[12-2-09]

Pre-Visit Teacher's Guide

ARCHITECTURE AT THE SKIRBALL
Grade 4

A Program of the Education Department
Skirball Cultural Center
2701 N. Sepulveda Blvd.
Los Angeles, CA 90049
(310) 440-4662
www.skirball.org

Skirball Cultural Center

Pre-Visit Teacher's Guide
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Grade 4

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Section I

Introduction

LETTER TO TEACHER

Dear Teacher:

Thank you for choosing the Skirball Cultural Center program *Architecture at the Skirball* for your students.

Architecture, in its most fundamental definition meaning structural design, is everywhere we turn. It literally surrounds us during most of our waking hours. It is integral to the buildings and structures we live in, work in, study in, play in, and use for transportation (for example, bridges and highway structures), and it has been so for thousands of years. It is the discipline that most blends art, science, and philosophy. Depending upon both technical knowledge and the materials available, humans have used architecture as one of many ways to define culture and civilization.

The architecture program created by the Education Department of the Skirball Cultural Center is designed to introduce your students to the field of architecture, to basic concepts of architectural design, and to the architecture of Southern California, particularly Los Angeles, where it reflects the influence of the myriad peoples who have immigrated to the region from throughout the world.

This *Pre-Visit Teacher's Guide* is designed to assist you in the classroom as you prepare your students for their museum visit. The activities in this guide will provide your students with appropriate background knowledge that will make their visit to the Skirball a more rewarding and enriching experience. Careful attention has been given to create materials that are grade-appropriate and interactive, but you are welcome to revise these activities to adapt to the specific needs of your class.

Important! *If you do not have time for all pre-visit activities*…

So that your students are introduced to the major themes they will discuss at the museum, we encourage you to complete all of the activities in this *Teacher's Guide* prior to your Skirball visit. But we understand that you may not have the time for all of them. To ensure the best educational experience of the students, please make sure to complete the following **REQUIRED** pre-visit activities:

Lesson #1: **Early Architecture: Native American Dwellings**
Lesson #2: **Shapes: The ABCs of Architecture**
Lesson #3: **Symmetry: Another Word for Balance**

Also, before visiting the museum:

- **Prepare a name tag for each student**—first name only, in large print so that the docents can read it.
- **Review museum rules and regulations with students and chaperones.**

Section Icons

The following three icons have been designed to help you identify sections of the lesson plan in a quick and convenient manner. Look for them in the upper right corner of each section.


Materials for the teacher: background information, instructions, etc.


Worksheets for students to complete.

For logistical details and additional instructions, please consult your tour confirmation packet. Feel free to contact us with any questions or concerns.

We look forward to welcoming you and your class to the Skirball!

Best regards,
Education Department
Skirball Cultural Center
(310) 440-4662
education@skirball.org

Architecture at the Skirball

CALIFORNIA STATE STANDARDS

Grade 4

CA State Standards—Mathematics
- Number Sense: 3.0, 3.4, 4.0, 4.1
- Algebra and Functions: 1.4
- Measurement and Geometry: 1.0, 1.1, 1.2, 1.3, 1.4, 3.0–3.8
- Mathematical Reasoning: 1.0, 1.1, 2.0, 2.2, 3.0, 3.3

CA State Standards—History–Social Science
- California: A Changing State: 4.1.1, 4.1.3, 4.1.5, 4.4.4

CA State Standards—English-language Arts
- 1.0–1.1

CA State Standards—Visual and Performing Arts
- 1.1–1.5, 2.1, 2.6–2.8, 3.1-3.3, 4.1, 4.2, 4.3, 5.2–5.4

Architecture at the Skirball
PROGRAM DESCRIPTION AND OBJECTIVES

Program Description: Your Visit to the Skirball

Your visit will include a two-hour program including an indoor and outdoor tour of the Skirball campus and a group building project in our Winnick Art Studio. All visits are guided by specially trained Skirball docents and staff.

Touring the Skirball campus: Students will…

- Learn basic architectural terms and design
- Identify architectural elements in their own environments
- Incorporate elements of mathematics, English language and visual and performing arts in their engagement with architectural elements
- Explore the evolving relationship between man-made architecture and the natural environment in which it is created
- Identify "negative space" and understand its importance in creating structures.
- Identify basic shapes (columns, slabs, cubes, pyramids, cones) used to create the building structure.
- Learn how architects must adapt to challenges posed by location, weather, available materials, etc.

In the Skirball classroom: Students will…

- Understand the purposes of a community space and how the design of a structure can bring people together.
- Identify those architectural elements and patterns that are repeated at the Skirball Cultural Center.
- Students will think about the <u>structural</u> and <u>architectural</u> **ELEMENTS** they want to add to their buildings; what style they would like to create; etc.
- Work in a cooperative group to create the space in a community building.

Section II

What is Architecture?

FOR TEACHERS

What is Architecture?

Introduction

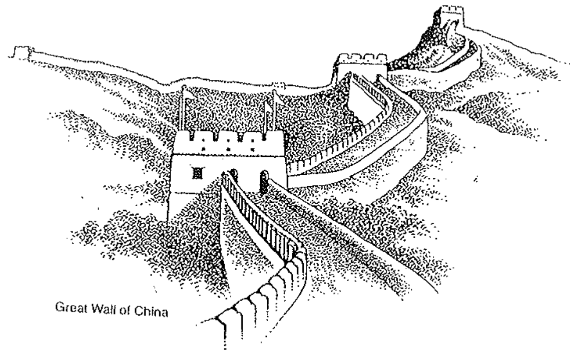
What do these structures have in common?

