



**SUBJECT: MATHEMATICS HIGH SCHOOL**  
**BOE APPROVAL: August 2018**

**Cliffside Park Public Schools**

**GRADE: 10**

# **Cliffside Park Public Schools**

## **COURSE OF STUDY UNIT PLANNING GUIDE FOR: GEOMETRY UNIT 3**

Grade Level:  
10th

Cliffside Park School District  
Cliffside Park, NJ 07010  
[www.cliffsidepark.edu](http://www.cliffsidepark.edu)



## Course Overview:

The study of High School geometry involves the study of Euclidean geometry. Students study congruence in terms of rigid motions. Experiment with transformations of shapes in the plane. Prove geometric theorems and make geometric conjectures. Students are required to understand similarity in terms of transformations. Prove theorems involving similarity. Define trigonometric ratios and solve problems using right triangles. They then use this understanding to apply trigonometry to general triangles.

Study continues with circles and the understanding and application of theorems about circles. Students explore arc lengths and areas of sectors. The course continues with translations between geometric descriptions and questions of conic sections. Coordinates are used to prove simple geometric theorems algebraically. Volume formulas are explored and explained. Two-dimensional and three-dimensional visualizations are explored. All geometric concepts are used to model situations and real-life events.

### Overview of Units:

1. **Congruence and Constructions**
2. **Congruence, Similarity & Proof**
3. **Trigonometric Ratios & Geometric Equations**
4. **Spatial Reasoning: Polygons, Solids, Area and Volume**





Mathematics: Geometry

Unit 3

Unit Name: Circles, Trigonometric Ratios & Geometric Equation

Primary Resource: Big Ideas Geometry Common Core Edition 2015 and Associated Online Resources;

Duration: Approximately 9 weeks

WEEK 23

Essential Question: Do “how” and “where” a line(s) intersect a circle make a difference? What are the definitions of the lines and segments that intersect a circle? How are circular arcs measured? What are two ways to determine when a chord is a diameter of a circle?

10.1, 10.2, 10.3

NJSL Standards	Concepts <i>What student will know.</i>	Skills <i>What students will be able to do.</i>	Activities	Assessments and Checks for Understanding
<p><b>G.CO.A.1</b> 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.</p> <p><b>G.C.A.1</b> Prove that all circles are similar.</p> <p><b>G.C.A.2</b> Identify and describe relationships among inscribed angles, radii, and chords. Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a</p>	<p><b>Lesson Vocabulary:</b></p> <p>Circle, tangent circles, concentric circles, radius, diameter, center, chord, tangent, common tangent, point of tangency, secant, minor arc, major arc, inscribed angle, central angle, circumference, area, semicircle, measure of a minor arc, measure of a major</p>	<ul style="list-style-type: none"> <li>Identify the parts of a circle</li> <li>Calculate the length of an arc in a circle</li> <li>Write the equation of a circle given the center and radius.</li> <li>Identify the center and radius of a circle given the equation.</li> <li>Find arc measures and identify congruent arcs</li> </ul>	<ul style="list-style-type: none"> <li>Explorations 1, 2 p 529: Lines and line segments that intersect a circle, Using string to draw a circle</li> <li>Discuss vocabulary</li> <li>Explain how to draw a circle with given radius</li> <li>Core Concept:               <ul style="list-style-type: none"> <li>Line Segments that intersect circles p. 530</li> <li>Coplanar Circles and Common Tangents p. 531</li> <li>Measuring rcs p. 538</li> </ul> </li> </ul>	<p><b>Formative:</b></p> <p>Analyzing Student classwork Strategic Questioning Monitoring Progress, p. 530-531, 547-548 Error Analysis, pp. 535, 542, 549 Modeling with Mathematics, p. 543-4 Thumbs up Think-pair -Share Monitoring Frayer Model Materials Exit Slips Do Nows Leveled Homework pp. 534, 544, 549</p>



