

# PATTERNS HERE, THERE, & EVERYWHERE

EDUCATOR RESOURCE PACKET

PRE-KINDERGARTEN — GRADE 2



NATIONAL BUILDING MUSEUM

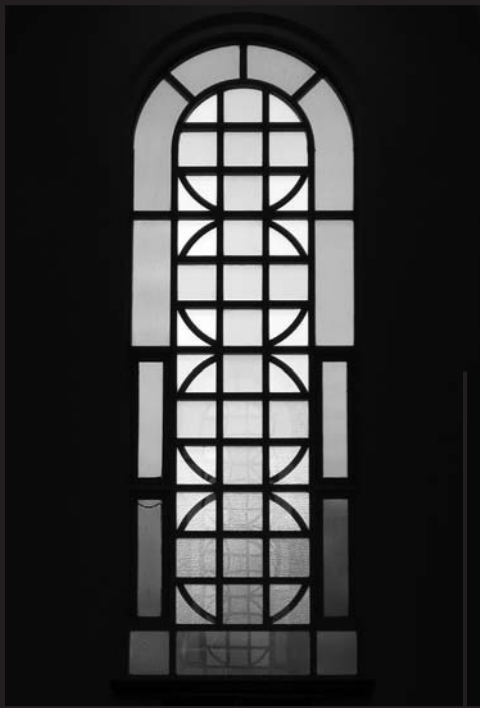


PATTERNS



HERE

THERE



AND

EVERYWHERE



# National Building Museum

Created by an act of Congress in 1980, the National Building Museum explores, celebrates, and illuminates achievements in architecture, design, engineering, construction, and planning. Since opening its doors in 1985, the Museum has become a vital forum for exchanging ideas and information about such topical issues as managing suburban growth, designing and building sustainable communities, and revitalizing urban centers. A private, non-profit institution, the Museum creates and presents engaging exhibitions and education programs, including innovative curricula for school children.

Over the past two decades, the Museum has created and refined an extensive array of youth programming. Each year, approximately 50,000 young people and their families participate in hands-on learning experiences at the Museum: several different, 2-hour-long school programs for grades K–9; major daylong festivals; drop-in family workshops; programs helping Cub and Girl Scouts earn activity badges; and three innovative outreach programs, lasting between 30 and 60 hours, for secondary school students. The Museum’s youth programming has won the Washington, D.C., Mayor’s Arts Award for Outstanding Contributions to Arts Education and garnered recognition from the National Endowment for the Arts.

The National Building Museum is located in a historic landmark structure at 401 F Street, NW, Washington, DC 20001. To learn more about the Museum, visit [www.nbm.org](http://www.nbm.org).

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# To the Educator

**T**he National Building Museum's *Patterns Here, There, and Everywhere* school program helps students in grades pre-K through two recognize patterns and discover their importance in the world around them. Whether a series of windows, columns, or different materials, patterns are an integral part of the built environment.

As an aid to teachers bringing students to the Museum for this program, the Museum has developed this Educator Resource Packet. It contains lessons for use in the classroom before and after a school group visits the Museum and provides other information useful to teachers.

## Why Patterns?

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Patterns are found everywhere and used every day. They help young people make sense of the world by organizing it into groupings that can be easily understood. Patterns can help students make connections and predict what will come next. Recognizing patterns will create a foundation for analyzing problems and designing solutions.

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## Why Use Design as an Education Model?

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The *Patterns Here, There, and Everywhere* school program and all other education programs at the National Building Museum inspire students to examine the people, processes, and materials that create buildings, places, and structures. All of the Museum's education programs for youth use the design process as an educational model. It requires young people to identify problems or needs, imagine solutions, test them before building a suitable design, and evaluate the product.

Learning by doing is central to design education in general and to the *Patterns Here, There, and Everywhere* program in particular. After engaging in a variety of hands-on activities that stimulate exploration of patterns and the built environment, students gain a fresh perspective on their surroundings and begin to understand how design decisions can have an impact on the environment.

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## What Are the Learning Benefits?

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The *Patterns Here, There, and Everywhere* program and supplementary lessons in this Educator Resource Packet meet national standards of learning in language arts, math, science, social studies, and visual arts. The specific standards are described on page 5.

The lessons in this curriculum encourage young people to explore and recognize how and where patterns are used. Through hands-on, interdisciplinary activities that address multiple learning styles, the *Patterns Here, There, and Everywhere* program encourages and fosters life skills such as critical thinking, problem-solving, and communication.

## **The Educator Resource Packet Includes**

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- list of national standards of learning addressed in the program;
- matrix of optional lessons to enhance students' learning experience;
- introductory lessons to more fully prepare students for the *Patterns Here, There, and Everywhere* program;
- reinforcement lessons for use after the Museum visit to help students continue their exploration of patterns found in buildings, nature, and materials; and
- architecture and patterns vocabulary and lists of supplementary resources.

## **NOTES:**

# Program Description

**P***atterns Here, There, and Everywhere* teaches young people that patterns exist all around them: including nature, language, and the built environment. Through pattern recognition, students organize random information into groupings that help them make sense of their everyday lives. During this program, students learn the importance of repetition, rhythm, and consistency in patterns that define the built environment. Working in teams, they identify shapes and patterns by examining the walls, floors, and ceiling of the National Building Museum. Students have fun creating their own patterns using their arms, legs, and faces and illustrating individual booklets with a variety of materials.

The *Patterns Here, There, and Everywhere* Educator Resource Packet includes lessons for classroom use before and after a group's visit to the Museum. These lessons use patterns to explore the places people frequent and the buildings with which students are familiar. Each lesson includes objectives, connections to specific national standards of learning, list of materials, teacher prep notes, lesson procedures, and vocabulary words.

## Goals, Objectives, and Skills Used in the Program

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### Goals

- Increase awareness of patterns in the world.
  - Understand how to identify patterns and predict how they continue.
  - Understand how to examine and interpret patterns found in the built environment.
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### Objectives

During and after completing the *Patterns Here, There, and Everywhere* program, students will be able to:

- identify shapes;
- recognize and describe patterns created by shapes, numbers, and objects;
- experiment and infer what happens when elements of patterns change;

- describe patterns found at the National Building Museum and other buildings and how they contribute to the building's appearance;
  - act out patterns identified in the Museum; and
  - apply knowledge of patterns to create new ones using a variety of materials.
- 

### Skills Used

- Analysis
- Application of knowledge
- Cooperative learning
- Experimentation
- Gross motor
- Prediction
- Problem solving

# National Standards of Learning

**P**atterns *Here, There, and Everywhere* meets local and national standards of learning in several disciplines. The national ones are listed by discipline in alphabetical order.

## Standards for the English Language Arts

National Council of Teachers of English and the International Reading Association

Students will	Standard
apply a wide range of strategies to comprehend, interpret, evaluate, and appreciate texts. They draw on their prior experience, their interactions with other readers and writers, their knowledge of word meaning and of other texts, their word identification strategies, and their understanding of textual features (e.g., sound-letter correspondence, sentence structure, context, graphics);	3
adjust their use of spoken, written, and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes; and	4
develop an understanding of and respect for diversity in language use, patterns, and dialects across cultures, ethnic groups, geographic regions, and social roles.	9

## Principles and Standards for School Mathematics

National Council of Teachers of Mathematics

Students will	Standard
sort, classify, and order objects by size, number, and other properties;	Algebra
recognize, describe, and extend patterns such as sequences of sounds and shapes or simple numeric patterns and translate from one representation to another; and	Algebra
analyze how both repeating and growing patterns are generated.	Algebra

**Curriculum Standards for Social Studies**

National Council for the Social Studies

Students will	Standard
describe how people create places that reflect ideas, personality, culture, and wants and needs as they design homes, playgrounds, classrooms, and the like;	3
work independently and cooperatively to accomplish goals.	4

**National Standards for Arts Education, Visual Arts Category**

Consortium of National Arts Education Associations

Students will	Standard
understand and apply media, techniques, and processes;	1
choose and evaluate a range of subject matter, symbols, and ideas.	3

# Lessons Matrix

Use the following Lessons Matrix to prepare students for their visit to the National Building Museum and to build upon what they have learned during the *Patterns* program.