1. TRANSPARENCY: Create a transparency using the next page, showing six famous architectural landmarks.

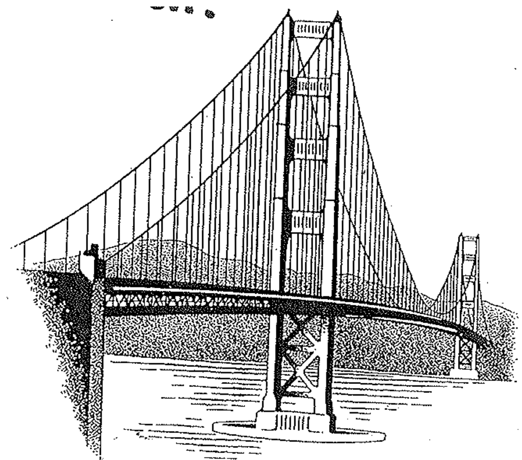
2. Ask the students what all of the structures pictured have in common:
   - They are all manmade.
   - They can all be defined as a **structure.**
   - All of them were specially designed by one or more **architects** whose job it was to create something that not only served the purpose for which it was intended (i.e., the purpose of bridge was to create the means to easily cross an expanse of water), but to also create something that is visually pleasing.

3. Explain to the class that they will soon be going on a field trip to the Skirball Cultural Center where they will not only tour a very interesting structure, but they will learn more about the field of architecture and learn how architecture is more than an art, it is a science as well.

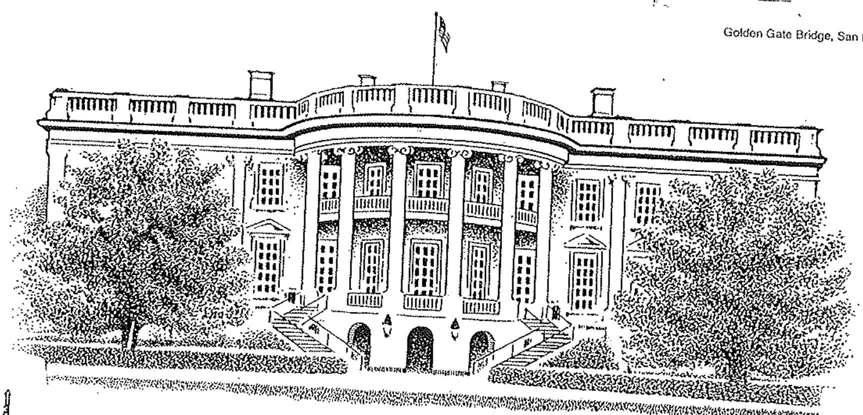
What do these structures have in common?



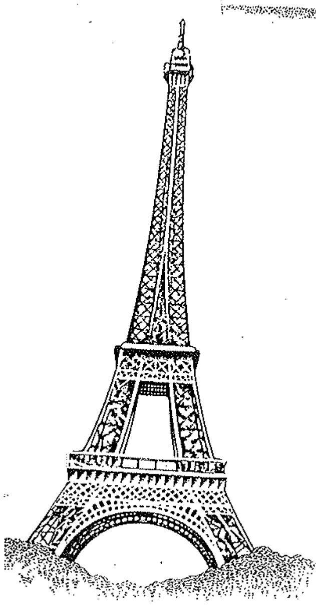
Great Wall of China



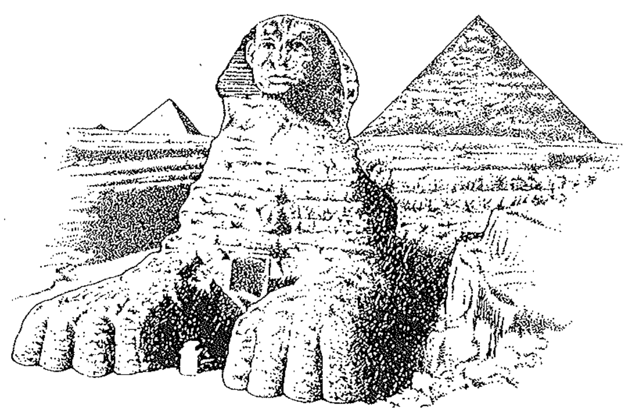
Golden Gate Bridge, San Francisco



The White House, Washington, D.C.



Eiffel Tower, Paris



Great Sphinx/Pyramids, Egypt

The Statue of Liberty, New York City

FOR TEACHERS

Lesson #1 *(Required):* **Early Architecture: Native American Dwellings**

ACTIVITY: Environmental and Communal Needs: Who Lived Where and Why?

1. Ask students: What basic things do human beings need to survive? Food and water, clothing, and **shelter**.
2. How has the environment and/or the geography of a place affected these basic needs in the past? How does the environment or geography affect these basic needs today? What part does technology play in regards to our shelters today? (increased knowledge of physics, new manmade materials, etc.)
3. Using Native American groups as an example (see chart on next page), examine how different Native American peoples created structures that reflected both their environment and their lifestyles (agricultural, migratory, hunter-gatherers, etc.).

ACTIVITY: Native American Dwellings

1. TRANSPARENCY: Create a transparency using the sheet of illustrations titled "Native American Dwellings." (See page 14.)
2. Explain that all of these structures are examples of the homes once built by Native Americans in different parts of the country.
   - How are they different?
   - How are they the same?
   - Which were built by those who were a nomadic people?
   - Which might have been built by those who were sedentary or settled?
   - What materials did they use and why?

Online Resources

1. This is a page for students studying Native American dwellings that includes photos, information, and links about each type.
   http://www.greatdreams.com/native/nativehsg.htm#PIT

2. This is a colorful map showing the different Native American dwellings used throughout North America. It also provides additional definitions and descriptions of these dwellings.
   http://www.kstrom.net/isk/maps/houses/housingmap.html

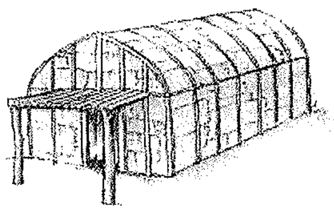
EXTENSION ACTIVITY: Build a Model of a Native American Dwelling

Have the class create a model of one of the Native American dwellings discussed, using historically accurate materials. For example, create a teepee using twigs, string, and fabric; or a pueblo using mud brick.