<p>diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.</p> <p><b>G.C.A.4</b> Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.</p> <p><b>C.MG.A.3</b> Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).★</p> <p><b>MP.1</b> Make sense of problems and persevere in solving them.  <b>MP.2</b> Reason abstractly and quantitatively.  <b>MP.3</b> Construct viable arguments &amp; critique the reasoning of others.  <b>MP.4</b> Model with mathematics.  <b>MP.5</b> Use appropriate tools strategically.  <b>MP.6</b> Attend to precision.  <b>MP.7</b> Look for and make use of structure.</p>	<p>arc, adjacent arcs, congruent circles, congruent arcs, similar arcs</p> <p><b>Learning Goals:</b></p> <p>Students will understand How circles define the relationships among segments, angles, and arcs</p>	<ul style="list-style-type: none"> <li>• Use chords of circles to find the lengths and arc measures</li> <li>• Solve real-world problems involving properties of circles;</li> </ul>	<ul style="list-style-type: none"> <li>• Theroems:             <ul style="list-style-type: none"> <li>○ Congruent Circles; Congruent Central Angles p. 540</li> <li>○ Similar Circles p. 541</li> </ul> </li> <li>• Exploration 1: Drawing Diameters p. 545</li> <li>• Explorations 2: A Chord perpendicular to a diameter.</li> <li>• Theorems, p. 546</li> <li>• Use word problems to illustrate real life examples of polynomial functions</li> <li>• Use TI-84 to construct a circle and a chord in order to model a real life situation</li> </ul>	<p>Quizzes</p> <p><b>Summative:</b></p> <p>Topic Tests</p> <p><b>Benchmark Tests:</b></p> <p>Approximately every 5-6 weeks.</p> <p><b>Alternative:</b></p> <p>Verbally ask students to explain how are chords and secants alike and how are they different?.</p> <p>Use dynamic geometry software to draw circular arc given a specific measure.</p>
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<p><b>MP.8</b> Look for and express regularity in repeated reasoning.</p>				
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**Possible Resources:**  
 Similar Circles : [G.C.A.1 Similar circles](#)    Chords and Circles TI-84: [Chords and Circles](#)  
 Right Triangles Inscribed in Circles: [G.C.A.2 Right triangles inscribed in circles I](#)  
 Circle Equation: [G.GPE.A.1 Explaining the equation for a circle](#)                      IXL: [Geometry](#)

**WEEK 24**  
**Essential Question:** How are inscribed angles related to their intercepted arcs? When a chord intersects a tangent line or another chord, what relationships exist among the angles and the arcs formed? How are the angles of an inscribed quadrilateral related to each other?  
 10.4 10.5

<b>NJSLS Standards</b>	<b>Concepts</b> <i>What student will know.</i>	<b>Skills</b> <i>What students will be able to do.</i>	<b>Activities</b>	<b>Assessments and Checks for Understanding</b>
<p><b>G.CO.D.13</b> Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.</p> <p>G.C.A.2 . Identify and describe relationships among inscribed angles, radii, and chords. Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter</p>	<p><b>Lesson Vocabulary:</b></p> <p>Inscribed angle            Intercepted arc            Subtend            Inscribed polygon            Circumscribed circle            Circumscribed angle</p> <p><b>Learning Goals:</b></p>	<ul style="list-style-type: none"> <li>● Use and apply vocabulary terms in context.</li> <li>● Find the measure of angles given angles with vertices at the center, inside the circle, on the circle, or outside the circle.</li> </ul>	<p>Exploration 1, 2 p. 553</p> <p>Use dynamic geometry software to construct inscribed and central angles in a circle.</p> <p>Use dynamic geometry software to inscribe a quadrilateral in a circle.</p> <p>Discuss how are inscribed</p>	<p><b>Formative:</b></p> <p>Analyzing Student classwork            Strategic Questioning            Error Analysis, p. 566            Think-Pair-Share            Exit Slips            Do Nows            Graphic Organizers            Homework            Quizzes</p>



<p>are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.</p> <p><b>G.C.A.3</b> Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.</p> <p><b>MP.1</b> Make sense of problems and persevere in solving them.</p> <p><b>MP.2</b> Reason abstractly and quantitatively.</p> <p><b>MP.3</b> Construct viable arguments &amp; critique the reasoning of others.</p> <p><b>MP.4</b> Model with mathematics.</p> <p><b>MP.5</b> Use appropriate tools strategically.</p> <p><b>MP.6</b> Attend to precision.</p> <p><b>MP.7</b> Look for and make use of structure.</p> <p><b>MP.8</b> Look for and express regularity in repeated reasoning.</p>	<p>Use circles in modeling situations and find missing values</p>	<ul style="list-style-type: none"> <li>Use examples and non-examples to distinguish inscribed, central, and circumscribed angles</li> </ul>	<p>angles related to their intercepted arcs?</p>	<p><b>Summative:</b></p> <p>Topic Tests</p> <p><b>Benchmark Assessments:</b> Every 5-6 weeks.</p> <p><b>Alternative:</b></p> <ul style="list-style-type: none"> <li>Have students create their own word problem and explain how material can be used to solve it</li> <li>Have students use technology to create a visual and explain the solution of a problem.</li> </ul>
<p><b>Possible Resources:</b></p> <p>IXL: <a href="#">Geometry</a></p> <p>Circumscribed Triangles - <a href="#">G.C.A.3 Circumscribed Triangles</a></p>				



Texas Instruments: [Inscribed Angles](#)

**WEEK 25**

**Essential Question:** What relationships exist among the segments formed by two intersecting chords or among segments of two secants that intersect outside a circle? How can you find the area of a circle and a sector of a circle?

