



Lesson One
Symmetry in Chinese Art
Elementary Grades 1 – 5

INTRODUCTION

This lesson uses the exhibition *Perfect Imbalance: Exploring Chinese Aesthetics* to analyze the concept of symmetry. Symmetrical or near symmetrical design is an integral component of Chinese art and the Chinese image of the cosmos. In addition to symmetry, students will also explore common geometric shapes through the Chinese puzzle of the tangram (qī qiǎo bǎn 七巧板).

LEARNING OBJECTIVES

- Students will explore and build knowledge about Chinese art.
- Students will develop an understanding of symmetry and the relationship of symmetry and design in real life.
- Students' spatial skills will be bolstered through the exploration of symmetry and geometry in Chinese art.

LINKS to MASSACHUSETTS CURRICULUM FRAMEWORKS

Mathematics Frameworks

Geometry Strand:

Grades 1-2 Standards: 2.G.1 – 2.G.6

Grades 3-4 Standards: 4.G.1, 4.G.2, 4.G.7 – 4.G.9

Grades 5-6 Standards: 6.G.6 – 6.G.8

Arts Frameworks

Visual Arts Strand:

Standards: 1, 2, 3, 5

Connections Strand:

Standards: 6, 8, 10

English Language Arts

Language Strand:

Standards: 1, 2, 3

History and Social Science Frameworks

Grade 1 Learning Standards: 1.7

Grade 4 Optional Standards for Ancient China: 4.3, 4.7

LOOKING AT CHINESE ART AT THE PEABODY ESSEX MUSEUM

This activity is designed to be used at the museum. It may be modified to take place in the classroom by using images from the website. *DK Eyewitness Book of Ancient China* is another source for images of Chinese art.

In this activity students will carefully analyze objects, and think about how the symmetrical and geometric elements contribute to the unique character of Chinese art. Building on a specific study of mathematical concepts, students' engagement with the art will lead to a better understanding of artists' intentions and the societal values the objects might reflect.

Pre-visit activity:

To facilitate a more productive museum visit, we recommend working with the *Perfect Imbalance* exhibition on the PEM website. By previewing the objects included in the exhibition students will have the opportunity to think about the symmetry, geometry, and content of the art work. For an exploration of geometry and symmetry, the four images in the "Cosmos" link lend themselves well to student analysis. Images on the website are printable so you can create overhead transparencies.

Materials:

- Access to *Perfect Imbalance* website and connection to projector *or*
- Photocopies of images from *Perfect Imbalance* web site *or*
- Images from *Perfect Imbalance* web site printed on overhead projection film *or*
- Copies of *DK Eyewitness Book of Ancient China*

Time Needed: 45 - 60 minutes

Procedure:

Using two images from the web site, lead your students in an analysis of the forms of symmetry found in the object.

1. Ask students to look closely at the object. What are their initial impressions?
2. Ask students to provide examples of symmetry or near symmetry. In Chinese painting and sculpture, there is often an element of "near symmetry" that creates harmonious tension to keep you looking. For instance, the embroidered designs on the *Second Degree Daoist Priest's Robe* are symmetrical but have slight variations.
3. Ask students to provide examples of geometric shapes found in the object.
4. Give students a photocopy of the objects. Working in small groups, ask students to label congruent figures and examples of reflectional and rotational symmetry.

Students should be familiar with the concepts of symmetry discussed above before visiting the museum.

During the museum visit:

Materials: Clipboards, pencils, worksheet

Time Needed: 1 hour

Procedure:

Distribute clipboards, pencils and worksheets to students prior to entering the gallery.

INTRODUCTORY GROUP DISCUSSION—Begin by gathering the class in the center of the gallery for a large group discussion. Consider the following topics:

- Chinese art is characterized by symmetry or near symmetry, reverence for antiquity, and aesthetics of the brush. Students will focus on symmetry, but might notice other characteristics as you explore the gallery.
- If the object used in the pre-visit is on display, ask students how looking at the actual work of art is different from looking at a reproduction. Ask students what they notice about the piece now that they are looking at it in real life.
- Choose a large object to gather around. After asking for initial impressions, practice identifying symmetry, near symmetry, and geometric shapes in a work of art.

