Mathematics Curriculum Guide

Algebra 2/Trig. Honors

2017-18

Topic 10: Sequences and Series & Quadratic Relations and Conic Sections

This unit is comprised of two sections: Sequences and Series, as well as Quadratic Relations and Conic Sections. Students will begin with sequences and series. They will learn that sequences and series (general, arithmetic, and geometric) are introduced as models of patterned real-world behavior in familiar contexts. Afterwards, students will study the structure of sequences to define them recursively. The second half of the unit is on quadratic relations and conic sections. Conic sections are introduced as models of real-world behavior in familiar contexts, and each conic section is analyzed separately for applications of its particular focal properties. The conic sections are studied analytically, graphically, and numerically with tables. Students will also study their distinguishing characteristics and their common origins as graphs of second degree equations in x and y.

Common Misconceptions and Errors:

- **Arithmetic Sequences and Series:** Students should not assume that two terms can be used to determine an explicit formula. For example, the sequence 3, 6, … could be arithmetic or geometric. When using summation notation, students must remember to count the actual number of terms rather than looking at the upper limit. For example, if the lower limit is 0 and the upper limit is 10, the number of terms is 11.
- **Geometric Sequences and Series:** Errors can occur when the ratio is negative. Remind students that r^n means that the entire value of r (including the negative) is raised to the power.
- **Recursive Definitions:** Errors can occur as students become familiar with subscript notation. Have students write the meanings in words to help them understand the following: a_n means the current term: a_{n-1} means the term before a_n.

Topic 10: Sequences and Series & Quadratic Relations and Conic Sections

Transfer Goals

1) Demonstrate perseverance by making sense of a never-before-seen problem, developing a plan, and evaluating a strategy and solution.
2) Effectively communicate orally, in writing, and using models (e.g., concrete, representational, abstract) for a given purpose and audience.
3) Construct viable arguments and critique the reasoning of others using precise mathematical language.

Timeframe: 23 days
Start Date: April 9, 2018
Assessment Dates: May 9, 2018

Standards:

A-SSE 4 – Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. *For example, calculate mortgage payments.*

F-IF 3 – Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. *For example, the Fibonacci sequence is defined recursively by* $f(0) = f(1) = 1, f(n+1) = f(n) + f(n-1)\ for\ n \geq 1.$

G-GPE 1 – 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.

G-GPE 2 – Derive the equation of a parabola given a focus and directrix.

G-GPE 3 – Derive the equations of ellipses and hyperbolas given the foci, using the fact that the sum or difference of distances from the foci is constant.

G-GPE 3.1 – Given a quadratic equation of the form $ax^2 + by^2 + cx + dy + e = 0$, use the method from completing the square to put the equation into standard form; identify whether the graph of the equation is a circle, ellipse, parabola, or hyperbola and graph the equation.

I-IF 8 – Write a function defined by an expression in different buy equivalent forms to reveal and explain different properties of the function.

Meaning-Making

Understandings

Students will understand that…

- If the numbers in a list follow a pattern, variables may be used to relate each number in the list to its numerical position in the list. (A-SSE 4, F-IF 3)
- In a geometric sequence, the ratio of any term (after the first) to its preceding term is a constant value, no matter what two terms are compared. A geometric sequence can be built by multiplying each term by that constant. (A-SSE 4, F-IF 3)
- When two terms and the number of terms in a finite arithmetic sequence are known, one of equivalent formulas can be used to find the sum of the terms. (A-SSE 4, F-IF 3)
- Just as with a finite arithmetic series, the sum of a finite geometric series can be found using a formula. The first term, the number of terms, and the common ratio must be known. (A-SSE 4, F-IF 3)
- The intersection of a cone and a plane parallel to the side of the cone is a parabola. (G-GPE 3)
- By changing the inclination of the plane that intersects with a cone, you can get a circle, an ellipse, or a hyperbola. (G-GPE 3)
- The x^2 and y^2 terms of the algebraic form of an ellipse, circle, hyperbola, and parabola represent the shape and structure of the figure. (G-GPE 3)

Essential Questions

Students will keep considering…

- How are arithmetic operations used to simplify and/or solve equations and functions?
- How can you represent the terms of a sequence explicitly and recursively?
- How can you model a geometric sequence and its sum?
- What shapes can be formed with the intersection of a cone and a plane?
- What are the differences between the algebraic representations of ellipses, circles, hyperbolas, and parabolas?

