

+ -Stage 1 - Identify Desired Results

Established Goals:

(This is the standard to which you are teaching.)

G

Name the Conics; Write and work with Equations of Circles
Analyze Parabolas and Solve Applied Problems
Analyze Ellipses and Solve Applied Problems
Analyze Hyperbolas and Solve Applied Problems
-Lincoln Northeast standards based on Sullivan Trigonometry textbook

Nebraska State Standards:

MA 12.2.1.g Know the definitions and basic properties of a circle and use them to prove basic theorems and solve problems.

MA 12.3.3 Procedures: Students will represent and solve equations and inequalities.

What understandings are desired?

Students will understand that. . .

U

(These are over-arching and topical "big ideas or understandings" for the entire unit. Strive for at least one over-arching U. Limit the topical U's to 2-3.)

Over-Arching:

Pre-calculus plays a role in one's everyday life.

Topical:

Circles, parabolas, ellipses, and hyperbolas are seen in our everyday life.

What essential questions will be considered?

(Questions are the interrogative form of the U declarative statement.)

Q

Over-Arching:

Why study pre-calculus?

How can we use pre-calculus in our everyday life?

Topical:

What are conics?

Why is understanding conics important?

What are similarities and differences between circles, ellipses, parabolas, and hyperbolas?

What key knowledge and skills will students acquire as a result of this unit?

Students will know. . .

K

(K items are expressed as nouns and usually represent facts, formulae, etc.)

What the graphs look like for circles, parabolas, ellipses, and hyperbolas.

Equations for circles, parabolas, ellipses, and hyperbolas.

Vocabulary:

- Center
- Focus
- Vertex
- Transverse axis
- Major axis

Students will be able to. . .

S

(S items are expressed as verbs and usually represent processes such as compute, research, measure, etc.)

Write and work with equations of circles.

- Find the center.
- Develop an equation for a circle with various centers.
- Given an equation, the student should be able to graph the circle.

Analyze parabolas and solve applied problems.

- Find the focus.
- Find the axis of symmetry.
- Develop an equation for a parabola.
- Given an equation, the students should be able to graph the parabola.

Analyze ellipses and solve applied problems.

- Find the foci.
- Find the vertex.
- Find the length of a major axis.
- Develop an equation for ellipses with various centers.
- Given an equation, the students should be able to graph the ellipse.

Analyze hyperbolas and solve applied problems.

- Find the center.
- Find the transverse axis.
- Find the vertices.
- Find the foci.
- Find the asymptotes.
- Develop an equation for hyperbolas with various centers.
- Given an equation, the students should be able to graph the hyperbola.

Stage 2 - Determine Acceptable Evidence

What evidence will show that students understand?

Performance Tasks (summary in GRASPS form):*

T

G=Goal

Your goal is to complete the notebook given by the instructor

R=Role

Your role is that of a student in Pre-Calc who is participating in a notebook assignment relating to conics discussed in class.

A=Audience

Your audience will consist of the instructor who will evaluate you and your work on the completion of the notebook.

S=Situation

You will work individually as well as with other students on sections of the notebook regarding various parts of the lesson.

P=Performance

Your performance will consist of completing an individual notebook.

S=Standards (expressed in a rubric)

(See rubric on next page)

Other Evidence (quizzes, tests, prompts, observations, dialogues, work samples):

OE

Informal observations - note taking

Evaluate vocabulary

Class examples

Student Self-Assessment and Reflection:

SA

1. Summarize your understanding of this unit.
2. How does the information covered in this lesson relate to your everyday life?
3. Which part of this unit was most challenging for you? Why?
4. Which part of this unit was most enjoyable and/or productive for you? Why?
5. What could I have done to make this better?