Native American Tribe and Region	Name of Dwelling	Materials	Description
Hopi (Southwest)	Pueblos	Adobe (clay)	They resembled apartment buildings with multiple rooms created side-by-side, built into cliff sides and on top of mesas of the Southwest desert.
Navaho (Southwest)	Hogans	Wooden poles covered with mud and bark	Traditional Navajo dwelling with a roof of earth.
Iroquois (Northeast)	Long Houses	Wood	Huge structures built to accommodate as many as 12 families in one house.
Yakima (Pacific Northwest)	Plank House	Wood	Constructed of thickly cut planks from local cedar trees. Houses were nearly 100 feet long and 25 feet wide.
Great Plains Indians (Midwest)	Teepee	Skins with wooden poles	Peoples of the Great Plains were nomadic (they moved from place to place). They used buffalo skins which they scraped and cleaned and arranged around long, 15-foot tall wooden poles in the shape of a cone. Tepees could hold 30 to 40 people at a time.
Ojibwa (East)	Wigwams	Logs covered with bark	Round buildings with a round top made from logs covered with bark.
Apache (Southwest)	Wickiups	Bent branches of young trees covered with animal skins.	Tree branches were bent and tied together to form an upside-down U-shaped home.

Native American Dwellings

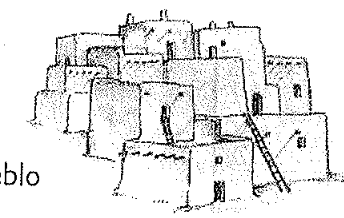
Longhouse



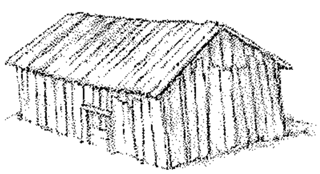
Hogan

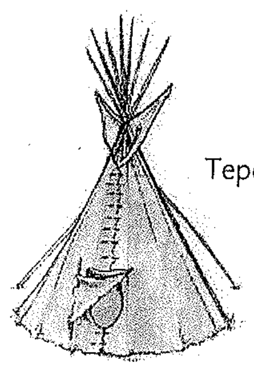
Wickiup

Adobe Pueblo



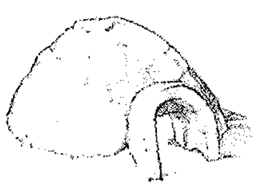
Plank House





Tepee

Igloo



Wigwam

FOR TEACHERS

Lesson #2 *(Required):* Shapes: The ABCs of Architecture

Objective:
Students will learn to identify and label the basic geometric shapes, and understand the difference between a two-dimensional plane figure and a three-dimensional solid figure.

Introduction

1. Hand out a blank sheet of paper and ask each student to draw a simple house, skyscraper, or bridge, or ask one or more students to volunteer to draw these structures on the board. ***Note: Save these drawings for Lesson #3, Part B: What is a Façade?***
2. Ask them to identify the different shapes they used in their drawings. (Very likely their structures will be made of a combination of basic shapes: squares, rectangles, triangles, etc.).
3. Explain that just as the students utilized basic shapes in creating their drawings, professional architects, the designers of buildings and other structures, use basic shapes in their designs. You could say that these **basic shapes are the ABCs of Architecture.**

Part A: Review the Basic Shapes: Planes and Solids

Instructions

- Explain that the terms 2-dimension (or 2-D) and 3-dimension (or 3-D) are related to "plane" figures and "solid" figures. What's the difference? The drawings they created of a house are 2-dimensional, or flat, but if they used those same drawings to then create a model of the house, rather like a doll's house, the model would be a 3-dimensional object.
- Draw a square on the board. Explain that this is a 2-dimensional figure or a plane figure. How can we turn it into a solid figure? Draw a **cube.** The drawing is still flat, but it represents a 3-dimensional object.
- Ask students:
    - A triangle would become what solid figure? A **pyramid.**
    - A 2-dimensional circle would become what solid figure? A **sphere.**
    - And so on.

ACTIVITY: Hunt for Shapes!

- Copy and distribute **Worksheet #2: Hunt for Shapes!**

- Using the classroom or school campus as an example, send students on a **Shapes Hunt** and identify as many shapes as possible, differentiating between Plane figures and Solid figures.

EXTENSION ACTIVITY: From Plane to Solid: Create Your Own 3-D Shapes

Online resources: The Web sites below contain geometric patterns and fun geometry games and activities.

http://mathforum.org/alejandre/workshops/cube.net.html
Build a cube out of paper and use it in a number of geometric activities.

http://pbskids.org/cyberchase/games/23dgeometry/index.html
A resource for building a number of geometric shapes out of paper using downloadable forms.

http://illuminations.nctm.org/LessonDetail.aspx?ID=L406
On-line activity for exploring geometric shapes.

Name______________________ **FOR STUDENTS**

Worksheet #2: Shapes: The ABCs of Architecture

Hunt for Shapes!

Take a look around your classroom and school. The world, both natural and manmade is made up of many different shapes. On the chart below, record the **NAMES** of the shapes you see, **WHERE** you saw them, and identify each shape as either a **PLANE** or a **SOLID** figure. The first one is done as an example. You may continue on the back of this sheet!

Name the shape!	Where did you find it?	Plane or solid figure?
Rectangle	Classroom doorway	Plane

Optional Lesson

Part B: Classic Orders in Architecture: The Column and More!

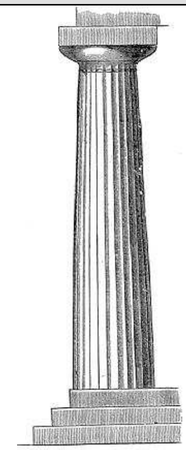
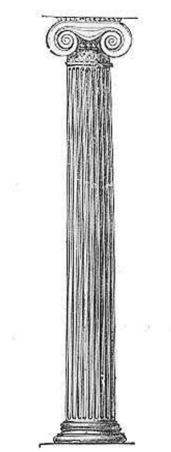
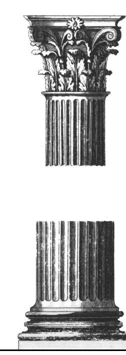
Objective
Students will be introduced to what is commonly termed “classic architecture,” or the five classic orders of architecture from ancient Greece and Rome.