Acquisition

Knowledge

Students will know…

Vocabulary: arithmetic sequence, arithmetic series, common difference, common ratio, converge, diverge, explicit formula, geometric sequence, geometric series, limits, recursive formula, conic section, focus of a parabola, directrix, focal length, circle, center of a circle, standard form of an equation of a circle, ellipse, focus of an ellipse, center of an ellipse, minor axis, vertices of an ellipse, co-vertices of an ellipse, hyperbola, center of a hyperbola, focus of a hyperbola, vertex of a hyperbola, transverse axis, axis of symmetry, conjugate axis

Concepts:

- Methods for finding mathematical patterns found in a sequence, and rules to describe patterns
- Common difference of an arithmetic sequence, and common ratio of a geometric sequence
- Qualities/attributes of parabolas, circles, ellipses, and hyperbolas
- Transformations and/or translations of parabolas, circles, ellipses, and hyperbolas
- Properties of Ellipses with Center (0,0), Hyperbolas with Center (0,0)
- Writing the standard -form equation of a conic section from the general form $Ax^2 + Cy^2 + Dx + Ey + F = 0$ can be done by completing the square and simplifying the resulting equation.

Skills

Students will be skilled at and able to do the following…

- Evaluate functions when determining the nth term in a sequence or series.
- Find and use the sum of a finite arithmetic series.
- Write a series in summation notation and find its sum.
- Identify mathematical patterns within sequences to write recursive definitions and explicit formulas for the pattern.
- Simplify complex fractions when finding the sum of an infinite geometric series.
- Identify conic sections that are created by various intersections of a cone and a plane.
- Identify conic sections by their equations and/or graphs.
- Identify the domain and range of the graphs of conics.
- Graph, translate, and state important parts of conic sections: parabolas, circles, ellipses, hyperbolas.

Topic 10: Sequences and Series & Quadratic Relations and Conic Sections

Transfer is a student's ability to independently apply understanding in a novel or unfamiliar situation. In mathematics, this requires that students use reasoning and strategy, not merely plug in numbers in a familiar-looking exercise, via a memorized algorithm.

Transfer goals highlight the effective uses of understanding, knowledge, and skills we seek in the long run – that is, what we want students to be able to do when they confront new challenges, both in and outside school, beyond the current lessons and unit. These goals were developed so all students can apply their learning to mathematical or real-world problems while simultaneously engaging in the Standards for Mathematical Practices. In the mathematics classroom, assessment opportunities should reflect student progress towards meeting the transfer goals.

With this in mind, the revised **PUSD transfer goals** are:

1) **Demonstrate perseverance by making sense of a never-before-seen problem, developing a plan, and evaluating a strategy and solution.**
2) **Effectively communicate orally, in writing, and by using models (e.g., concrete, representational, abstract) for a given purpose and audience.**
3) **Construct viable arguments and critique the reasoning of others using precise mathematical language.**

Multiple measures will be used to evaluate student acquisition, meaning-making and transfer. Formative and summative assessments play an important role in determining the extent to which students achieve the desired results in stage one.

Formative Assessment	Summative Assessment
Aligning Assessment to Stage One	
• What constitutes evidence of understanding for this lesson? • Through what other evidence during the lesson (e.g. response to questions, observations, journals, etc.) will students demonstrate achievement of the desired results? • How will students reflect upon, self-assess, and set goals for their future learning?	• What evidence must be collected and assessed, given the desired results defined in stage one? • What is evidence of understanding (as opposed to recall)? • Through what task(s) will students demonstrate the desired understandings?
Opportunities	
• Discussions and student presentations • Checking for understanding (using response boards) • Ticket out the door, Cornell note summary, and error analysis • *Performance Tasks* within a Unit • Teacher-created assessments/quizzes	• Unit assessments • Teacher-created quizzes and/or mid-unit assessments • *Illustrative Mathematics* tasks (https://www.illustrativemathematics.org/) • Performance tasks