## Building a Foundation Lessons

*Optional lessons to introduce the basic concepts of patterns*

Lesson	Purpose	Standards of Learning	Duration	Materials Needed
Shhhh Shapes, Pssst Patterns pp. 18–24	Introduce students to basic patterns definitions and identify shapes and patterns and their use in different buildings	<b>Mathematics</b> Algebra <b>Social Studies</b> 3, 4 <b>Visual Arts</b> 1, 3	2 class periods, 45–60 minutes each	<ul style="list-style-type: none"> <li>■ Copies of worksheets, pp. 21–24</li> <li>■ Crayons or markers</li> <li>■ Optional: photographs of the White House and Fredrick Douglass house</li> </ul>
Classic Tales and Patterns pp. 25–27	Identify pattern sequencing found in stories	<b>Language Arts</b> 3, 4 <b>Mathematics</b> Algebra <b>Social Studies</b> 3, 4, 9	1–2 class periods, 45–60 minutes each, depending upon the number of stories read	<ul style="list-style-type: none"> <li>■ <i>The Three Little Pigs</i></li> <li>■ <i>Goldilocks and the Three Bears</i></li> <li>■ <i>Three Billy Goats Gruff</i></li> <li>■ <i>A House is a House for Me</i> by Mary Ann Hoberman</li> </ul>

## Reinforcement Lessons

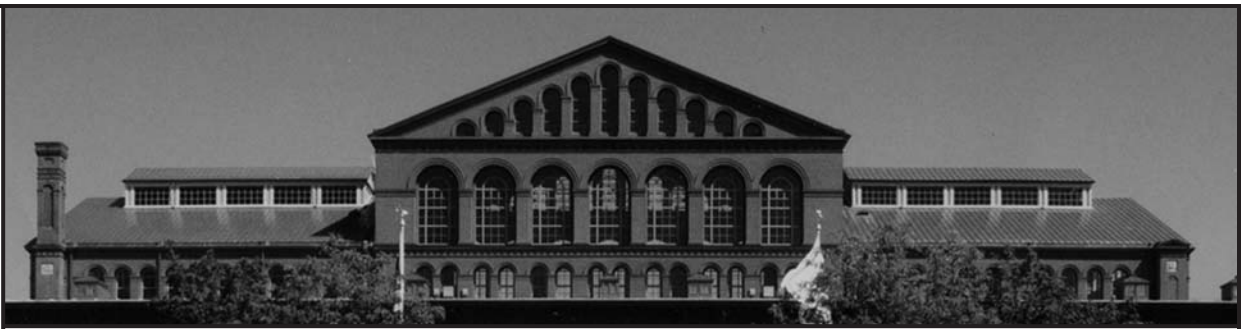
*Optional lessons and suggested activities to expand the Museum experience*

Designing Stamps, Decorating Streets pp. 30–33	Design individual stamps to use to create a class streetscape	<b>Mathematics</b> Algebra <b>Social Studies</b> 3, 4 <b>Visual Arts</b> 1, 3	2 class periods, 45–60 minutes each	<ul style="list-style-type: none"> <li>■ Copies of worksheet, p. 33</li> <li>■ Sheets of Styrofoam that are 1" or 2" thick should be cut into 4 x 4" blocks</li> <li>■ Paper (8.5 x 11")</li> <li>■ Tubes of acrylic paint</li> <li>■ Ink or painting rollers (3" wide roller brush)</li> <li>■ Butcher block paper</li> <li>■ Pencils</li> <li>■ Crayons</li> <li>■ Paper plates</li> <li>■ Tape</li> </ul>
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## Reinforcement Lessons (continued)

*Optional lessons and suggested activities to expand the Museum experience*

Lesson	Purpose	Standards of Learning	Duration	Materials Needed
<p>Glorious Glass pp. 34–36</p>	<p>Introduce use of stained glass in architecture and create individual “stained glass windows” using patterns</p>	<p><b>Language Arts</b> 4</p> <p><b>Mathematics</b> Algebra</p> <p><b>Social Studies</b> 4</p> <p><b>Visual Arts</b> 1, 3</p>	<p>1 class period, 45–60 minutes</p>	<ul style="list-style-type: none"> <li>▪ Pencils</li> <li>▪ Paper (8.5 x 11”)</li> <li>▪ Clear contact paper (available at most hardware stores)</li> <li>▪ Scissors</li> <li>▪ Colored paper, tissue paper or colored cellophane</li> <li>▪ Colored tape (optional)</li> <li>▪ Images of stained glass windows</li> </ul>
<p>Mosaic Madness pp. 37–40</p>	<p>Introduce use of mosaics in architecture and create individual mosaics using patterns</p>	<p><b>Mathematics</b> Algebra</p> <p><b>Social Studies</b> 4</p> <p><b>Visual Arts</b> 1</p>	<p>1 class period, 45–60 minute</p>	<ul style="list-style-type: none"> <li>▪ Mosaic tiles</li> <li>▪ Glue sticks</li> <li>▪ Copies of worksheets, pp. 39–40</li> </ul>
<p>Patterns Here, There, and Everywhere: Take a Closer Look p. 41</p>	<p>Examine patterns more closely, using several suggested lesson ideas</p>	<p><b>Mathematics</b> Algebra</p> <p><b>Social Studies</b> 3, 4</p> <p><b>Visual Arts</b> 1, 3</p>	<p>Teacher’s Choice</p>	<p>Teacher determines</p>
<p>Fun Field Trips: Exploring Your Community p. 42</p>	<p>Use the community as a source for pattern exploration and encourage students and their families to explore patterns together</p>	<p><b>Mathematics</b> Algebra</p> <p><b>Social Studies</b> 3, 4</p> <p><b>Visual Arts</b> 1, 3</p>	<p>Teacher/Family’s Choice</p>	<p>Teacher/Family determine</p>



# I. Museum Orientation

The information found in this section provides all of the logistical details for the field trip to the National Building Museum. Information in this section comprises the following:

## **Getting Ready**

Before Visiting the Museum

Directions

Map

Nametag Template

## **While You're Here**

Upon Arrival

Touring the Building and Exhibitions

Lunches

Visiting the Museum Shop

## **The National Building Museum**

Facts About the Historic Home of  
the National Building Museum

# Getting Ready

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## Before Visiting the Museum

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1. Share this Educator Resource Packet with each participating teacher.
2. Select chaperones. One adult must accompany every five students. Please instruct chaperones that they are expected to actively assist students.
3. Arrange transportation and obtain permission slips.
4. Contact the Museum's assistant youth groups coordinator at 202.272.2448, x3450, if the number of students changes by five or more.
5. Review the map and directions to the National Building Museum and bring a copy with you.
6. If you would like to tour the building or an exhibition, allow for extra time after your 1.5-hour program.

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## Prepare Your Students

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1. Divide students into three even, compatible groups.
2. Make nametags— use template on p.13 to make it a fun activity.
3. Use the lessons in this packet to introduce pattern concepts to your students before attending the museum program.

## **Directions to the National Building Museum**

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The Museum is located between 4th & 5th and F & G Streets, NW. It is accessible by Metro and located immediately adjacent to the Judiciary Square Metro station (Red Line). Two-hour metered parking is available on all sides of the building. Buses may park in the G Street driveway, but drivers must remain with them. Please distribute this sheet to the drivers and remind them that the National Building Museum is NOT on the National Mall.

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### **From Northern Virginia on I-395**

Follow I-395 north into the District.

Take either 14th Street or 12th Street exit northbound.

Follow either 14th or 12th Street north to Constitution Avenue.

Turn right on Constitution Avenue.

Follow Constitution Avenue east to 6th Street, NW.

Turn left on 6th Street, NW.

After several blocks, turn right on F Street, NW.

Follow F Street east to 5th Street, NW.

Turn left on 5th Street, NW.

Turn right on G Street, NW.

Pull into the G Street driveway.

### **From Northern Virginia on I-66**

Follow I-66 east into the District, crossing the Roosevelt Bridge.

I-66 becomes Constitution Avenue.

Follow directions above from Constitution Avenue.

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### **From Maryland southbound on I-95 / Baltimore-Washington Parkway (I-295)**

Follow I-95 to Baltimore-Washington Parkway southbound.

Take Baltimore-Washington Parkway to Rt. 50 westbound into Washington, D.C.

Route 50 becomes New York Avenue.

Follow New York Avenue several miles, eventually passing the I-395 southbound exit to your left.

Shortly after the I-395 southbound exit, turn left on 5th Street, NW.

Take 5th Street to G Street and turn left.

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### **From Maryland southbound on I-270**

Take I-270 to I-495 (Beltway) eastbound.

Take exit Route 355, Wisconsin Avenue southbound.

Follow Wisconsin Avenue into the District.

