

Part I

Types of Symmetries

The goal of this section is to introduce ideas of symmetry.

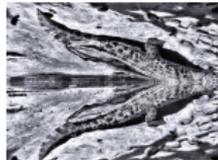
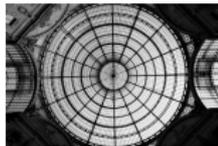
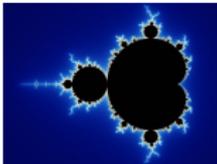
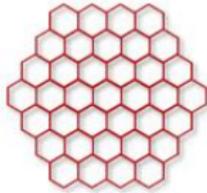
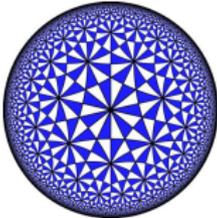
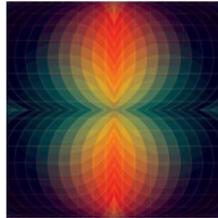
Before the first class

Please upload an image that you like that has symmetry. We will talk about some of the images on the first day of class. Any standard format is fine (.pdf, .jpg, .png, etc.) or you can just give a link to an image on the web.

Introduction

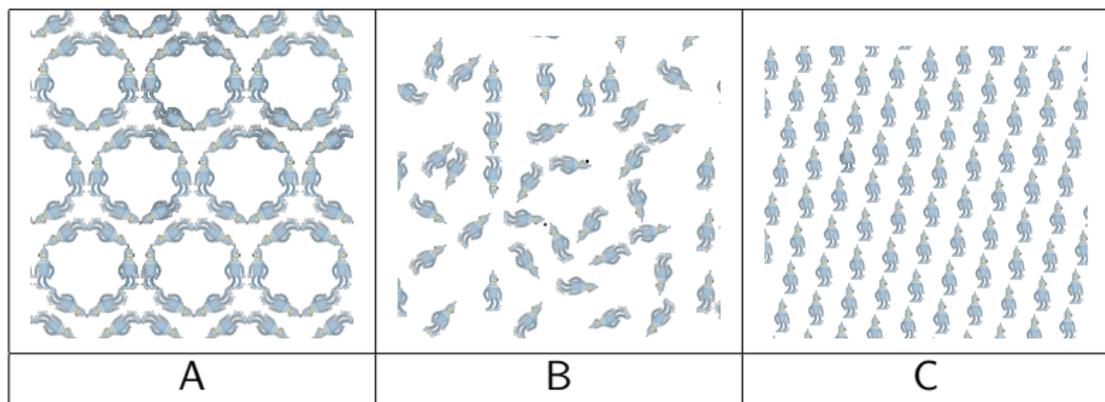
In groups of 3 - 4 students, look at the patterns given, taken from student submissions.

1. Describe the types of symmetry you see.
2. Group the patterns based on which ones have the same or related types of symmetry.
3. How would you define "symmetry"?



More or less symmetry

Which figure would you say has the most symmetry? the least symmetry? Why?



Definitions

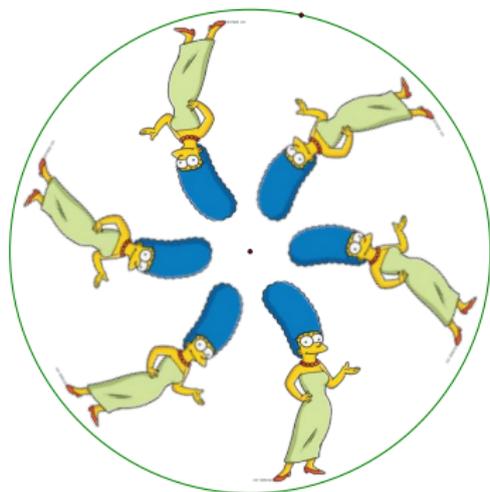
- ▶ An *isometry* of the plane is:
- ▶ Isometries of the plane are also called:
- ▶ Name (or describe) as many isometries of the plane as you can think of.

