TEACHING BY DESIGN

FRANK LLOYD WRIGHT TRUST

ENDLESS POSSIBILITIES: LEGOS AND FRANK LLOYD WRIGHT

GRADE: 3-5
TIME: One 90-minute session

In this lesson, students will read Chapter 6 and 7 of Blue Balliett's *The Wright 3*, paying particular attention to pages 56-59 in Chapter 7, when Calder realizes he can build sections of Robie House with his pentominoes. Students will be introduced to the concepts of orientation, rotation, and reflection, and asked to find examples of each in Frank Lloyd Wright's work. Students will then experiment with these concepts by recreating the Robie House out of Legos, much like Calder with his pentominoes.

INTEGRATED SUBJECTS: Language Arts, Visual Arts, Math

OBJECTIVES

1. Learn how Frank Lloyd Wright used geometry in his architecture.
2. Define and demonstrate orientation, rotation, and reflection.
3. Explore hands-on building by creating a model with Legos.

MATERIALS | RESOURCES

The Wright 3 by Blue Balliett
Robie House images, Robie House floorplan, Images of Wright designed homes (Appendix A Packet)
Scissors
Miscellaneous Legos, enough for each student to have around 25 Legos total
Definition sheets, Practice sheet, Orientation in Architecture worksheet (Appendix B Packet)
Lego Shapes example sheet (Appendix C)
Final Reflection worksheet (Appendix D)

ESSENTIAL QUESTIONS

1. How do the characters in *The Wright 3* interact with Robie House and its shapes?
2. What shapes does Wright use in his architecture, and how does he orient them? How does he apply the concepts of reflection and rotation?
3. How can the same shapes be used to make buildings that look different and individual?

LESSON PROCEDURE

EXPLORE

- If your class is reading *The Wright 3* in its entirety, this activity fits into Chapters 6 & 7. If your class is not reading the entirety of *The Wright 3*, read Chapters 6 & 7 and pay particular attention to pages 56-59, when Calder uses pentominoes to model Robie House.
- After reading the sections and chapters, discuss how Calder makes connections between his pentominoes and the Robie House. Ask students:
    - ◊ *How does experimenting with his pentominoes help him understand the geometry of Robie House? How can we do the same?*

ENGAGE

- Introduce the students to the connection between Frank Lloyd Wright and geometry. Have students partner up and pass out Robie House images and Robie House floorplan (Appendix A). Ask students to work with a partner to outline the shapes they find.
    - ◊ Invite groups to share with the class.
- Display or distribute images of other Wright designed homes. Discuss how Frank Lloyd Wright used geometry in the other homes he designed (Appendix A).
- Introduce the students to the three key concepts of orientation, reflection, and rotation. Display or distribute the definitions sheets of these concepts (Appendix B). While still in pairs, have students demonstrate their understanding of rotation and reflection using the included Practice sheet (Appendix B). Direct students to rotate and reflect the shapes on their worksheet using a pencil. Then, instruct students to find 3 examples of rotation and reflection in the images of Robie House's design and to list them on their Orientation in Architecture worksheet (Appendix B).
- Encourage students by posing the following questions:
    - ◊ *Where do you see repeated shapes in Robie House's design? Where do you see a shape that's rotated in a new direction? Where do you see a shape that's reflected across Robie House's design?*
- Relate students' observations back to *The Wright 3*, by asking students:
    - ◊ *How is Calder using these three concepts as he plays with his pentominoes when recreating Robie? Where do we see these ideas illustrated in the text?*
    - ◊ *How does Calder's love of geometry drive action in the story?*

DESIGN

- Display images of Lego shapes: 1 square, 1 rectangle, 1 triangle (Appendix C). Distribute a handful of Lego pieces to each student and instruct them to create one of each shape.
- Have students lay the Lego shapes over the floorplan of Robie House. Direct students to locate the Lego shapes in Robie House's floorplan. Encourage students to reflect, rotate, and reorient their Lego shapes to find as many shapes as possible.
- Looking at Robie House' floorplan, ask students to share in which areas they found shapes that were rotated, reflected, and reoriented.
- Next, instruct students to create a three-dimensional model of Robie House with the bricks they have already been given. Encourage students to focus on the building's most basic forms. Give students two minutes to create.

LESSON PROCEDURE *(continued)*

- After they have attempted their first build, provide students with 5 more bricks and another two minutes. Continue giving students five more blocks every two to four minutes until they reach 25 blocks. Watch how students rotate, reflect and reorient their blocks as they are given more and change their design. Ask students:
    - ◊ *Does having more blocks make recreating the Robie House easier or more challenging?*
- Allot time for students to share their ideas and buildings. Ask students to point out one area where they used reflection and rotation.
- Finally, prompt students to create their own unique building inspired by Robie House with Legos using as many pieces as they'd like. Ask them to consider orientation, reflection, and rotation as they are building. Students may use as many Legos as needed and have up to 15 minutes to build.