Conics: Ellipses, Hyperbolas, Parabolas, and Circles

Grading Criteria

Category	Poor 5 pt	Fair 10 pt	Good 15 pt	Excellent 20 pt
Definition/Description Provide definition and show how it is formed using cones and planes.	No definition or cone description given.	Definition given but no cone description.	Definition and cone description given but non descriptive.	Very good definition and cone description given.
Problem Solving Problems solved with correct information identified.	Less than 60% of problems solved correctly.	60% of problems solved correctly.	70% of problems solved correctly.	90% of problems solved correctly.
Participation Participated discussions with accurate helpful information and or insight related to conics.	No participation in discussions.	Little participation with helpful information related to the topic.	Participated in discussions occasionally with helpful information.	Excellent participation in discussions with accurate and insightful information related to conics.
Constructions Constructions are correct and neatly displayed and labeled.	No constructions provided.	Constructions are provided but are incorrect.	Constructions are correct, but not neatly displayed or labeled.	Constructions are correct and neatly displayed and labeled.
Completion Project handed in on time.	Handed in completed project 3 or more days late.	Handed in completed project 2 days late.	Handed in completed project 1 day late.	Handed in completed project on time.

Lesson Plan Template (Long Form)

Preservice Teacher's Name: Laura Jeppesen

Grade Level: 10-12

State Standard: Analyze Parabolas and Solve Applied Problems

Subject: Pre-Calculus

Name of Lesson: The Parabola

Period/Time: 1 and 7

I. Goal: Analyze parabolas and solve applied problems.

- Find the vertex.
- Find the focus.
- Find the axis of symmetry.
- Develop an equation for parabolas with various vertex points.
- Given an equation, the students should be able to graph the parabola.

II. Objectives:

- The students will be able to find the focus and axis of symmetry of each parabola when the vertex at the origin 85% of the time.
- The students will be able to find the vertex, focus, and axis of symmetry of each parabola when the vertex is not at the origin 80% of the time.
- The students will be able to find an equation for each parabola given a different vertex, focus, and or axis of symmetry 80% of the time.
- The students will be able to solve word problems relating to parabolas 80% of the time.

III. Adaptations for Diverse Learners

- Individuals will have the chance to work in groups to be able to communicate with their peers and explore different ideas.
- Students will have the opportunity to work relatively at their own pace through the note pack after the initial direct instruction section is complete.

IV. Materials:

- Note pack for each student
 - Vocabulary
 - Constructions
 - Problem Solving
 - Discussion Questions
 - Real life Applications
- Elmo projector
- Wax Paper
- Picture of McDonald's Golden arches

V. Procedure:

A. Set / Hook - 2 min

"Even if you haven't eaten at McDonalds, you have probably seen those golden arches more times than you can count. But, did you know those famous golden arches have the curvature of a parabola? Although when writing, our M's may have more of a point at the tops, McDonald's M's are curved in such a way that they are pleasing to the eye. Where else have you seen the parabolic shape in your everyday life?"

****Take suggestions:** - St. Louis Arch, smiley face, satellite dish, free throw (falling things), skateboard ramps, bridges, head lights, domes, rainbows, etc.

B. Transition

"As we can see, conics are quite evident in our everyday lives. After studying how a parabola originates from a cone, we will take a deeper look at the various parts that define a parabola, how parabolas are

described in an equation, how they are constructed, and problems relating to parabolas and real life.”

C. Main lesson

-See attached note pack-

Define - Direct Instruction: I will be working on the board and on a paper projected on the screen to work through definitions and equations. The students will define each word in their own terminology and then again with the book’s definition, 23 min.

- Parabolas
- Vertex
- Focus
- Directrix
- Axis of Symmetry

Equation - with Direct Instruction: The students will be discovering the equations through processing the information they already know and incorporating the materials they just defined.

- Define equation
- Specify each part

Constructions - Activity, 15 min

- Wax paper example (picture provided in the parabola note pack)
- Student/Group activity

D. Transition

“With our experience in making a parabola and understanding of the different parts that make up a parabola, we can examine our own life and create our own example of a parabola in both picture and equation form.”

E. Conclusion

Demonstrate how the McDonald’s arches are parabolas in an equation and label the parts of each of the arches: vertex, focus, and axis of symmetry.

-More information on the attached note pack-

Application - Assignment, 10 min

- Individual problem solving
- Group work
- Discussion

Problems not finished in class are assigned as homework.

VI. Assessment:

The grading will be based on the student’s classroom participation as well as how they demonstrate their knowledge in completion of the note pack including their own real life example.