10.6

NJSLS Standards	Concepts <i>What student will know.</i>	Skills <i>What students will be able to do.</i>	Activities	Assessments and Checks for Understanding
<p><b>G.C.A.2</b> Identify and describe relationships among inscribed angles, radii, and chords. Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle</p> <p><b>G.MG.A.1</b> Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).★</p> <p><b>MP.1</b> Make sense of problems and persevere in solving them.</p> <p><b>MP.2</b> Reason abstractly and quantitatively.</p> <p><b>MP.3</b> Construct viable arguments &amp; critique the reasoning of others.</p>	<p><b>Lesson Vocabulary:</b></p> <p>Segments of a chord Tangent segments Secant segments External segment</p> <p><b>Learning Goals:</b></p> <p>Understand the difference between tangent and secant</p>	<ul style="list-style-type: none"> <li>● Use and apply vocabulary terms in context.</li> <li>● Use segments of chords, tangents, and secants</li> <li>● Finding the radius of a circle</li> </ul>	<ul style="list-style-type: none"> <li>● Exploration 1, 2 p.569: Segments formed by two intersecting chords Secants Intersecting Outside a Circle</li> <li>● Core Concept               <ul style="list-style-type: none"> <li>○ Tangent Segment and Secant segment p. 571</li> <li>○</li> </ul> </li> <li>● Theorem               <ul style="list-style-type: none"> <li>○ 10.19 Segments of Secant</li> <li>○ 10.20 Segments of Secants and Tangents p. 572</li> </ul> </li> <li>● Writing prompt: explain the differences between tangent segment and secant segment</li> </ul>	<p><b>Formative:</b></p> <p>Analyzing Student classwork Strategic Questioning Error Analysis, p. 573 Thumbs up, Thumbs down Exit Slips Do Nows Graphic Organizers, to diagram the Core concepts Homework Quiz</p> <p><b>Summative:</b></p> <p>Topic Tests Projects</p> <p><b>Benchmark Assessments:</b> Every 5-6 weeks.</p> <p><b>Alternative:</b> Have students draw and label secants and tangents, using word bank</p>





<p><b>MP.4</b> Model with mathematics.  <b>MP.5</b> Use appropriate tools strategically.  <b>MP.6</b> Attend to precision.  <b>MP.7</b> Look for and make use of structure.  <b>MP.8</b> Look for and express regularity in repeated reasoning.</p>				
<p><b>Possible Resources:</b></p> <p>Illustrative Mathematics: <a href="#">Tangents to a circle from a point:</a>          Khan Academy - <a href="#">Tangents</a>          IXL: <a href="#">Geometry</a></p>				
<p><b>Additional Resources:</b></p> <p><a href="http://www.desmos.com">www.desmos.com</a>  <a href="http://www.GeoGebra.com">www.GeoGebra.com</a>  <a href="http://www.ixl.com">www.ixl.com</a></p>				
<p><b>WEEK 26</b>  <b>Essential Question(s):</b> What is the equation of a circle with a center <math>(h,k)</math> and a radius <math>r</math> in the coordinate plane? How can you find the area of a circle and the area of a sector of a circle?          10.7 11.2</p>				
<p><b>NJSLS Standards</b></p>	<p><b>Concepts</b>  <i>What student will know.</i></p>	<p><b>Skills</b>  <i>What students will be able to do.</i></p>	<p><b>Activities</b></p>	<p><b>Assessments and Checks for Understanding</b></p>