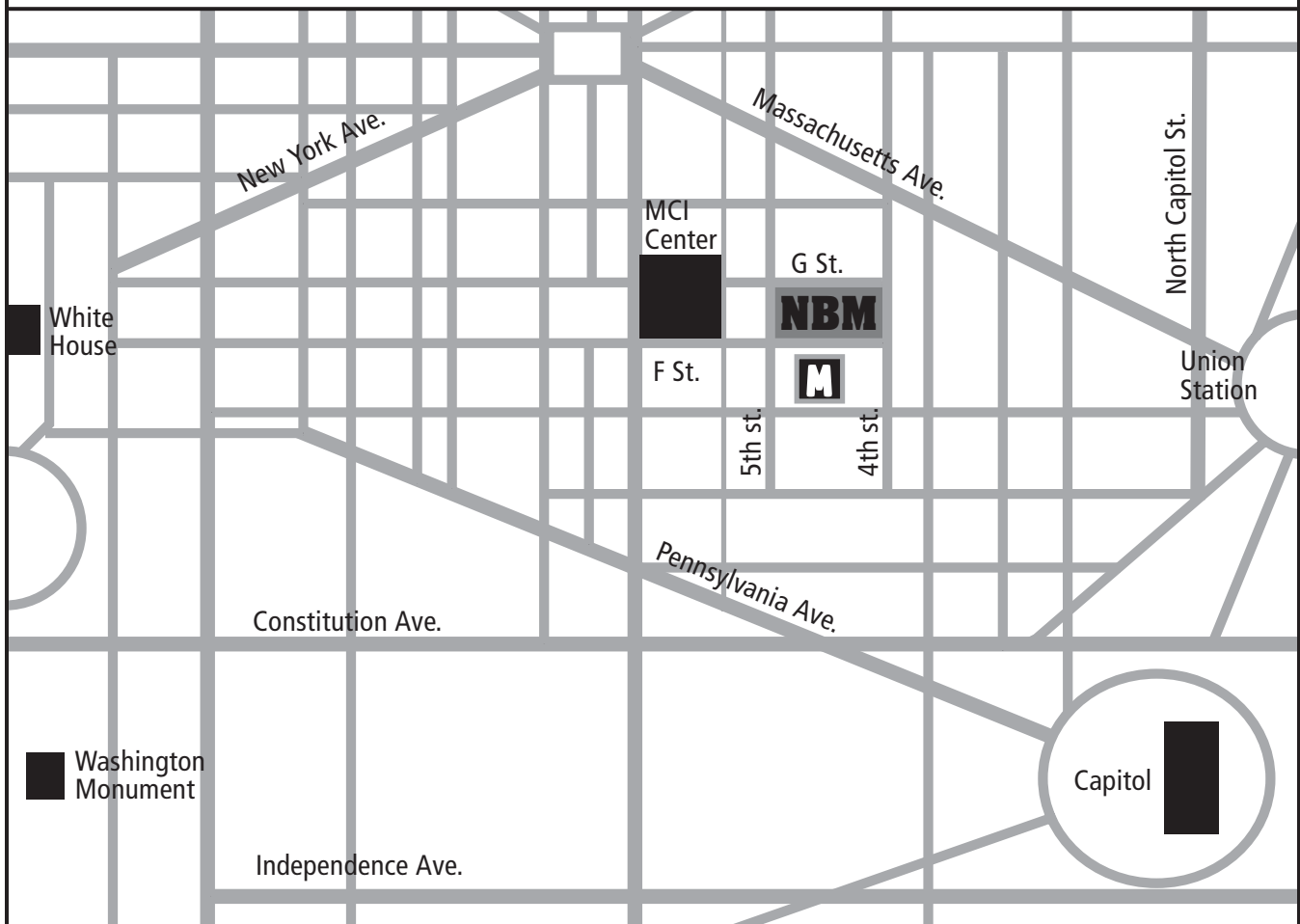
Turn left onto Massachusetts Avenue.

Take Massachusetts Avenue towards the Capitol, going through Dupont Circle.

Turn right onto 5th Street, NW.

Take 5th Street to G Street, and turn left.

# Map to the National Building Museum



**NBM**

## National Building Museum

401 F Street NW Washington, DC 20001

Between 4th and 5th and F and G Streets at the Red Line Metro; Judiciary Square.  
Wheelchair access at 4th and G Street entrances.

Telephone: 202.272.2448

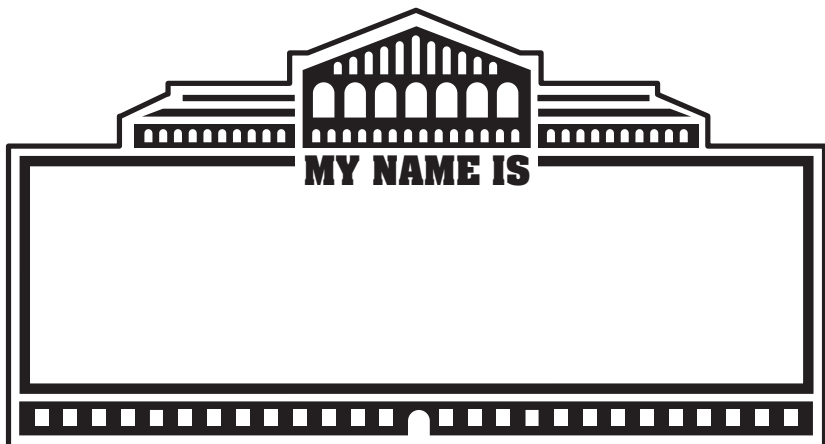
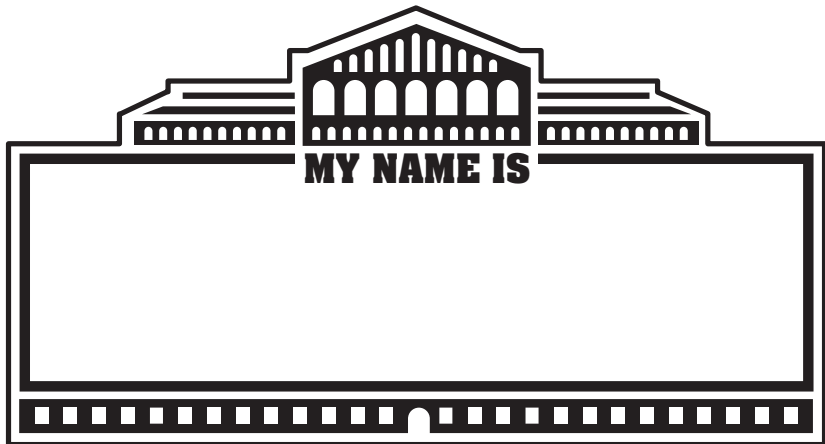
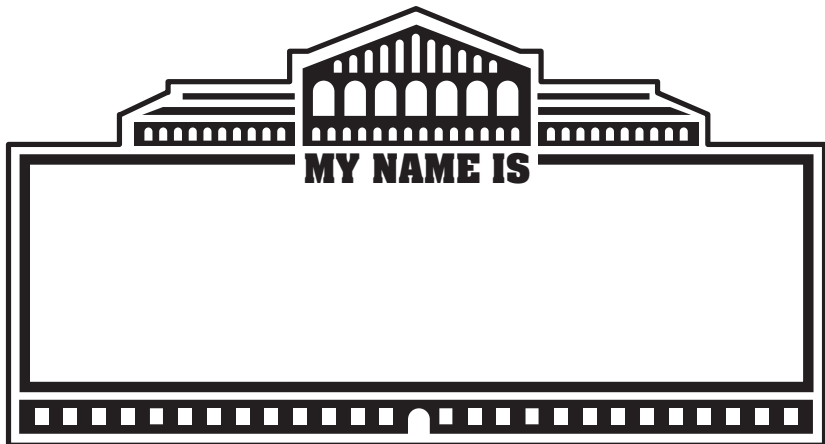
Facsimile: 202.376.3564

Web site: [www.NBM.org](http://www.NBM.org)

# Nametag Template

**Make a nametag before visiting the National Building Museum.**

1. Write first name clearly.
2. Cut out nametag.
3. Color nametag.
4. Attach nametag to shirt with tape or a safety pin.



# While You're Here

## Upon Arrival

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- A museum teacher will greet you inside the entrance to the Museum.
  - Please have a total count of students and adults ready for the guard at the entrance.
  - Security measures require the checking of adults' bags.
- 

## Touring the Building and Exhibitions

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Complimentary self-guided booklets on patterns are available to guide you through the Museum's grand, historic building. Call the assistant youth groups coordinator at 202.272.2448, x3450, to order advance copies; one booklet is available per student. Exhibition tours are self-guided. Please allow additional time for these activities, as the *Patterns Here, There and Everywhere* program does not include building or exhibition tours.

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## Lunches at the National Building Museum

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Please note that there are no formal lunch facilities at the National Building Museum. Students may picnic on the west lawn outside of the Museum, or eat in the Museum's Great Hall when space is available. However, please note that the Great Hall is frequently used for large events. When it is in use, students can eat outdoors or on their return trip to school.

