USING GEOMETRY TO CREATE SCENIC DESIGNS LESSON PLAN
Grades 3-5
Created for use in your classroom before seeing
Rudolph the Red-Nosed Reindeer at The Coterie
Developed by The Coterie Education Director Amanda Kibler and Education Intern Theresa Hancock

Mathematical Learning Standards:
Grade 3: Measure areas by counting unit squares (square cm, square m, square in, square ft, and improvised units).
Grade 4: Apply the area and perimeter formulas for rectangles in real world and mathematical problems. For example, find the width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor.
Grade 5: Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.

Materials Included:
- Shape Worksheet
- Description of Settings
- Definition of Drafting

Student Objectives:
Students will be able to:
- Create a scenic design for a setting of Rudolph the Red-Nosed Reindeer.
- Use given measurements and scale while creating the scenic design.

Grade Focus Area:
- 3rd grade: Use the unit square to find the area of a shape
- 4th grade: Find the area and perimeter of a rectangle using equations
- 5th grade: Convert measurements using a given scale

Assessments:
- Post-share Q&A: Students will compare their drawings and discuss what they drew.
- Individual design: Students turn in their designs.
Lesson:

Introduction

- Introduction to Designing (15-20 minutes): Before seeing The Coterie’s production of *Rudolph the Red-Nosed Reindeer*, students will be creating their own designs of the settings from the play. This activity will introduce some of the elements needed to create their designs: shape and size.

  Divide students into small groups. A large area is needed for this activity, so ask students to push desks aside and create a large working space in the classroom. Each group will get a yard stick, yarn, and masking tape. Ask students to use the yarn to create a rectangle or square that is 36 square feet (it can be a smaller area depending on the space available). The masking tape can be used to hold down the corners and keep the shape.

  Ask students to step inside their rectangle and use their bodies to create different locations from *Rudolph the Red-Nosed Reindeer* (Appendix A). Choose a location and read the description out loud. After you read one, give the students a couple minutes to work as a group and use their bodies to build the setting of the story within the square they created with yarn (i.e. Santa’s workshop could have a table, stools, and a pile of toys). Repeat this activity with several of the locations.

Building Activities

- Become a Designer (40-50 minutes): Students will now have a chance to independently create a design for one of the locations. This is called drafting. You can find a detailed explanation of drafting in Appendix D. **“Drafting” is the process of drawing a picture of the set on a piece of paper.**

  - 3rd grade: Each student will have his/her own piece of paper. The Coterie’s proscenium (opening in the wall that surrounds the stage) is approximately 12’ tall by 20’ wide. This activity will be in ½ inch scale. Ask students to measure out a proscenium that is 6” tall by 10” wide on their paper. This lets you know how much space the designers have to create the setting. After the area is drawn, students get to choose which of the locations they would like to design. Starting in pencil, students will draw their design within the perimeter of the stage. The design should only be objects and places, animals and people are played by the actors and therefore not drawn into the scenic design. The most difficult part is knowing how big to make each piece. Remind them that if a door reaches all the way to the top line in their drawing that means it reaches the ceiling in the theatre (which is 12 feet tall!). After they have sketched their ideas in pencil, they will color in their design because color is a very important element of design.

  - 4th grade: Give students the measurements of the perimeter of The Coterie proscenium in feet (2 x 20’ + 2 x 12’). A proscenium is the opening in the wall that surrounds the stage. With these
measurements, ask students to draw what they think The Coterie’s proscenium looks like. This lets you know how much space the designers have to create the setting. After the area is drawn, students get to choose which of the locations they would like to design. Starting in pencil, students will draw their design within the perimeter of the stage. The design should only be objects and places, animals and people are played by the actors and therefore not drawn into the scenic design. The most difficult part is knowing how big to make each piece. Remind them that if a door reaches all the way to the top line in their drawing that means it reaches the ceiling in the theatre (which is 12 feet tall!).

After they have sketched their ideas in pencil, they will color in their design because color is a very important element of design.