Topic 10: Sequences and Series & Quadratic Relations and Conic Sections

The following pages address how a given skill may be assessed. Assessment guidelines, examples and possible question types have been provided to assist teachers in developing formative and summative assessments that reflect the rigor of the standards. *These exact examples cannot be used for instruction or assessment, but can be modified by teachers.*

Unit Skills	SBAC Targets (DOK)	Selected Standards	Examples
• Evaluate functions when determining the nth term in a sequence or series. • Find and use the sum of a finite arithmetic series. • Write a series in summation notation and find its sum. • Identify mathematical patterns within sequences to write recursive definitions and explicit formulas for the pattern. • Simplify complex fractions when finding the sum of an infinite geometric series.	Create equations that describe numbers or relationships. (1,2) Represent and solve equations graphically. (1,2) Interpret functions that arise in applications in terms of a context. (1,2) Analyze functions using different representations. (1,2) Apply mathematics to solve well-posed problems in pure mathematics and arising in everyday life, society, and the workplace. (2,3)	**A-SSE 4** – Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. *For example, calculate mortgage payments.* **F-IF 3** – Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. *For example, the Fibonacci sequence is defined recursively by* $f(0) = f(1) = 1, f(n+1) = f(n) + f(n-1)\ for\ n \geq 1.$	**5.** Lanie has decided to add strength training to her exercise program. Her trainer suggests that she add weight lifting for 5 minutes during her routine for the first week. Each week thereafter, she is to increase the weight lifting time by 2 minutes. **a)** Which formula represents this sequential increase in weight lifting time? Choose: ○ $f(n) = 5n + 2$ ○ $f(n) = 2n + 5$ ○ $f(n) = 3n + 2$ ○ $f(n) = 2n + 3$ **b)** If Lanie continues with this increase in weight lifting time, how many minutes will she be devoting to weight lifting in week 10? Choose: ○ 23 ○ 25 ○ 32 ○ 52 **6.** A research lab is to begin experimentation with a bacteria that doubles every 4 hours. The lab starts with 200 bacteria. **a)** Which recursive formula represents the growth numbers of the bacteria? Choose: ○ $f(1) = 200;\ f(n) = f(n-1) + 200$ ○ $f(1) = 200;\ f(n) = 4 \cdot f(n-1)$ ○ $f(1) = 200;\ f(n) = 2 \cdot f(n-1)$ ○ $f(1) = 200;\ f(n) = f(n-1) + 400$ **b)** How many bacteria will be present at the end of the 12th hour? Choose: ○ 800 ○ 1,600 ○ 2,400 ○ 819,200 **3.** Given the sequence: {5, 7, 9, 11, ...} **a)** Which explicit formula generates this sequence? Choose: ○ $f(n) = 3n + 2$ ○ $f(n) = 2n + 3$ ○ $f(n) = 2n - 3$ ○ $f(n) = 3n - 2$ **b)** Which recursive formula generates this sequence? Choose: ○ $f(1) = 5;\ f(n) = f(n+1) + 2$ ○ $f(1) = 5;\ f(n) = f(n-1) + 4$ ○ $f(1) = 5;\ f(n) = f(n+1) + 4$ ○ $f(1) = 5;\ f(n) = f(n-1) + 2$ **c)** What is the 11th term of the sequence? Choose: ○ 21 ○ 23 ○ 25 ○ 27