<p><b>G.GPE.A.1</b> Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.</p> <p><b>G.GPE.B.4</b> Use coordinates to prove simple geometric theorems algebraically. <i>For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point <math>(1, \sqrt{3})</math> lies on the circle centered at the origin and containing the point <math>(0, 2)</math>.</i></p> <p><b>G.GMD.A.1</b> Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. Use dissection arguments, Cavalieri's principle, and informal limit arguments.</p> <p><b>G.MG.A.2</b> . Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).★</p> <p><b>G.C.B.5</b> Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to</p>	<p><b>Lesson Vocabulary:</b></p> <p>Standard equation of a circle, Density, Sector</p> <p><b>Lesson Concepts:</b></p> <ol style="list-style-type: none"> <li>1. Write and graph equations of circles</li> <li>2. Write coordinate proofs involving circles</li> <li>3. Solve application problems using graphs of circles</li> <li>4. Understand how to use the formula for the area of a circle.</li> <li>5. Find area of a sector</li> </ol>	<ul style="list-style-type: none"> <li>• Use and apply vocabulary terms in context.</li> <li>• Write and graph equations of a circle</li> <li>• Write coordinate proofs involving circles.</li> <li>• Use graphs of circles to solve real-life problems.</li> <li>• Use the formula for population density p. 603</li> <li>• Find area of a circle and sector.</li> </ul>	<ul style="list-style-type: none"> <li>• Exploration 1,2,3 p. 575             <ul style="list-style-type: none"> <li>○ 1: The equation of a circle with center at the origin</li> <li>○ 2: The equation of a circle with center <math>(h,k)</math></li> <li>○ 3. Deriving the standard equation of a circle.</li> </ul> </li> <li>• Exploration 1, 2, p. 601:             <ul style="list-style-type: none"> <li>○ 1: Finding the area of a sector of a circle</li> <li>○ 2: Finding the area of a circular sector</li> </ul> </li> <li>• Core Concept:             <ul style="list-style-type: none"> <li>○ Standard equation of a circle p. 576</li> <li>○ Area of a circle p. 602</li> <li>○ Area of a sector p. 604</li> </ul> </li> <li>• Explore area of different sectors and apply to real life problem involving circles and sectors</li> </ul>	<p><b>Formative:</b></p> <p>Analyzing Student classwork          Strategic Questioning          Error Analysis, pp. 579, 598          Think-pair-share          Turn and Talk: describe how we can use the area of a circle to find area of a sector form that circle          Exit Slips          Do Nows          Leveled Homework          Quiz</p> <p><b>Summative:</b></p> <p>Topic Tests          Projects</p> <p><b>Benchmark Assessments:</b>          Every 5-6 weeks.</p> <p><b>Alternative:</b>          illustrations, computer projects, oral response, creative presentations or demonstration</p>
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<p>the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector.</p> <p><b>MP.1</b> Make sense of problems and persevere in solving them.  <b>MP.2</b> Reason abstractly and quantitatively.  <b>MP.3</b> Construct viable arguments &amp; critique the reasoning of others.  <b>MP.4</b> Model with mathematics.  <b>MP.5</b> Use appropriate tools strategically.  <b>MP.6</b> Attend to precision.  <b>MP.7</b> Look for and make use of structure.  <b>MP.8</b> Look for and express regularity in repeated reasoning.</p>				
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**Additional Resources:**

IXL: [Geometry](#)

Khan Academy: [Area of Circles](#)

**BENCHMARK**



**WEEK 27**

**Essential Question:** How can you prove the Pythagorean Theorem? How can you use the Pythagorean Theorem to find sides of a triangle?  
 9.1

<b>NJSLS Standards</b>	<b>Concepts</b> <i>What student will know.</i>	<b>Skills</b> <i>What students will be able to do.</i>	<b>Activities</b>	<b>Assessments and Checks for Understanding</b>
<p><b>G.SRT. 4</b> Prove theorems about triangles</p> <p><b>G.SRT. 8.</b> Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems</p> <p><b>MP.1</b> Make sense of problems and persevere in solving them.</p> <p><b>MP.2</b> Reason abstractly and quantitatively.</p> <p><b>MP.3</b> Construct viable arguments &amp; critique the reasoning of others.</p> <p><b>MP.4</b> Model with mathematics.</p> <p><b>MP.5</b> Use appropriate tools strategically.</p> <p><b>MP.6</b> Attend to precision.</p> <p><b>MP.7</b> Look for and make use of structure.</p> <p><b>MP.8</b> Look for and express regularity in repeated reasoning.</p>	<p><b>Lesson Vocabulary:</b></p> <p>Pythagorean triple            Hypotenuse            Legs of right triangle            Right triangle</p> <p><b>Learning Goals:</b></p> <p>1. SWBAT solve problems and identify right triangles using Pythagorean Theorem.</p> <p>2. SWBAT identify triangles as acute or obtuse using the Pythagorean Inequalities Theorem</p>	<ul style="list-style-type: none"> <li>● Use and apply vocabulary terms in context.</li> <li>● Apply Pythagorean Theorem to solve right triangles</li> <li>● Identify if triangles are right, using the Converse of the Pythagorean theorem</li> <li>● Identify triangles as acute or obtuse, using the Pythagorean Inequalities Theorem</li> </ul>	<ul style="list-style-type: none"> <li>● Exploration 1 Proving the Pythagorean Theorem without Words. p. 463</li> <li>● Exploration 2, Proving the Pythagorean Theorem p. 463</li> <li>● Core Concepts p. 464</li> <li>● Solving a real life problem. pp. 465</li> </ul>	<p><b>Formative:</b></p> <p>Analyzing Student classwork            Strategic Questioning            Error Analysis, pp 468,            Modeling with Mathematics, pp.469,            Student discussion            Exit Slips            Do Nows            Extra Examples pp. 470</p> <p><b>Summative:</b></p> <p>Dynamic Assessment Tool            Topic Tests            Projects</p> <p><b>Benchmark Assessments:</b></p> <p>Every 5-6 weeks.</p> <p><b>Alternative:</b></p> <p>Questioning            Journal responses            illustrations, computer projects, oral response, creative presentations or demonstration, etc</p>