VII. Assignment:

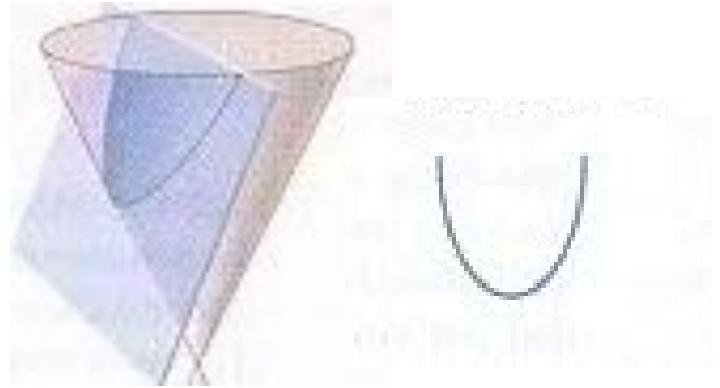
The students are expected to complete the note pack and have it ready to turn in the next day. If they have questions, they should address them at the beginning of class. The grades will be figured by points on the rubric and out of 100 for the assignment. A percentage will be recorded in the grade book.

VII. Self Evaluation: (On Back)

IX. Coop’s Comments: (On Back)

Parabolas

What are some examples of parabolas you have seen?



	Your Definition	Book Definition
Parabola		
Focus		
Directrix		
Axis of Symmetry		
Vertex		

Provide a picture of a parabola labeling all parts:

Equation of a Parabola: Vertex at (0, 0), Focus at (a, 0), $a > 0$.
a = the distance from F to V which is equal to the distance from V to D

Equations of a Parabola: Vertex at (0, 0); Focus on an Axis; $a > 0$.

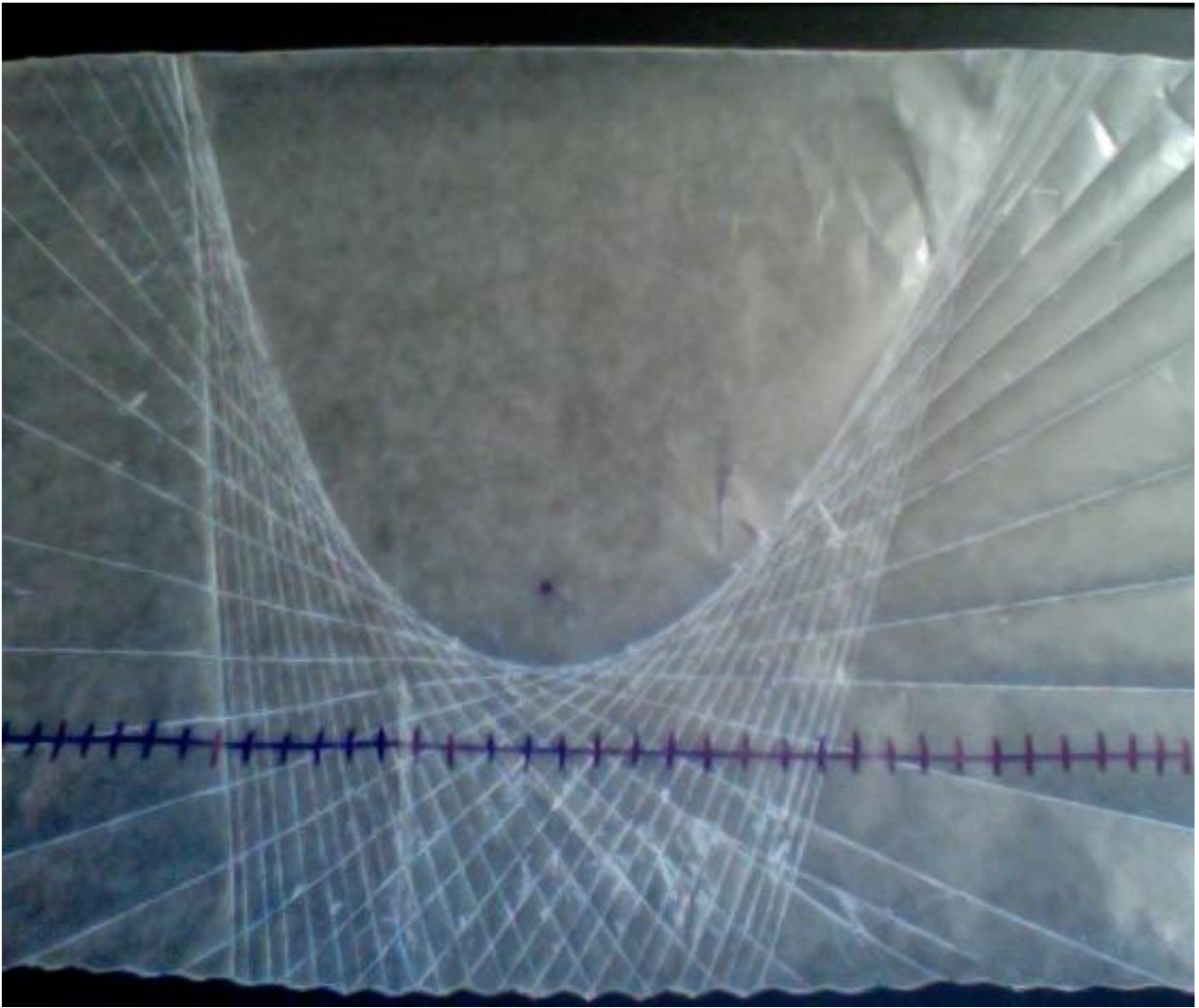
Vertex	Focus	Directrix	Equation	Description