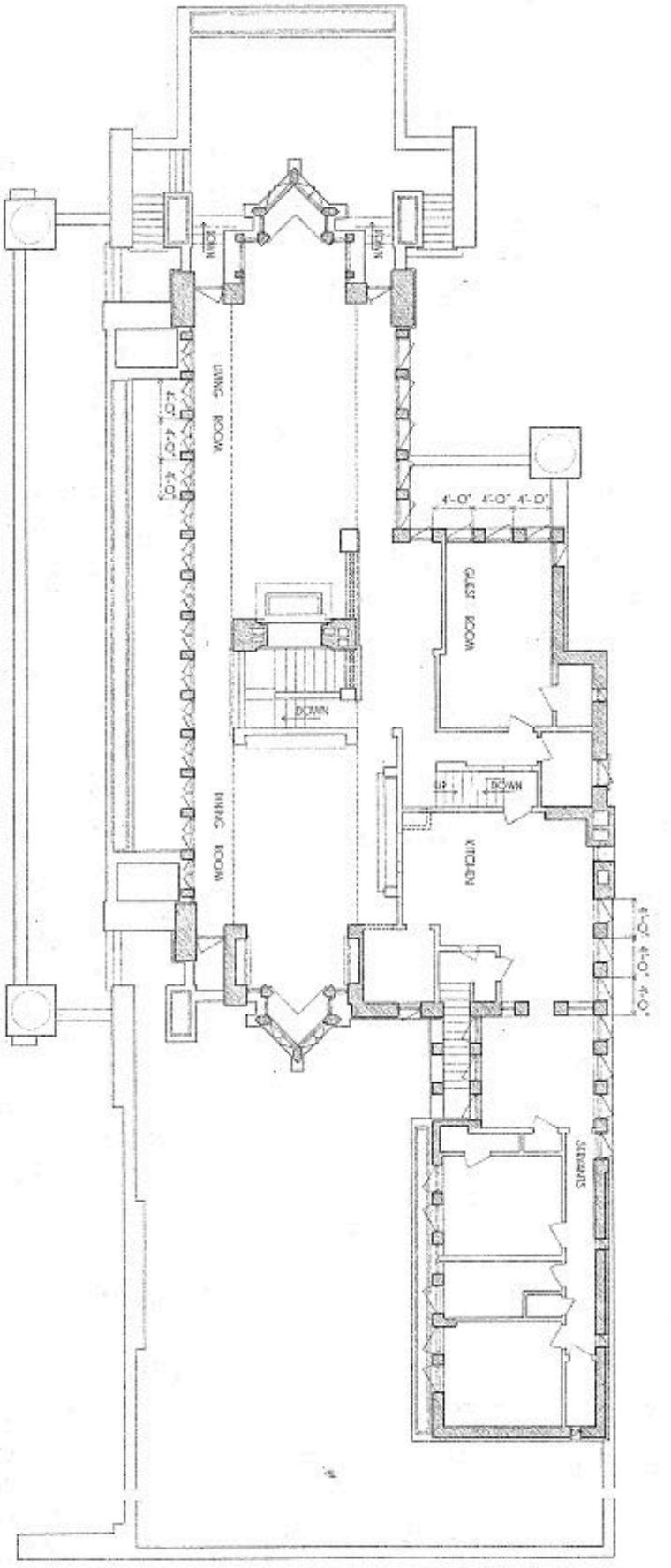
CRITIQUE & INTERPRET

- Have students partner up and begin a mini-critique looking at one another's original designs.
- Discuss the following questions as a class:
    - ◊ *Where do you see Wright's influence in this building? Where do you see examples of rotation, orientation, and reflection? What do you enjoy about your classmates' builds? Where did your classmates rotate, reflect, or reorient a shape in their builds?*
- Ask students to complete the Final Reflection worksheet (Appendix D).