**Additional Resources:**

WebQuest: Right Triangles & Stairs: [www.alschappell.net/WQStairs/WQStairs.htm](http://www.alschappell.net/WQStairs/WQStairs.htm)

Illustrative Mathematics: Applying the Pythagorean Theorem, <https://www.illustrativemathematics.org/content-standards/tasks/1693>

**WEEK 28**

**Essential Question:** What is the relationship among the side lengths of 45-45-90 triangles? 30-60-90 triangles? What are the Law of Sines and Cosines?

9.2

NJSL Standards	Concepts <i>What student will know.</i>	Skills <i>What students will be able to do.</i>	Activities	Assessments and Checks for Understanding
<p><b>G.SRT.C.6.</b> Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.</p> <p><b>MP.1</b> Make sense of problems and persevere in solving them.  <b>MP.2</b> Reason abstractly and quantitatively.  <b>MP.3</b> Construct viable arguments &amp; critique the reasoning of others.  <b>MP.4</b> Model with mathematics.  <b>MP.5</b> Use appropriate tools strategically.  <b>MP.6</b> Attend to precision.  <b>MP.7</b> Look for and make use of structure.</p>	<p><b>Lesson Vocabulary:</b>  Special right triangle  Law of sines  Law of Cosines</p> <p><b>Learning Goals:</b></p> <ol style="list-style-type: none"> <li>1.Find side lengths of special right triangles</li> <li>2.Solve real-life problems using special right triangles</li> </ol>	<ul style="list-style-type: none"> <li>• Use and apply vocabulary terms in context.</li> <li>• Find side lengths in special right triangles.</li> <li>• Solve real-life problems involving special right triangles</li> <li>• Find areas of triangles</li> <li>• Use the Law of Sines and Cosines to solve problems</li> </ul>	<ul style="list-style-type: none"> <li>• Exploration 1, Calculating a tangent ratio, p.487</li> <li>• Exploration 2. Using a calculator, p.487</li> <li>• Exploration 1, Side ratios of an isosceles right triangle, pp. 471</li> <li>• Exploration 2, Side ratios of a 30-60-90 triangle, pp. 471</li> <li>• Communicate your answer, pp. 471</li> <li>• Find side lengths in special right triangles</li> <li>• Theorem <ul style="list-style-type: none"> <li>○ 9.4 45-45-90 Thm p. 472</li> <li>○ 30-60-90 Thm p. 473</li> </ul> </li> </ul>	<p><b>Formative:</b></p> <p>Analyzing Student classwork  Strategic Questioning  Error Analysis, p. 475, p. 513  Modeling with Mathematics, pp. 474,  Dynamic Investigations  Student discussion  Exit Slips  Do Nows</p> <p><b>Summative:</b>  Dynamic Assessment Tool  Topic Tests  Projects</p> <p><b>Benchmark Assessments:</b>  Every 5-6 weeks.  Every 5-6 weeks.</p> <p><b>Alternative:</b></p>



<p><b>MP.8</b> Look for and express regularity in repeated reasoning.</p>				<p>illustrations, computer projects, oral response, creative presentations or demonstration, etc</p>
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**Additional Resources:**  
Khan Academy -[Special Right Triangles](#) :

OnlineMathLearning.com: [Special Right Triangles](#)

[www.ixl.com](http://www.ixl.com)

**WEEK 29**  
**Essential Question:** How is a right triangle used to find the tangent of an acute angle? Is there a unique right triangle that must be used? How is a right triangle used to find the tangent, sine and cosine of an acute angle? Is there a unique right triangle that must be used?  
9.4 9.5