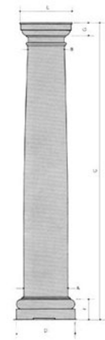
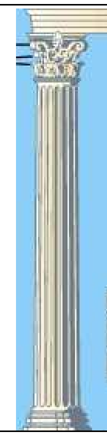
Instructions

1. Using a world map, point to Greece and Rome and explain that architects worldwide learn from one another and even from architects who lived many hundreds, and even thousands, of years ago. Explain that the work of architects in ancient Greece and Rome still influence architects of today.

2. TRANSPARENCY: Create a transparency using the illustrated chart on the next two pages, introducing the **five classic orders** of architectural style: Doric, Ionic, Corinthian, Tuscan, and Composite.

3. Explain that vertical pillars or columns (note that the basic shape is a cylinder) have long been used in architecture as supports for the roof or the upper floors of a building, but also for decoration. These five orders or styles are often identified by the type of column used in the building.

Type of column	Description	When it was developed	Picture
Doric	It has a plain, cushion-shaped capital (the top or crown of a column), a plain shaft (the long, tall part of the pillar) with 20 fluted sides (soft curves, which are carved into the column and reach from the top to the bottom), and **no special base,** or bottom piece. *(Note: Clue to remembering the meaning of the word "capital"—it contains a "cap"!)*	7th Century BCE *(over 2,700 years ago!)*	 Doric Column from the Temple of Neptune at Paestum.
Ionic	Taller than the Doric column, its shaft is also more narrow. The sides of the shaft are also carved into flutes and the capital looks like a scroll placed facedown on the top of the shaft. The base is large and looks like a **set of rings or inner tubes,** stacked one upon the other.	6th Century BCE	
Corinthian	The fanciest of all the orders of columns, its capitals include flowers and the leaves of the acanthus plant, while the slender shaft and base are like the Ionian column, containing flutes and a **ringed base.**	4th Century BCE	

Tuscan	Of Roman origin, it is very similar to the Doric order, but it doesn't have any flutes or carved sides in the shaft. It is a **smooth column,** slightly narrower on the top than on the bottom, with no special decorations other than a plain, single-ring base, and a simple capital.	2nd Century CE	
Composite	Invented by the ancient Romans, it is a **combination** of the Ionic and the Corinthian, which can be seen in the capital where the acanthus leaves (Corinthian) are topped with a scroll (Ionic).	1st Century BCE	

ACTIVITY: The Strength of Columns

Objectives

- Through experimentation and group problem solving, students will learn about the strength of columns and why they are used so prevalently in architecture.
- Students will learn they physics of load weight and distribution.

Materials

Each group of two students will need:

- 2 empty paper towel tubes (have extras available)
- Sand or salt
- Dishpan or tray
- A piece of cardboard (from a cereal box works nicely) to catch any spilled sand or salt
- Sturdy chair
- Funnel

Instructions

1. Hold up a toilet-paper tube and announce to the class that you are going to stand on top of it.
2. Ask students: Do you think this will hold me up?
3. Discuss their answers. How much weight could it support? An elephant? A car? A bowl of jellybeans?
4. You may want to stand on it and crush it as a demo.
5. Tell students that you will be giving them a challenge that has to do with columns: Find a way to make a toilet-paper tube support a person's weight.
6. Provide students with their materials.
7. The students can experiment with different ways of fortifying the column. They can fill the tube with different amounts of salt and sand, reinforce the sides with tape, and put a cover of cardboard on the top to spread out the weight more evenly.
8. Test each group's columns one at a time in front of the whole group.

The Big Idea

Students will find different solutions to increase the strength of the tube. Some proven methods are reinforcing the sides by wrapping with bands of tape, placing tape over the ends of the tube and filling the tube with sand or salt increases its strength enough to hold a person's weight. The load gets distributed evenly by the material inside the tube. The sand spreads out, but is contained by the sides of the tube, which hold it in and enable it to support the load. In construction, a thin-walled column can be filled with inexpensive material that still greatly increases the column's strength in compression.

EXTENSION ACTIVITIES FOR THE STRENGTH OF COLUMNS LESSON:

- Talk about circumference, diameter, and area of circles using the tubes.
- Challenge students to figure out if a column with a greater circumference will be able to support a heavier weight.
- Play around with the arrangement of the columns. Smaller columns arranged in a triangle may support more weight than one very large, central column.

Online Resources:

http://www.thesolutionsite.com/lesson/7202/activitycolumn.html
Explore the creation of columns by building one using everyday materials.

FOR TEACHERS

Lesson #3 *(Required):* **Symmetry: Another Word for Balance**

Introduction

Symmetry is another way of expressing balance. If we look in the mirror, our own faces appear to us mostly symmetrical. Much of what we see in nature appears to be symmetrical. Butterflies and moths have two equal sides and their wings appear to be symmetrical or mirror images of each other. Many leaves appear symmetrical, and snowflakes fall into this category as well. Throughout history and in every corner of the world, builders and architects have used symmetry to create balance in the manmade world.

Part A: Symmetrical and Asymmetrical

ACTIVITY: Finding Symmetry/Asymmetry in the Classroom

- Explain that the opposite of symmetrical is **asymmetrical**. Here the letter “a” means “not,” as in “not symmetrical.” Similarly, students may know the word “typical,” and “atypical,” or “not typical.”
- Look around the classroom. Find examples of objects that are symmetrical, meaning that if the object were divided in two exactly in the middle, one side would “mirror” the other. Find other objects that are asymmetrical.

ACTIVITY: Capital Letter Symmetry

- Using a very simple tool, the capital letters of our alphabet, teach the following lesson about symmetry and asymmetry, and **vertical** and **horizontal line symmetry**.
- Copy and distribute **Worksheet #2A: Capital Letter Symmetry** (**Venn Diagram)**, or create your own Venn diagram by writing all the letters of the alphabet in a simple block script on the board.
- Ask students if they think that most of the letters in the alphabet are symmetrical or asymmetrical.
- Begin with the letter **A.** Can it be divided into two identical halves? How? By drawing a line vertically from top to bottom, making the left side a mirror or reflective equal to the right side. This line is called the **line of symmetry**. Can the A be divided horizontally? No.
- Point to the **B.** Can the **B** be divided into two identical halves? Yes, but not vertically. The line of symmetry can be drawn horizontally through the midpoint of the **B** making the top half equal to the bottom half.