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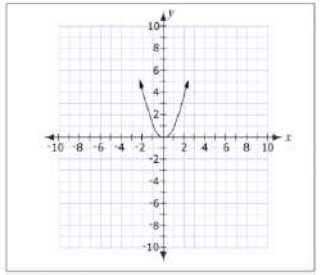
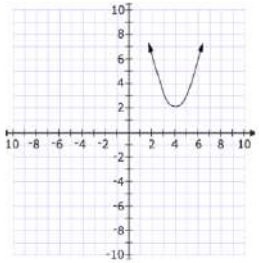
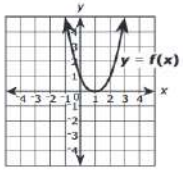
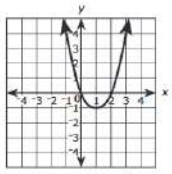
Unit Skills	SBAC Targets (DOK)	Selected Standards	Examples
• Identify conic sections that are created by various intersections of a cone and a plane. • Identify conic sections by their equations and/or graphs. • Identify the domain and range of the graphs of conics. • Graph, translate, and state important parts of conic sections: parabolas, circles, ellipses, hyperbolas.	Create equations that describe numbers or relationships. (1,2) Represent and solve equations graphically. (1,2) Interpret functions that arise in applications in terms of a context. (1,2) Analyze functions using different representations. (1,2) Apply mathematics to solve well-posed problems in pure mathematics and arising in everyday life, society, and the workplace. (2,3)	**G-GPE 1** – 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. **G-GPE 2** – Derive the equation of a parabola given a focus and directrix. **G-GPE 3** – Derive the equations of ellipses and hyperbolas given the foci, using the fact that the sum or difference of distances from the foci is constant. **G-GPE 3.1** – Given a quadratic equation of the form $ax^2 + by^2 + cx + dy + e = 0$, use the method from completing the square to put the equation into standard form; identify whether the graph of the equation is a circle, ellipse, parabola, or hyperbola and graph the equation. **I-IF 8** – Write a function defined by an expression in different buy equivalent forms to reveal and explain different properties of the function.	**26. Theater Arts** The director of a stage show asks you to design an elliptical platform. Her sketch shows the platform centered at (9, 7) from the front left corner of the stage. The platform has a 12-ft major axis parallel to the front edge of the stage and extends to within 3 ft of the edge. Write an equation that models the platform. **662** The graph of $y = x^2$ is shown on the grid. Drag the graph to show $y = (x - 4)^2 + 2$.  For this item, a full-credit response (1 point) includes: • correct placement of the graph with its vertex at (4, 2)  Use the information provided to answer Part A through Part D for question 29. Consider the function $f(x)$, shown in the xy-coordinate plane, as the parent function.  **29. Part A** The graph of a transformation of the function $f(x)$ is shown.  Which expression defines the transformation shown? Ⓐ $f(x + 0) - 1$ Ⓑ $f(x + 0) + 1$ Ⓒ $f(x - 1) + 0$ Ⓓ $f(x + 1) + 0$

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1) Demonstrate perseverance by making sense of a never-before-seen problem, developing a plan, and evaluating a strategy and solution. 2) Effectively communicate orally, in writing, and using models (e.g., concrete, representational, abstract) for a given purpose and audience. 3) Construct viable arguments and critique the reasoning of others using precise mathematical language.						
Essential Questions: • How are arithmetic operations used to simplify and/or solve equations and functions? • How can you represent the terms of a sequence explicitly and recursively? • How can you model a geometric sequence and its sum? • What shapes can be formed with the intersection of a cone and a plane? • What are the differences between the algebraic representations of ellipses, circles, hyperbolas, and parabolas?					**Standards:** A-SSE 4, F-IF 3, G-GPE 1, G-GPE 2, G-GPE 3, G-GPE 3.1, F-IF 8 **Timeframe:** 23 days **Start Date:** April 9, 2018 **Assessment Dates:** May 9, 2018 **(5 extra days have been added to this pacing to allow for the SBAC Summative Review and Assessment)**	
Time	**Lesson/ Activity**	**Focus Questions for Lessons**	**Understandings**	**Knowledge**	**Skills**	**Resources**
5 days	**These five days have been added for review and administration of the Smarter Balance Summative Assessment. The Assessment is scheduled for the week of April 23 – 27.**					
1 day	**Opening Activity:** Introduction to the Common Core Performance Task p. 563					
1 day	**Lesson 9.1: Mathematical Patterns** SMP: 1,3,4,7 (pp. 564-571) **A-SSE 4**	**Focus Question(s):** • How can we use variables to show how numbers in a list relate and follow a pattern? **Inquiry Question(s):** Pg. 564 Solve It!	• If the numbers in a list follow a pattern, variables may be used to relate each number in the list to its numerical position in the list.	**Vocabulary:** term of a sequence, sequence, explicit formula, recursive formula **Concepts:** • Rules to describe mathematical patterns	• Evaluate functions when determining the nth term in a sequence or series.* • Identify mathematical patterns within sequences to write recursive definitions and explicit formulas for the pattern.*	Workbook: Think About a Plan **Thinking Map:** Begin a Tree Map that is divided in two main sections for Arithmetic & Geometric formulas. Use sub-sections to record formulas with examples and descriptions. **CC Problems:** #5,6,53, 54, 64, 65, 66, 70, 71-75