<p><b>NJSLS Standards</b></p>	<p><b>Concepts</b> <i>What student will know.</i></p>	<p><b>Skills</b> <i>What students will be able to do.</i></p>	<p><b>Activities</b></p>	<p><b>Assessments and Checks for Understanding</b></p>
<p><b>G.SRT.C.6</b> Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles</p>	<p><b>Lesson Vocabulary:</b></p> <p>Trigonometric ratio Tangent Sine Cosine</p> <p><b>Learning Goals:</b></p>	<ul style="list-style-type: none"> <li>Use and apply vocabulary terms in context.</li> <li>Identify and use tangent ratios</li> </ul>	<ul style="list-style-type: none"> <li>Exploration 1, Calculating a tangent ratio, p.487</li> <li>Exploration 2. Using a calculator, p.487</li> <li>Exploration 1, Calculating Sine and Cosine, pp. 493</li> </ul>	<p><b>Formative:</b></p> <p>Analyzing Student classwork Strategic Questioning Partner work Error Analysis p. 491 Calculator activities Modeling with Mathematics,</p>



<p><b>G.SRT.C.7</b> Explain and use the relationship between the sine and cosine of complementary angles.</p> <p><b>G.SRT.C.8</b> Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.</p> <p><b>MP.1</b> Make sense of problems and persevere in solving them.</p> <p><b>MP.2</b> Reason abstractly and quantitatively.</p> <p><b>MP.3</b> Construct viable arguments &amp; critique the reasoning of others.</p> <p><b>MP.4</b> Model with mathematics.</p> <p><b>MP.5</b> Use appropriate tools strategically.</p> <p><b>MP.6</b> Attend to precision.</p> <p><b>MP.7</b> Look for and make use of structure.</p> <p><b>MP.8</b> Look for and express regularity in repeated reasoning.</p>	<p>1. Students will be able to derive the trigonometry formulas</p> <p>2. Students will be able to use trigonometric ratios to solve right triangles.</p>	<ul style="list-style-type: none"> <li>• Use trigonometric ratios to solve right triangles</li> <li>• Solve real life problems involving trigonometric ratios</li> </ul>	<ul style="list-style-type: none"> <li>• Solve quadratic equations algebraically pp. 95-96</li> <li>• Core Concepts; Vocabulary Core Concept Check, pp.491, pp. 498</li> </ul>	<p>pp. 491 Reasoning Problems, pp. 492 Exit Slips Do Nows</p> <p><b>Summative:</b>          Dynamic Assessment Tool Modeling with Mathematics, pp. 491, pp.499, pp. 500 Solving Real Life Problems, pp. 490          Topic Tests          Projects</p> <p><b>Benchmark Assessments:</b>          Every 5-6 weeks.</p>
<p><b>Additional Resources:</b>          Khan Academy -Trigonometric ratios: <a href="https://www.khanacademy.org/tag/trig-ratios-sine-cosine-tangent">https://www.khanacademy.org/tag/trig-ratios-sine-cosine-tangent</a></p>				



Illustrative Mathematics: Trigonometric ratios and the Pythagorean Theorem  
<https://www.illustrativemathematics.org/content-standards/tasks/1693>  
[www.ixl.com](http://www.ixl.com)

**WEEK 30**

**Essential Question:**? How can we use angles of elevation and depression to solve real life problems? When you know the lengths of the sides of a right triangle, how can you find the measures of the two acute angles?

**9.4 9.5**

<b>NJSLS Standards</b>	<b>Concepts</b> <i>What student will know.</i>	<b>Skills</b> <i>What students will be able to do.</i>	<b>Activities</b>	<b>Assessments and Checks for Understanding</b>
<p><b>G.SRT.6</b> Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.</p> <p><b>G.SRT.7</b> Explain and use the relationship between the sine and cosine of complementary angles.</p> <p><b>G.SRT.8:</b> Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.</p> <p><b>MP.1</b> Make sense of problems and persevere in solving them.</p> <p><b>MP.2</b> Reason abstractly and quantitatively.</p> <p><b>MP.3</b> Construct viable arguments &amp; critique the reasoning of others.</p>	<p><b>Lesson Vocabulary:</b></p> <p><b>Learning Goals:</b></p> <p>1. SWBAT use angles of elevation and angles of depression to solve real life problems</p> <p>2. SWBAT use trigonometric ratios to solve right triangles.</p>	<ul style="list-style-type: none"> <li>• To identify angles of elevation</li> <li>• To identify angles of depression</li> <li>• To solve real life problems using angles of elevation and depression</li> <li>• Use inverse trigonometric ratios.</li> <li>• Solve right triangles</li> </ul>	<ul style="list-style-type: none"> <li>• Solving Real Life Problems: angle of elevation, pp. 490</li> <li>• Solving Real Life Problems: angle of depression, pp. 497</li> <li>• Exploration 1,2: Solving Right Triangles, pp. 501</li> </ul>	<p><b>Formative:</b></p> <p>Analyzing Student classwork            Strategic Questioning            Modeling with Mathematics, pp. 499            Error Analysis, pp. 505            Word Problems solving, pp. 505</p> <p>Dynamic Investigations            Student discussion            Exit Slips            Do Nows</p> <p><b>Summative:</b></p> <p>Dynamic Assessment Tool            Topic Tests            Projects</p> <p><b>Benchmark Assessments:</b>            Every 5-6 weeks.</p>