Equations of a Parabola: Vertex at (h, k); Axis Symmetry Parallel to a Coordinate Axis; a >0.

Vertex	Focus	Directrix	Equation	Description

Construction Zone

-Provided is a picture of an example of what the students will be doing.



Applications

Using the information we have covered, create your own example of a parabola using an object from your everyday life. As we did with the golden arches, give a visual representation of the parabola and label the different parts. Also, explain the parabola in equation form.

From your textbook, complete the following examples:

Lesson Plan Template (Long Form)

Preservice Teacher's Name: Laura Jeppesen

Grade Level: 10-12

State Standard: Analyze Ellipses and Solve Applied Problems

Subject: Pre-Calculus

Name of Lesson: The Ellipse

Period/Time: 1 and 7

I. Goal: Analyze ellipses and solve applied problems.

- Find the foci
- Find the vertex
- Find the length of the major axis and minor axis
- Develop an equation for ellipses with various centers
- Given an equation, the students should be able to graph the ellipse

II. Objectives:

- The students will be able to find the vertices, foci, and length of the major axis of each ellipse when the center at the origin 85% of the time.
- The students will be able to find the center, vertices, foci, and length of the major axis of each ellipse when the center is not at the origin 80% of the time.
- The students will be able to find an equation for each ellipse given different centers, foci, vertices, and or lengths of major axis 80% of the time.
- The students will be able to solve word problems relating to ellipses 80% of the time.

III. Adaptations for Diverse Learners

- Individuals will have the chance to work in groups to be able to communicate with their peers and explore different ideas.
- Students will have the opportunity to work relatively at their own pace through the note pack after the initial direct instruction section is complete.

IV. Materials:

- Note pack for each student
 - Vocabulary
 - Constructions
 - Problem Solving
 - Discussion Questions
 - Real life Applications
- Elmo projector
- Tacks
- String
- Clear glass with water
- Picture of Mickey Mouse

V. Procedure:

A. Set / Hook - 3 min

"Even if you haven't seen an entire Mickey Mouse episode, you can probably describe what Mickey Mouse looks like. Obviously, he looks like a mouse with a little white face, but most people recognize him by his unforgettable ears. What is most interesting about his ears is, however, although he is drawn facing different directions, his ears always remain circular, which brings us to ellipses. Every circle viewed obliquely looks like an ellipse. In other terms, although the top of a cup is circular when looking from the top, at a different angle, that circle may appear elliptic. Also, the water in this glass appears elliptic when the glass is tilted. What other things in your everyday life have this elliptic shape?"

