

# Unit 07 Conics

Content Area: **Mathematics**  
Course(s): **Trigonometry/Pre-Calculus**  
Time Period: **May**  
Length: **5 weeks**  
Status: **Published**

## Unit Overview

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This unit introduces conic sections. Students will use equations to identify important characteristics of each conic section. They will then use these characteristics to graph parabolas, circles, ellipses and hyperbolas. students will also translate and rotate conic sections. Student should be able to identify each conic section by its equation and graph.

## Enduring Understandings

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- There are several types of conic sections
- Mathematical models can be used to describe and quantify real-world phenomena
- Reasoning and/or proof can be used by verifying or refuting conjectures or theorems analytically

## Essential Questions

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- Analytical methods can be used to prove geometric theorems
- How do mathematical representations model situations?
- In what way are the conic sections used to describe physical relationships?
- What are the different types of conic sections?
- What situations can be analyzed and represented using mathematical transformations and rotations?

## Standards

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MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
MA.G-GPE.A	Translate between the geometric description and the equation for a conic section
MA.G-GPE.B	Use coordinates to prove simple geometric theorems algebraically

## Indicators

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MA.G-GPE.A.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.
MA.G-GPE.A.2	Derive the equation of a parabola given a focus and directrix.
MA.G-GPE.A.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.
MA.G-GPE.B.4	Use coordinates to prove simple geometric theorems algebraically.

## Student Learning Objectives

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- SWBAT identify conic sections by their equations in either form
- SWBAT identify parts of a circle
- SWBAT identify parts of a hyperbola
- SWBAT identify parts of a parabola
- SWBAT identify parts of an ellipse
- SWBAT solve a system of three equations in order to find the general form equation of a circle
- SWBAT use analytical methods to prove geometric relationships
- SWBAT use and determine the standard and general form of an ellipse
- SWBAT use and determine the standard and general form of the equation of a hyperbola
- SWBAT use and determine the standard and general forms of the equation of a parabola
- SWBAT use the standard and general form of the equation of a circle

## Lesson Titles

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- Circles
- Ellipses
- Hyperbolas
- Introduction to Analytic Geometry
- Parabolas

## Career Readiness, Life Literacies & Key Skills

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WRK.K-12.P.4	Demonstrate creativity and innovation.
WRK.K-12.P.6	Model integrity, ethical leadership and effective management.
WRK.K-12.P.7	Plan education and career paths aligned to personal goals.
WRK.K-12.P.9	Work productively in teams while using cultural/global competence.

## Inter-Disciplinary Connections

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LA.RL.11-12.4	Determine the meaning of words and phrases as they are used in the text, including figurative and connotative meanings; analyze the impact of specific word choices on meaning and tone, including words with multiple meanings or language that is particularly fresh, engaging, or beautiful. (e.g., Shakespeare as well as other authors.)
LA.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.
LA.RI.11-12.4	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines faction in Federalist No. 10).
LA.WHST.11-12.1.E	Provide a concluding paragraph or section that supports the argument presented.
9-12.HS-ETS1-4.5	Using Mathematics and Computational Thinking

## **Instructional Strategies/Learning Activities/Levels of Blooms/DOK**

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- demo on graphing calculator use of rref
- explain how to translate and rotate conic sections
- list distance formula, midpoint formula, and slope formula, work thru finding each one given points
- review completing the square
- review homework
- review study guide
- to graph and apply ellipses, go over hw, explain eccentricity
- to graph parabolas and write equations of a parabola given certain characteristics, go over hw, work thru examples
- to identify and graph ellipses, go over test, define and label terms, list general form and standard form of an ellipse, develop relationships between parts, read thru notes examples 2,3,4 start chart
- to identify and graph ellipses, go over test, define terms, hand out notes, go thru all parts and relationships of an ellipse, list standard and general form of an ellipse, start charts
- To identify and graph parabolas, go over quiz, introduce parts and equations for a parabola, discuss the characteristics, use a chart to describe the characteristics of a parabola, graph selected examples, start chart
- to identify and graph parabolas, go over quiz, read thru p.653, use notes, label and define terms draw both types of parabolas explain differences, general form and standard form, do selected examples start filling out chart
- to identify and write equations for hyperbolas given some characteristics, go over chart, place selected examples on board, do guided practice on board, discuss an equilateral hyperbola
- to identify circles as a conic section, explain what a conic section is? write general form and standard form of a circle, define terms,
- to identify circles as a conic section, list both forms of a circle, give examples in both standard and general form, algebraically go back and forth and draw the circles, ex 1,2,4
- to identify parts of an hyperbola and graph it, go over hw, hand out notes define and label all parts, list general and standard form of an hyperbola start chart on board
- to prove selected quadrilaterals properties by analytical methods, go over hw, develop models for each type of quadrilateral, do several proofs, emphasize final conclusion and use of algebra start packet
- to review analytical proofs, go over packet place on board, start review use ws 10.1

