solve problems and to prove relationships in geometric figures

G.GPE.5 – Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems

G.SRT.4 – Prove theorems about triangles

A line parallel to one side of a triangle divides the other two proportionally

### **Essential Questions:**

- How do you use proportions to find side lengths in similar polygons?
- How do you show two triangles are similar?
- How do you identify corresponding parts of similar triangles?

### **Affirmation Statements:**

Students will be able to...:

- Write ratios and solve proportions
- Identify and apply similar polygons
- Use the AA Postulate and the SAS and SSS Theorems
- Use similarity to find indirect measurements
- Find and use relationships in similar right triangles
- Use the Side-Splitter Theorem and the Triangle-Angle-Bisector Theorem

### **Common Assessments:**

- Mid-chapter quiz
- Unit 1 Test
- Homework given on a nightly basis



<b>Unit:</b>	8. Right Triangles and Trigonometry	<b>Duration:</b>	
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G.SRT.8 – Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems

G.MG.1 – Use geometric shape, their measures, and their properties to describe objects

G.SRT.7 -

### Essential Questions:

- How do you find a side length or angle measure in a right triangle?
- How do trigonometric ratios relate to similar right triangles?

### Affirmation Statements:

Students will be able to...:

- Use the Pythagorean Theorem and its converse
- Use properties of 45-45-90 and 30-60-90 triangles
- Use sine, cosine, and tangent ratios to determine side lengths and angle measures in right triangles
- Use angles of elevation and depression to solve problems

### Common Assessments:

- Mid-chapter quiz
- Unit 1 Test
- Homework given on a nightly basis

<b>Unit:</b>	9. Transformations	<b>Duration:</b>	
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G.CO.2 – Represent transformations in the plane

Describe transformations as functions that take points in the plane as inputs and give other points as outputs

G.CO.4 – Develop definitions of rotations

In terms of angles, circles, perpendicular lines, parallel lines, and line segments

G.CO.5 – Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure

Specify a sequence of transformations that will carry a given figure onto another

G.CO.6 – Use geometric descriptions of rigid motions to transform figure and to predict the effect of a given rigid motion on a given figure

G.CO.7 – Use the definition of congruence in terms of rigid motions to show that two triangles are congruent

G.CO.8

G.SRT.1a, 1b – A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged

G.SRT.2 – Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar

G.SRT.3

### **Essential Questions:**

- How can you change a figure's position without changing its size and shape? How can you change a figure's size without changing its shape?
- How can you represent a transformation in the coordinate plane?
- How do you recognize congruence and similarity in figures?

### **Affirmation Statements:**

Students will be able to...:

- Identify isometries
- Find translation images of figures
- Find relation images of figures
- To draw and identify rotation images of figures
- Find compositions of isometries, including glide reflections
- Classify isometries
- Identify congruence transformations
- Prove triangle congruence using isometries
- Understand dilation images of figures
- Identify similarity transformations and verify properties of similarity

### **Common Assessments:**

- Mid-chapter quiz
- Unit 1 Test
- Homework given on a nightly basis

<b>Unit:</b>	10. Area	<b>Duration:</b>	
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G.MG.1 Use geometric shapes, their measures, and their properties to describe objects  
 G.GPE.7 Use coordinates to compute perimeters of polygons and areas of triangles and rectangles  
 G.CO.13  
 G.GMD.3 Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems  
 G.SRT.9 Derive the formula  $A = \frac{1}{2} ab \sin(C)$  for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side  
 G.CO.1 Know precise definitions of... circle...  
 G.C.1 Prove that all circles are similar  
 G.C.2  
 G.C.5 Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector  
 S.CP.1 Describe events as subsets of a sample space using characteristics of the outcomes, or as unions, intersections, or complements of other events

**Essential Questions:**

- How do you find the area of a polygon or find the circumference and area of a circle?
- How do perimeters and areas of similar polygons compare?

**Affirmation Statements:**

Students will be able to...

- Find the area of parallelograms and triangles
- Find the area of a trapezoid, rhombus, or kite
- Find the area of a regular polygon
- Find the perimeters and areas of similar polygons
- Find areas of regular polygons and triangles using trigonometry
- Find the measures of central angles and arcs
- Find the circumference and arc length
- Find the areas of circles, sectors, and segments of circles
- Use segment and area models to find the probabilities of events

**Common Assessments:**

- Mid-chapter quiz
- Unit 1 Test
- Homework given on a nightly basis

<b>Unit:</b>	11. Surface Area and Volume	<b>Duration:</b>	
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G.GMD.4 Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects

G.MG.1 Use Geometric shapes, their measures, and their properties to describe objects

G.GMD.1 Give an informal argument for the formulas for... volume of a cylinder... Use... Cavalieri's Principle...

G.GMD.3 Use volume formulas for cylinders...

G.GMD.2

G.MG.2 Apply concepts of density based on area and volume in modeling situations

### **Essential Questions:**

- How can you determine the intersection of a solid and a plane?
- How can you find the surface area and volume of a solid?
- How do the surface areas and volumes of similar solids compare

### **Affirmation Statements:**

Students will be able to...

- Recognize polyhedral and their parts
- Visualize cross sections of space figures
- Find the surface area of a prism and a cylinder
- Find the surface area of a pyramid and a cone
- Find the volume of a prism and the volume of a cylinder
- Find the volume of a pyramid and of a cone
- Find the surface area and volume of a sphere
- To compare and find the areas and volumes of similar solids

### **Common Assessments:**

- Mid-chapter quiz
- Unit 1 Test
- Homework given on a nightly basis

<b>Unit:</b>	12. Circles	<b>Duration:</b>	
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G.C.2 Identify and describe relationships among inscribed angles, radii, and chords... the radius of a circle is perpendicular to the tangent where the radius intersects the circle

G.C.3 ... Prove properties of angles for a quadrilateral inscribed in a circle

G.C.4

G.GPE.1 Derive the equation of a circle given center and radius using the Pythagorean Theorem...

G.GMD.4... Identify three-dimensional objects generated by rotations of two-dimensional objects

### **Essential Questions:**

- How can you prove relationships between angles and arcs in a circle?
- When lines intersect in a circle or within a circle, how do you find the measures of resulting angles, arcs, and segments?
- How do you find the equation of a circle in the coordinate plane?

### **Affirmation Statements:**

Students will be able to...:

- Use properties of a tangent to a circle
- Use congruent chords, arcs, and central angles
- Use perpendicular bisectors to chords
- Find the measure of an inscribed angle
- Find the measure of an angle formed by a tangent and a chord
- Find measures of angles formed by chords, secants, and tangents
- Find the lengths of segments associated with circles
- Write the equation of a circle
- Find the center and radius of a circle
- Draw and describe a locus

### **Common Assessments:**

- Mid-chapter quiz
- Unit 1 Test
- Homework given on a nightly basis