- Proceed through the rest of the alphabet, or ask the students to work on their worksheets on their own. (Note: BDEC can be divided horizontally, AMTUVWY can be divided vertically, and HIOX can be divided both horizontally and vertically. FGJKLNPQRSZ are not reflectively symmetrical)

http://countdown.luc.edu/NCTM_cat/Geometry/Symmetry/921107/SymmetryIntropt1/index.html
An on-line lesson about symmetry.

EXTENSION ACTIVITY: Color the Butterfly's Wings

- Copy and distribute **Worksheet #2B: Butterfly Symmetry.**
- Ask the students to very carefully design a pattern for the wings (using line, shape, color to create the design).
- Students must also decide on a **line of symmetry** so that the pattern of each wing will be the exact ***mirror copy*** of the other.

Name______________________ **FOR STUDENTS**

Worksheet #2A: Symmetry: Another Word for Balance

Capital Letter Symmetry

(Venn Diagram)

Use the Venn Diagram below to classify capital letters by their symmetry, whether they have HORIZONTAL symmetry, VERTICAL symmetry, both types, or neither.

A B C D E F G H I J K L M N
O P Q R S T U V W X Y Z

Vertical Symmetry

Horizontal Symmetry

Name_______________________ **FOR STUDENTS**

Worksheet #2B: Color the Butterfly's Wings

Butterfly Symmetry

Part B: What is a Façade? And is it Symmetrical?

Class Discussion

- Ask students to retrieve the drawings of simple houses or skyscrapers they made when first introduced to the architecture lesson. What part of the house or building did they draw? Most of them will have drawn the front of a building. This is also called the **FAÇADE**, or in another architecture term, the front **ELEVATION** of a building.

- The word “façade” (pronounced *feh-saad*) is from the French language, or the Italian, *faccia,* or face. It means the “front of a building,” or any “face” of a building that is given a special treatment.

- The façade is the first thing most people see of any building, and just as you like to look nice when you meet people, an architect also wants his/her building to make a good impression. Therefore, the façade of the building is of great importance to the overall look of the structure.

- Explain that you are going to show photographs taken of the facades or front elevations of four houses from the Los Angeles area. Ask them to look closely and identify which, if any, are symmetrical. Ask them to point to the line of symmetry? Ask them to also identify any basic shapes used in the homes’ designs.

- Houses B and C have symmetrical facades. Houses A and D have asymmetrical facades.

FOR TEACHERS

Lesson #4: Compression and Tension: The Push and Pull of Building

Introduction

All manmade structures depend upon *invisible* forces to hold them together and to allow them to support extra weight. How do we know that there are unseen forces at work? To better understand how an architect works, we must explore these forces and study a bit about the physics and mechanics of *architectural engineering.* Let's try some of these exercises.

ACTIVITY: **Acting Out Structures**

1. Push and Pull

- Ask two students to stand on opposite sides of a chair.
- Ask whether or not there are any invisible forces acting upon the chair. (**Gravity** is an unseen force pulling down on the chair).
- Have one student gently push the chair a few feet. What force created this motion? The push acted against the other force (gravity) and made it move. A pull will do the same in the opposing direction.
- Now ask two students to face each other and push with equal pressure on opposite sides of the chair so that it doesn't move. Note that now there are two forces, but they are balanced, causing the chair to remain in place. This is called **compression**. Try the same thing with a pull, **tension**. If the students apply the same amount of force, the results will be the same as with the push.
- Ask all students to place their hands together, palm-to-palm, fingers pointing up, and press their palms hard one against the other. This force is called **compression.**
- Ask all students to turn their left hand palm up, their right hand palm down, clasp their curled fingers together and pull. This force is called **tension.**
- Explain that some buildings get additional support via compression through the use of something called a **buttress.** (Show the students the images of the Chartres Cathedral and the Cathedral of Notre-Dame in France).

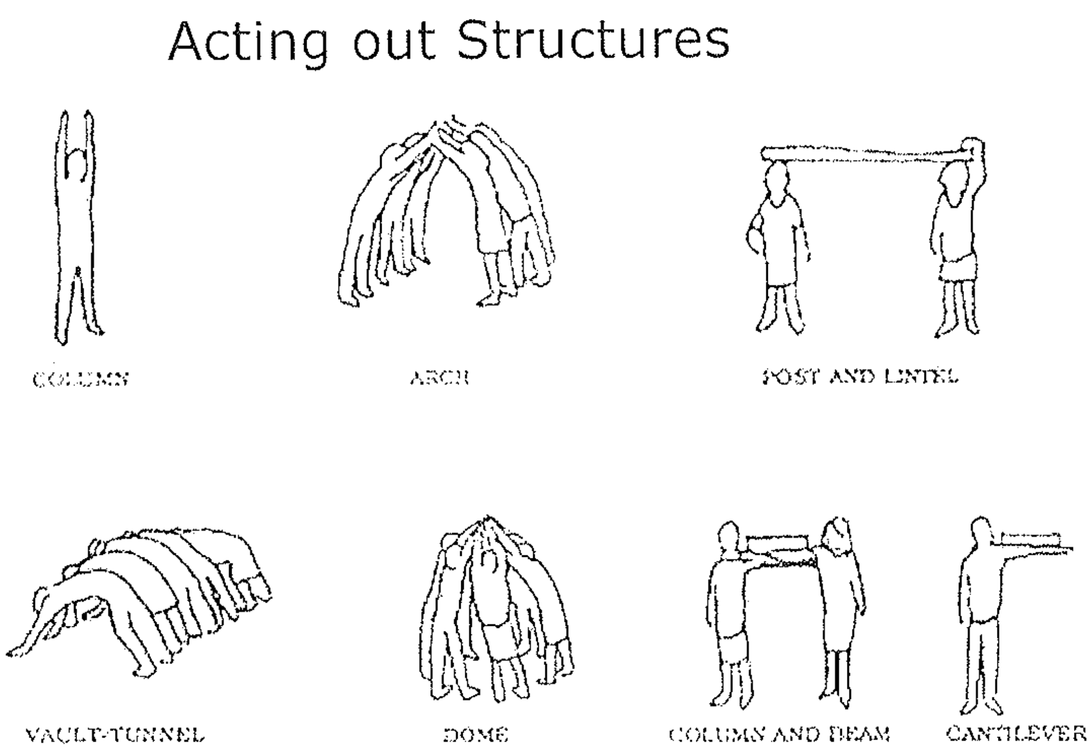
2. Create a "Flying Buttress"