- to write equations of an ellipse given characteristics, go over hw finish chart on board, work thru examples
- to write general form of a circle given 3 points on the circle, go over hw, work thru at least 3 examples use simult button in calculator
- to write standard form of a circle given 3 points on that circle, go over hw, review simultaneous equations, place selected examples on board, use graphing overhead for help
- tutoring during Delsea One

## **MODIFICATIONS**

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### **ELL Modifications**

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- 1:1 testing
- Create planned opportunities for interaction between individuals in the classroom: skits, cooperative and collaborative learning, student generated stories based on personal experience
- Digital translators
- Intentional scheduling/grouping with student/teacher who speaks the same language if possible
- Offer resources for specific topics in primary language (Youtube web resources)
- Provide formal and informal verbal interaction to provide practice, increase motivation, and self-monitoring
- Provide support as ELL students move through all levels of language acquisition: scaffold learning, processing time, as well as other modifications mentioned above

### **IEP & 504 Modifications**

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- allowing student to take notes in class for reinforcement but also providing a copy of completed/correct notes to study from
- for testing - allowing student to correct mistakes or answer wrong questions correctly for additional credit if failed the first test (another way to re-teach material)
- for testing -rewording questions so that there are not higher level vocabulary within the question (you are testing for understanding of the content not the ability to understand the question)
- if not in a co-teaching setting allowing time in the schedule for a special education teacher to consult with general education teachers on what specifically can be modified or how to paraphrase things in a different way specific to that lesson
- math tests could have formula's available on the test and/or sample problems
- providing study guides that don't lead the student to study too much extraneous information (less unnecessary details)/scaffolded study guides
- students could use calculator and/or other math tools (x grids, chips, ect)
- teaching the main ideas/concepts (limiting not needed details)to be taught and repeating them in several different ways over several different days
- tutoring during Delsea One

## **G & T Modifications**

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- Ask students' higher level questions that require students to look into causes, experiences, and facts to draw a conclusion or make connections to other areas of learning.
- Effective questioning techniques (focus on what's important, provide processing time, require higher order thinking)
- Encourage students to explore concepts in depth and encourage independent studies or investigations.
- Math- provide additional rigorous challenge problems for advanced students
- Refrain from having them complete more work in the same manner.

## **At Risk Modifications**

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- additional help during tutoring/Delsea One/Academic Enrichment
- allowing student to take notes in class for reinforcement but also providing a copy of completed/correct notes to study from
- guided notes and study guides
- more resources/supports

## **Benchmark Assessment**

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Skill based assessment - math practice

## **Alternative Assessments**

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Performance tasks

Project-based assignments

Problem-based assignments

Presentations

## **Formative Assessment**

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- anticipatory set
- Circles Quiz
- closure
- groupwork
- homework
- participation

- pop quizzes
- Quiz on analytical geometry
- student boardwork
- warm up

## Summative Assessment

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- Alternate Assessment
- benchmark assessment
- Marking period assessment
- Midchapter test Circles and Parabolas
- Midchapter Test Ellipses and Hyperbolas

## Resources & Materials

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- Advanced Mathematical Concepts Precalculus with Applications textbook
- Cooperative learning exploration
- evoke student participation from their seats and at the board
- Google classroom
- Mathispower4u math videos
- PowerPoint Lessons
- teacher generated worksheets
- youtube videos for introduction/demonstration of concepts in real-life situations

## Technology

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- Chromebook
- Desmos graphing calculator
- Equatio
- Graphing calculator
- Promethean Board
- Quizizz

TECH.8.1.12.A

Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.

TECH.8.1.12.B

Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.

TECH.8.1.12.E

Research and Information Fluency: Students apply digital tools to gather, evaluate, and use information.