During the museum visit, and especially during lunch, please ask your students and chaperones to observe the following guidelines:

- Dispose of trash properly. Please bring a garbage bag with you for this purpose.
  - Stay with the group at all times. Forming a circle to the side of one of the large columns encourages the group to stick together.
  - Keep away from the fountain, café tables (reserved for café patrons), and the information desk. TIP: Asking the students to stay on the carpet will help prevent them from falling into the fountain.
  - Walk. Although children are often tempted to run and jump in the Great Hall, these actions are unsafe and not recommended. Climbing on the columns is not permitted.
  - Talk and laugh, but please be considerate of other museum visitors who may be enjoying a tour or exhibition.
  - Restrooms are located at the southeast and southwest corners of the Great Hall.
- 

## Visiting the Museum Shop

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The National Building Museum shop offers a variety of items for children that range in price from 30 cents to \$5.00 and up, including postcards, pencils, erasers, and puzzles. When visiting the Museum Shop, please keep these things in mind:

- Alert a shop staff member that a group of children will be visiting the shop.
- All children should be reminded to behave appropriately when visiting the shop.
- Students may visit the shop in groups of ten at a time. At least one adult must accompany and supervise each group of students.
- Arrangements can be made to purchase pre-packaged goody bags in amounts of \$1.00 and up. Please call 202.272.7706 for more information.

**NOTES:**

# Facts About the National Building Museum

## Who designed the National Building Museum?

Montgomery C. Meigs (1816 – 1892), Quartermaster General in charge of provisions during the Civil War. He was a West Point-trained engineer. Meigs' design was inspired by Italian Renaissance architecture.

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## When was it built, and how much did it cost?

1882 – 1887 and \$886,614.04

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## What was the building used for before it was a museum?

Until 1926, it was occupied by the Pension Bureau, which provided pensions to veterans disabled during wartime. The building was later occupied by several other government agencies.

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## How big is it?

On the exterior, 400 feet by 200 feet, 75 feet to cornice level

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## What is it made out of?

15,500,000 bricks with brick and terra cotta ornaments

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## How long is the frieze on the building's exterior, and who designed it?

1,200 feet long, 3 feet high, made of terra cotta

Designed by Bohemian-born sculptor Caspar Buberl (1834 – 1899)

Features a continuous parade of Union Civil War units

## What are some interesting facts about the Great Hall inside the museum?

316 feet by 116 feet (a little larger than a football field)

159 feet — approximately 15 stories — at its highest point (The Statue of Liberty, without her base, could stand up straight if she were placed on top of the fountain.)

The Presidential seal has been in place since 1901, the only Presidential seal permanently affixed to a building other than the White House.

Presidential inaugural balls, from Grover Cleveland's in 1885 to the present, have been held in the Great Hall.

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## What are the Corinthian columns made from, and how tall are they?

Among the tallest interior columns in the world — 75 feet high, 8 feet in diameter, 25 feet in circumference

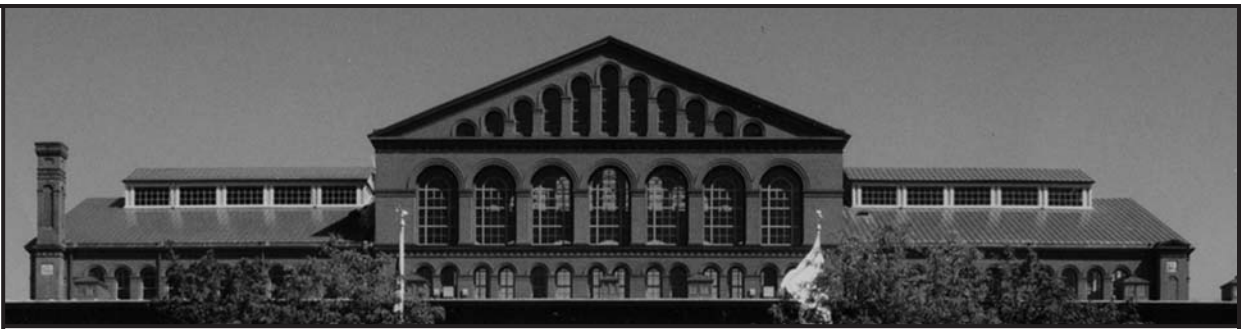
Each one is built out of 70,000 bricks and covered by plaster.

Originally painted in 1895 to resemble marble. The present faux marble pattern was applied in 2000.

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## How many columns are part of the arcade, and what are they made of?

On the first floor, there are 72 Doric-style columns (terra cotta covered with plaster); and on the second floor, 72 Ionic-style columns (cast iron).



## 2. Building a Foundation Lessons

Before visiting the Museum, these lessons may be used to introduce students to the basic concepts of patterns. These lessons are optional; they provide a deeper foundation to the basic patterns principals learned in the program.

### **Building a Foundation Lessons:**

Shhhh Shapes, Pssst Patterns

Classic Tales and Patterns



# Shhhh Shapes, Psssst Patterns

Learning to recognize how color, pattern, texture, and size create the overall appearance of buildings is important to understanding why places look the way they do. By locating visual clues and making sense of them, students will begin to appreciate architecture and decisions made by architects, urban planners, and engineers. This lesson, which introduces students to basic shapes in architecture, will prepare them for subsequent, deeper exploration of buildings and patterns.

## OBJECTIVES

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Students will:

- identify shapes;
- recognize and describe patterns created by shapes, numbers, and objects; and
- describe patterns found in buildings and how they contribute to the building's appearance.

## NATIONAL STANDARDS OF LEARNING

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**Mathematics** . . . . . Algebra

**Social Studies** . . . . . 3, 4

**Visual Arts** . . . . . 1, 3

## DURATION

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2 class periods,  
45–60 minutes each

## MATERIALS

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- Copies of 2 worksheets for each student, pp. 21–24
- Crayons or markers
- Optional: photographs of the White House and Fredrick Douglass house

## **LESSON PROCEDURE**

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1. Discuss shapes and patterns.
2. Introduce shapes and patterns found in buildings.
3. Find and record patterns in the school building.
4. Discuss the influence of patterns on the “feel” of a building.

## **TEACHER PREP**

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- Photocopy worksheets, pp. 21–24
- Optional: research pictures of the White House and Fredrick Douglass house

## **PATTERN VOCABULARY**

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Alternating Pattern, Arch, Architecture, Ascending Pattern, Built Environment, Column, Descending Pattern, Pattern, Progressive Pattern, Repeating Pattern, Shape

## **LESSON PLAN**

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### **1. Discuss Shapes and Patterns. (15 minutes)**

- Introduce a variety of shapes to students.
- Explain that one circle is a shape, but two circles together form a pattern.
- Define a pattern as something that repeats.
- Give examples of alternating, ascending, descending, progressive, and repeating patterns using shapes, colors, numbers, letters, nature, and buildings.

### **2. Introduce Shapes and Patterns Found in Buildings. (25 minutes)**

- Explain that all buildings contain shapes.
- Many building shapes take architectural form as windows (squares), columns (lines), doors (rectangles), and towers (triangles) and often create patterns.
- The students’ school, town, and Washington, D.C., where the National Building Museum is located, have endless examples of architectural shapes and patterns. Ask for examples.
- Give students the Patterns in Buildings Student Worksheet, pp. 21–22. They will find patterns in two Washington, D.C. buildings.
- Optional: show pictures of the White House and Fredrick Douglass house as other visual aids.

### **3. Find and Record Patterns in the School Building. (30 minutes)**

- Explain to students that they will now explore their school to find patterns. As a class, spend 10-15 minutes examining the outside of the school. The Patterns at School Student Worksheet, pp. 23–24, is designed to help students identify shapes and patterns in buildings by examining their overall form and the sum of their parts.
- This will prepare them for their field trip where they will explore the Museum’s architectural patterns firsthand.

### **4. Discuss the Influence of Patterns on the “Feel” of a Building. (15 minutes)**

- After students have completed their worksheets, review their patterns.
- Ask them if they think the shapes and patterns of each building make it appear quiet or loud, bright or dull, simple or complex.
- Explain to them that the sequence or rhythm of certain shapes and patterns often contributes to the overall “feel” of a place.

#### **Taking it Further**

- Have each student create a sketch of the building in which he/she lives (house, apartment, etc.). Note shapes and patterns.
- Have the class or individual students use magazines, catalogs, and newspapers to create a collage of houses using patterns as the guiding element.

#### **NOTES:**

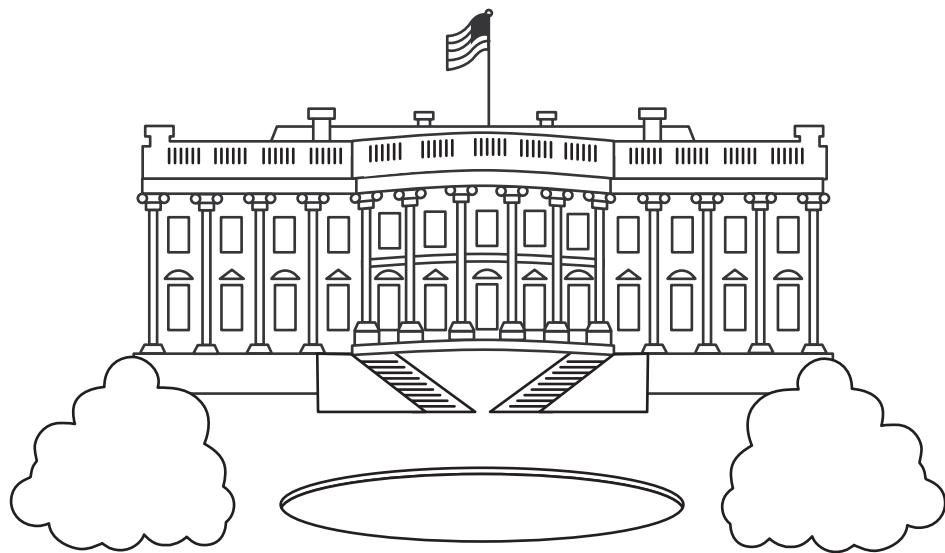
# Patterns in Buildings Student Worksheet

**NAME:**

**Each building on this worksheet is made up of shapes and patterns.**

1. Find patterns in the building and draw them on the lines below.
2. Look for circles, half circles, squares, triangles, and lines.