- Ask for three volunteers.
- One student (**A**) will stand facing forward while the other two students (**B** and **C**) will stand three to four feet to the left and to the right of the first student, facing the first student, like this:

B > A < C

- **A** will represent the main structure. **B** and **C** will lean forward, keeping their feet in place, and *gently* place their hands on A's upper arms and shoulders. B and C form the **buttress.** The compression from the buttress, B and C, helps to strengthen the structure, A.

3. Here are some other structures you can have students act out.



To build other "human structures," go to the following website:
http://www.pbs.org/wgbh/buildingbig/educator/act_index.html

FOR TEACHERS

Lesson #5—What Type of Load? Is it Dead or Alive?

Introduction

When building any type of structure, the architect must consider what type of “load” the structure must support. There are basically two types of load: “dead” load and “live” load.

- **Dead load** is that weight which is a part of the structure itself and will not move after the structure has been built. For example: concrete, steel, brick, wood, and glass.
- **Live load** is any weight that will move about or will be added after the structure has been built. For example: people, furniture, cars and trucks, other materials.

ACTIVITY: Finding “Dead” Load in the Classroom

- Ask students to look around the classroom.
- Give students post-it notes to identify those parts that would be considered dead load: walls, ceilings, floors, doors, windows, etc., and those that would be considered live load: students, desks, books, ceiling lamps, etc.

ACTIVITY: We Are the Structure!

- Imagine that your body is part of a structure such as a supporting wall. The wall would be considered in architectural terms: “dead” load.
- Try the following exercises:

  Test #1:
  - Seven students stand in a line, arms linked over shoulders. XOXOXO
  - How strong is the line?
  - Now, the Xs stand on one leg. How strong is the line now?
  - Now ask the Os to stand on one leg. Note how the line has weakened. Ask the student in the center to stand to two legs. Does this make a difference? Ask the two students on the end to stand on two legs? Does this make a difference?

  Test #2:
  - Six students stand in a line, arms linked over shoulders. XOXOXO
  - The four in the center stand on one leg. How strong is the line now?
  - What would happen if the four in the center pick up the other leg?

EXTENSION ACTIVITY:

- Copy and distribute **Worksheet #5: Build an Index Card Bridge**
- Why do people build bridges? (to get safely across a body of water or a canyon)
- The bridge must be strong enough to support whatever is going to move across, be it people, cars, horses, wagons, or trains. These loads are always moving and their weight is always changing. Therefore these are called **live loads.**
- But the bridge must also be strong enough to support another type of load—the weight of the bridge itself. This is called the **dead load.** This load never changes.
- Both loads, the live load and the dead load, exert invisible forces on the structure of the bridge. These two important and invisible forces are called **compression** and **tension.**

Name______________________ **FOR STUDENTS**

Worksheet #5—What Type of Load? Is it Dead or Alive?

Build an Index Card Bridge

Supplies:
- A package of 4” x 6” index cards
- Pennies (about 300–400 pennies, or 3–4 rolls)
- Scissors
- 4–6 large books of equal size

Step 1:
- Create two equal stacks of books and place them about 4 inches apart.

Step 2:
- Place one index card over the gap resting about 1/2” of the card on each book.
- Try to guess how many pennies you can place on the index card “bridge” before the bridge will collapse. 5? 10? 50? 100? Try it…and see whether you guessed right or wrong.

Step 3:
- Try to make your bridge stronger *without adding anything* to the index card.
- Change the card itself to make it stronger. Experiment! Fold it in half; fold it into pleats; make an arch; make a four-sided beam or slab.
- To test your experiments, place the pennies (either single coins or in rolls) once again on your new bridges. What works and what does not work?
- Hypothesize: Why do you think one works better than the other?

Step 4: Testing Log. Record here the results of your different experiments:

Type of Index Card Bridge	Number of Pennies
1.) ________________________________	______________
2.) ________________________________	______________
3.) ________________________________	______________

Worksheet continues on next page! >>>

There are basically three kinds of bridge structures, though each can be designed to look very different from the other. These three types are:

- **Beam or truss spans**. This is the simplest type of bridge. For example, a fallen log across a stream is a type of beam span, as is a span of steel across a river, or a file card laid across two books.
- **Arch spans**. The first arch bridges, often made of stone, were built about 2,000 years ago by during the Roman Empire.
- **Suspension spans**. These get their support from ropes or cables which must be anchored to a rock or tree or, as in the modern bridges of today (like the Golden Gate Bridge in San Francisco), anchored to a great block of concrete called an "anchorage."

Note: Using only index cards you can make different types of beam spans, and even an arch span, but not a suspension span.

FOR TEACHERS

Lesson #6—Blueprints: Plans on Paper

Introduction

Tell students: When architects put their ideas on paper, they begin with three steps:

1. Create a PLAN
2. Create a SECTION
3. Create an ELEVATION

ACTIVITY: Bell Pepper "House"

Materials

- Two bell peppers
- Paring knife
- Paint or ink
- Paper

Instructions

1. Using two bell peppers, explain and illustrate three architectural terms: **plan, section** and **elevation.** (You can also do this exercise using decorated paper or Styrofoam cups.)

2. The outer walls of the peppers are like the exterior walls of a house, and the inner walls are similar to the dividing walls of the house's rooms.