Robie House images

Appendix A

Robie House floorplan



Appendix A

Images of Wright designed homes

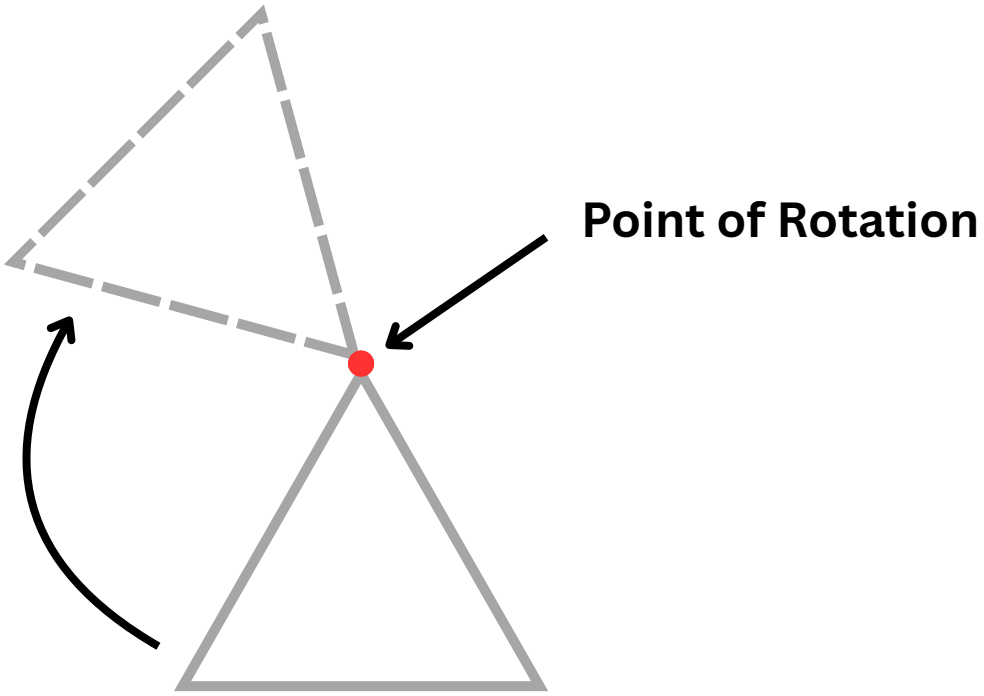
Peter A. Beachy House, 1906

Frank Thomas House, 1901

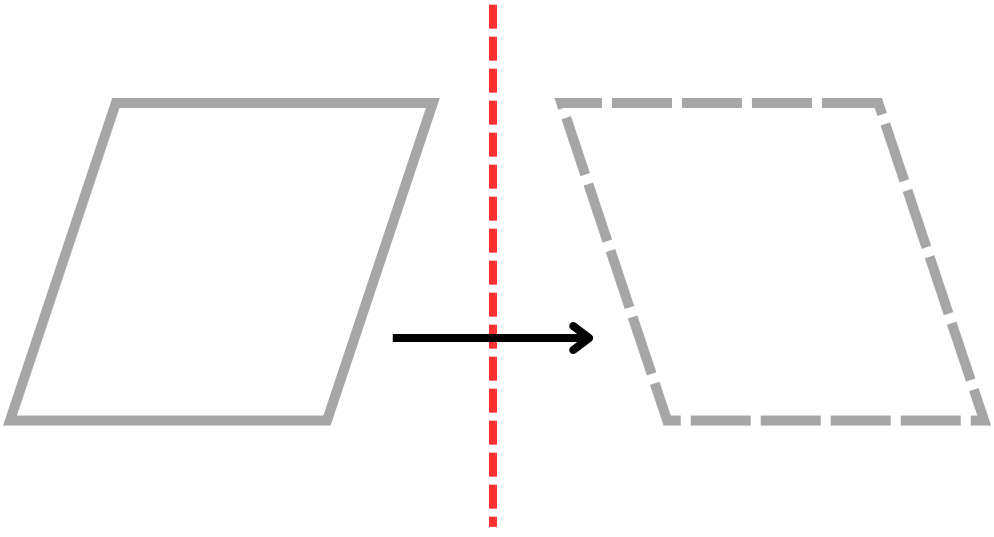
Arthur Heurtley House, 1902

Appendix A

Rotation is the action of moving an object around a fixed point called a point of rotation.