** Take Suggestions: Racetrack, planetary motion, track, satellites, etc.

B. Transition

“As we noticed, ellipses are closely related to circles. In our investigation today, we will explore how ellipses are similar and different from circles in how they look, how they are defined, and the make up of their equations. From there, using what we know we will construct our own ellipse and follow up with few real life application problems.”

C. Main lesson

-Note pack-

Define - Direct Instruction: I will be working on the board and on a paper projected on the screen to work through definitions and equations. The students will define each word in their own terminology and then again with the book's definition, 23 min.

- Ellipses
- Center
- Vertex
- Foci
- Major and minor axis

Equation - with Direct Instruction: The students will be discovering the equations through processing the information they already know and incorporating the materials they just defined.

- Define equation
- Specify each part

Possible Transition: “If you have every used a compass or piece of string to construct a circle, you will notice the construction of an ellipse is very similar. The difference with the ellipse is that there are two focus points and a center where as the circle has solely the center that is equidistant from the sides.”

Constructions - Activity, 10 min

- Tack-string example
- Student activity

D. Transition

“Now that we have explored what an ellipse is and how to explain it in equation form, we can prepare own example of an ellipse present in our daily lives in both picture and equation form.”

E. Conclusion

“Knowing what we do now, if we were to draw Mickey's ears when he is looking to the side, what would his ears look like?”

-Demonstrate how Mickey's ears would like as ellipses when looking to the right.

-Note pack-

Application - Assignment, 14 min

- Individual problem solving
- Group work
- Discussion

VI. Assessment:

The grading will be based on the student's classroom participation as well as how they demonstrate their knowledge in completion of the note pack including their own real life example.

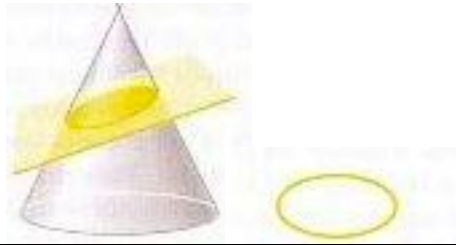
VII. Assignment:

The students are expected to complete the note pack and have it ready to turn in the next day. If they have questions, they should address them at the beginning of class. The grades will be figured by points on the rubric and out of 100 for the assignment. A percentage will be recorded in the grade book.

VII. Self Evaluation: (On Back)

IX. Coop's Comments: (On Back)

Ellipses



	Your Definition	Book Definition
Ellipse		
Foci		
Vertices		
Major Axis		
Minor Axis		

Provide a picture of a ellipse labeling all parts:

