

## **Shape and Space Lesson Plan**

by Andrea Rogers

### **Grade Level:**

Nine

### **Engage:**

#### **1 Class Period**

#### **Objective**

Students should already know about different types of shapes and the properties that they have and using this previous knowledge, be able to identify the characteristics that make something symmetrical or asymmetrical.

#### **Activity**

In this activity, students will look at various shapes that have already been pre-categorized into two groups. One will be symmetrical shapes and the other asymmetrical shapes. The teacher won't tell the students why they are categorized into each group. The goal is for the students to identify what each of the groups has in common. The teacher should look for phrases like, mirror image, or both sides are the same. The goal of this engage activity is for the students to identify the mystery category.

This activity maybe quite short and might not take up an entire class period, so it might be useful to put it at the end of the previous topic.

#### **Indicators:**

- a. Classify different 2-D shapes or designs made of 2-D shapes according to lines of symmetry.

### **Explore:**

#### **1 Class Period**

#### **Objectives**

Students will use technology to explore more ideas behind symmetry.

#### **Activity**

Using photo booth, students will look use the effects to take photos of themselves. Because this is an explore activity, they can look into different ways they position their face to make different lines of symmetry. After the students have taken a few different photos, they need to display them and discuss what they observed while doing the activity. They can do this using any medium. Because this is primarily an environmentally friendly lesson, it's suggested that the students try to keep it an electronic piece. Programs like Comic Life, Photoshop, Windows Movie Maker, iPhoto and iMovie are good ways for students to display their work. If you have a blog or wiki, students can display what they learned. NOTE: Do not put a students name and their photo on the same page.

Have students discuss what happen during the activity with a partner.

This activity uses the technology mathematical process. It lets them see a new way to present information, rather than the traditional essays, formulas, and posters.

#### **Indicators:**

- a. Complete a 2-D shape or design given a part of a shape or design and one or more lines of symmetry.

### **Explain:**

#### **3 Class Periods**

First class, will be all about sorting out what happened in the engage and explore activities. The teacher will introduce the proper vocabulary and words to describe the different lines of symmetry. This is mostly teacher based and can be more student-orientated by adding in questions.

#### **Objectives**

- Students will look for examples of line and rotational symmetry in nature.
- Students will understand how rotational symmetry works and what the angle of rotation is.
- Students will be able to identify where the line of symmetry is in each of the natural examples.
- Students will explore reasons behind leave no trace.
- Students will learn to use photoshop to show lines of symmetry.

### **Activity**

#### **Materials:**

Cameras (Good use for cell phones in the classroom).  
List of different types of symmetry.  
Computers to upload photos.

Take students outside and get them to observe different things in nature that have radial symmetry, lines of symmetry (horizontal, vertical and diagonal) and are asymmetric. Students can use camera's to take photos of their findings instead of picking grasses, flowers, bugs, or anything out of nature. This way they are leaving no trace. Remind the students why they are taking photos rather than collecting things out of nature. Have a class discussion 10 minutes before the class is done and ask the students to expand on what they found. Did all the flowers they found, rotationally symmetric? What items were asymmetric? Why might this be? Get students to look deeper into the ideas behind symmetry.

The next class, get the students to upload their photos onto the computer. Using any photoshop program, get the students to draw the lines of symmetry on their digital photo. Get them to record how many lines of symmetry are on each shape.

Students will draw all the lines on all of the photos they have taken. The teacher can either use this as an assessment or as a learning tool.

### **Elaborate:**

#### **1 Class Period**

#### **Objectives**

- Students will look at First Nations art forms, which have symmetry in them.
- Students will look at how to create an art form that has symmetry.

### **Activity**

Explain to students that many different art forms use types of symmetry. Show some examples. The last example will be of a birch bark biting. This will help to introduce the video of Rosella Carney creating a traditional birch bark biting.

Get students to create their own version of birch bark bitings but as a snowflake. They can fold paper into however they want and cut pieces out of the paper and unfold it to make a snowflake. Then, students must use a ruler to draw and identify the lines of symmetry and say if it has radial symmetry. Also get students to record on a chart the number of folds vs the number of lines of symmetry. This is a way to introduce how the two relate.

Another way of doing this, instead of using paper and scissors, is using patty paper to create a pattern when folded. Patty paper is what is put between hamburger patties when they are frozen and can be bought at a grocery store. When folded, they leave a nice crease and show a darker line where it was folded.

### **Indicators:**

- a. Describe examples of the use and significance of line and rotation symmetry in First Nations and Métis art.
- b. Create or provide an artwork (such as paintings or dance) that demonstrates line and rotation symmetry, and identify the lines of symmetry and the order and angle of rotation.

**Evaluate:****Objectives:**

Student will be able to express what they have learned throughout the learning cycle.

**Activity**

This whole outcome has many opportunities for evaluation. There is lots of room for formative assessment through questioning and the inquiry based activities. The explore, explain and elaborate activities all have something that can be assessed.

The last form of evaluation is to give students, Mira boards and a sheet of paper with a shape on it. The student must retrace that shape to create another one that is vertically symmetrical, rotationally symmetrical, horizontally symmetrical and diagonally symmetrical. For rotational symmetry, the teacher can assign various angles of rotation. This is simply a right and wrong exercise because it is different to the other exercises where they are very abstract in assessment. This is good for certain learners and bad for others which is important to have various forms of assessment.

**Indicators: ALL**

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