<p><b>MP.4</b> Model with mathematics.  <b>MP.5</b> Use appropriate tools strategically.  <b>MP.6</b> Attend to precision.  <b>MP.7</b> Look for and make use of structure.  <b>MP.8</b> Look for and express regularity in repeated reasoning.</p>				<p><b>Alternative:</b>          illustrations, computer projects, oral response, creative presentations or demonstration, etc</p>
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**Additional Resources:**  
 Angles of elevation and depression: <https://www.desmos.com/calculator/ho7bu3vi9j>  
 Zipline activity: <https://teacher.desmos.com/activitybuilder/custom/58bda8188bb11e05bd6756f9>

**Interdisciplinary Connections:**

**NJSLS-ELA**

**RST.11-12.3** Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

**RST.11-12.4** Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.

**RST.11-12.9** Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

**RST.11-12.10** By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.

**W.11-12.1** Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.



**W.11-12.2.D** Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.

**NJSLS-S: Physics**

**HS-PS3-2** Energy Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative positions of particles (objects)

**HS-PS3-5.5** Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction

**HS-PS2-4** : Forces and Motions Use mathematical representations of Newton’s Law of Gravitation and Coulomb’s Law to describe and predict the gravitational and electrostatic forces between objects

**NGSS Practices:**

*Analyzing and Interpreting Data:* Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution.

*Developing and Using Models:* Develop or use a model based on evidence to illustrate the relationships between systems or between components of a system.

*Engaging in Argument from Evidence:* Make and defend a claim based on evidence about the natural world that reflects scientific knowledge, and student-generated evidence.

**NJSLS- Biology**

**HS-LS3** Heredity: Inheritance and Variation of Traits

**HS-LS3-2.** Make and defend a claim based on evidence that inheritable genetic variations may result from (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.

**NJSLS-Technology:**

Students will use Desmos, GeoGebra or the TI-84 calculator to assist in graphing and analyzing these equations. They will discuss their findings with the instructor and their classmates. Students will participate in activities on Google Classroom and other online resources, Desmos, GeoGebra, IXL

**8.1.12.A.3** Collaborate in online courses, learning communities, social networks or virtual worlds to discuss a resolution to a problem or issue.

**8.1.12.A.4** Construct a spreadsheet workbook with multiple worksheets, rename tabs to reflect the data on the worksheet, and use mathematical or logical functions, charts and data from all the worksheets to convey the results.



**Career Ready Practices:**

**CRP2.** Apply appropriate academic and technical skills.

**CRP4.** Communicate clearly and effectively and with reason

**CRP8.** Utilize critical thinking to make sense of problems and persevere in solving them.

**CRP11.** Use technology to enhance productivity

**21st Century Life and Career:**

**9.1.12.B.6** Design and utilize a simulated budget to monitor progress of financial needs.

**9.1.12.C.2** Compare and compute interest and compound interest and develop an amortization table using business tools.

**9.1.12.C.3** Compute and assess the accumulating effect of interest paid over time when using a variety of sources of credit.

**Integrated Differentiation/Accommodations/Modifications for **Geometry Unit 3****  
*(Alternate Modes of Instruction and Support)*

<b>Modifications to Support Gifted and Talented Students</b>	<b>Modifications to Support English Language Learners</b>	<b>Modifications to Support Our Learners (Students with IEPs/504s and At-Risk Learners)</b>
<p>See specific modifications in each lesson.</p> <p>Integrate Higher Order Thinking Skills (HOTS) through questioning and extension projects specific to linear equations, inequalities and functions</p> <p>Provide menu of challenge activities for when the child finishes the lesson early (integrate technology when possible).</p>	<p>See specific modifications in each lesson.</p> <p><b>Concept/Idea Map</b> - teacher models note-taking on Circles , inscribed angles and polygons, Segment relationships in circles, circle in the coordinate plane, the Pythagorean Theorem, Sine, Cosine and Tangent ratios.</p> <p><b>Contextualize language</b> See each lesson for specific vocabulary</p>	<p>See specific modifications in each lesson.</p> <p>Review student individual educational plan and/or 504 plan for instructional, assessment, and environmental supports.</p> <p>Allow student to use calculator to solve problems involving graphing.</p> <p>Utilize manipulatives and/or visuals within instructional presentation of graphing functions.</p>