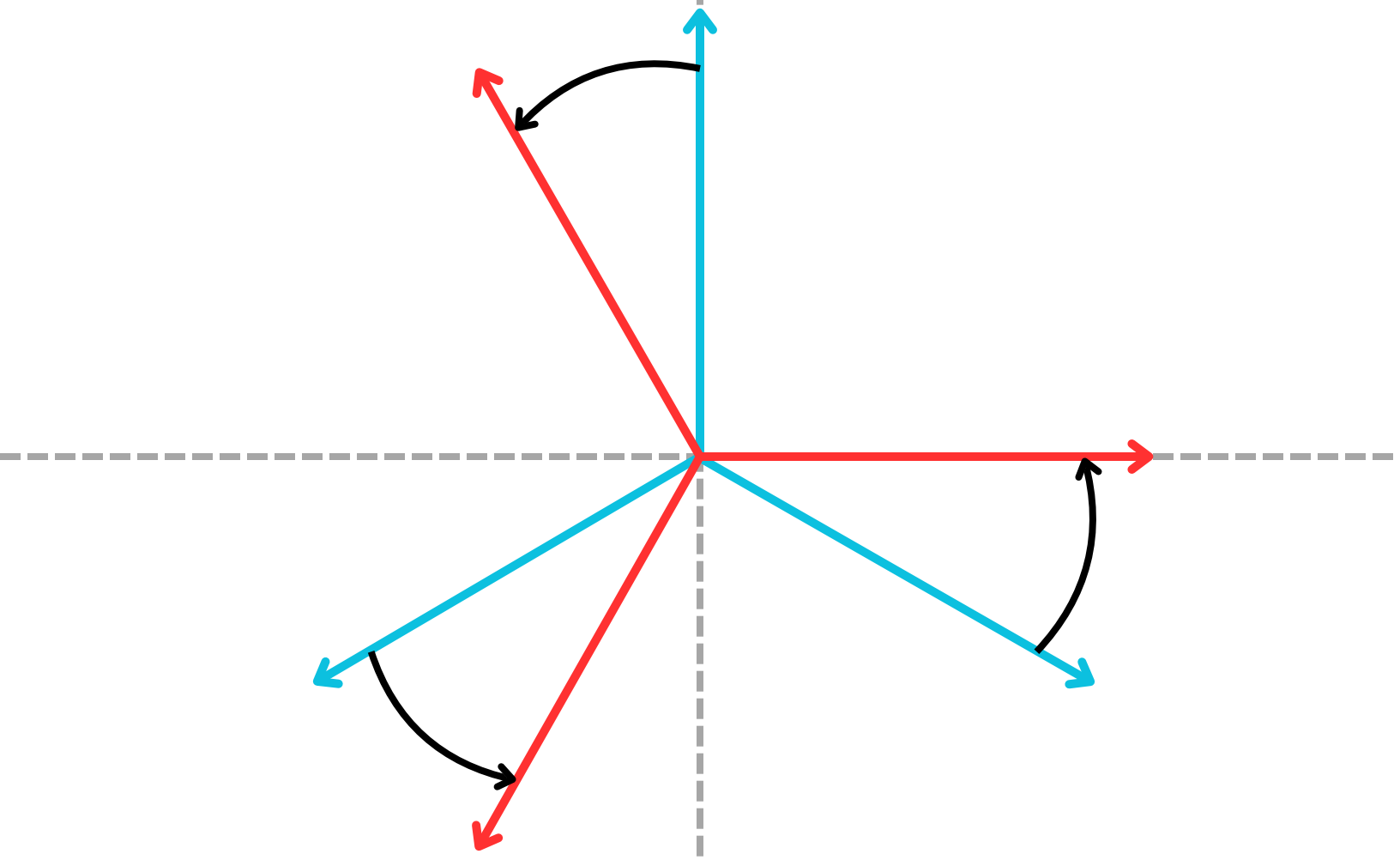


Reflection is the action of flipping an object across a fixed line, making it a mirror image.



Definition Sheet

Orientation describes the position of an object (such as a building) in the space it occupies. Rotation and reflection are examples of a change in orientation.



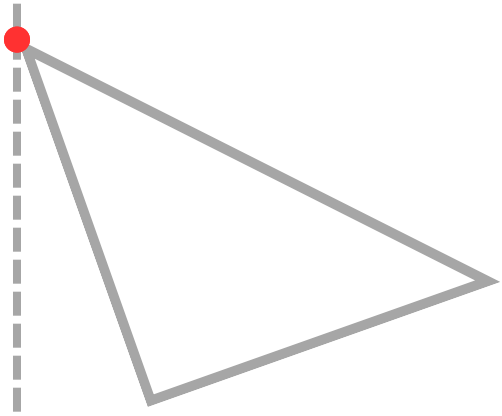
Definition Sheet

Appendix B

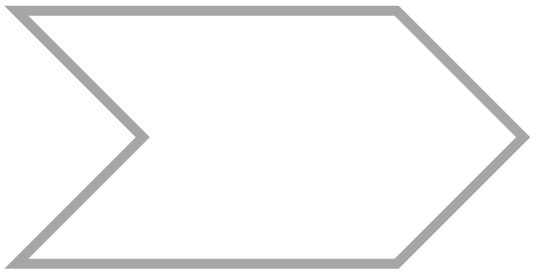
Name:

Practice Sheet

Illustrate an example of rotation below



Illustrate an example of reflection below



Appendix B

Name: Appendix B

Orientation in Architecture

Take a look at the floorplan for Frank Lloyd Wright's Robie House and find three examples of rotation and reflection in the building.

Rotation

1. _____

2. _____

3. _____

Reflection

1. _____

2. _____

3. _____

Appendix C

Name:

Appendix D

Final Reflection

How did Frank Lloyd Wright create complex buildings out of simple shapes?

What do Calder's pentominoes teach him about geometry in Frank Lloyd Wright's architecture?

Choose one of the following terms to define: rotation, reflection, orientation.

Was it easier to recreate Frank Lloyd Wright buildings with fewer Legos or more Legos? Why?