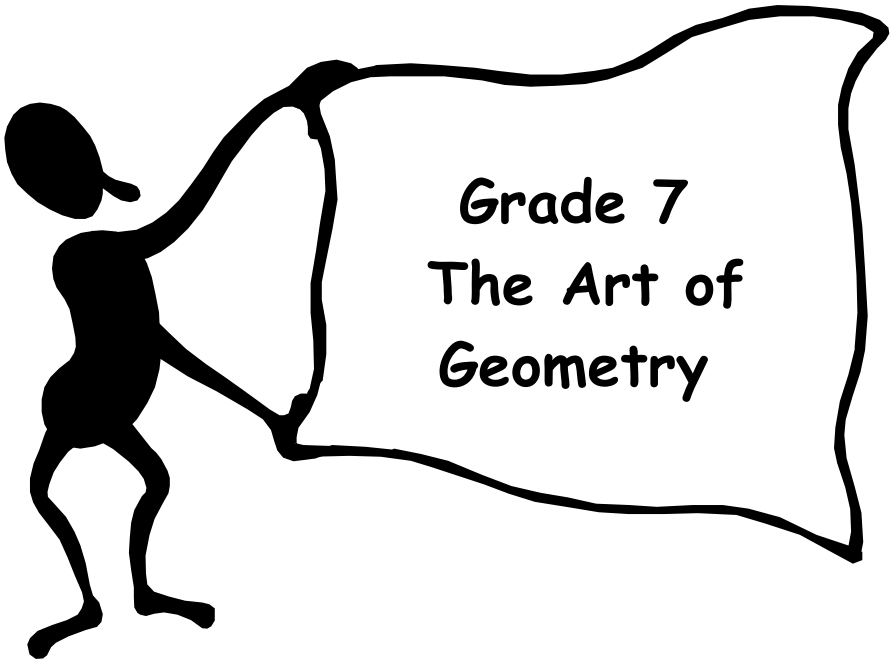
Backwards Design Unit Planning

New York City Department of Education
Magnet Program District 25 & 28

Rachel Carson Middle School
IS-237



Essential Question: How can geometry help us create artistic designs?
Suggested Time Frame: 4 to 5 weeks
Theme: Arts