Time	Lesson/ Activity	Focus Questions for Lessons	Understandings	Knowledge	Skills	Additional Resources
1 day	**Lesson 9.2: Arithmetic Sequences** SMP: 1,2,3,4,5,6 (pp. 572-577) **F-IF 3**	**Focus Question(s):** • How can you represent the terms of sequence explicitly? How can you represent them recursively? • What are equivalent explicit and recursive definitions for an arithmetic sequence? **Inquiry Question(s):** Pg. 572 Solve It!	• If the numbers in a list follow a pattern, variables may be used to relate each number in the list to its numerical position in the list. • In an arithmetic sequence, the difference between any two consecutive terms is always the same number. • An arithmetic sequence can be defined explicitly by describing its *n*th term with a formula using *n* or recursively by stating its first term and a formula for its *n*th term using *(n-1)* term.	**Vocabulary:** arithmetic sequence, common difference, arithmetic mean, series, finite series, infinite series, arithmetic series, limits **Concepts:** • Common difference of an arithmetic sequence • Property: Sum of a Finite Arithmetic Series	• Define, identify and analyze arithmetic sequence. • Use an explicit formula for an arithmetic sequence.* • Identify mathematical patterns within sequences to write recursive definitions and explicit formulas for the pattern. • Evaluate functions when determining the nth term in a sequence or series.*	Workbook: Practice Form G pg. 2 **Thinking Map:** Add to the Tree Map started in lesson 9.1. Use sub-sections to record formulas with examples and descriptions. **CC Problems:** #5,6,32, 33, 40, 50, 51, 52, 61, 62
1 day	**Lesson 9.4: Arithmetic Series** SMP: 1,2,3,4 (pp. 587-593) **Extends F-IF 3**	**Focus Question(s):** • How are arithmetic series and sequences the same? How are they different? • How can the formula for the sum of a finite arithmetic series be explained using the concept of mean? **Inquiry Question(s):** Pg. 587 Solve It!	• When two terms and the number of terms in a finite arithmetic sequence are known, the sum of the terms can be found. • A sequence can be defined explicitly by describing its *n*th term with a formula using *n* or recursively by stating its first term and a formula for its *n*th term using the *(n-1)* term.	**Vocabulary:** series, finite series, infinite series, arithmetic series, limits **Concepts:** • Property: Sum of a Finite Arithmetic Series • Summation notation	• Finding and using the sum of a finite arithmetic series.* • Writing a series in summation notation and finding its sum.* • Evaluate functions when determining the nth term in a sequence or series.	Workbook: Think About a Plan **Thinking Map:** Add to the Tree Map started in lesson 9.1. Use sub-sections to record formulas with examples and descriptions. **CC Problems:** #5,6,7, 33, 46, 47, 50 **STEM:** #46