**The White House  
Washington, D.C.**



Pattern Example



**Can you find two more?**

Pattern #1

Pattern #2

The Fredrick Douglass House  
Washington, D.C.



Pattern Example



**Can you find two more?**

Pattern #1

Pattern #2

# Patterns at School Student Worksheet

**NAME:**

**Your school is an important building that contains shapes and patterns.**

1. Examine the outside of your school and draw a picture of it including patterns. Color your school and the patterns.
2. Draw two patterns found on the outside of your school on the next page.
3. Write one thing about the way it looks.

## **1. Your School**

**2. Pattern #1**

---

**Pattern #2**

**3. My school looks** \_\_\_\_\_

**because** \_\_\_\_\_

# Classic Tales and Patterns

This lesson uses patterns to build language skills and as a means to provide ordered repetition which allows students to anticipate information and identify key features within stories. Many traditional folktales provide patterns of three, thereby teaching students counting, number sequencing, and repetition. Stories such as *Three Billy Goats Gruff* and *Goldilocks and the Three Bears* provide sequences of three, as well as patterns in ascending and descending order. The books recommended for this lesson feature houses, building materials, and bridges—all of which make up the built environment. They also refer to places that students either use or see in their community.

## OBJECTIVES

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Students will:

- recognize and describe patterns created by shapes, numbers, and objects;
- practice language arts skills through story telling; and
- identify patterns found in the stories they read.

## NATIONAL STANDARDS OF LEARNING

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**Language** . . . . . 3, 4

**Mathematics** . . . . Algebra

**Social Studies** . . . . 3, 4, 9

## DURATION

---

1–2 class periods,  
45–60 minutes each,  
depending on the number  
of stories read

## MATERIALS

---

### ■ *The Three Little Pigs*

Three pigs build their own houses to protect themselves from a wolf. Present are patterns of three and word repetition.

### ■ *Goldilocks and the Three Bears*

Three bears find a girl who has used their things and eaten their food. Present are patterns of three, word repetition, and descending patterns.

## **MATERIALS (CONTINUED)**

---

### ■ *Three Billy Goats Gruff*

Three goats cross a bridge by tricking a troll who lives underneath it. Present are patterns of three, word repetition, and ascending patterns.

### ■ *A House is a House for Me* by Mary Ann Hoberman

A boy and other animals are matched with their homes using lively illustrations and rhyme. Present are patterns through word repetition.

## **LESSON PROCEDURE**

---

1. Discuss and review patterns.
2. Read stories.
3. Discuss patterns found in stories.

## **TEACHER PREP**

---

- Obtain 1–4 of the recommended books, either from a bookstore or local library

## **PATTERN VOCABULARY**

---

Alternating Pattern, Ascending Pattern, Built Environment, Descending Pattern, Pattern, Progressive Pattern, Repeating Pattern

## **LESSON PLAN**

---

### **1. Discuss and Review Pattern Definitions. (10–15 minutes)**

- Explain that patterns are present in many of the stories they read.

### **2. Read Stories. (15–20 minutes)**

- Assemble students in a circle and read one story at a time.

### **3. Discuss Patterns Found in Stories. (15–20 minutes)**

- After each story, discuss patterns found in the stories and ask students a variety of questions about what they read.
- Record their responses on a black board. This will allow students to refer to their answers and begin recognizing patterns in the story.

■ Suggested Questions

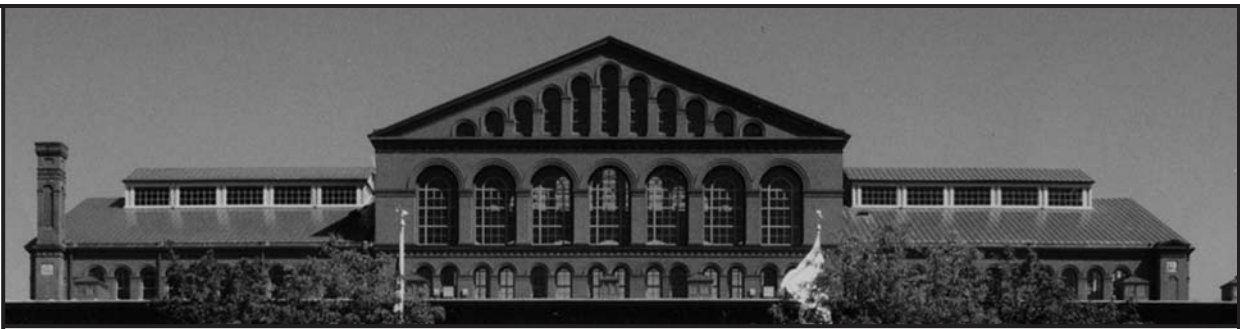
- Who are the main characters, and how many are there?
- Do the same characters speak throughout the story, and if so, how many times?
- Do the same characters speak throughout the story, and if so, in what order?
- How are the characters similar?
- How are they different?

**Optional Lessons**

- Repeat the story and have the students act it out.
- Have the class write and perform a play incorporating architecture and patterns of three, word repetition, and ascending or descending patterns.
- Have students write stories about their families and houses using patterns.

**NOTES:**

**NOTES:**



## 3. Reinforcement Lessons

After visiting the National Building Museum, use these optional Reinforcement Lessons to strengthen the students' understanding of patterns. Students further explore patterns found in buildings, nature, and materials.

### **Reinforcement Lessons:**

Designing Stamps, Decorating Streets

Glorious Glass

Mosaic Madness

Patterns Here, There, and Everywhere:

Take a Closer Look

Fun Field Trips: Exploring Your Community

# Designing Stamps, Decorating Streets

Since students have created patterns using architectural stamps during their field trip to the National Building Museum, have them now create their own stamps that reflect the buildings in their community.

## OBJECTIVES

---

Students will:

- identify different buildings found in cities and design building stamps to use to create a streetscape;
- recognize and describe patterns created by shapes, numbers, and objects; and
- experiment and infer what happens when elements of patterns change.

## NATIONAL STANDARDS OF LEARNING

---

**Mathematics** . . . . . Algebra

**Social Studies** . . . . . 3, 4

**Visual Arts** . . . . . 1, 3

## DURATION

---

Two class periods,  
45–60 minutes each

## MATERIALS

---

- Optional: Streetscape Scavenger Hunt Student Worksheet, p. 33
- Sheets of Styrofoam that are 1" or 2" thick, should be cut into 4 x 4" blocks
- Paper (8.5 x 11")
- Tubes of acrylic paint, 2-4 different colors
- Ink or painting rollers (3" wide roller brush)
- Butcher block paper
- Pencils
- Crayons
- Paper plates
- Tape

## **LESSON PROCEDURE**

---

1. Discuss different types of buildings.
2. Design stamps.
3. Create a streetscape.
4. Identify patterns in students' work.

## **TEACHER PREP**

---

- Collect Styrofoam, paper, acrylic paint, 3" wide roller brushes, butcher block paper, paper plates, pencils, crayons, and tape
- Cut 1" or 2" thick Styrofoam into 4 x 4" blocks
- Optional: Photocopy worksheet, p. 33, for each student
- Prep printing station by putting a squirt of each color of paint on different paper plates and place 1–2 ink or painting rollers with each paper plate

## **PATTERN VOCABULARY**

---

Alternating Pattern, Architecture, Ascending Pattern, Built Environment, Descending Pattern, Pattern, Progressive Pattern, Repeating Pattern

## **LESSON PLAN**

---

### **1. Discuss Different Types of Buildings. (5 minutes)**

- Ask students to recall important buildings such as houses, stores, schools, libraries, bridges, landmarks, and parks in their community (or the community around their school) and record their comments.
- Optional: Have students complete the Streetscape Scavenger Hunt worksheet, p. 33, for inspiration.