SMALL GROUP ACTIVITY—Divide students into small groups of two or three.

1. In pairs, have students explore the exhibition, and then choose an art object to analyze in depth that reflects the themes of balance, symmetry, or geometric shapes. Students may also choose a portion of an object such as a poem on a painting. Ask students to complete Worksheet 1.
2. To extend older students' work with symmetrical properties, Worksheet 2 provides a template for students to sketch the object and enlarge, reduce or rotate it.
3. Ask students to present their objects and analysis to the class, focusing on the final questions on Worksheet 1: "What do you think about this object and its sense of balance? Do the symmetrical and geometric elements influence your reaction to the piece, and how so?"
4. Gather the class around an object that is not symmetrical but *is* balanced. Ask students to think about the difference between symmetry and balance. For instance, in scroll painting a tree at the bottom may be balanced by a poem at the top. To conclude your discussion, ask students:
 - Why do you think the curator titled this exhibition *Perfect Imbalance*?
 - What could the common theme of symmetry and balance in Chinese art tell us about cultural values?
 - What was/is important to Chinese artists?

SYMMETRY AND BALANCE ACTIVITIES

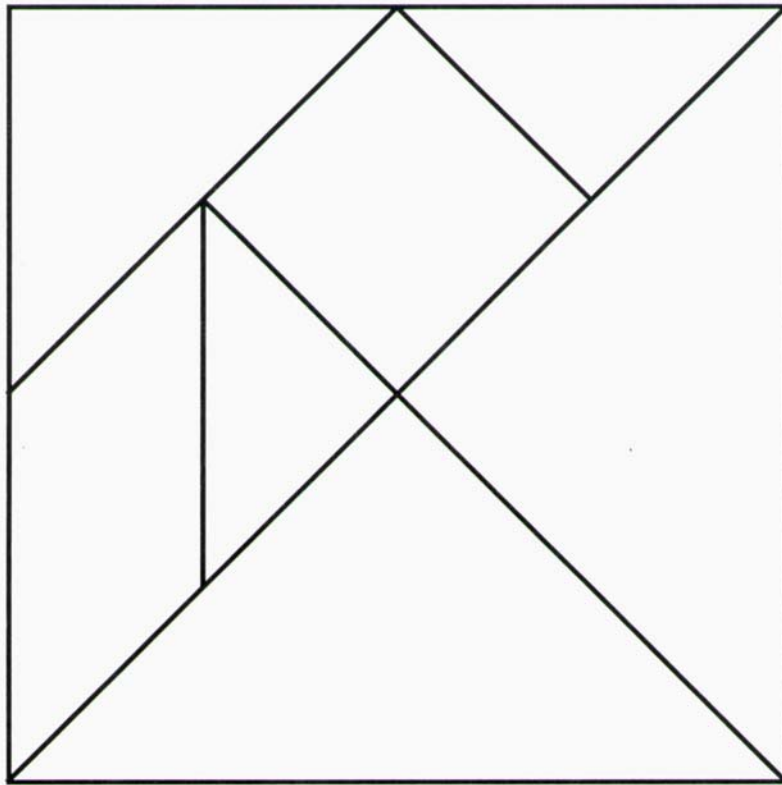
Tangram Puzzles

Tangrams are a great way to involve students in playing with geometric shapes and thinking about concepts such as angles, vertices, congruence, line reflection, reflectional symmetry, and rotational symmetry (see glossary). The tangram is an ancient Chinese game that gained popularity in the Qing Dynasty (1644-1911). *Qi qiao ban* (chee chyao ban), as it is known in China, means “seven clever boards.” The seven pieces can be rearranged into a variety of images. Tangrams have been a favorite teaching tool for mathematics teachers in China.