Time	Lesson/ Activity	Focus Questions for Lessons	Understandings	Knowledge	Skills	Additional Resources
1 day	**Lesson 9.3: Geometric Sequences** SMP: 1,2,3,4,6 (pp. 580-586) **A-SSE 4** *Prep for Performance Task (Apply What You Have Learned) p. 586 (Lesson 9.3)*	**Focus Question(s):** • How can you find a specific term of a geometric sequence when you know a term and the common ratio? • How can you model a geometric sequence? **Inquiry Question(s):** Pg. 580 Solve It!	• In a geometric sequence, the ratio of any term (after the first) to its preceding term is a constant value, no matter what two terms are compared. A geometric sequence can be built by multiplying each term by that constant. • A geometric sequence can be modeled explicitly or recursively.	**Vocabulary:** geometric sequence, common ratio, geometric mean **Concepts:** • Common ratio of a geometric sequence • Geometric Mean	• Define, identify and analyze geometric sequence.* • Use a geometric sequence.* • Use the geometric mean. • Evaluate functions when determining the nth term in a sequence or series.	Workbook: Think About a Plan **Thinking Map:** Add to the Tree Map started in lesson 9.1. Use sub-sections to record formulas with examples and descriptions. **CC Problems:** #5,6,25, 48, 49, 50, 59, 60 **STEM:** #25
1 day	**Lesson 9.5: Geometric Series** SMP: 1,2,3,4,5 (pp. 595-601) **A-SSE 4** *Prep for Performance Task (Apply What You Have Learned) p. 601 (Lesson 9.5)*	**Focus Question(s):** • What is the difference between finding the sum of a finite and infinite geometric series? • How can you model a geometric sequence and its sum? **Inquiry Question(s):** Pg. 595 Solve It!	• Just as with a finite arithmetic series, the sum of a finite geometric series can be found using a formula. The first term, the number of terms, and the common ratio must be known. • A geometric sequence can be modeled explicitly or recursively.	**Vocabulary:** geometric series, converge, diverge **Concepts:** • Sum of a Finite Geometric Series • Infinite Geometric Series	• Finding the sum of a finite geometric series.* • Use the Geometric Series Formula.* • Analyze infinite geometric series. • Simplify complex fractions when finding the sum of an infinite geometric series. • Evaluate functions when determining the nth term in a sequence or series.	Workbook: Practice Form G pg. 2 **Thinking Map:** Add to the Tree Map started in lesson 9.1. Use sub-sections to record formulas with examples and descriptions. **CC Problems:** #5,6,7, 16, 38, 39, 40, 46, 47, 48, 49, 50, 51, 52 **STEM:** #50
1 day	**Review and Assess sections 9.1-9.5** Use Textbook Resources and/or Teacher Created Items for Assessment					
1 day	**Performance Task for sections 9.1-9.5** Textbook p. 602 *Pull It All Together* Have students work collaboratively to reflect on *Completing the Performance Task* and *On Your Own*					