3. Cut the first pepper in half horizontally. Look at it from the top. You can see the **PLAN** of the pepper "house," including the different "rooms." (You can dip the pepper in ink or paint to make a print demonstrating the "plan" or "***blueprint***" of the pepper.)

4. Cut the second pepper in half vertically, and remove the face or **exterior ELEVATION** of the pepper to look at an **interior SECTION** of the pepper.

Online Resources

Visit the Web site, Architecture in Education, for further information on this activity: http://www.aiaphila.org/aie/new-stuff/class_projects/bellpepper.html

ACTIVITY: Creating Classroom Blueprints

Materials

- Graph paper
- Rulers, compasses, and pencils
- Foam core or cardboard

Instructions

1. Create a **plan, elevation,** and **section** of the classroom (or alternately, as a homework project, of the students' bedrooms).

2. Teams 2, 3, 4, and 5 will *each* be assigned to create a "blueprint" of one of the classroom's four walls, also called an **elevation**.

3. All teams will work with rulers, pencils, compasses, and graph paper to the same **scale**. For example, 1 square = 1 foot, or 4 squares = 1 foot

4. Mount the blueprints on cardboard or foam core, cut to size, and then assemble to form a three-dimensional scale model of the classroom.

5. Add details, such as desks, clocks, windows, doors, etc., using the same **scale** to measure these objects. Draw or color details, assemble with masking tape and/or glue on top of a firm piece of cardboard.

Section III

Exploring the Architecture of Los Angeles

FOR TEACHERS

Lesson #7—Exploring the Architecture of Los Angeles

Part A: Immigrants and Their Cultural Influence

Introduction

Los Angeles was founded over 100 years ago in 1781, by a man who was working for King Carlos III of Spain. (Point out Spain on a world map). This man's name was **Felip De Neve,** the Governor of California. Governor de Neve was able to persuade settlers (or *pobladores)* to come north to *Alta California* (Upper California) from Sonora, Mexico (point out the northwest portion of Mexico on the map) to settle in this area. The first group consisted of 11 men, 11 women, and 22 children who were of European, African, and Native American culture. They traveled from Sonora to *Baja California* (Lower California) and then north to meet Governor de Neve. The *pobladores* settled at a site along the banks of the river, Porciuncula. The new *pueblo,* or town, was named: *El Pueblo de Nuestra Señora la Reina de* ***los Angeles*** *de Porciuncula.*

Class Discussion

- Ask students: What was the dominant language spoken in the tiny pueblo of Los Angeles at that time.
- Spanish, the language of Mexico, was not the only thing imported or brought over to the new city of Los Angeles. The settlers also brought with them their style of cooking, their clothing, and even their way of building homes.
- Ask if any of the students have visited the plaza at El Pueblo de Los Angeles and Olvera Street. There they can visit the oldest house in the city, the *Avila Adobe,* which was built in 1818. Why is it called the Avila Adobe? Because it's named after **Francisco Avila** who built the house, and after the type of building material used: adobe or mud bricks. The settlers who came to Los Angeles from Mexico brought with them the same technique of building with adobe that they used in Mexico. And the architects among them created structures that reminded them of the places that they had left behind in Mexico.
- Many buildings in L.A. today evoke the early heritage of Mexico and Spain. These building styles are called **Spanish Colonial, Spanish Baroque,** and **Southwestern.** Today many buildings in Los Angeles reflect the heritage of people who have moved here from all over the world as well as popular building styles from different time periods in history.

ACTIVITY: The Diverse Styles of Los Angeles

Make a transparency from the color copy titled "The Diverse Styles of Los Angeles," featuring pictures of these local architectural landmarks:

A. **Plaza Methodist Church**, or the Biscailuz Building. Located on the plaza at El Pueblo de Los Angeles at the corner of Olvera Street. Built in 1925-26 in the Spanish Baroque style, until recently housed the Mexican Consulate General's office.
B. **Chinatown.** The main gateway and central plaza in L. A.'s Chinatown reflects the tradition of Chinese buildings with their tiled roofs and upturned corners.
C. **Union Station.** Opened in 1939, this building reflects Spanish Colonial and Southwestern style and is known as the "last of the great railway stations" built in the United States. The architects were a father-and-son team, John Parkinson and Donald B. Parkinson, who also designed Los Angeles City Hall, which for many years was the tallest building in Los Angeles.
D. **Little Tokyo.** The blue-tiled Yagura Tower near First and San Pedro Streets. This is a replica of a fire lookout tower in old rural Japan.
E. **St. Vincent de Paul Roman Catholic Church.** Built in 1923–25 by the architect Albert C. Martin, it is a beautiful example of the 18th-century Baroque style popular at that time in colonial Mexico. It is located at the corner of Adams and Figueroa Streets.

Part B: Different Styles for Different Times

Introduction

Los Angeles is also known for having many structures that reflect popular building styles from different time periods in history. Just as clothing styles have changed over time, so have building styles.

ACTIVITY: Finding Pictures of Local Architecture

Have students use the Internet, newspapers, magazines, and other sources to find photographs of buildings in and around Los Angeles. For example:

Los Angeles International Airport
http://www.lawa.org/lax/gallery.cfm

J. Paul Getty Museum
http://www.getty.edu/museum/about.html

L.A. City Hall
http://www.glasssteelandstone.com/US/CA/LosAngelesCityHall.html

Walt Disney Concert Hall

http://en.wikipedia.org/wiki/Walt_Disney_Concert_Hall

L.A. County Museum of Art
http://www.lacma.org/info/TransformingOverview.aspx

Frank Lloyd Wright's Ennis House
http://www.greatbuildings.com/buildings/Ennis_House.html

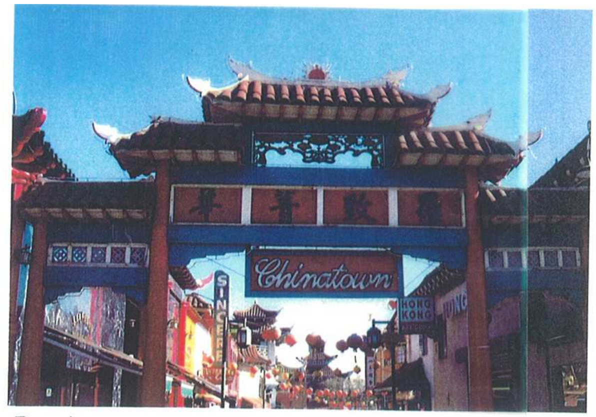
Skirball Cultural Center
http://www.skirball.org/index.php?s=welcome

EXTENSION ACTIVITY FOR THE DIVERSE STYLES OF LOS ANGELES LESSON:

- Create an individual collage or a group mural with the theme: *Los Angeles Architecture—A City of Contrasts.*

- Use drawings and/or photographs of structures in Los Angeles, maps, cut-out or handwritten text, paint, and/or crayons, to create a work of art that reflects your feelings about Los Angeles as a city established over 200 years ago that today is home to millions of people from all over the world.