Rotation

- ▶ A *rotation* moves an object through a specified angle around a specified point, called the *center of rotation*, or *rotocenter*.
- ▶ Does a rotation have any fixed points? A *fixed point* of an isometry is a point that stays in the same place before and after applying an isometry.

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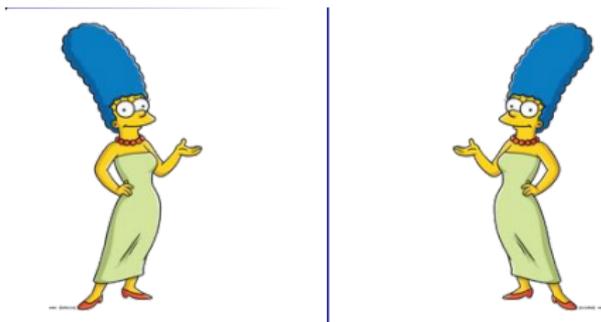


Reflection

- ▶ A *reflection* moves an object through a specified *mirror line*, also called an *axis of reflection*.
- ▶ If a point of the object starts out a distance d from the mirror line, then ...
- ▶ The line between a point and its reflected image point is
....
- ▶ A reflection changes the orientation of a figure. Two figures have different *orientation* if one is left-handed and the other is right-handed, i.e. one is the mirror image from the other.
- ▶ Does a reflection have any fixed points?

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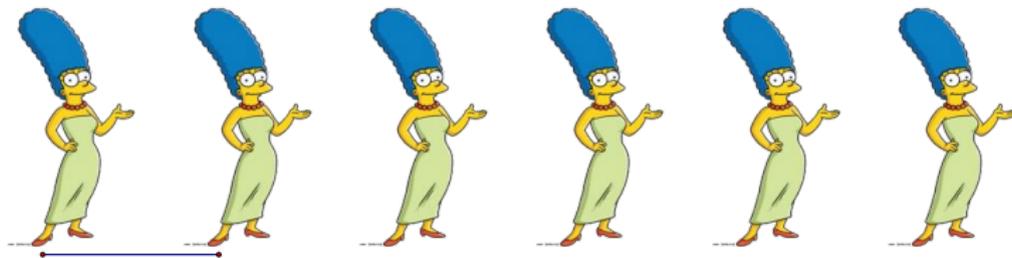


Translation

- ▶ A *translation* moves an object a specified distance along a specified straight path, called a *translation vector*.
- ▶ Does a translation have any fixed points?
- ▶ Does a translation preserve or reverse orientation?

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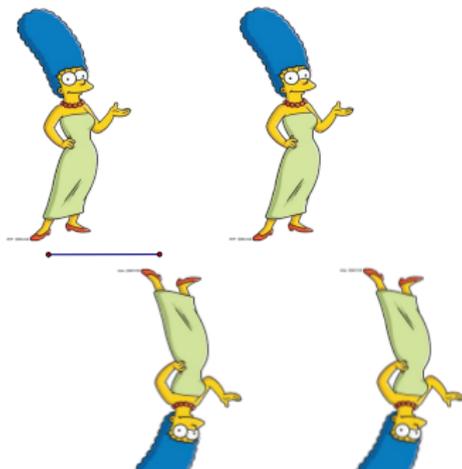


Glide reflection

- ▶ A *glide reflection*, or *glide*, combines a reflection and a translation in the following way:
 - ▶ First, the object is reflected across the mirror line.
 - ▶ Then, the object is translated a specified distance in a specified direction **ALONG THE MIRROR LINE**.
- ▶ The mirror line for a glide reflection is also called the *glide line*.
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Symmetry and isometries

For most of the semester, we will focus on types of symmetry that are related to isometries.

- ▶ We will say that a figure has rotational symmetry if:
- ▶ We will say that a figure has reflection symmetry if:
- ▶ In general, we will say that a figure has (rigid motion) symmetry if:

Homework

Write a few sentences to answer these questions:

1. Why did you sign up for this class?
2. Is there something you are particularly interested in doing in this class?