### **2. Design Stamps. (30–40 minutes)**

- Assign each student to a building, bridge, landmark, or park.
- Using a sheet of paper and a pencil, ask each student to draw his or her structure and recall color, shapes, and patterns.
- Once their sketches are complete, give each student a 4 x 4" block of Styrofoam and ask each to copy his or her drawing onto the Styrofoam. Students can etch their designs in the Styrofoam using the point of a pencil.

### **3. Create a Streetscape. (15–20 minutes)**

- Roll out a long sheet of butcher block paper.
- Using the ink or painting rollers, have students cover their architectural stamp with paint.
- Ask them to place their building stamp on the butcher block paper to create a street or several streets.
- Once the paint is dry, have students draw trees, fences, and street signs.

### **4. Identify Patterns in Students' Work. (30–40 minutes)**

- Ask students to analyze their work and identify the patterns they see. Ask them to locate patterns using colors, shapes, building types, and numbers. Record their patterns at the top of the butcher block paper. Ask students if they can differentiate between patterns. Can they identify alternating, progressive, and repeating patterns?
- Following the same process outlined above and using the stamps that the students have made, create a new street that has their buildings, bridges, landmarks, and parks grouped by alternating and repeating patterns.
- Have the students compare and contrast the streets.
- Possible questions:
  - Ask them which aspects of the streets are similar?
  - Which aspects are different?
  - Which streets do they like better and why?
  - Does the use of patterns, or lack thereof, affect their decision?

#### **Taking It Further**

- Display students' art around the classroom.
- Create group or individual streets using buildings from magazines and newspapers.

#### **NOTES:**

# Streetscape Scavenger Hunt Student Worksheet

**NAME:**

**At the National Building Museum** you found patterns throughout the building. Groups of buildings and streets can also form patterns. Identify and recreate patterns from the neighborhoods below.

## **Uptown**

An Urban Neighborhood



Pattern#1

Pattern#2

## **Shadybrook**

A Suburban Neighborhood

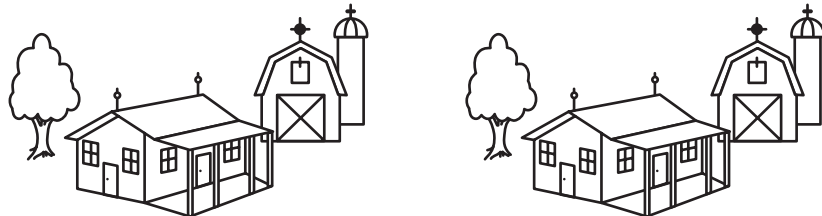


Pattern#1

Pattern#2

## **East Meadow**

A Rural Neighborhood



Pattern#1

Pattern#2

# Glorious Glass

The history of stained glass is rooted in architecture and dates back hundreds of years. Artists drew inspiration from religion, nature, and geometric forms. Frank Lloyd Wright, a famous American architect (1867–1959), often created windows in people’s homes using shapes and patterns. Wright believed that “...glass, more than any other architectural material, offered the most expressive and cost effective means to introduce pattern into a space and create special effects of light.” Today artists employ many of the same techniques used in the past to create stained glass windows for buildings. Shapes, color, and patterns are used to influence a building’s appearance.

## OBJECTIVES

---

Students will:

- recognize and describe shapes and patterns used in stained glass windows and explain how artists use shapes, colors, patterns, and light to create a mood within windows;
- apply knowledge of patterns to create a stained glass window using paper and cellophane; and
- describe and evaluate patterns found in student-designed glass windows.

## NATIONAL STANDARDS OF LEARNING

---

- Language Arts . . . . . 4
- Mathematics . . . . . Algebra
- Social Studies . . . . . 4
- Visual Arts . . . . . 1, 3

## DURATION

---

One class period,  
45–60 minutes

## MATERIALS

---

- Pencils
- Paper (8.5 x 11")
- Clear contact paper (available at most hardware stores) cut 4 x 8"
- Scissors
- Colored paper, tissue paper, or colored cellophane
- Colored tape (optional)
- Images of stained glass windows

## **LESSON PROCEDURE**

---

1. Introduce stained glass and its role in architecture.
2. Design stained glass.
3. Exhibit and discuss students' work.

## **TEACHER PREP**

---

- Collect contact paper, cellophane, colored tape (optional), colored paper, or tissue paper
- Cut contact paper to 4 x 8" pieces
- Collect images of stained glass from books, magazines, etc.

## **PATTERN VOCABULARY**

---

Architecture, Built Environment, Pattern, Shape

## **LESSON PLAN**

---

### **1. Introduce Stained Glass and Its Role in Architecture. (10 minutes)**

- Show students some pictures of stained glass windows in houses, places of worship, and civic buildings.
- Ask them to identify shapes and patterns within the windows as seen in the pictures.
- Explain how artists use shapes, colors, patterns, and light to create a mood within windows of great beauty.

### **2. Design Stained Glass. (30–40 minutes)**

- Ask students to draw a stained glass window using a pencil and sheet of 8.5 x 11" paper. Their windows must contain shapes that form a pattern or a series of patterns.
- Have each student trace his or her design on colored paper or cellophane. Have each student cut out his or her design.
- Give each student a 4 x 8" piece of contact paper and have each fold it in half.
- Encourage students to lay out their design before peeling off the nonadhesive backing of the contact paper. Have them place their pattern on one half of the contact paper before folding the other half onto it—like a sandwich. Students may need help since the contact paper can be difficult for them to use by themselves.
- Frame the windows with colored tape.

### 3. Exhibit and Discuss Students' Work. (10–15 minutes)

- Exhibit students' "stained glass" on the windows of classroom.
- Have students compare and contrast the windows. Ask them a series of questions.
- Possible questions:
  - Which windows use colors as their primary patterns?
  - What colors are they?
  - Which windows use shapes as their primary patterns?
  - What shapes are they?
  - Do the windows change the classroom's look and feel? If so, how?

#### **NOTES:**

# Mosaic Madness

**M**any buildings are decorated with mosaics. They are patterns formed by inlaying small pieces of stone, tile, glass, or enamel into cement, mortar, or plaster. Mosaics can tell stories or form designs. This lesson gives students the opportunity to create patterned mosaics.

## OBJECTIVES

---

Students will:

- recognize and describe shapes and patterns used in mosaics;
- apply knowledge of patterns to create a mosaic using paper tiles; and
- describe and evaluate patterns found in student-designed glass windows.

## NATIONAL STANDARDS OF LEARNING

---

**Mathematics** . . . . Algebra

**Social Studies** . . . . . 4

**Visual Arts** . . . . . 1

## DURATION

---

One class period,  
45–60 minutes

## MATERIALS

---

- Mosaic tiles
- Glue sticks
- Copies of worksheets, pp. 39 and 40

## LESSON PROCEDURE

---

1. Introduce mosaics and their role in architecture.
2. Design mosaics.
3. Exhibit and discuss students' work.

## TEACHER PREP

---

- Make mosaic tiles by cutting colored construction paper or magazines into 1/2 x 1/2" squares or order them from [www.roylco.com](http://www.roylco.com)
- Photocopy students worksheets, pp. 39 and 40, for each student
- Collect examples of mosaics, either images from books or a real mosaic

## **PATTERN VOCABULARY**

---

Architecture, Mosaic, Pattern, Shape, Tile

## **LESSON PLAN**

---

### **1. Introduce Mosaics and Their Role in Architecture. (5–10 minutes)**

- Show students books with examples of mosaics in buildings. If possible, show them an example of a real mosaic.

### **2. Design Mosaics. (25–30 minutes)**

- Using the worksheets, p.39 and p.40, have students create their own mosaic patterns by cutting paper mosaic tiles to fit the worksheet shapes. As students cut and design mosaics, have them glue the mosaic tiles to the worksheets.

### **3. Exhibit and Discuss Students' Work. (10–15 minutes)**

- Display students' work throughout the classroom. With the class, compare and contrast the mosaics. Examine the use of color, design, and pattern.