Equation of an Ellipse: Center at (0, 0); Major Axis along the x-Axis

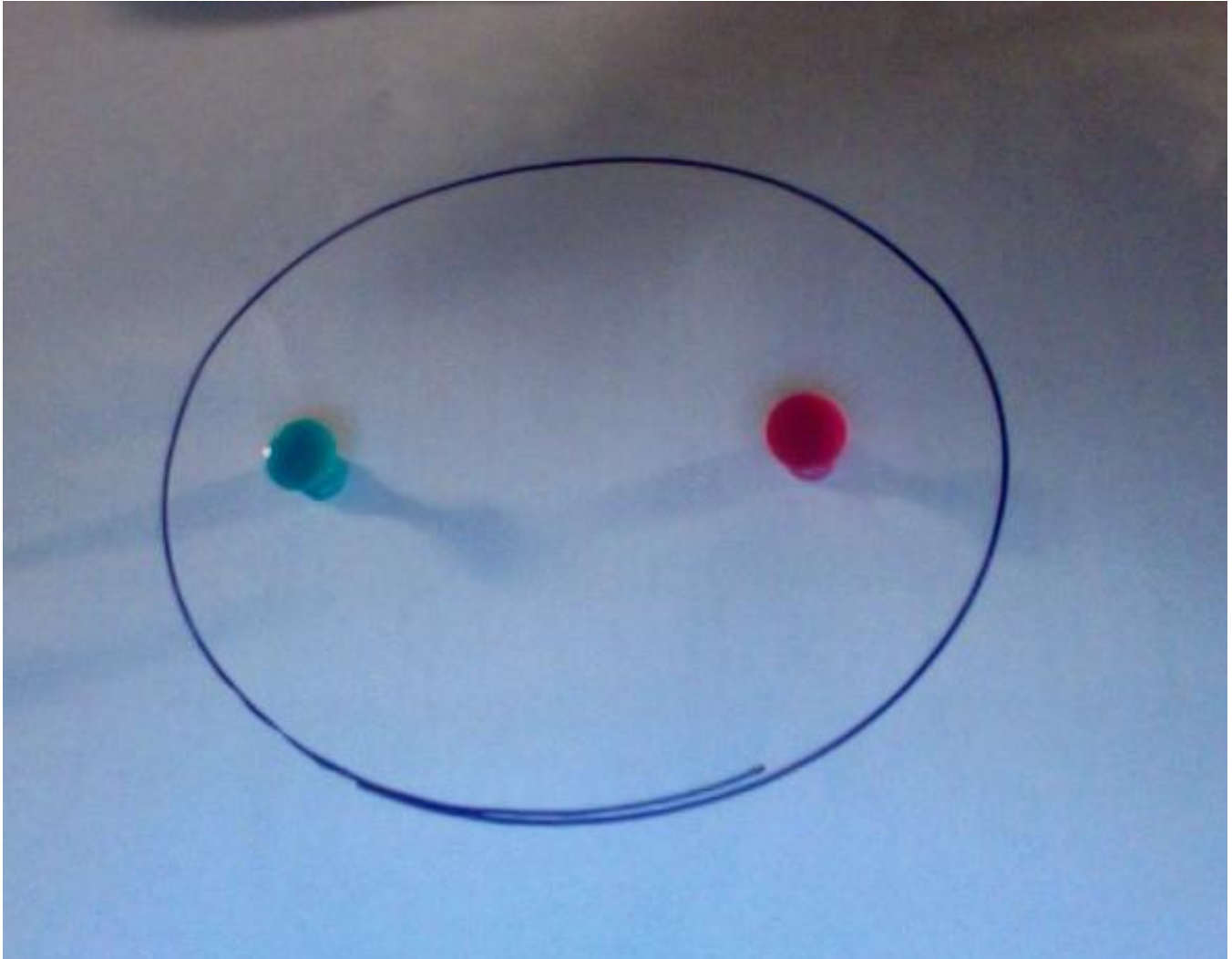
Equation of an Ellipse: Center at (0, 0); Major Axis along the y-Axis

Equation of an Ellipse: Center at (h, k); Major Axis Parallel to a Coordinate Axis

Center	Major Axis	Foci	Vertices	Equation

Construction Zone

-Provided is a picture example of what the students will be constructing.



Applications

Using the information we have covered, create your own example of an ellipse using an object from your everyday life. Give a visual representation of an ellipse and label the different parts. Also, explain the ellipse in equation form.

From your textbook, complete the following examples below and on the back of this note pack:

Lesson Plan Template (Long Form)

Preservice Teacher's Name: Laura Jeppesen

Grade Level: 10-12

State Standard: Analyze Hyperbolas and Solve Applied Problems

Subject: Pre-Calculus

Name of Lesson: The Hyperbola

Period/Time: 1 and 7

I. Goal: Analyze hyperbolas and solve applied problems.

- Find the center.
- Find the transverse axis.
- Find the vertices.
- Find the foci.
- Find the asymptotes.
- Develop an equation for hyperbolas with various centers.
- Given an equation, the students should be able to graph the hyperbola

II. Objectives:

- The students will be able to find the transverse axis, vertices, foci, and asymptotes of each hyperbola when the center at the origin 85% of the time.
- The students will be able to find the center, transverse axis, vertices, foci, and asymptotes of each hyperbola when the center is not at the origin 80% of the time.
- The students will be able to find an equation for each hyperbola given different centers, foci, vertices, and or asymptotes 80% of the time.
- The students will be able to solve word problems relating to hyperbolas 80% of the time.

III. Adaptations for Diverse Learners

- Individuals will have the chance to work in groups to be able to communicate with their peers and explore different ideas.
- Students will have the opportunity to work relatively at their own pace through the note pack after the initial direct instruction section is complete.