Materials: Tangram template, heavy card stock, scissors, puzzle designs, solutions

Time Needed: 30 – 45 minutes

Tangram Puzzle Template:



Making Tangrams

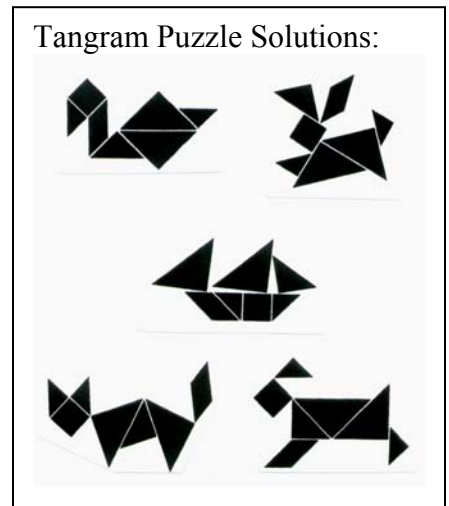
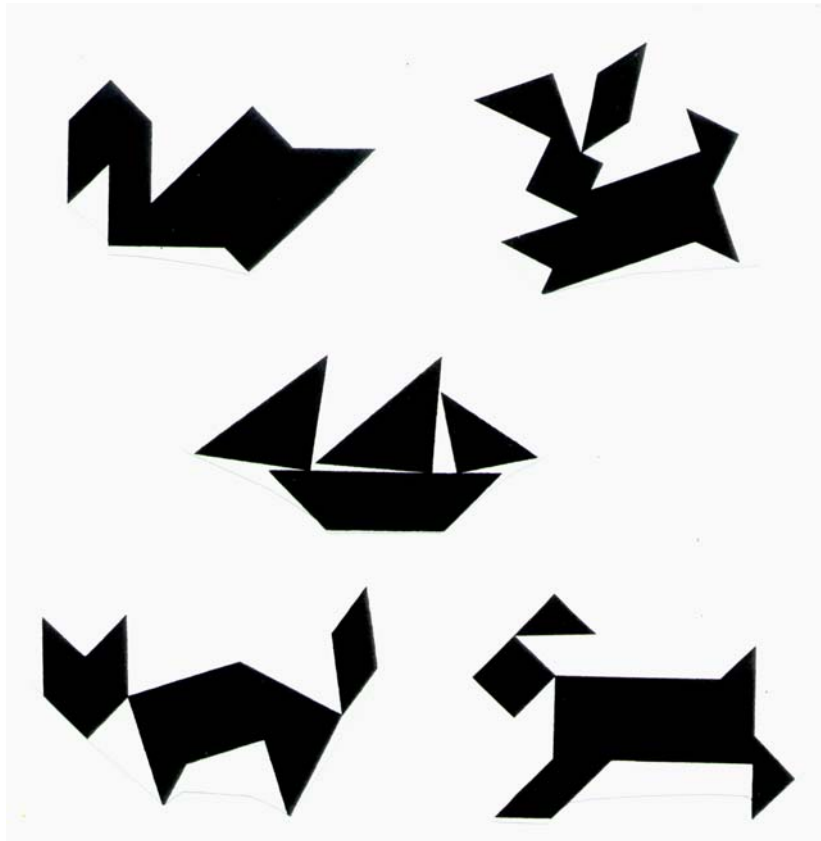
- Photocopy tangram puzzle template onto heavy card stock.
- Ask students to cut the tangram pieces from the template.
- Challenge students to create the different puzzle forms (provided below).
- Ask students to create their own tangram puzzle designs.

When solving tangram puzzles remind students of the rules:

- All seven tangram pieces must be used
- Tangram pieces should not overlap

Here are five tangram puzzles your students can try to solve:

Tangram Puzzles:



Tangram Discussion Questions:

- Name and describe the shapes and their geometric properties.
- Are any of the tangram shapes congruent?
- Do any of the tangram shapes have rotational symmetry?
- Do any of the tangram shapes have reflectional symmetry?

Tangram Web Resources:

http://www.linkslearning.org/Kids/1_Math/2_Illustrated_Lessons/
<http://www.pbs.org/teachers/mathline/concepts/asia/activity2.shtm>
<http://standards.nctm.org/document/eexamples/chap4/4.4/index.htm>
<http://www.tangrams.ca/index.htm>

Making Mobiles:

For upper elementary and lower middle school students, challenging hands-on activities working with balance and symmetry can be a synthesis of content knowledge. The *Perfect Imbalance* exhibition is replete with compositions that explore complementary forces: dark and light; force and acquiescence; awesome and diminutive. A further extension for older students creating mobiles would be to ‘balance’ Chinese and Western symbols.

Materials: Construction paper or card stock, string, yarn or wire, scissors, sticks or dowels, markers or color pencils

Time needed: 45 – 60 minutes

Procedure:

- Students can consider the balance of the sizes and weights of materials as they make their own mobiles.
- Create mobiles using the geometric shapes of the tangram.
- Create mobiles using symbols from Chinese art and the exhibition.
A study of the symmetry of Chinese characters and their meanings would also make interesting mobile content. Students can create mobiles balancing Chinese characters’ meanings and forms or pictures. Some common Chinese characters are provided on Worksheet 3.
- An Internet search will provide you with several websites detailing ways to make mobiles.

READING CONNECTIONS – Use this annotated bibliography to connect mathematics with lessons in English Language Arts.

DK Eyewitness Book of Ancient China

Arthur Cotterell, Dorling Kindersley Publishing, 1994

Ancient China provides examples of objects that demonstrate aspects of symmetry or near symmetry. We recommend asking students to look through the text themselves and find examples of the forms of symmetry that you are looking for in your unit of study.

Grandfather Tang's Story: A Tale Told with Tangrams,

Ann Tompert, Crown Publishers, Inc. 1990

This is an exciting and magical tale that encourages students to use their skills of prediction to aid their comprehension, and gives many examples of animals created with the seven puzzle tiles of the tangram.

The Story of Paper

Ying Chang Compestine, Holiday House, 2003

An entertaining story rich in symmetrical pictures. The illustrations are in a paper cut style, and the text is written for lower level elementary grades' interest and reading levels. This story may be a nice model for a class working on the mobile project.

Beyond the Great Mountains: A Visual Poem about China

Ed Young, Chronicle Books, 2005

Nature and symbols are the dominant themes of this creative book by Ed Young. Semi-abstract art, ancient Chinese characters, and a short poem embrace the power of nature in the Chinese artistic tradition.

The Master Revealed: A Journey with Tangrams.

Barbara E. Ford, Tandora's Box Press, 1990.

Full of tangram designs, this small book includes a version of the original story of the creation of the tangram puzzle. Written for upper elementary reading abilities, the majority of the book is pages of tangram designs grouped into themes: abstract shapes, birds, sea life, numbers, letters, household items, etc.

GLOSSARY

Congruence. Two objects are congruent if they have the same dimensions and shape.

Dilation. A transformation that produces an image that is the same shape as the original, but is a different size. An image is expanded in scale or reduced in scale using a grid or matrix as a reference point.

Reflectional symmetry. An object has reflectional symmetry if there is at least one line that splits the image in half so that one side is the mirror image of the other. Also called line symmetry or mirror symmetry. Examples: a heart, a butterfly.

Rotational symmetry. An object has rotational symmetry if there is a point in the image where it can be rotated a certain number of degrees and still appear the same. Examples: a six-pointed star, a stop sign, a flower with multiple petals.

Symbol. Something that stands for or suggests something else by reason of relationship, association, convention, or accidental resemblance.

Symmetry. Natural or manmade forms that are balanced around a line or a point; bilateral symmetry (forms like leaves or the human body); radial symmetry (forms like snowflakes or composite flowers).

In addition to the essential forms of symmetry above, congruence, reflectional, and rotational, it is also useful to note two more examples of symmetry that are not pure symmetry in the mathematical sense but are important for understanding Chinese aesthetics:

Form symmetry. A term to indicate an object that has a symmetrical shape, but does not have a symmetrical design pattern.

Compositional balance. Balance creates visual interest in an art work by controlling degrees of interest in different colors, shapes and sizes of figures and motifs in a composition.

Worksheet 1
Symmetry in Chinese Art

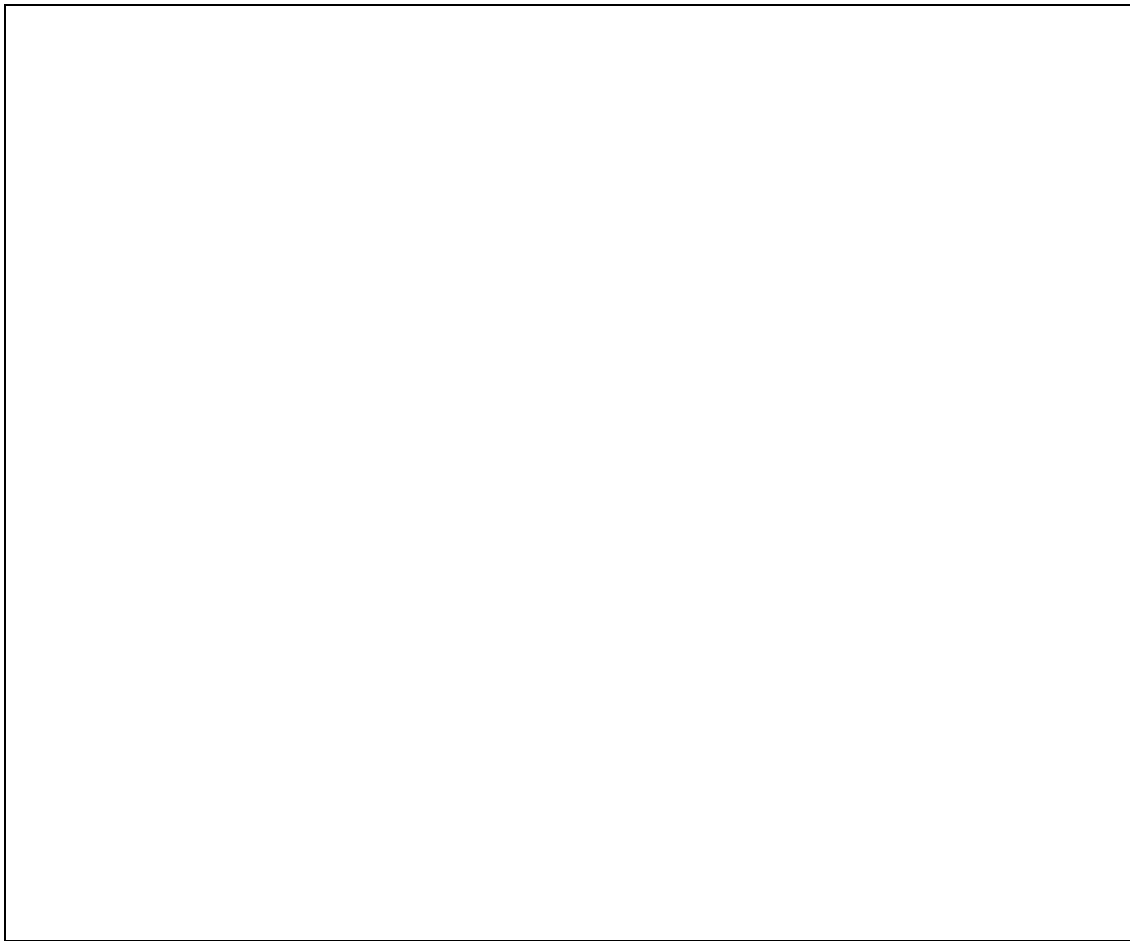
Student Name: _____

Name and Date of the Object: _____

Artist's Name: _____

Medium (materials used): _____

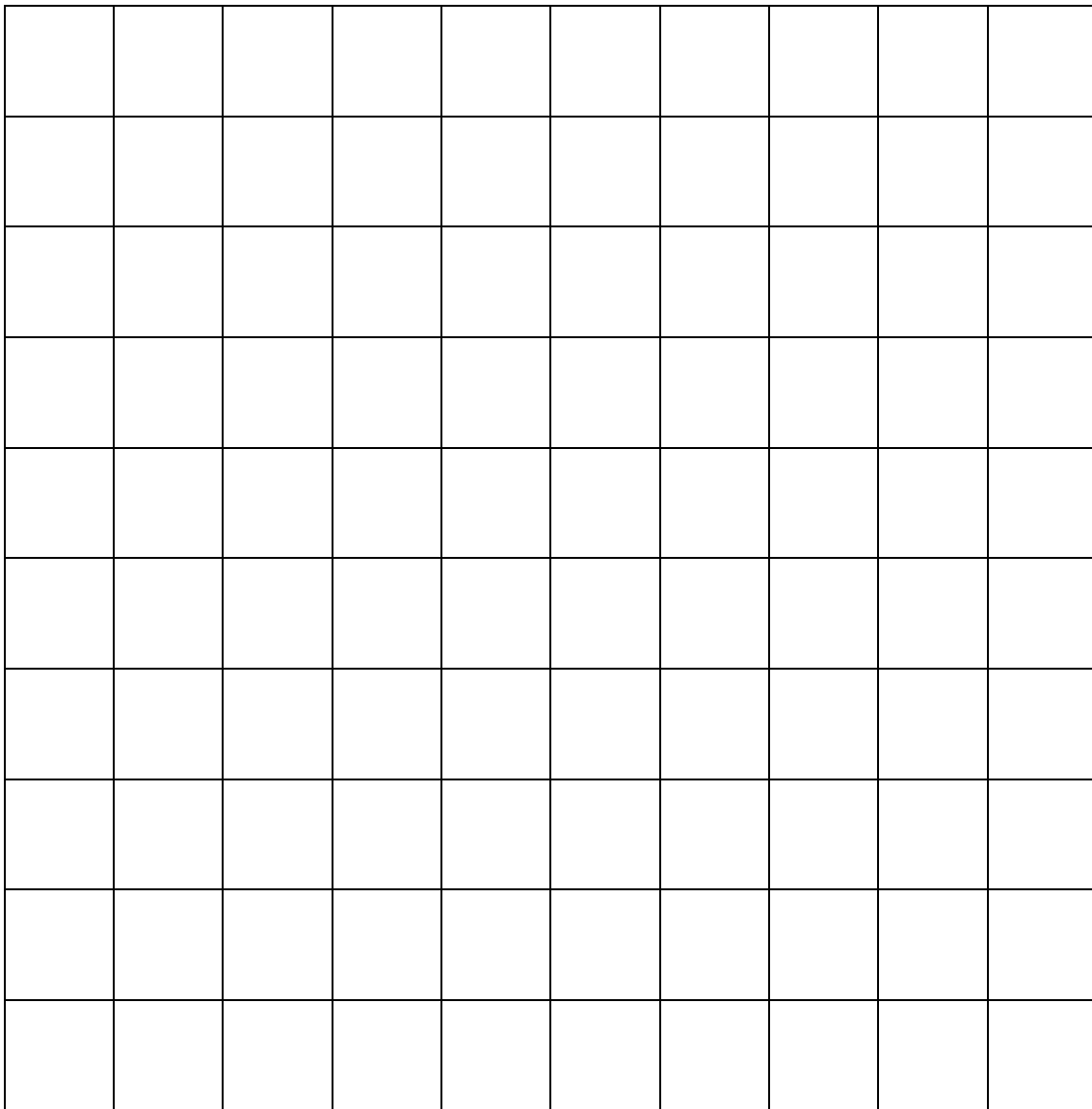
Sketch the object and identify the characteristics of symmetry that you see.



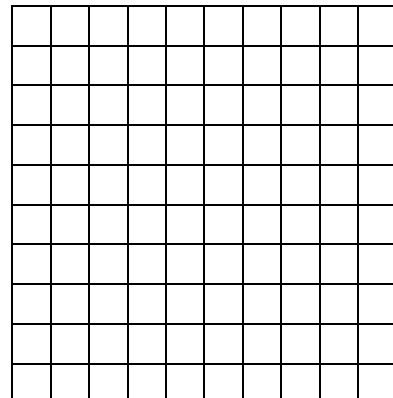
What are your personal reactions to the object?

Do the object's symmetrical and geometrical elements or sense of balance influence your reaction to the piece? How so?

Worksheet 2
Dilation Activity Sheet



Instructions: First sketch the object that you are studying in the small box on the right. Use this sketch to create the larger version in the bigger box above. Use the grid lines in the sketch to help ensure that your large picture is proportional and symmetrical.



Worksheet 3
Chinese Character Sheet

Which characters are symmetrical. Which are not?

Explain your answers.

春
spring

冬
winter

日
sun

月
moon

天
day

夜
night

本
root

木
tree

天
heaven

地
earth

東
east

西
west

中
middle

外
outside