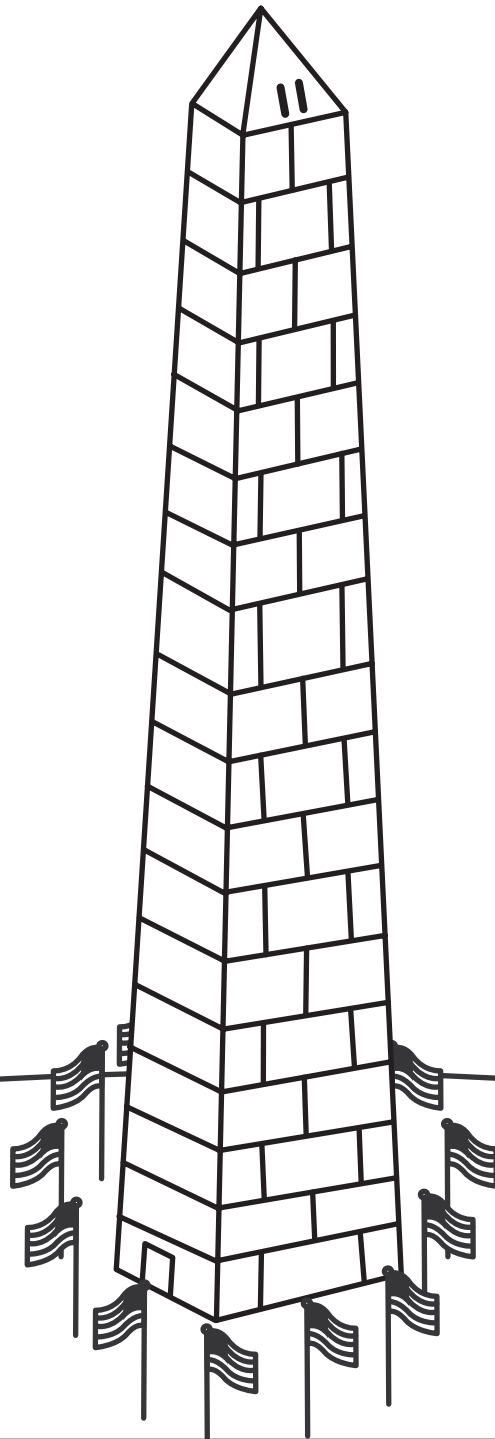
### **Taking It Further**

- Find a mosaic artist to discuss and demonstrate his/her work.
- As a class trip or with their families, have students visit buildings their community that have mosaics. Ask them to identify the patterns.

## **NOTES:**

# Washington Monument Mosaic Student Worksheet

NAME:



# Streetscape Mosaic Student Worksheet

NAME:



# Patterns Here, There, and Everywhere: Take a Closer Look

## A Material World

---

Collect building materials such as bricks, wood, marble, and stone. Have your students classify them into groups by their size, shape, type, color, or texture. Have each student create a variety of patterns (and rubbings) by separating and mixing the materials. Compare and contrast their work. Have each student display his or her patterns while the class describes them.

---

## Abstract Architecture

---

Have your students create patterns using vegetables. Slice vegetables (potato, radish, carrot, celery, green pepper) in half for them to use as stamps. Have students dip their vegetable pieces in tempera paint (not too much) and stamp patterns onto butcher block paper. Encourage them to experiment using one vegetable and two or more colors to make a pattern and then use two or more vegetables and one color to make a different pattern.

Using markers, have your students transform their vegetable forms into buildings by adding roofs, windows, doors, towers, columns, and other architectural elements. Be sure their buildings form patterns.

---

## Exploring Patterns in Nature

---

During a walk outside, identify and examine patterns in nature. For example, bark not only helps protect a tree, but its patterns can tell you what type of tree it is. Have students collect materials to create their own pattern-inspired art. Some suggestions are leaves, sticks, nuts, pine needles,

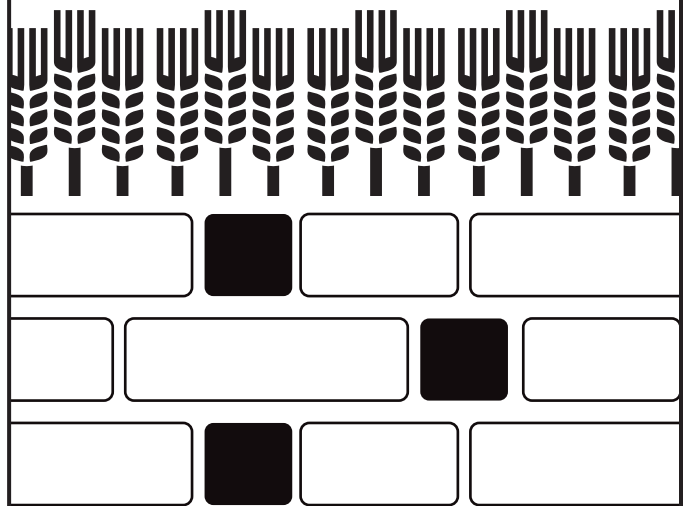
grass, flowers, and pebbles. Encourage them to work in pairs and take turns creating and extending patterns. One student can create a pattern, and his/her partner can identify and extend it. Challenge your students to create a pattern and then repeat it using different objects.

---

## Daring Designers

---

Organize a Pattern Day when all students wear patterns to school. Fabrics are full of patterns (e.g., stripes, polka dots). Invite clothing or interior designers to discuss why and how patterns are used on fabrics to make them interesting. Contact your local paint and fabric store for wallpaper or fabric remnants. Using large sheets of paper, have your students pretend to be designers responsible for a fresh, new furniture or clothing line. Have them cut and paste a variety of samples using the fabric remnants to create their own designs which they must "sell" (the concept) to the class.



# Fun Field Trips: Exploring Your Community

## Families:

Your children are learning about patterns in school and at the National Building Museum. Encourage them to explore patterns in their community and have them teach you how to find and make patterns.

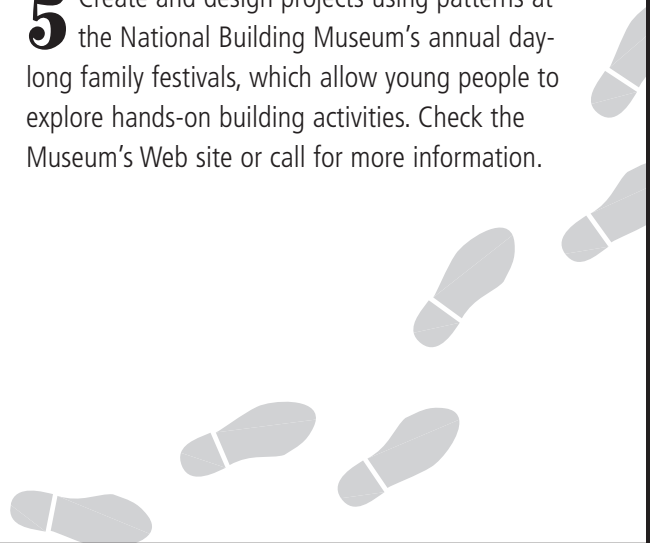
**1** Ask your child about the patterns s/he made while visiting the National Building Museum. Have him/her explain the patterns in his/her packet. Return to the Museum with your child and have him/her show you some of the patterns found there.

**2** Visit the U.S. Capitol or the Lincoln Memorial. See how many patterns you can find on the building's exterior. Take paper and crayons to draw a record of the patterns that you found. Visit the National Building Museum's *Washington: Symbol and City* exhibition to see and feel the patterns found on large models of the U.S. Capitol building and the Lincoln Memorial.

**3** Take a trip on the Metro. While waiting for your train, look up. Describe the patterns on the ceiling in the underground station. Do you see patterns on the floor? Where would you find this pattern in nature (honeycomb)? Why are bumpy tiles used closest to the tracks?

**4** Visit buildings in your community that have stained glass windows. What patterns are in the windows? What colors and shapes do you see? How do the colors and shapes create patterns? Two buildings in Washington, D.C., famous for their stained glass windows are the National Cathedral and the Jefferson Building at the Library of Congress.

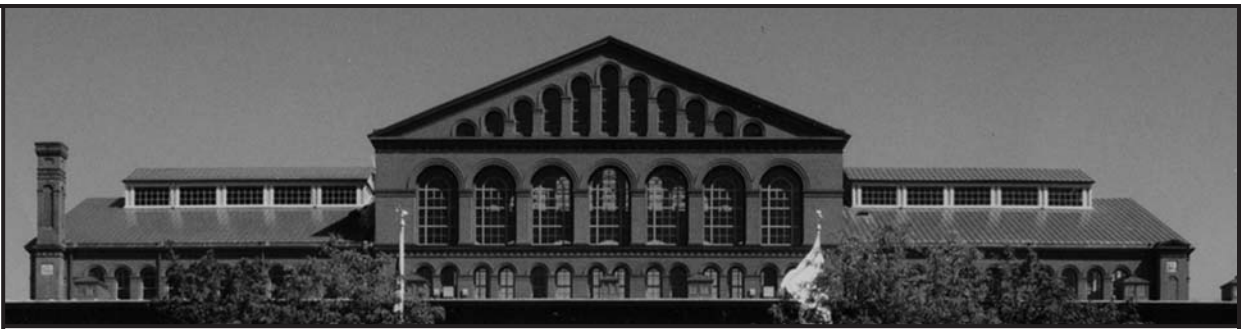
**5** Create and design projects using patterns at the National Building Museum's annual day-long family festivals, which allow young people to explore hands-on building activities. Check the Museum's Web site or call for more information.