A



B

The Diverse Styles
of
Los Angeles

C

D

E

Section V

Post-Visit Activities:
Some Ideas for Your Students

Architecture at the Skirball

POST-VISIT ACTIVITIES:
Some Ideas for Your Students

The following online resources provide additional activities related to architecture:

1. Design a house/building of the future.

http://www.housesofthefuture.com.au/hof_houses01.html

http://www.popsci.com/popsci/technology/hometechnology/0536cc54d08a9010vgnvcm1000004eecbccdrcrd.html

2. Research different types of "green" (ecologically sound) architecture.

For example, the straw-bale house:

http://thestrawbalehouse.blogspot.com/search/label/Education

3. Create a photographic journal or scrapbook.

Students could explore one of the following themes:

- Collect pictures of classical architectural elements (Doric columns, etc.) and label them.
- Select a neighborhood with a distinctive cultural flavor and photograph the elements that are related to a particular culture or heritage. Label the photos.

http://www.usatourist.com/english/places/california/losangeles.html

http://www.globalimpacttours.com/tours/losangeles.html

Section IV

Recommended Resources

Architecture at the Skirball
RECOMMENDED RESOURCES

Suggested Books to Use with Students:

Ching, Francis D.K. ***Architectural Graphics.*** Van Nostrand Reinhold, New York, NY, 1985.

Ching, Francis D.K. ***Architecture: Form, Space, & Order.*** Van Nostrand Reinhold, New York, NY, 1979.

Ching, Francis D.K. ***A Visual Dictionary of Architecture.*** John Wiley & Sons, Inc., Canada, 1995.

Eisen, David. ***Fun with Architecture.*** The Metropolitan Museum of Art and Viking Press, New York, NY, 1992.

Macaulay, David. ***Building Big.*** Houghton Mifflin Co., New York, NY, 2000.

Macaulay, David. ***Castle*.** Houghton Mifflin Co., New York, NY, 1977.

Macaulay, David. ***Cathedral: The Story of Its Construction.*** Houghton Mifflin Co., New York, NY, 1973.

Macaulay, David. ***City: A Story of Roman Planning and Construction.*** Houghton Mifflin Co., New York, NY, 1974.

Macaulay, David. ***Mosque.*** Houghton Mifflin Co., New York, NY, 2003.

Macaulay, David. ***Underground.*** Houghton Mifflin Co., New York, NY, 1976.

Salvadori, Mario. ***The Art of Construction: Projects and Principles for Beginning Engineers and Architects.*** Chicago Review Press, Chicago, IL, 1990.

Section V

Comprehensive Vocabulary

Architecture at the Skirball
COMPREHENSIVE VOCABULARY

adobe: sun-dried mud bricks.

arch: an architectural element in the shape of an overhead curve or arc.

architecture: 1) the art and science of designing and constructing buildings and other structures, such as bridges, tunnels, arenas, etc.; 2) a special style of a building, example: a building from a particular time period or place.

base: the bottom or foot of a column.

beam: a supporting shaft or girder, of wood or steel or stone.

blueprint: architect's detailed scale-sized drawings of a structure.

buttress: a structure that supports or reinforces a building to make it stronger.

capital: the top portion of a classical column.

clerestory: windows placed in the upper part of a wall.

colonnade: a row of columns that usually support a roof or arches.

column: round or square pillars, often used as structural supports, but can also be decorative.

compression: the application of pressure, or the state of being under pressure.

cube: a solid figure with six equal square plane sides, each set at right angles to the four sides adjacent to it, i.e., a block.

cylinder: a tube shape with straight sides and equal-sized circular ends.

doric: simple Greek column/capital detail made with multiple layers of round turnings.

drafting: hand-drawn mechanical drawings including floor plans, elevations, reflected ceiling plans, cabinetry, and architectural details.

element: a component or part of the architectural structure.

elevation: scaled drawing showing the details of an exterior or interior wall.

façade: the face or front of a building given special architectural treatment.

flute: a groove running down an architectural column.

load: the weight of a structure, either “dead” (part of the structure) or “live” (additional to the structure).

perimeter: distance around the outside of a room or shape.

plan: diagram, map, or sketch of a structure or part of a structure.

plane: a flat level surface, a two-dimensional shape.

plaza: an open space or gathering place between buildings.

porch: open or closed gallery or glassed-in room attached to a main structure.

portico: entrance to a building with columns supporting a roof, which can be large enough to enable a car to drive underneath, giving protection to passengers getting in and out of car.

pyramid: a solid shape that has triangular sides that slope upward to meet in a point, with a square or triangular base.

section: a portion or a segment of a larger object or plan.

shaft: a pole or rod, or the cylindrical part of an architectural column.

square: a plane shape with four sides of equal length.

square feet: measurement obtained by measuring the width times the length, also referred to as area.

structure: something built or erected; a building, bridge, or framework put together of many parts, usually in an orderly fashion.

strut: a support or brace.

symmetry: balance, evenness, proportion. Opposite: **asymmetry** (uneven, not balanced).

tension: stress, opposition, pull.

triangle: a plane shape with three sides.

truss: to support or strengthen a roof, bridge, or other elevated structure with a network of beams and bars.

veranda: a balcony or outdoor porch.