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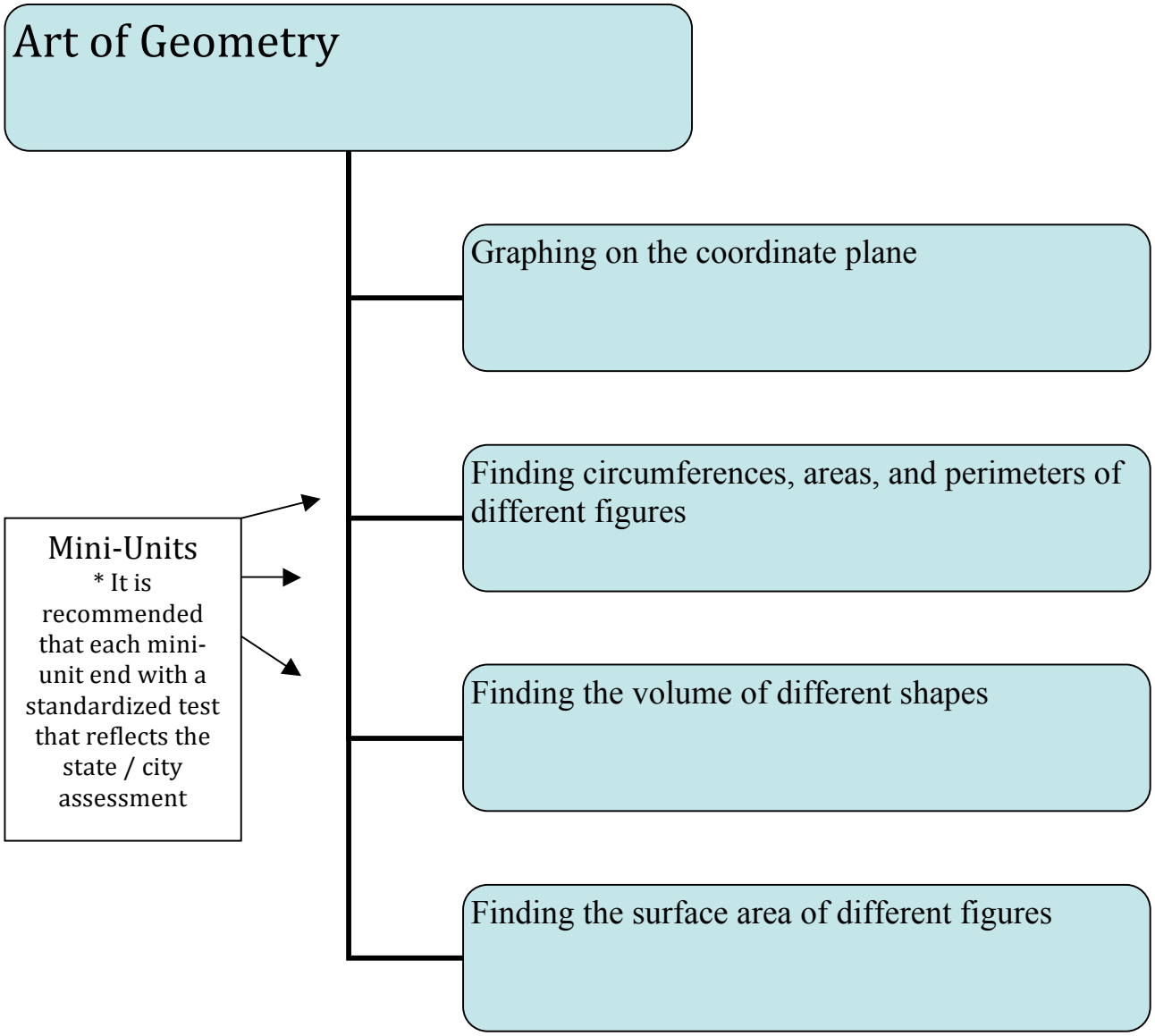
Graphic Overview of Unit

Suggested Time Frame: 4 to 5 weeks

Essential Question: How can geometry help us create artistic designs?



Unit's Culminating Project: (briefly explain in 2-3 sentences): The students will play the roles of glassware designers for Crate and Barrel who are in charge of creating three to five unique designs for cylindrical glasses that have different dimensions, but the same volume.

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Stage 1- Desired Results

Standards-Based Learning Goals:

6.G.6 Understand the relationship between the diameter and radius of a circle.
6.G.7 Determine the area and circumference of a circle, using the appropriate formula.
6.G.9 Understand the relationship between the circumference and the diameter of a circle.
6.G.10 Identify and plot points in all four quadrants.
7.G.1 Calculate the radius or diameter, given the circumference or area of a circle.
7.G.2 Calculate the volume of prisms and cylinders, using a given formula and a calculator.
7.G.3 Identify the two-dimensional shapes that make up the faces and bases of three-dimensional shapes (prisms, cylinders, cones, and pyramids).
7.G.4 Determine the surface area of prisms and cylinders, using a calculator and a variety of methods.
7.M.11 Estimate surface area.

Concepts

Big Ideas for this Unit Relationships/Patterns Creativity	**Magnet School Theme:** The Arts **How does the Big Idea in your unit connect to your theme?** Knowledge of geometric relationships can provide us with tools to create art.
Enduring Understandings Students will understand that "art is all around us". Knowledge of geometric relationships can provide us with tools to create art.	**Overarching Essential Question: (this question should connect to your school theme)** How can a drinking glass be a work of art? How do the geometric relationships between height, base, and volume affect the "look" of a piece of art?

Content and Skills

Content **Students will know…** • **Area** • **Features of a Circle** • **Circumference** • **Features of a Cone** • **Features of a Cylinder** • **Diameter** • **Net**	**Skills** **Students will be able to…** • **Discern the relationship between the diameter and radius of a circle** • **Determine the area and circumference of a circle, using the appropriate formula** • **Discern the relationship between**

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• **Perimeter** • **Pi** • **Prism** • **Features of a Pyramid** • **Radius** • **Characteristics of two and three dimensional shapes** • **Surface Area** • **Volume**	**the circumference and the diameter of a circle** • **Identify and plot points in all four quadrants** • **Calculate the radius or diameter, given the circumference or area of a circle** • **Calculate the volume of prisms and cylinders, using a given formula and a calculator** • **Identify the two-dimensional shapes that make up the faces and bases of three-dimensional shapes (prisms, cylinders, cones, and pyramids)** • **Determine the surface area of prisms and cylinders, using a calculator and a variety of methods** • **Estimate surface area**

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Stage 2- Summative Assessment Evidence

If students understand, know and are able to do the items in Stage 1, they should be able to show their understanding by completing an authentic task found in the world beyond the classroom.

G- (goal) Your goal is to create three to five designs for cylindrical glasses that have different dimensions, but the same volume.

R- (role) You are a glass and stemware designer who is in charge of designing glasses for the "Crate and Barrel" chain of stores.

A- (audience) The target audience are customers, buyers, and executives of Crate and Barrel.

S- (situation) Your challenge is to create unique designs that appeal to the tastes of different customers. The glasses should have various heights, bases and colors; however, they must have the same volume.

P- (purpose and product) The purpose of this project is to use the concept of volume to help design and sell various glassware products.

S- (standards for performance) Projects will be graded on the following:

- The designs:
  - Three to five different designs
  - Must all have the same volume, but different bases and heights
  - Must include decorative elements such as colors, patterns, and distinctive designs
- The written work:
  - Clear written explanation of designs (show all your work, what you want to achieve with your design, and any observations about the relationship between base and height or other findings)
  - A cover, with a title, your name and date, class, the name of your math teacher, and pictures of your design.

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Student Task

Student Task (exactly as it will be presentated)

Dear Glassware Designer,

Congratulations!

You have been hired by Crate and Barrel to create three to five unique designs for our new glassware catalogue. Your challenge is to create unique designs that appeal to the tastes of our different customers. The glasses should have various heights, bases and colors; however, they must have the same volume. We already have a glass with the diameter of 6 inches and the height of 16 inches, therefore none of your designs may have these dimensions.

You will present your designs to a panel of customers, buyers, and executives of Crate and Barrel. The best designs will be chosen for our new catalogue. Your glassware will be judged on:

- The designs:
  - Three to five different designs
  - Must all have a same volume, but different bases and heights
  - Must include decorative elements such as colors, patterns, and designs.
- The written work
  - Clear written explanation of designs (show and label all your work, what you want to achieve with your design, and any observations about the relationship between base and height)
  - A cover with a title, your name and date, class, the name of your math teacher, and pictures of your designs.

Good luck and have fun exploring the geometry of art!

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Rubric For Culminating Project

4:

- **A step-by-step approach is shown with the explanation of each problem**
- **Student clearly labels his/her work**
- **All work is shown**
- **All questions are answered completely and correctly with pictorial representations**
- **An exemplary explanation is given of the solutions obtained**
- **Exceeds the standard set for this task (Each problem solved two alternative ways)**

3:

- **Correct solutions are obtained and explanation is provided**
- **Reasonably clear labeled work**
- **Most of the work is shown**
- **Both questions are answered completely and correctly with pictorial representations.**

2:

- **An attempt to arrive at the solutions is made with some success**
- **Limited, somewhat labeled student work**
- **Some work is shown and/or some solutions are correct**
- **Demonstrates partial understanding of what was asked for with one major mistake and several minor mistakes**
- **Incomplete procedure provided.**

1:

- **No attempt is made to develop solutions either mathematically or using English language**
- **No attempt to answer questions or solutions that don't make logical sense.**