- **5th grade:** Students will have the chance to draw the proscenium of the Coterie in scale. Each student will need a pencil, a piece of paper, and a ruler. Give the students the measurements of The Coterie stage in feet: 12 feet tall by 20 feet wide. Ask them to convert the measurements using a scale of ½ inch to 1 foot (see Appendix B) When they have finished the conversions, students will draw the stage based off of the measurements they have found. When they are done, they will have created a scale drawing of the Coterie Theatre’s stage. After the area is drawn, students get to choose which of the locations they would like to design. Starting in pencil, students will draw their design within the perimeter of the stage. The design should only be objects and places, animals and people are played by the actors and therefore not drawn into the scenic design. The most difficult part is knowing how big to make each piece. Remind them that if a door reaches all the way to the top line in their drawing that means it reaches the ceiling in the theatre (which is 12 feet tall!).

After they have sketched their ideas in pencil, they will color in their design because color is a very important element of design.

**Wrap-up**

- **Collaborative Design Share (10-15 minutes):** Bring the class together and have them sit in groups by the location they chose, so all Christmastown designs would sit together, etc.
  - What differences did you find in your partner’s design versus your design?
  - What similarities did you find?

Keep the collaborative discussion going by asking if students within each character group how their take was similar and different from the others within their group.

- Where did you get a different perspective?
- Why did you choose that idea?
- How did it change your design?
Appendix A

*Rudolph the Red-Nosed Reindeer* Settings

- **Christmastown**
  - Christmastown is also called the North Pole. It is where Mr. and Mrs. Clause live with the elves and all the reindeer. Christmastown is a clearing in the hills just beyond Santa’s castle. There are a lot of trees and you can see Santa’s castle shining over the hill. It’s the first one on the left.

- **The Donners’ Cave**
  - This is where Rudolph and his family live. It is a cave in the side of one of the hills in Christmastown.

- **Interior of Santa’s Castle**
  - The interior of Santa’s Castle is where you’ll find all of the elves busy making toys for the good boys and girls to open on Christmas Day! There are benches and tables for the elves to work at.

- **King Moonracer’s Throne Room**
  - King Moonracer’s Throne Room is where the king of the Island of Misfit Toys meets with Rudolph and his friends.

- **An Icy Mountain Pass**
  - An Icy Mountain Pass is a pathway cut into the side of a huge mountain, covered in snow and ice. This is where Rudolph and Hermey meet for the first time.

- **The Island of Misfit Toys**
  - The Island of Misfit Toys is where all of the toys that kids do not want to play with go to live. There are many snowdrifts that the Toys hide behind and play in.

- **The Cave of Bumble the Abominable Snowman**
  - This is where Bumble the Abominable Snowman lives. It is very dark and there is a lot of ice everywhere. Right outside the cave is a large cliff that falls down into deep hole.
Appendix B

How to Draft a Scale Model

Before a set can be built, it has to be drawn on a piece of paper. This is called drafting. One of the first things to do when drafting is to draw out your basic shapes. After you have determined how you want your set to look, you will have to measure every line that you drew. This is so the director, the technical director, the lighting designer, and the master carpenter all know how big the set is supposed to be. Since you can’t fit the actual size of a stage onto a piece of paper, you need to use what is called a scale. If you measured the desk in front of you, and then had to build it exactly the same way, you would be building it at a 1:1 scale. That means that every measurement is exactly the same. For every inch on your desk, you built another inch. In order to fit the drawing of your set on the paper and have accurate measurements, you can’t draw the stage with a 1:1 scale. You need to draw smaller lines that will represent the bigger lines for the stage. You will need to use a scale that is smaller than 1:1.

There are two common sizes that designers use. The smallest one is 1/8in:1ft. What this means is that for every one eighth of an inch in a line on the paper, it will equal one foot on stage. If you draw a line that is 1 inch long, then when you build a line that is 8 feet long on the stage. The other commonly used scale is 1/4in:1ft. This means that for every one fourth of an inch in a line on the paper, it will equal one foot on stage. If you draw a line that is one inch long, it means you will build a line that is 4 feet long on the stage.

Let’s say you drew a rectangle in 1/4in:1ft scale. The rectangle on your paper is 1 inch x 2 inches. When that rectangle gets built for the stage it becomes 4 feet x 8 feet.

The whole purpose of using a scale is so that you have an accurate picture of what you are drawing, but at a reduced sized that can fit on your paper.