Time	Lesson/ Activity	Focus Questions for Lessons	Understandings	Knowledge	Skills	Additional Resources
1 day	**Lesson 10.1: Exploring Conic sections** SMP: 1,2,3,5 (pp. 614-620) **G-GPE 1, Prepares for G-GPE 2, G-GPE 3**	**Focus Question(s):** • How are the domain and range of conic figures related to the x- and y- intercepts? **Inquiry Question(s):** Pg. 614 Solve It!	• There are four types of curves known and conic sections: parabolas, circles, ellipses, and hyperbolas. Each curve has its own district shape and properties.	**Vocabulary:** conic section	• Identify conic sections that are created by various intersections of a cone and a plane. • Identify conic sections by their equations and/or graphs. • Identify the domain and range of the graphs of conics.	**Thinking Map:** Begin a Tree Map to record key information about each of the conics. **Common Core Problems:** #5,6,38,39,44-49,51, 52 **STEM:** #50
2 days	**Lesson 10.2: Parabolas** SMP: 1,3,4,6 (pp. 622-629) **G-GPE 2**	**Focus Question:** • What shapes can be formed with the intersection of a cone and a plane? **Inquiry Question:** Pg. 628 # 40	• Each point of a parabola is equidistant from a point called the focus and a line called the directrix • The intersection of a cone and a plane parallel to a line along its side is a parabola	**Vocabulary:** focus of a parabola, directrix, focal length **Concepts:** • Qualities/attributes of parabolas • Transformations of parabolas	• Graph, translate, and state important parts of conic sections: parabolas*	**Thinking Maps**: Add Parabola to the *Tree Map* **Common Core Problems:** #5,6, 40, 55, 58 **STEM:** #41,45
2 days	**Lesson 10.3: Circles** SMP: 1,3,4,7 (pp. 630-636) **G-GPE 1** **Lesson 10.4: Ellipses** SMP: 1,2,3,4,7 (pp. 638-644) **G-GPE 3**	**Focus Question:** • What shapes can be formed with the intersection of a cone and a plane? **Inquiry Question:** Pg. 634 # 5 (10.3) Pg. 642 # 5 (10.4)	• A circle is the set of points a fixed distance from one point. An ellipse "stretches" a circle in one direction and is the set of points that have a total fixed distance from two points. • The x^2 and y^2 terms of the algebraic form of an ellipse and circle are both positive.	**Vocabulary:** circle, center of a circle, standard form of an equation of a circle, ellipse, focus of an ellipse, center of an ellipse, minor axis, vertices of an ellipse, co-vertices of an ellipse **Concepts:** • Transforming a Circle • Properties of Ellipses with Center (0,0)	• Graph and translate conic sections: circles and ellipses*. • Identify conics and their applications*	**Thinking Maps**: Add Circle and Ellipse to the *Tree Map* **Common Core Problems:** **10.3:** #5,6,43,44 **10.4:** #5,6,42,47,62 **STEM:** **10.3:** #52, 65 **10.4:** #60

Time	Lesson/ Activity	Focus Questions for Lessons	Understandings	Knowledge	Skills	Additional Resources
1 day	**Lesson 10.5: Hyperbolas** SMP: 1,2,3,4,5 (pp. 645-652) **G-GPE 3**	**Focus Question:** • What shapes can be formed with the intersection of a cone and a plane? **Inquiry Question:** Pg. 644 *Apply What You've learned* (add the description of the wings)	• The shape of a hyperbola is guided by asymptotes • Relate ellipses with hyperbolas and state similarities and differences • In the x^2 and y^2 terms of the algebraic form of a hyperbola, one term is positive.	**Vocabulary:** hyperbola, center of a hyperbola, focus of a hyperbola, vertex of a hyperbola, transverse axis, axis of symmetry, conjugate axis **Concepts:** • Properties of Hyperbolas with Center (0,0)	• Graph of conic sections: hyperbolas.* • Identify conics and their applications	**Thinking Maps**: Add Hyperbola to the *Tree Map* **Common Core Problems:** #6,7,24,39,40, 41 **STEM:** #23, 38
1 day	**Lesson 10.6: Translating Conic Sections** SMP: 1,3,4,5,7 (pp. 653-660) **G-GPE 2, G-GPE 1, F-IF 8**	**Focus Question:** • What shapes can be formed with the intersection of a cone and a plane? • What is the difference between the algebraic representations of ellipses, circles, hyperbolas, and parabolas? **Inquiry Question:** Pg. 658 # 6 Pg. 659 # 22	• The x^2 and y^2 terms of the algebraic form of an ellipse, circle, hyperbola, and parabola represent the shape and structure of the figure. • In an x-y relationship, replacing x by $(x - h)$ and y by $(y - k)$ with h and k > 0 translates the graph of the relation h units to the right and k units up	**Concepts:** • Writing the standard -form equation of a conic section from the general form $Ax^2 + Cy^2 + Dx + Ey + F = 0$ can be done by completing the square and simplifying the resulting equation • Translate Horizontal Ellipses • Translate Vertical Ellipses • Translate Horizontal and Vertical Hyperbolas	• Graph translated conic sections • Identify conics and the functions of various conic sections*	**Thinking Maps**: *Flow Map* to show processes for translating conic sections **Common Core Problems:** #5,6,7,22, 23,37 **STEM:** #37
2 days	**Review Topic 10 Concepts & Skills** Use Textbook Resources and/or Teacher Created Items					
1 day	**Topic 10 Assessment** (Created and provided by PUSD)					

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