<p>College/Career Readiness skill enhancement          - G &amp; T students can research professions related to the Algebra.</p> <p>Have the student teach the lesson - peer tutoring (research-based strategy)          Accelerate pace for students who are advanced in concepts.</p> <p>Use inquiry-based, discovery learning approaches that emphasize open-ended problems with multiple solutions or multiple paths to solutions.</p> <p>Allow students to design their own ways to find the answers to complex questions.</p>	<p><b>Visuals and illustrations</b> to be used for Circles , inscribed angles and polygons, Segment relationships in circles, circle in the coordinate plane, the Pythagorean Theorem, Sine, Cosine and Tangent ratios and other concrete terms.</p> <p><b>Word/picture bank</b> available for students' reference in classroom, online and in their textbooks.</p> <p><b>Wait Time Two</b> - extend basic "Wait Time" - after the 1st student responds to a question, the teacher waits an additional 5 - 7 seconds before calling on another student to ask a question about unit 3.</p> <p><b>Native Language Supports</b> (peer, online assistive technology, translation device, bilingual dictionary)</p> <p>Teach the text backward - <b>frontload</b> the concepts and vocabulary needed for learning the material and activating prior knowledge vocabulary, see specific lesson for vocabulary list.</p> <p>Use a <b>word square</b> to teach target academic vocabulary for this unit.</p> <p>WebQuest in Spanish:  <a href="http://www.marianovillagas.com/njctl/">http://www.marianovillagas.com/njctl/</a>  <a href="http://www.alschappell.net/WQStairs/WQStairs.html">www.alschappell.net/WQStairs/WQStairs.html</a></p>	<p>Teach students how to check the accuracy of the solution that was derived from use of the calculator or other method.</p> <p>Utilize graphic organizer or partially completed template for students to solve word problems and other complex problems in the unit.</p> <p>Provide study guides that are partially completed by teacher, allowing the student to fill in missing information during instruction in order to aid in obtaining information pertaining to graphs of functions and polygons</p> <p>Utilize visual aids such as charts or graphs connected to to</p> <p>By utilizing individual student assessment results, the teacher will provide small group or remedial instruction to review essential questions/big ideas, key concepts and provide additional explanations, more examples, and to model procedures in finding the solutions to particular problems.</p> <p>Provide wait time to allow students to process orally presented information and questions relating to the unit.</p> <p>Access to word/picture banks to develop an understanding and use content-specific vocabulary.</p> <p>Allow for Student Choice: Students should be permitted to demonstrate understanding of content through illustrations, computer projects, oral response, creative presentations or demonstration, etc.</p>
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	<p>www.IXL.com <a href="#">Khan Academy in Spanish</a></p>	<p>Support comprehension of unknown vocabulary, by providing examples of Note-taking, highlighting, underlining, etc.</p> <p>Students should be given copies of grade level material or text so they can highlight or underline pertinent information.</p> <p>Text to speech/Oral reading if necessary</p> <p>Provide students with flexible seating options while working independently, depending on need or preference.</p> <p>Math-specific vocabulary and literary terms should be pre-taught before teaching relevant concepts.</p> <p>Allow extra time to complete in class written assignments.</p> <p>Provide students with a sample problem or list of steps or procedures for multi-step solutions to problems. Allow student to reference these procedures when solving independently.</p> <p>Reduce the number of assigned problems within a unit.</p> <p>Provide models or templates to teach the structure of how to solve problems systematically.</p> <p>If necessary, provide additional set of materials or online access so that students can utilize resources at school and home.</p>
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		<p>Provide study guide for students to review before Unit quizzes or tests.</p> <p>Review essential questions/big ideas of Circles , inscribed angles and polygons, Segment relationships in circles, circle in the coordinate plane, the Pythagorean Theorem, Sine, Cosine and Tangent ratios to provide additional explanations, more examples, and to model procedures in finding the solutions to particular problems.</p> <p>Provide wait time to allow students to process orally presented information and questions relating to the unit.</p> <p>Modify tests to address big ideas/essential questions of the unit.</p>
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**Sources:**

- New Jersey Student Learning Standards (2016)- Math <https://www.state.nj.us/education/cccs/2016/math/standards.pdf>
- New Jersey Student Learning Standards (2016) -ELA <https://www.state.nj.us/education/cccs/2016/ela/g1112.pdf>
- New Jersey Student Learning Standards (2016)- Science <https://www.state.nj.us/education/cccs/2016/science/>
- New Jersey Student Learning Standards: Technology (2014) <http://www.state.nj.us/education/cccs/2014/tech/8.pdf>
- Career Ready Practices (2014) <http://www.state.nj.us/education/cccs/2014/career/CareerReadyPractices.pdf>