**Visit the National Building Museum,  
where families can discover the world we build for ourselves!**

NATIONAL BUILDING MUSEUM 401 F Street NW Washington, DC 20001  
202.272.2448 | [www.NBM.org](http://www.NBM.org) | Red Line Metro, Judiciary Square

Programs for Schools, Families, and Scouts, Outreach Programs, Discovery Carts, Exhibitions, Birthday Parties, Festivals, and Interactive Web site



## 4. Resources

Information in this section comprises the following:

- Architecture and Pattern Vocabulary
- Books
- Web sites



# Architecture and Pattern Vocabulary

## Arch

A curved structure which spans an opening; usually consists of wedge-shaped blocks.

## Architecture

The art and science of designing and building structures.

## Brick

A solid or hollow masonry unit of clay molded into a rectangular shape and then fired in a kiln.

## Built Environment

Human-made surroundings, such as buildings, structures, parks, streets, bridges, etc.

## Capital

The topmost part of a column that is usually decorated.

**Doric:** The oldest and simplest of the three orders of classical Greek architecture, characterized by heavy columns with plain capitals and no base.

**Ionic:** An order of Greek architecture characterized by two spirals in the capital.

**Corinthian:** The most ornate of the three classical orders, characterized by a column having a bell-shaped capital decorated with acanthus leaves.

## Column

A cylindrical support consisting of a base, shaft, and capital.

## Marble

A metamorphic rock that is valued for its strength, color, and appearance.

## Mosaic

A pattern formed by inlaying small pieces of stone, tile, glass, or enamel into cement or mortar.

## Ornamental Plaster

A decorative architectural element made from pouring plaster (a paste-like material made by mixing cement, lime, or gypsum with water and sand) into a mold.

## Pattern

A series of elements — colors, lines, shapes, numbers — that repeat.

**Alternating Pattern:** Two elements that repeat such as ABABAB.

**Ascending Pattern:** Elements that increase in a systematic fashion and repeat, i.e., small, medium, large.

**Descending Pattern:** Elements that decrease in a systematic fashion and repeat, i.e., large, medium, small.

**Progressive Pattern:** Elements that repeat within themselves, i.e., a pattern of squares inside a square.

**Repeating Pattern:** One element that repeats such as AAAAAA.

## Shape

The surface configuration of a thing that takes on a form.

## Tile

A ceramic unit or shape made from clay or other ceramic material that has a glazed or an unglazed face.

# Books

## General Books

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Asher, Kirsty and Patilla, Peter. *Fun with Patterns*. The Millbrook Press: Brookfield, Connecticut, 1998.

Students can explore and match patterns in color pictures.

Hoban, Tana. *Shapes, Shapes, Shapes*. Greenwillow Books: New York, New York, 1986.

Photographs that help students identify a variety of shapes.

King, Andrew. *Discovering Patterns (Math for Fun Series)*. Copper Beech Books: Brookfield, Connecticut, 1998.

Exploration of patterns in nature and numbers through games and projects.

MacCabe, Richard and Steinecker, David L. *Patterns (Discovering Shapes Series)*. Benchmark Books: New York, New York, 1997.

A source of pattern-creating games, art ideas, and problems to solve.

Ross, Catherine Sheldrick. *Squares: Shapes in Math, Science and Nature*. Kids Can Press: Toronto, Canada, 1996.

Activities for all levels that relate math to everyday life.

Ross, Catherine Sheldrick. *Triangles: Shapes in Math, Science and Nature*. Kids Can Press: Toronto, Canada, 1994.

Activities for all levels using triangles.

Thorne-Thomsen, Kathleen. *Frank Lloyd Wright for Kids*. Chicago Review Press: Chicago, Illinois, 1994.

Activities based on Frank Lloyd Wright's extensive use of patterns in his designs.

Tomczyk, Mary. *Shapes, Sizes and More Surprises*. Williamson Publishing: Charlotte, Vermont, 1996.

Over 60 activities that help foster development of early learning skills — activities are written for younger students but can easily be expanded for older ones.

Walker, Lester. *Block Building for Children*. The Overlook Press: Woodstock, New York, 1995.

Provides building patterns for students.

Winters, Nathan B. *Architecture is Elementary*. Gibbs M. Smith, Inc.: Salt Lake City, Utah, 1986.

A guide to visual thinking through the examination of architecture.

## Storybooks

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Borten, Helen. *Do You See What I See?* Abelard-Schuman: New York, New York, 1959.

The author tells of her emotional responses to colors, shapes, and patterns. A starting point for connecting everyday patterns to feelings.

Green, Rhonda Gowler. *When a Line Bends...A Shape Begins*. Houghton Mifflin Company: Boston, Massachusetts, 1997.

A story about finding shapes everywhere in your world. Includes vivid, bright illustrations.

Harris, Tudy. *Pattern Fish*. Millbrook Press: Brookfield, Connecticut, 2000.

Many colorful patterns worth investigating.

Stockdale, Susan. *Nature's Paintbrush: The Patterns and Colors Around You*. Simon & Schuster: New York, New York, 1999.

The author artfully presents the purpose of colors and patterns in nature.

Swinburne, Stephen. *Lots and Lots of Zebra Stripes: Patterns in Nature*. Boyds Mill Press: Honesdale, Pennsylvania, 1998.

A photo-essay that introduces patterns by examining them in the wild.

## Activity Kits

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*Fun with Pattern*. Fifi Weinert. The Metropolitan Museum of Art, New York.

*Shapemaker Fun: The Young Architect*. Buki Toys Ltd. New York.

Stencils of basic shapes. Includes patterns for students to copy.

# Web sites

*At the publication of this resource packet, the following Web sites were all active.*

## **Pattern Activities**

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### **Kinderart**

<http://kinderart.com>

Art projects — many focus on patterns.

### **Patterns and Picture Books**

<http://www.carolhurst.com/subjects/math/patterns.html>

Storybooks that integrate patterns using math, literature, etc.

### **Patterns Here, There and Everywhere!**

<http://mathcentral.uregina.ca/RR/database/RR.09.96/hanlin1.html>

A fun 10-day unit for pre-K through 3rd grade that uses a variety of activities to learn about patterns.

### **Patterns in Mathematics**

<http://www.learner.org/teacherslab/math/patterns>

Activities using logic patterns, number patterns, and word patterns.

## **General Educator Resources**

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(includes many pattern activities)

### **Awesome Library**

<http://awesomelibrary.org>

Games and lesson plans divided by grade level and subject.

### **Frederick Douglass**

<http://www.cr.nps.gov/museum/exhibits/douglass/athome.htm>

### **Going to a Museum? A Teacher's Guide**

<http://curry.edschool.virginia.edu/it/projects/Museums/>  
Field trip lesson plan developed by Washington, D.C., area teachers.

### **Math Central**

<http://mathcentral.uregina.ca>

A resource for mathematics educators created by the University of Regina in Regina, Saskatchewan, Canada.

### **PBS Teachersource**

<http://pbs.org/teachersource/math.htm>

Complete lesson plans for math for preschool to high school.



## **Other School Programs at the National Building Museum**

*Be a Builder*

*Bridge Basics*

*City by Design*

*Early American Architecture*

*Fuller's Fantastic Geodesic Dome*

*Mathitecture*

*Washington: Symbol and City*

For more information, or to obtain a school programs brochure, contact school programs at [school@nbm.org](mailto:school@nbm.org) or 202.272.2448.

## **Other Youth Programs at the National Building Museum**

*Birthday Parties*

*Family Programs*

*Festivals*

*Outreach*

*Scout*

For more information, contact youth education at [birthday@nbm.org](mailto:birthday@nbm.org), [family@nbm.org](mailto:family@nbm.org), [outreach@nbm.org](mailto:outreach@nbm.org), [scout@nbm.org](mailto:scout@nbm.org), or 202.272.2448.

**Visit the Museum's Web site at [www.NBM.org](http://www.NBM.org)**

# National Building Museum

401 F Street, NW  
Washington, DC 20001  
Telephone: 202.272.2448  
Facsimile: 202.376.3564  
Web site: [www.NBM.org](http://www.NBM.org)

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The National Building Museum, a nonprofit educational institution, was created by Congress in 1980 to celebrate achievements in architecture, urban planning, construction, engineering, and design. It presents exhibitions and public programs, collects artifacts of the building process, and publishes books and a quarterly journal.

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## MUSEUM HOURS

Monday to Saturday, 10:00am – 5:00pm  
Sunday, 11:00am – 5:00pm

## ADMISSION

Admission is free.

## LOCATION

401 F Street NW, between 4th and 5th  
Streets at the Judiciary Square Metro Station (Red Line).  
Wheelchair access at 4th and G Street entrances.

## MUSEUM SHOP

The Museum Shop, located on the ground floor, is Washington's finest source of design and building-related books and gifts, including jewelry, home furnishings, toys, and games. Museum members and teachers receive a discount on all purchases.

## MEMBERSHIP

Museum membership offers such privileges as invitations to exhibition openings and special events; discounts on Museum Shop purchases, programs, workshops, and tours; and subscriptions to *Blueprints* and the Museum Calendar of Events.

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