IV. Materials:

- Note pack for each student
 - Vocabulary
 - Constructions
 - Problem Solving
 - Discussion Questions
 - Real life Applications
- Elmo projector
- Wax Paper
- Picture of Hoover Dam
- Picture of light reflecting off water

V. Procedure:

A. Set / Hook - 3 min

"Has anyone ever been to Hoover Dam before? From what you know as of now, what conic does the Hoover Dam appear to be?" -Provide picture

"Your first instinct might be to say parabola, but you may say it is hard to tell in this picture. The next conic we will describe, however, is much like the parabola. In fact it has the same overall shape and often gets confused with parabolas, but the hyperbola is angled differently and contains two curves that have asymptotes between them. Light as it bounces off water is also an example of a hyperbola, can you think of any others?"

** Take suggestions: focus lenses, hourglass, Hurley logo, finding the range of distant events - earthquakes, bridge supports, etc.

B. Transition

“Looking at how the hyperbola and parabola relate will help us as we define what a hyperbola is, how they are described in an equation, how they are constructed, and problems relating to hyperbolas in our everyday life.”

C. Main lesson

-Note pack-

Define - Direct Instruction: I will be working on the board and on a paper projected on the screen to work through definitions and equations. The students will define each word in their own terminology and then again with the book's definition, 22 min.

- Hyperbolas
- Center
- Transverse Axis
- Vertices
- Foci
- Asymptotes

Equation - with Direct Instruction: The students will be discovering the equations through processing the information they already know and incorporating the materials they just defined.

- Define equation
- Specify each part

Constructions - Activity, 15 min

- Wax paper example
- Student activity

D. Transition

“Although hyperbolas are quite similar to parabolas, we can compare the two and find examples of each in our everyday life and compare them to one another.”

E. Conclusion

-Demonstrate how the Hoover Dam is a hyperbola and compare it to a parabola.

-Note pack-

Application - Assignment, 10 min

- Individual problem solving
- Group work
- Discussion

VI. Assessment:

The grading will be based on the student's classroom participation as well as how they demonstrate their knowledge in completion of the note pack including their own real life example.

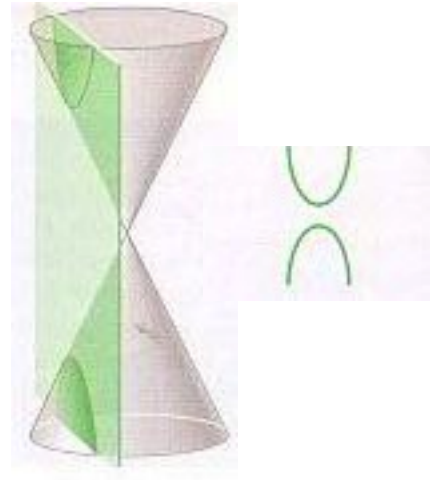
VII. Assignment:

The students are expected to complete the note pack and have it ready to turn in the next day. If they have questions, they should address them at the beginning of class. The grades will be figured by points on the rubric and out of 100 for the assignment. A percentage will be recorded in the grade book.

VII. Self Evaluation: (On Back)

IX. Coop's Comments: (On Back)

Hyperbolas



	Your Definition	Book Definition
Hyperbola		
Foci		
Transverse		
Center		
Conjugate Axis		
Branches		
Vertices		

Provide a picture of a hyperbola labeling all parts:

Equation of a Hyperbola: Center at $(0, 0)$; Transverse Axis along the x-Axis

Equation of a Hyperbola: Center at $(0, 0)$; Transverse Axis along the y-Axis

Asymptotes of a Hyperbola

Equation of a Hyperbola: Center at (h, k); Transverse Axis Parallel to a Coordinate Axis

Center	Transverse Axis	Foci	Vertices	Equation	Asymptotes

Construction Zone

-Provided is a picture example of what the students will be constructing during class.



Applications

Using the information we have covered, create your own example of a hyperbola using an object from your everyday life. Give a visual representation of a hyperbola and label the different parts. Also, explain the hyperbola in equation form.

From your textbook, complete the following examples below and on the back of this note pack: