



GOTHIC ADVENTURE

Exploring the gothic style of
Washington National Cathedral

ABSTRACT

A three-part program that is Common Core friendly and introduces architectural concepts and explores the relationship between gothic architecture, math, science, and art. Each lesson is about an hour. Worksheets and handouts are attached at the end of each lesson.

TABLE OF CONTENTS

Introduction and Welcome.....	ii
Curriculum Standards.....	iii
Part I: <i>The Architectural Landscape</i>	1-12
Part II: <i>It's Bigger on the Inside</i>	14-22
Part III: <i>What's in an image?</i>	24-36
Photo Credits.....	37

Gothic Adventure

Objectives: After completing the three-part Gothic Adventure lesson plan, students will be better able to

- a. Analyze their surroundings;
- b. Identify architectural forms of a Gothic cathedral;
- c. Explain how those features work together to create a desired effect;
- d. Communicate and share different perspectives; and
- e. Cite ways in which math, science, and art achievements of the past have influenced modern architecture through ratios, area, writing, comparing/contrasting, and hands-on activities.

Audiences:

1. The primary audience of this program is fifth-grade students (ages 10-11).
2. Teachers may also benefit from the program as a preparatory tool for a visit to Washington National Cathedral or as a primer for teaching fundamentals of gothic architecture in the classroom.

Welcome to Washington National Cathedral

Washington National Cathedral offers educational materials to enrich the learning experiences of students across the country by helping them connect with engaging content through the art, architecture, and history of the Cathedral.

The programs help fulfill the Cathedral's mission of hospitality and education and are separate from the Cathedral's religious mission. In addition to its function as a working church, Washington National Cathedral welcomes 400,000 visitors each year. It is a place of architectural significance, selected by the American Institute of Architects as the number three site of "America's Favorite Architecture." It also serves national purposes, ranging from state funerals to prayer services for the inauguration or for national tragedies.

Curriculum connections based on Common Core standards – Grade 5

Mathematics

Write and interpret numerical expressions.

CCSS.MATH.CONTENT.5.OA.A.2

Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them.

Geometric measurement: understand concepts of volume.

CCSS.MATH.CONTENT.5.MD.C.3

Recognize volume as an attribute of solid figures and understand concepts of volume measurement.

CCSS.MATH.CONTENT.5.MD.C.4

Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units.

CCSS.MATH.CONTENT.5.MD.C.5

Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume.

Language Arts

Text Types and Purposes:

CCSS.ELA-LITERACY.W.5.3

Write narratives to develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences.

Comprehension and Collaboration:

CCSS.ELA-LITERACY.SL.5.1

Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 5 topics and texts*, building on others' ideas and expressing their own clearly.

CCSS.ELA-LITERACY.SL.5.1.C

Pose and respond to specific questions by making comments that contribute to the discussion and elaborate on the remarks of others.

CCSS.ELA-LITERACY.SL.5.1.D

Review the key ideas expressed and draw conclusions in light of information and knowledge gained from the discussions.

Vocabulary Acquisition and Use:

CCSS.ELA-LITERACY.L.5.4

Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 5 reading and content, choosing flexibly from a range of strategies.

CCSS.ELA-LITERACY.L.5.4.A

Use context (e.g., cause/effect relationships and comparisons in text) as a clue to the meaning of a word or phrase.

Part I: The Architectural Landscape

Outcome: After completing The Architectural Landscape, students will be better able to

- a. Analyze their surroundings; and
- b. Identify architectural forms of a Gothic cathedral.

Output: Lesson to introduce the concepts of gothic architecture with accompanying PowerPoint. 45-60 minutes for prep time.

Audience: Students who have studied basic operation with fractions and decimals. They have been introduced to statistics and probability. This background provides the foundation for learning about ratios and percentages.

Objects and Resources

PowerPoint presentation
Golden Ratio
Exterior of west façade of Notre-Dame in Paris, France, shown with Washington National Cathedral west facade
Exterior of “Munster in Freiberg”, Germany, shown with Washington National Cathedral buttress exterior
Cathedral Diagram
Ratios All Around Worksheet
Words to Know Crossword Puzzle with clues and answers
Glossary of Gothic Terms

Advance Organizer (1 minute)

Today, we will be introduced to gothic architecture. We'll go over the vocabulary together then I'll give you time to work on the crossword puzzle together. After that, we will see how important ratios are in architecture, especially Gothic.

Entrance Narrative - Crossword
Hook – Straw poll
Ratios All Around
Exit Narrative - Crossword
Conclusion

Entrance (4 minutes)

(Entrance and exit narratives are strategies that help students prepare themselves with content, thinking, and language that they will encounter in the text. They are prompts that provide instructors with a quick student diagnostic.)

Materials: pencils, Words to Know puzzle, clues, and glossary

Description: Students solve a crossword puzzle to introduce them to vocabulary related to gothic architecture and Washington National Cathedral

Directions: Give each student copies of the crossword puzzle and the clues sheet. Explain that this is a way for you to see how much they know about gothic architecture terms and it is okay if they are not able to answer all of the clues.

Hook (10 minutes)

Straw Poll: Number of people with blue eyes compared to brown eyes in the class.

Directions: Hand out a straw to each students. Place two cups on a table, one labeled blue, and the other labeled brown. Ask the students to place their straws in the cup that matches their eye color. Later, calculate the ratio and percentage for each response and have students draw a simple bar graph to represent the data in the straw poll. You can compare brown to blue, brown to the whole class, and/or blue to the whole class. You can also compare green eyes to brown or green to blue.

Body (40 minutes total; 10 for Ratios All Around worksheet)

A. Ratios and Architecture (Ratios worksheet is attached. Print one for each student.)

Can someone explain what a ratio is?

➤ A ratio compares two numbers.

Ratios are part of our daily lives. We see ratios used in many ways like in numerical data, graphs, charts, medical information, and sports data. Take some time to practice your ratio solving skills by solving the problems on the worksheet.

(Students solve problems.)

As we have learned, ratios are very important. One of the most important mathematic principles in gothic architecture is a ratio. Gothic architecture began during the late medieval period in France and characterized by having pointed arches, thinner and taller walls, more and larger windows. Together, a Gothic building like a church is a great achievement but without math, none of those things would be possible!

There is a special type of ratio used in architecture called the **Golden Ratio** (or golden mean), a ratio of 1 to 0.618 that is commonly found in nature (flowers, plants, pinecones, the human face and hand). Gothic architects, along with other architects, believed that this ratio is the most aesthetically pleasing.

Start with the main rectangle. If you draw a line inside the rectangle to form a perfect square, the sides of the new rectangle will have the same ratio as the main rectangle. You can keep doing this over and over forever.

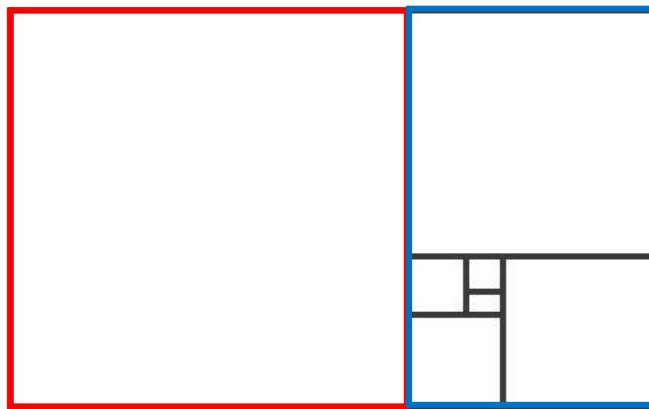


Figure 1: Visual representation of the Golden Ratio

As seen above, the red square is 1 and the blue rectangle is 0.618. This continues in each newly formed rectangle over and over again.

Gothic Adventure

We're going to look at two European cathedrals and how the golden ratio applies to them. Before we do, let's look at how Washington National Cathedral compares to Notre Dame in Paris and the Munster in Freiberg.

Look at the west facades and exteriors and compare and contrast.



Notre Dame, Paris, France



Washington National Cathedral

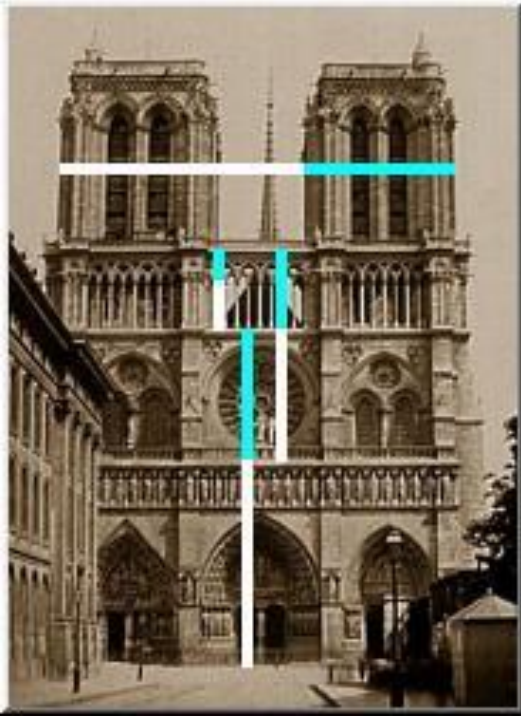


Freiburg Minster, Freiburg, Germany

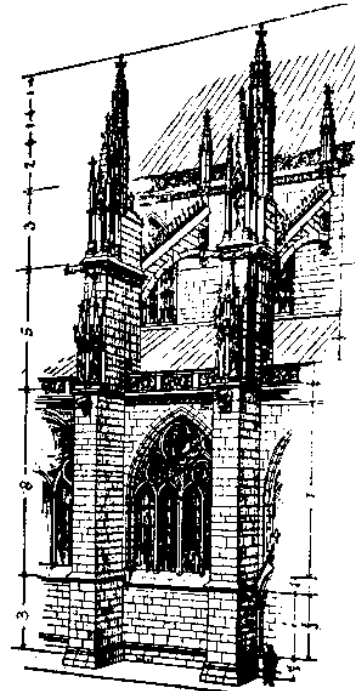


Washington National Cathedral

Gothic examples:



Notre Dame, Paris, France



“Munster in Freiberg”, Germany

(Discuss Notre Dame first. Each blue and white rectangle section represents the golden ratio of 1:0.618. Teachers can refer to the glossary and cathedral diagram when examining these images.)

How many golden ratios can you see on Notre Dame?

Notre Dame: 4

The Towers

The Arcade Level (you can point out the columns and arches)

The Arcade and Rose Window

Rose Window and Portal Level

(Munster in Freiberg)

Notice how the ratios between several heights follow closely to the golden ratio.

Exit (4 minutes)

Materials: pencils, Words to Know puzzle, clues, and glossary

Description: Students solve a crossword puzzle to introduce them to vocabulary related to gothic architecture and Washington National Cathedral

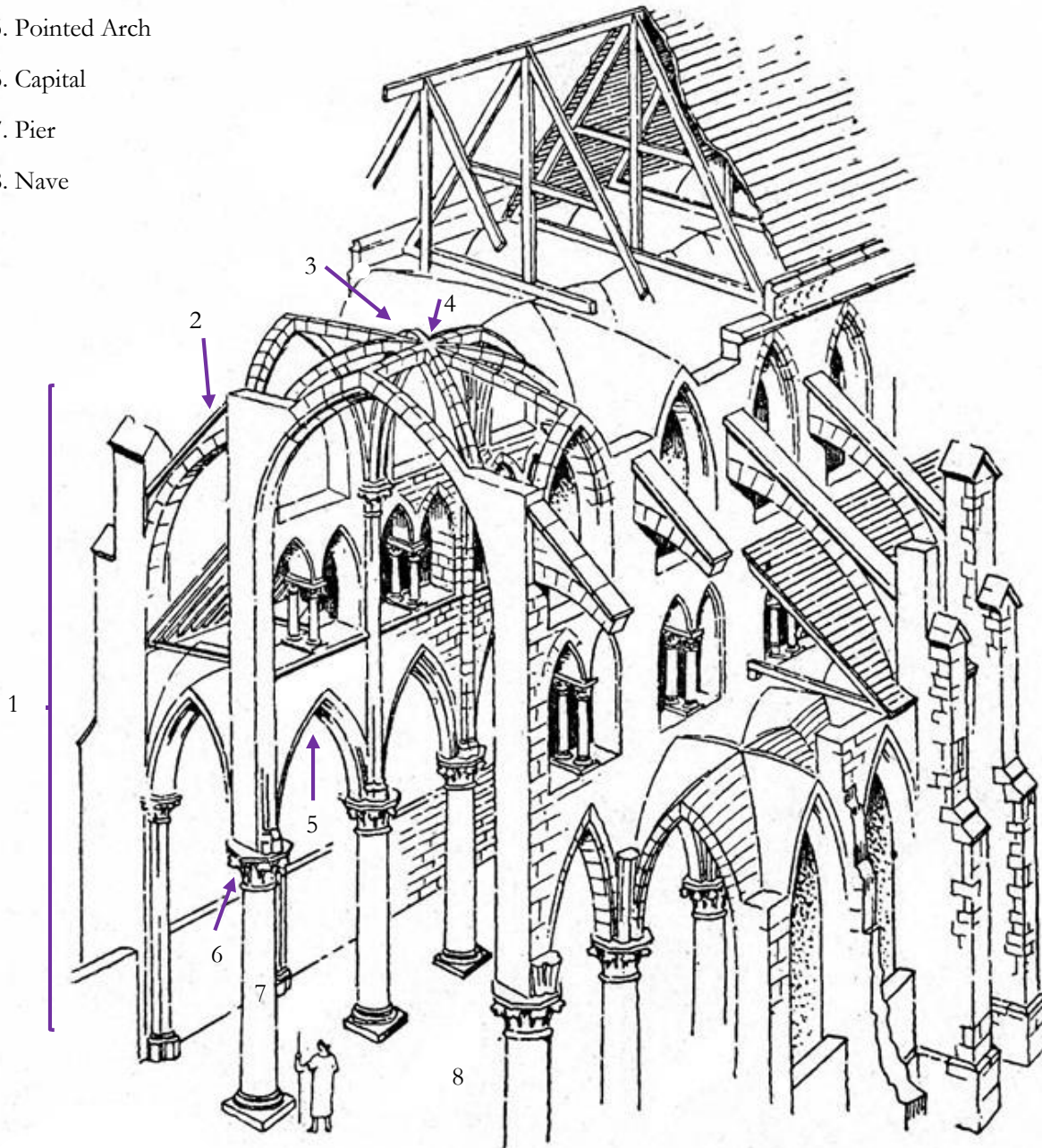
Directions: Have the students look at the crossword again. See if they can solve unanswered clues. If crossword is still unsolved, send home with glossary to finish.

Conclusion (1 minute)

Today we talked about some of the different characteristics and concepts of gothic architecture. In our next lesson, we'll talk about these concepts more and put them into practice.

Gothic Diagram

1. Buttress
2. Flying Buttress
3. Vault
4. Boss
5. Pointed Arch
6. Capital
7. Pier
8. Nave



Ratios All Around

A **ratio** is the relationship between two parts of a set. For instance, consider the names of the days of the week. If you compare the number of days that start with the letter “T” to the number of days that start with another letter, the ratio is 2:5. There are two days that start with a “T” (Tuesday and Thursday) and five that do not (Monday, Wednesday, Friday, Saturday, and Sunday).

1. Find ratios in your classroom. They’re all around you!

Teachers : students _____ : _____

Girls : Boys _____ : _____

Desks : Chairs _____ : _____

Pieces of Chalk : Erasers _____ : _____

Doors : Windows _____ : _____

*Bonus: *Reduce* your ratios by dividing. For instance, a ratio of 3:6 is the same as 1:2, because both 3 and 6 are divisible by 3.

2. Change some ratios. Write the ratio in your classroom if:

Two more girls are added _____ : _____

Three desks are removed _____ : _____

*Bonus: If two girls were added to your class, how many boys would have to be added to keep the ratio the same as it is now?

3. Solve these ratio problems.

- Jordan gives out 12 pencils. She gives Ling one pencil for every 3 pencils she keeps for herself. How many pencils does Ling get?

- William wants to make some pink paint by mixing one can of red with two cans of white. He uses 9 cans altogether. How many cans of red paint does he need?

- Carlos uses 3 tomatoes for every 2 cups of salsa. How much salsa can he make from 15 tomatoes?

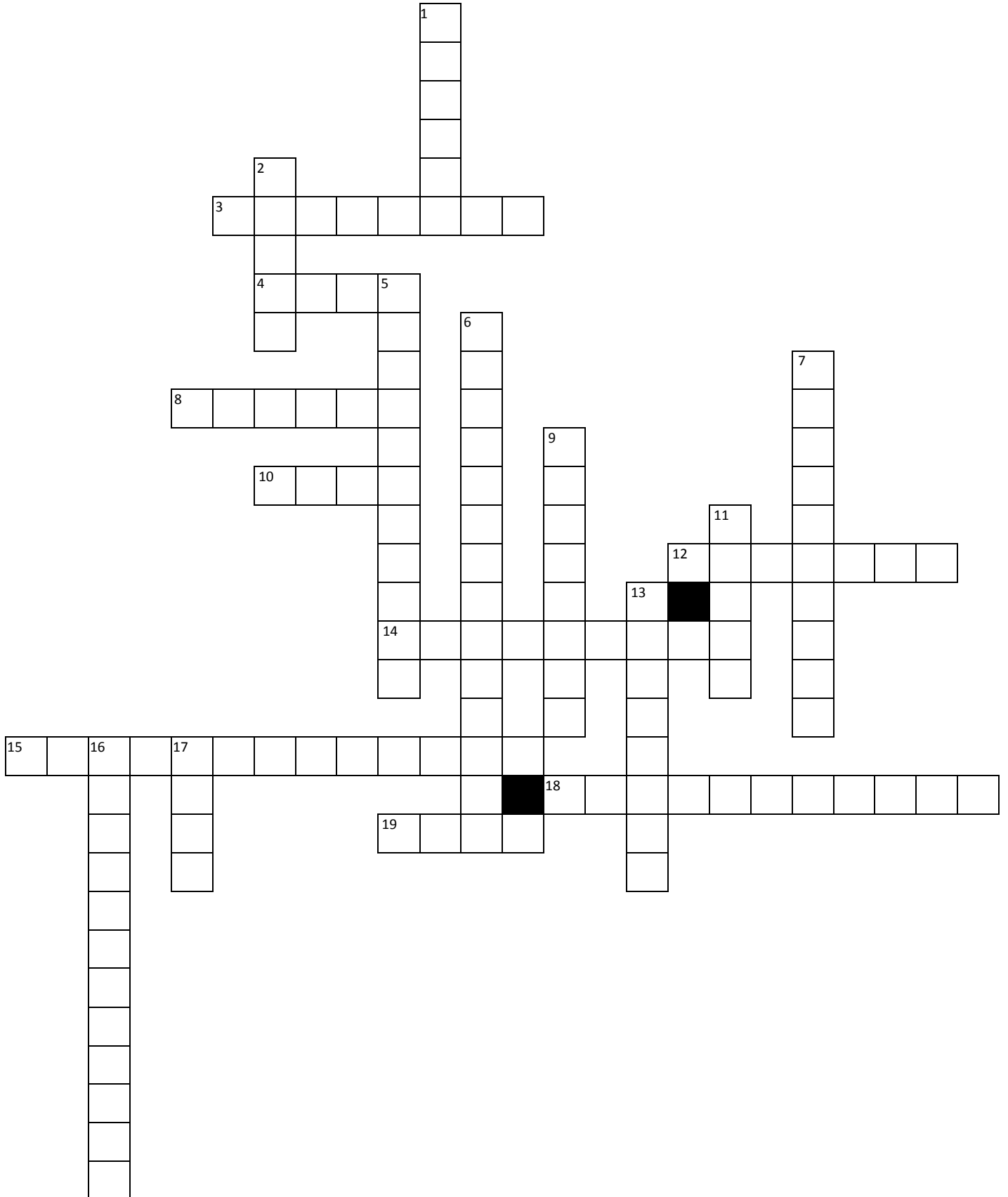
Glossary of Gothic Terms

Arcade	A series of arches and their supporting columns.
Arch	A curved or pointed structure over an open space.
Bay	A division or compartment in architecture marked by space between piers.
Bishop	The highest ranking member of the Episcopal clergy.
Boss	A large carved stone that connects the ribs of a vaulted ceiling.
Buttress	A mass of stone that is built up to support a wall.
Capital	The upper part of a column or pier frequently decorated with carvings.
Cathedra	The seat/chair reserved for the bishop.
Cathedral	A church with a bishop as its leader.
Chapel	A small worship space within a larger church, or a small building that is a place of worship. Washington National Cathedral has nine chapels.
Choir	The section of a cathedral where the service is sung.
Column	A cylindrical support usually standing on a base and topped with a capital.
Crossing	The area where the nave, transepts, and choir connect.
Crypt	A chamber or passageway beneath a church.
Façade	The exterior front to a building.
Flying Buttress	A freestanding buttress connected to the outer wall of a building by an arch.

Gothic Adventure

Gargoyle	A carved stone waterspout attached to a gutter with a pipe running through its center. The pipe carries rainwater away from the wall.
Grotesque	A small stone carving on the outside of a building designed to coax water off of the building.
Nave	The main part of a church.
Pier	A number of columns grouped together.
Pointed Arch	An arch with a point at its apex (top).
Post and Lintel	A construction characterized by the use of vertical columns and a horizontal beam to carry a load over an opening.
Rose Window	A round window with a flower-like pattern.
Rounded Arch	A semicircular arch.
Stained Glass	Pieces of colored glass joined together with strips of lead to make a picture or a pattern.
Transept	One of two arms of a church that is built in the shape of a cross.
Vault	Curved ceiling

The Architectural Landscape



Words to Know

The Architectural Landscape: Words to Know

Clues

Across

- 3. one of two arms of a church that is built in the shape of a cross
- 4. a number of columns grouped together
- 8. a cylindrical support usually standing on a base and topped with a capital
- 10. the main part of a church
- 12. the upper part of a column or pier frequently decorated with carvings
- 14. a church with a bishop as its leader
- 15. a structure characterized by the use of vertical columns and a horizontal beam to carry a load over an opening
- 18. an arch with a point at its top
- 19. a large carved stone that connects the ribs of a vaulted ceiling

Down

- 1. a series of arches and their supporting columns
- 2. a chamber or passageway beneath a church
- 5. a semicircular arch
- 6. a freestanding buttress connect to the outer wall of a building by an arch
- 7. a round window with a flower-like pattern
- 9. a mass of stone that is built up to support a wall
- 11. curved ceiling
- 13. the area where the nave, transepts, and choir connect
- 16. pieces of colored glass joined together with strips of lead to make a picture or pattern
- 17. a curved or pointed structure that spans an opening

Gothic Adventure
Words to Know

Answer Key

1. Arcade
2. Crypt
3. Transept
4. Pier
5. Rounded Arch
6. Flying Buttress
7. Rose Window
8. Column
9. Buttress
10. Nave
11. Vault
12. Capital
13. Crossing
14. Cathedral
15. Post and Lintel
16. Stained glass
17. Arch
18. Pointed Arch
19. Boss

Gothic Adventure

Part II: It's Bigger on the Inside

Outcome: After completing Gothic Adventure lesson plan, students will be better able to

- a. Analyze their surroundings; and
- b. Explain how gothic features work together to create a desired effect.

Output: Lesson with hands-on activities that demonstrate architectural forces with accompanying PowerPoint. 45-60 minutes for prep time.

Audience: Students who have studied basic operations with fractions and decimals. They have been introduced to statistics and probability. This background provides the foundation for learning about ratios and percentages. Students are also familiar with different units of measurements. Students have participated and completed *The Architectural Landscape*, giving them an introduction to Gothic architecture.

Objects and Resources

PowerPoint Presentation

Washington National Cathedral Virtual Tour on Google: <http://goo.gl/4cGT97>

Lion Gate in Mycenae, Greece

Colosseum in Rome, Italy

Washington National Cathedral (Narthex, Chapel of St. Joseph of Arimathea, South Transept view of nave)

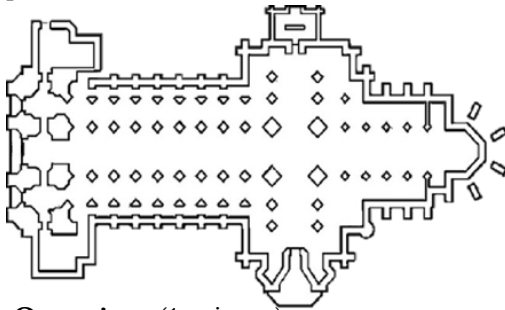
Math worksheet

Answer Sheet

Yard stick

Swim noodle

Floor plan of the Cathedral's main level



Advance Organizer (1 minute)

Today, we will learn about the kind of effects Gothic architects and the Church wanted to achieve on the inside and outside of Gothic cathedrals and how they achieved these goals. We will be looking at Washington National Cathedral (WNC) in Washington, DC, as an example.

Recap

Entrance Narrative - Question

Hook – Google Virtual Tour

Gothic Architecture through Washington National Cathedral

Arch Activity

Calculating Your Space Worksheet

Exit Narrative - Question

Conclusion

Recap (2 minutes)

During the last lesson, we learned about ratios in architecture and our classroom. Does anyone remember the kind of ratio we learned about?

The golden ratio/ the golden mean

What else did we learn?

Gothic vocabulary

Entrance (2 minutes)

(Entrance and exit narratives are strategies that help students prepare themselves with content, thinking, and language that they will encounter in the text. They are prompts that provide instructors with a quick student diagnostic.)

How does what we do in class relate to other things you do or experience outside of the classroom?

(You can choose to have students discuss their initial thoughts or have students write down their thoughts so they can share them at the end of this lesson.)

Hook (7 minutes)

Use the Washington National Cathedral Virtual Tour on Google: <http://goo.gl/4cGT97>

Have students point out gothic characteristics they notice. (If you are in a computer lab or students have access to tablets, students may explore the virtual tour on their own.)

*Note: Be sure to test link before class time. Google does update their maps from time to time, which can cause complications.

Body (15 minutes for overview, 15 minutes for Arch Activity, 15 minutes for Calculating Your Space)

A. Gothic Architecture Overview

First, let's think about what the name tells us: Washington National Cathedral. **What does the name "Washington" tell us?**

- It's in Washington, DC.

What does the name "national" tell us?

- It's a place for the whole nation, the whole United States of America
*People of all religions, as well as those who are not religious, are welcome here.
- On September 29, 1907 the Cathedral's foundation stone was laid with President Theodore Roosevelt present.
- Washington National Cathedral has held funeral and memorial services for 21 presidents of the United States including Woodrow Wilson, Dwight Eisenhower, and Ronald Reagan

Lastly, what is a cathedral?

- A church

What makes a church a cathedral, though? How is it different from other churches?

- It has a bishop, or a leader of a group of churches
*The name comes from the bishop's ceremonial chair, which is called a *catbedra*.

Where and when did Gothic architecture get started?

- Western Europe in the Middle Ages
*Specifically, Gothic architecture was first used at a church called St. Denis in Paris, France in the 12th century, developed by Abbot Suger (pronounced SOO-zhayr) who wanted the church to be filled with light and color.

Before we examine Gothic architecture, let's discuss earlier styles of architecture.

Post and lintel architecture

- Lion Gate, Mycenae, Greece
- Door into nave of National Cathedral



What shape are these openings?

- Rectangle

What's the name for this type of opening?

- Post and lintel

Which part is the post and which part is the lintel?

- The post is the vertical part of the door opening and the lintel is the horizontal beam going across the top

Where else do you see post and lintel openings?

Rounded Arch

- Colosseum, Rome, Italy
- Chapel of St. Joseph of Arimathea, National Cathedral



What shape are these openings?

- A half-circle or semi-circle

How does a rounded arch opening compare to a post and lintel opening?

- Creates more height (given the same height posts)

Pointed Arch

- Nave, Washington National Cathedral



What shape is this?

- an arch with a pointed apex

How does it compare to the other openings?

- Taller, allow greater height

Why do you think the architects of Washington National Cathedral chose Gothic architecture over the two earlier styles?

- Create great height
- Make the Cathedral impressive looking from outside and inside

Now try to imagine how Gothic architecture must have impressed people in the Middle Ages.

How do you think it made them feel about the Church when they looked at huge cathedrals like this and came inside?

Churches were built as places of worship and to the glory of God. They were also centers of community life and education. **Why?**

- The Church and government were closely entwined
- The Church was the center of reading, writing, and learning through art and music. Before books, images were used to teach about the Bible and the church.
- The Church was the center of commerce. Usually the location of markets, plays, and music events.
- So much larger than everything else, able to be seen from a distance – Cathedrals are pilgrimage sites

B. Arch Activity

(Teachers can choose to either 1. Use different sets of student volunteers to demonstrate each arch; or 2. Break the class into groups of 3 or 4 so the whole class can perform the same activity at the same time.)

Now that we know that pointed arches offer the greatest height, let's do some experiments to discover what architectural achievements enabled architects to support these tall structures.

- First we will test post and lintel. Two of you, that are the same height, will play the part of the posts. (Use the yard stick and two students to create a post and lintel opening.) The yardstick will

Gothic Adventure

be the lintel, and someone else in your group will be gravity. Let's see what happens. (Apply pressure onto the center of the lintel). **What is happening to the lintel?**

- Bowing from the weight

What would you need to better support this post and lintel?

- Add more posts

I need someone in your group to be our additional post. (Repeat experiment with third post.)

What's the disadvantage of having additional posts in this opening?

- Opening gets narrower

➤ Now let's try the second kind of opening we've learned about. **What kind is that?**

- Rounded arch

I need two more volunteers to help me create a rounded arch. (Have students each hold one end of a swim noodle to the floor to create a rounded arch.) **As I apply more and more weight on a rounded arch, what happens?**

- it collapses, sides sway out

If architects in ancient Rome used this type of arch, they must have been able to prevent the arch from collapsing. **How could we support this arch?**

- thick walls, wall supports – wall buttresses

Our volunteers are now going to serve as thick walls by sitting on the floor and with their knees drawn to their chests, supporting the sides of the rounded arch. Let's see what happens. (Repeat experiment.)

➤ For the pointed arch, I need two of you to face each other and reach your arms up and together to create a pointed arch. Try pressing down on the pointed arch. **As you put more and more weight on the pointed arch, what do you think will happen?**

- collapse

Volunteers, what direction did you feel the weight moving?

- down and out

With post and lintel, the weight traveled down, with the rounded arch it traveled out. This does both! The weight follows the shape of the arch and is pushed down through the arch and out at the bottom of the arch. **How can we prevent the arch from collapsing?**

- flying buttresses

I need the other two in your group to be the flying buttresses. **Where should they stand to support the pointed arch?**

- Behind each student, hands on shoulders, at the bottom part of the arch

What do you think will happen now as I put weight on this pointed arch supported by flying buttresses?

- stay standing

Calculating Your Space (Worksheet is attached. Print one for each student.)

Next we're going to look at solving perimeter, area, and volume of shapes and spaces. On the worksheet are different polygons. The first three, you will find the area and perimeter. Then you'll find the volume of the quadrilateral at the bottom of the page. (You may want to review how to find area, perimeter, and/or volume. There is a hint box on the worksheet as well.)

(Give time to answer questions and solve problems)

When everyone is finished, we are going to measure our classroom. (Decide as a class which unit of measurement to use for area. Be as creative as you see fit. Possible options: yardsticks, notebooks. It could be anything.)

(Calculate area and volume of classroom)

Now look at the simplified plan of the cathedral. Let's calculate the area of the Cathedral's main floor then we will compare that with our classroom's measurements. ***Note: measurements have been rounded to the nearest foot so calculations will be close approximations to actual Cathedral measurements***

(Ask three students to solve the Cathedral's area in front of the class, one for each section. The rest of the class can double check calculations. After each section's area has been solved, add the areas together for the Cathedral's main floor area.)

Great! We have calculated the Cathedral's area. **How does this compare to our classroom?**

- It's much bigger!

How many of our classrooms can fit in the Cathedral?

(Solve)

What does this tell you about the size of our classroom? What does this tell you about the size of the Cathedral?

Exit (2 minutes)

How does what we do in class relate to other things you do or experience outside of the classroom?

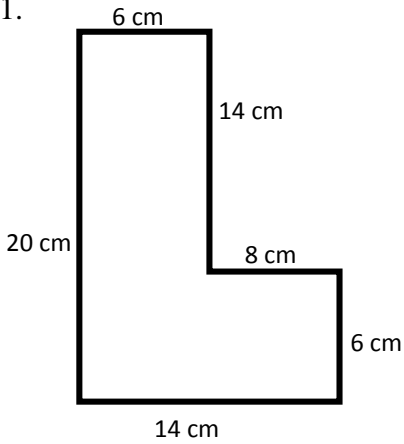
Conclusion (1 minute)

Today we measured spaces and analyzed the size of the National Cathedral. We also looked at three different doorways and openings. Try to look around today and see what types of openings are in our homes, stores, and other buildings.

Calculating Your Space Worksheet

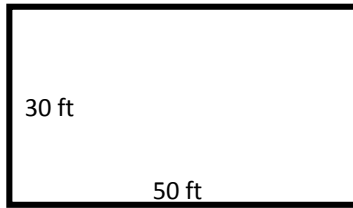
Warm up: Find the area and perimeter of each polygon.

1.



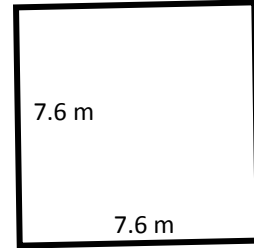
Perimeter: _____
Area: _____square cm (cm²)

2.



Perimeter: _____
Area: _____ square ft (ft²)

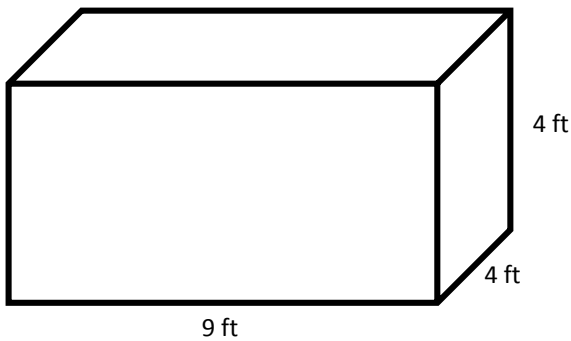
3.



Perimeter: _____
Area: _____square m (m²)

Find the volume of this polygon.

4.



Volume: _____

Helpful hints:
Area of a rectangle = width × height
Volume = length × width × height

Calculating Your Space Worksheet

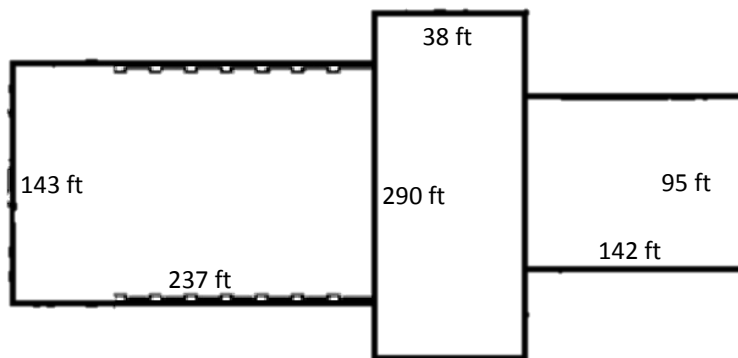
Use the space below to calculate the area and volume of your classroom using the chosen measurement unit.

1. Area:

2. Volume:

3. Looking at the Cathedral

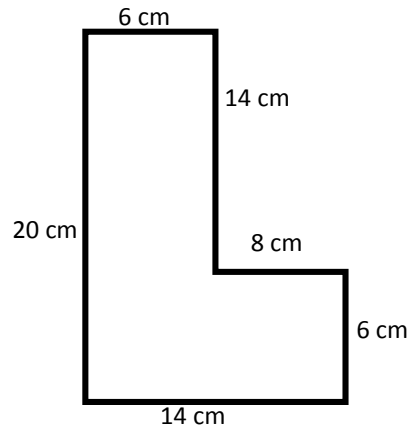
Calculate the area of the nave level as shown below. This is a simplified plan.



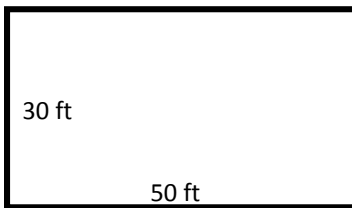
How many of your classrooms could fit inside the Cathedral?

Answer Sheet

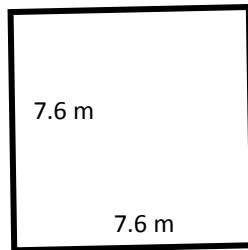
1. Perimeter: 160 cm
Area: 1500 cm²



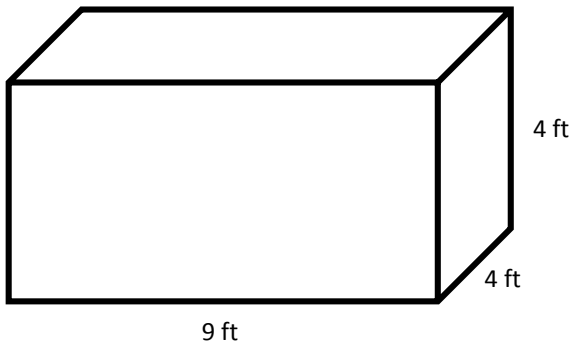
2. Perimeter: 160 ft
Area: 1500 ft²



3. Perimeter: 30.4 m
Area: 57.76 m²

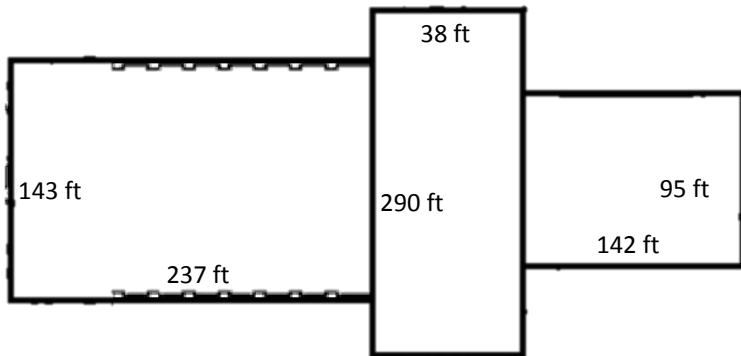


4. Volume: 144 ft³



Answer Sheet

3. Area: 70,252 ft²



$$237 \times 143 = 33,891$$

$$38 \times 290 = 22,871$$

$$142 \times 95 = 13,490$$

$$\text{Total: } 70,252 \text{ ft}^2$$

Part III: What's in an image?

Outcome: After completing Gothic Adventure lesson plan, students will be better able to

- a. Analyze their surroundings; and
- b. Communicate and share different perspectives.

Output: Lesson with two activities: create your own design and writing with accompanying PowerPoint. 45-60 minutes for prep time.

Audience: Students who have studied basic operations with fractions and decimals. They have been introduced to statistics and probability. This background provides the foundation for learning about ratios and percentages. Students have participated and completed the first two parts of this lesson, giving them an introduction to Gothic architecture.

OBJECTS

PowerPoint Presentation

Battista Dossa, *David and Goliath in Combat*, 16th century tapestry

Stained glass window - story worksheet

My Stained Glass Window worksheets – 2 lancets and 3 lancets

Pencils, colored pencils

Stained glass windows

Advance Organizer (1 minute)

Today will be our last lesson. We will take a look at a tapestry, complete a demonstration, look at another important element of Gothic architecture, complete a writing activity and art activity, look at the tapestry again and then conclude.

Entrance Narrative - Tapestry

Hook - Demonstration

Stained Glass Windows

Write a story Activity

My Stained Glass Window Activity

Exit Narrative - Tapestry

Conclusion

Recap (2 minutes)

We've had two lessons so far in our Gothic Adventure. What do you remember so far?

Possible follow up questions/discussions:

Measuring size and volume

The past two lessons have addressed important features of Gothic architecture. In the last lesson, we learned about three different openings. I need three students to tell us what they are called.

Post and lintel, rounded arch, and pointed arch

Which is the better choice for Gothic architecture?

Pointed arch

Entrance (2 minutes)

(Entrance and exit narratives are strategies that help students prepare themselves with content, thinking, and language that they will encounter in the text. They are prompts that provide instructors with a quick student diagnostic.)

What kind of story does this tapestry tell? (Have students write their answers or share out loud)



Hook (5 minutes)

Ask students if they have a transparent, colored piece of plastic (could be a bottle or a sandwich container lid). Take the object and shine light through it. (If students do not have access to these sort of items, bring in your own objects that are colorful and allow light to shine through such as old soda bottles, water bottles, Tupperware, candle holders, etc.)

What do you see happening?

- The light is coming and the color is being reflected.

Body – Stained Glass Windows (10 minutes)

(Bring up the Google virtual tour again: <http://goo.gl/4cGT97>)

So far we have looked at core characteristics of gothic architecture: great height, pointed arch, and flying buttresses. As you look through the tour, **what else really catches your eye?**

- Windows

What is different about the windows here at the National Cathedral than those you might have at your school or home?

- Stained glass

So let's talk about why we are focusing on stained glass windows today. Take a look. **How do they compare to the other features we have learned about?**

- They don't help keep the building strong. They're fragile/delicate.

But where are the windows located?

- The walls

So if the windows can't support the weight of the Cathedral, and the windows are in the walls – **what does that tell you about the walls of the Cathedral?**

- They don't support much weight

At no point have we said that Gothic architecture needs **walls** to keep it strong. **What *does* keep the Cathedral strong?**

- pointed arches
- flying buttresses
- vaulted ceiling with ribs
- piers

Without having to build thick, strong walls, Gothic cathedrals can have thin walls pierced by these enormous windows. Windows bigger than what was possible with earlier kinds of architecture. **Why was it not possible to have windows this big with post and lintel or rounded arch architecture?**

- Post and lintel needs more posts to hold up a large span
- Rounded arches need thick walls to support them – big windows would disrupt that support

What do the windows do for the Cathedral?

- Let in light, color
- Tell stories

Why would it be important for cathedrals in the Middle Ages to tell stories in their windows? Why not just hand everyone who came in a written copy of the stories?

- Not many people could read in the Middle Ages
- Books were scarce – in the early Middle Ages, the printing press hadn't even been invented yet!

And even though more people can read now, the windows still tell stories.

Activity – Write a story (*Stained Glass Windows – Story Worksheet* and windows are attached. Print worksheets for each student and print as many copies of each window as you feel is necessary.) (20 minutes)

I'd like for you to help me discover some of those stories told at the National Cathedral right now. You're going to complete this worksheet by selecting a window that appeals to you, studying it, and writing a short story or poem to describe what's going on in that window (students will have 3 National Cathedral window choices to choose from). Then, give your story a name, and if you have time, draw a sketch of the window.

First, we're going to draw a box in the big space above the lines. Watch me. Then you draw one on your worksheet. (Draw a box that takes up half the space. This allows the other half to be used to draw a picture of the window if there is time or if the student is interested.)

(Before starting their own windows, you may want to practice with your students by using the first window labeled 'Example Window.' This is at your discretion if you feel your students have or have not had experience identifying visual clues. If they have, you may choose to not use the example window. If they have not, you may use to the window to point out what students recognize and what these visual clues mean together to tell the window's story.)

(Students will now pick their window.)

You will have three minutes to "free write" in the box you drew. This means write down any words/thoughts/ideas that come to you when you look at your window. You may notice the colors, shapes, objects. You can write down what they remind you of. Just write whatever comes to mind, no matter how wacky, and fill the box with words. (Students will "free write.")

Gothic Adventure

Now there are a few different ways you can write your story on the lines below or on your own paper. Remember, this is just a beginning. You don't need to finish today.

- a. Write a story about your window.

It can be fantasy--what they **think** is happening, or what would they would like to be happening. If there's had a lot of time, you can go into setting and characters and beginning/middle/end.

- b. Write a personal response.

This is a piece about **them**, and how **they** feel/think when they look at the window.

- c. Write a poem.

About this window, or all the windows or the Cathedral in general. (Tell them that the poem does not have to rhyme, and remind them that most of the best poetry does not rhyme. And if they're stuck, they can do a "list poem"--a list of words/phrases, like a column, words that describe what they see/hear/taste/smell/feel when they encounter the window, and that all those words, put together, will create for the reader a certain kind of "window experience.")

Notes: ***If you want, you could have a short piece that you'd already written so you could share with them. ***After you list the three choices, you can ask how many of them plan to do stories (raise your hand) and how many personal responses (raise your hand) and poems (raise your hand).

(Students write stories.)

Okay, class, now it's **time to share**. **Who would like to show the class their window and share their writing?** (Alternative option: Split students into groups to share writings with other students who chose the same window. This way they can share with each other their different perspectives.)

Activity – Create Your Own Window (My Stained Glass Window worksheets are attached.) (15-17 minutes)

Now that we have looked and shared our thoughts on the kind of subjects that are displayed on stained glass windows, each of you will create your own window. I'll provide you with the location of your window and give you time to think about the story you want to tell and how you can create that story with images.

(There are different options to providing the framework. You may choose or allow them to choose the framework.)

1. For your school
2. For your home
3. For Washington National Cathedral

(Students create their windows with color pencils.)

Allow time for students to share their windows with their peers.

Exit (2 minutes)

What kind of story does this tapestry tell? (Have students share any changes out loud)



Conclusion (1 minute)

Today, we talked about how stories can be told through color and images, not with words. We see images everywhere that tell stories or give messages in many different ways. During our Gothic Adventure, we have looked at Washington National Cathedral, the past, mathematical exercises, and visual analysis to see the many ways in which we give an object, building, or image its purpose and meaning.

Window Information

Agriculture and Maritime, Joseph G. Reynolds, Jr., 1959, Nave, North Main Arcade, Bay 6.

This window is dedicated to William Green, who worked in the coal mines but later organized the American Federation of Labor. His life's work was to create a society in which every human being was recognized for the value of his or her work. It recognizes those members of the agriculture and maritime "guilds" who ply their trades in the soil and on the sea, providing the basic nourishment of life. The theme of the window is the sacramental nature of work through the production of food, basic to life, culminating in the bread and wine of Holy Communion. A series of biblical stories represents labor as an elemental part of secular and religious life. Ruth, here a symbol of agriculture, dominates the center lancet, as she gleanes in the fields of Boaz, and then when famine strikes the land, appeals to her mother-in-law Naomi to be allowed to go with her to Bethlehem. There, Ruth begins again, as she sows seed, a symbol of the renewal of life. In the lower left lancet, Peter, garbed like Ruth in blue and white, stands before the sea and the sails of his fishing vessel. Other figures include a Native American baking bread in a "bee house," farmers harvesting fields and raising dairy cattle, and the shepherd Joseph tending his flock. The seals of the forty American Federations of Labor unions are incorporated into the window's borders.

American Statesmen, Wilbur H. Burnham and Joseph G. Reynolds, Jr., 1946, North Transept, East Aisle, North Wall.

The theme of the window that originally filled this spot depicted Jesus counseling citizens to "Give unto Caesar" and "Give unto God." The window ended up being too dark for the space and the theme was changed to American statesmanship, a way of bridging the gap between biblical and modern times. Burnham created the left lancet, which focuses on Thomas Jefferson, writer of the Declaration of Independence and the Virginia Bill of Religious Liberties, and founder of the University of Virginia. His accomplishments are represented in the medallions above and below. Reynolds' depiction of James Madison, father of the U.S. Constitution, in the right lancet, focuses on the results of Madison's work as architect of the American system of government: a president taking the oath of office and the Supreme Court in deliberation. In the borders surrounding them are tiny colonial figures, such as a Minuteman and his wife and child, symbolizing the ideal that democracy also uplifts the common people. This window was made during World War II so the Cathedral had to justify to the War Production Board the use of the materials and labor involved, as well as relate the finished product to the war effort.

Space, Rodney Winfield, 1973, Nave, South Main Arcade, Bay 5.

This window commemorates the exploration of space and recognizes the countless people who pioneered our space endeavors and the first lunar landings. Photographs taken during the Apollo 11 mission provided inspiration for the color palette. The window is an **unusual** design that crosses all three lancets and suggests a vast opening into an infinite cosmos, rather than a window simply confined and framed by stonework. The color of the glass suggests immense solar spheres surrounded by radiations of light. A multitude of symbolic stars, represented as small white dots etched into the blue glass, penetrates the deep colors of space. The trajectory of a symbolic manned spaceship circling one of the spheres emphasizes man's small size in God's universe. A small round piece of white glass, shining in the center of a large dark red sphere in the upper portion of the center lancet, represents the artist's suggestion of microcosm. On this small piece of glass is attached the 2 3/8-inch basalt moon rock chip brought back by the Apollo 11 crew and presented to the Washington National Cathedral on April 21, 1974, at the dedication of the window and the fifth anniversary of the Apollo 11 landing.

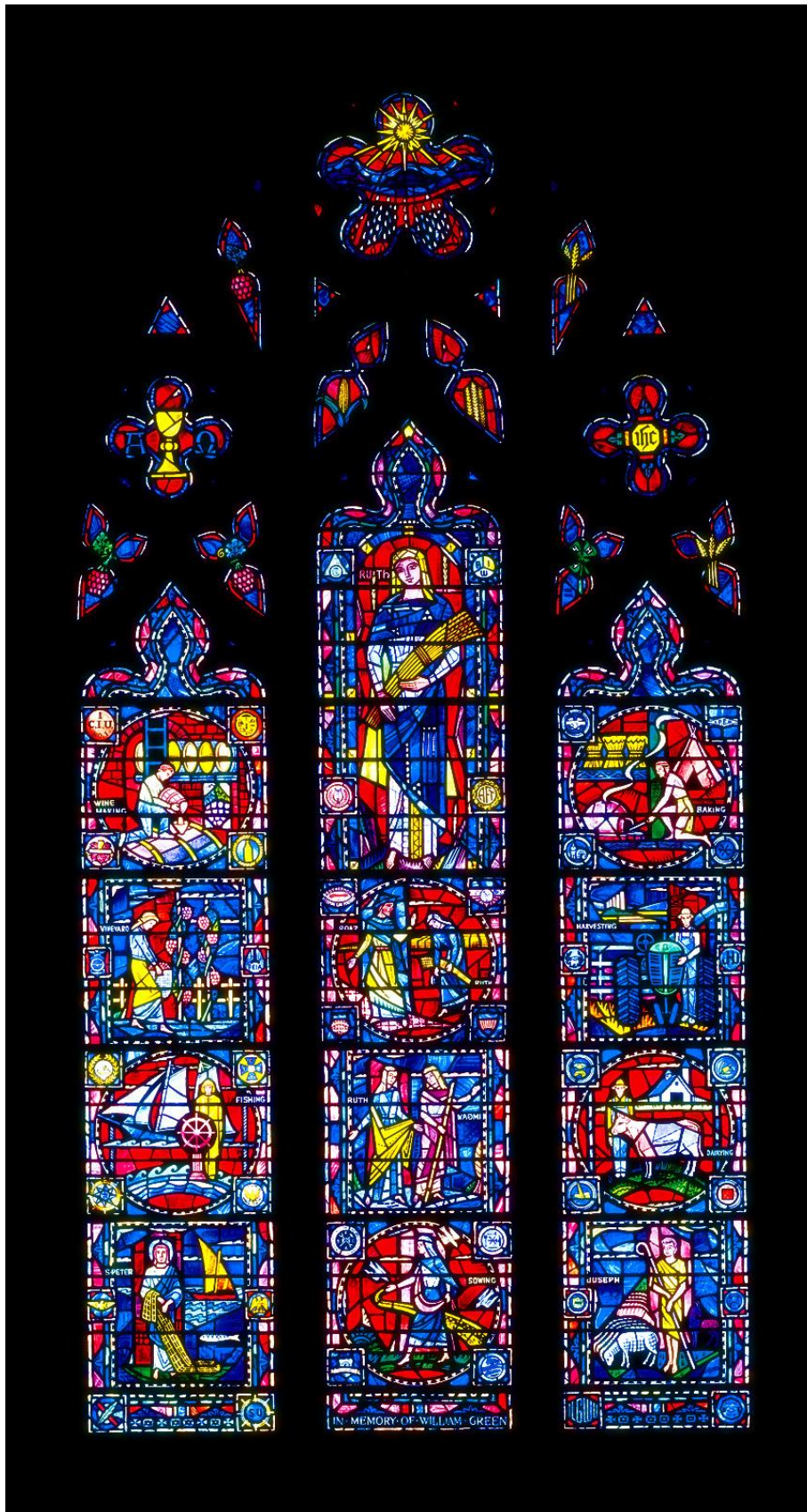
Women of the Bible, Brenda Belfield, 1977, Nave, North Main Arcade, Bay 2.

This window celebrates women who have expressed their love and devotion to God through unselfish service and humanitarian reform. It features women from the Old and New Testaments, whose devotion and faithfulness transcends the limits of time and connect them in a sisterhood that continues today in the work of the Young Women's Christian Association. The left lancet illustrates the story of Pharaoh's daughter, who discovers Moses in a basket along the Nile River and raises him as her own, illustrating how an act of charity can overcome national barriers. The center lancets features sisters Mary and Martha. Martha prepares the food while Mary basks in a golden light representative of divine presence. Naomi is depicted in the right lancet with her arms extended toward her daughter-in-law, Ruth. The mutually loving relationship of these women of different backgrounds celebrates the YWCA's mission to draw together women of diverse experiences and faiths. In the cinquefoil above, a blue triangle represents the YWCA's motto, "Body, Spirit, and Mind."

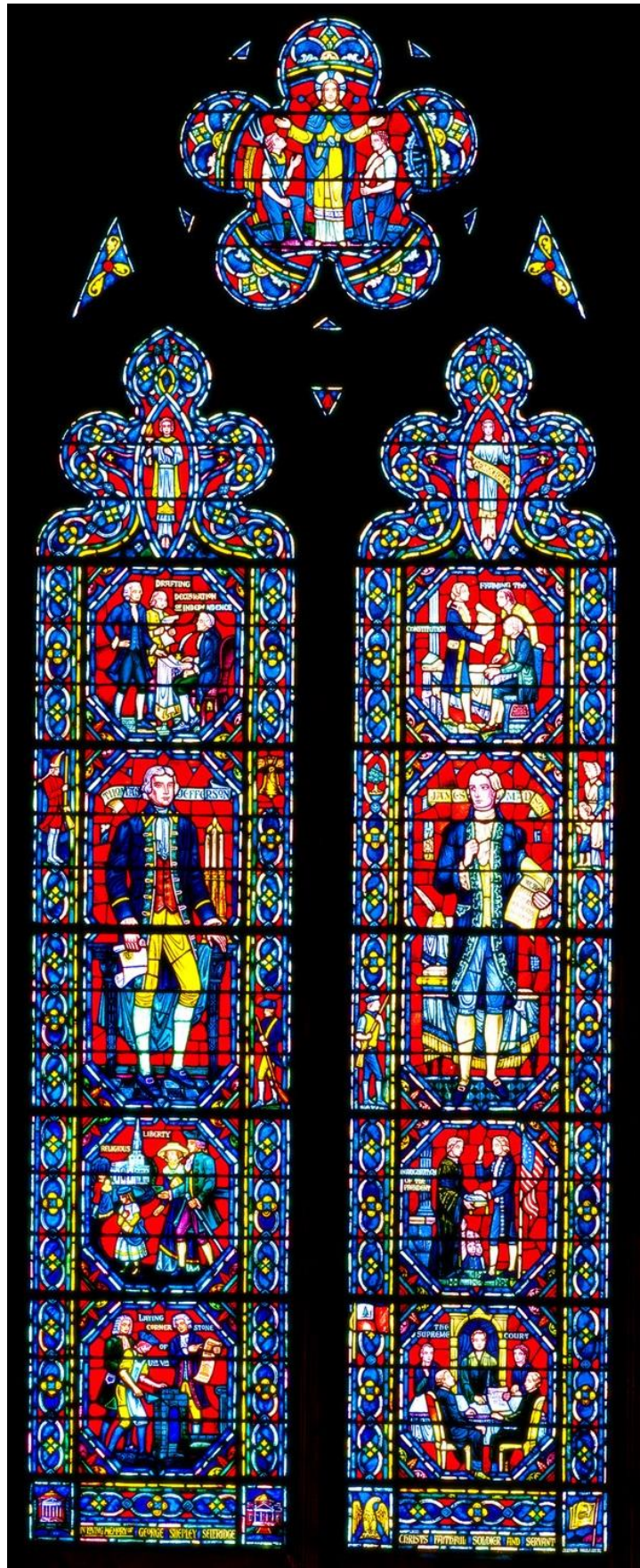
Stained Glass Windows - Story Worksheet

Name of my window _____

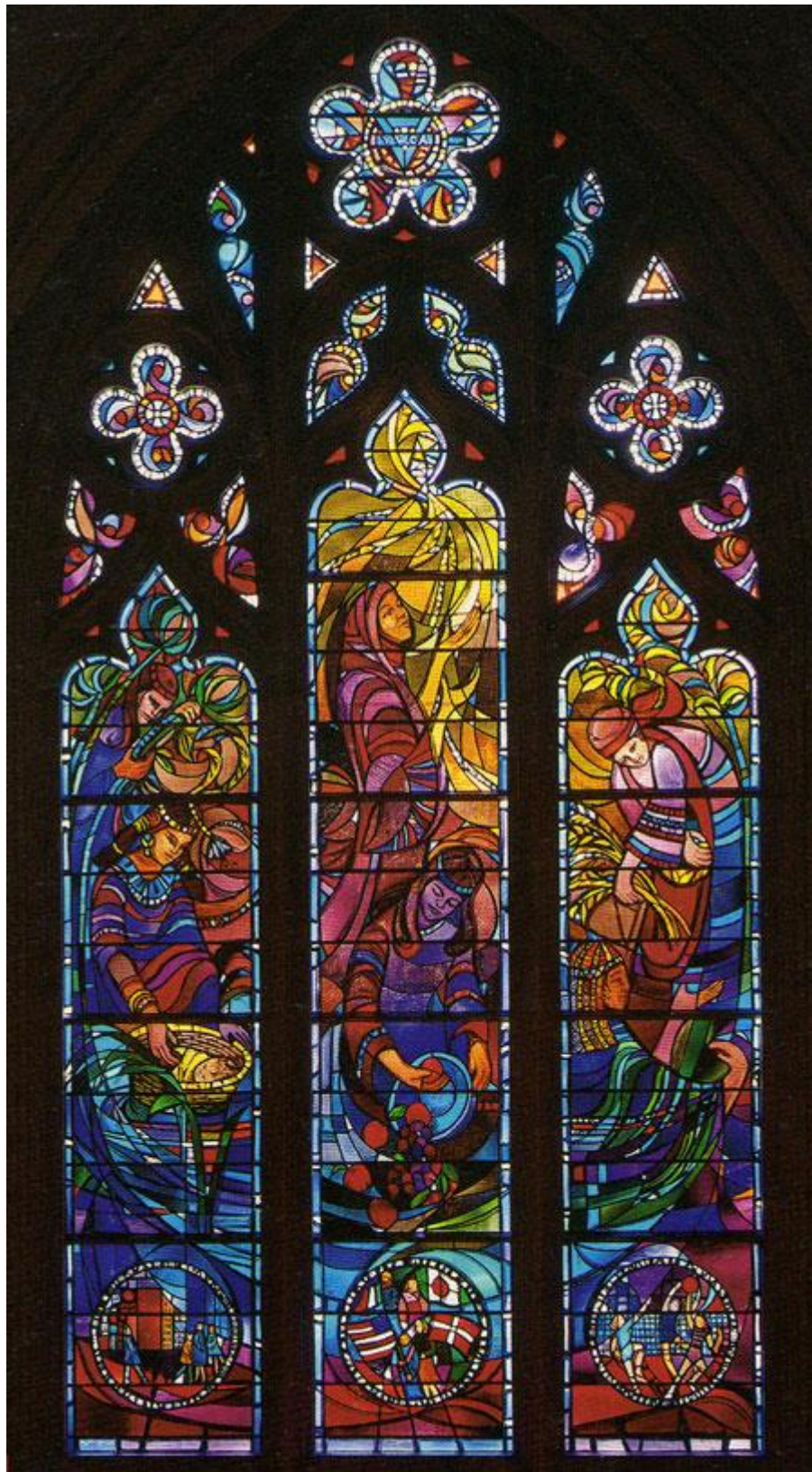
Example Window



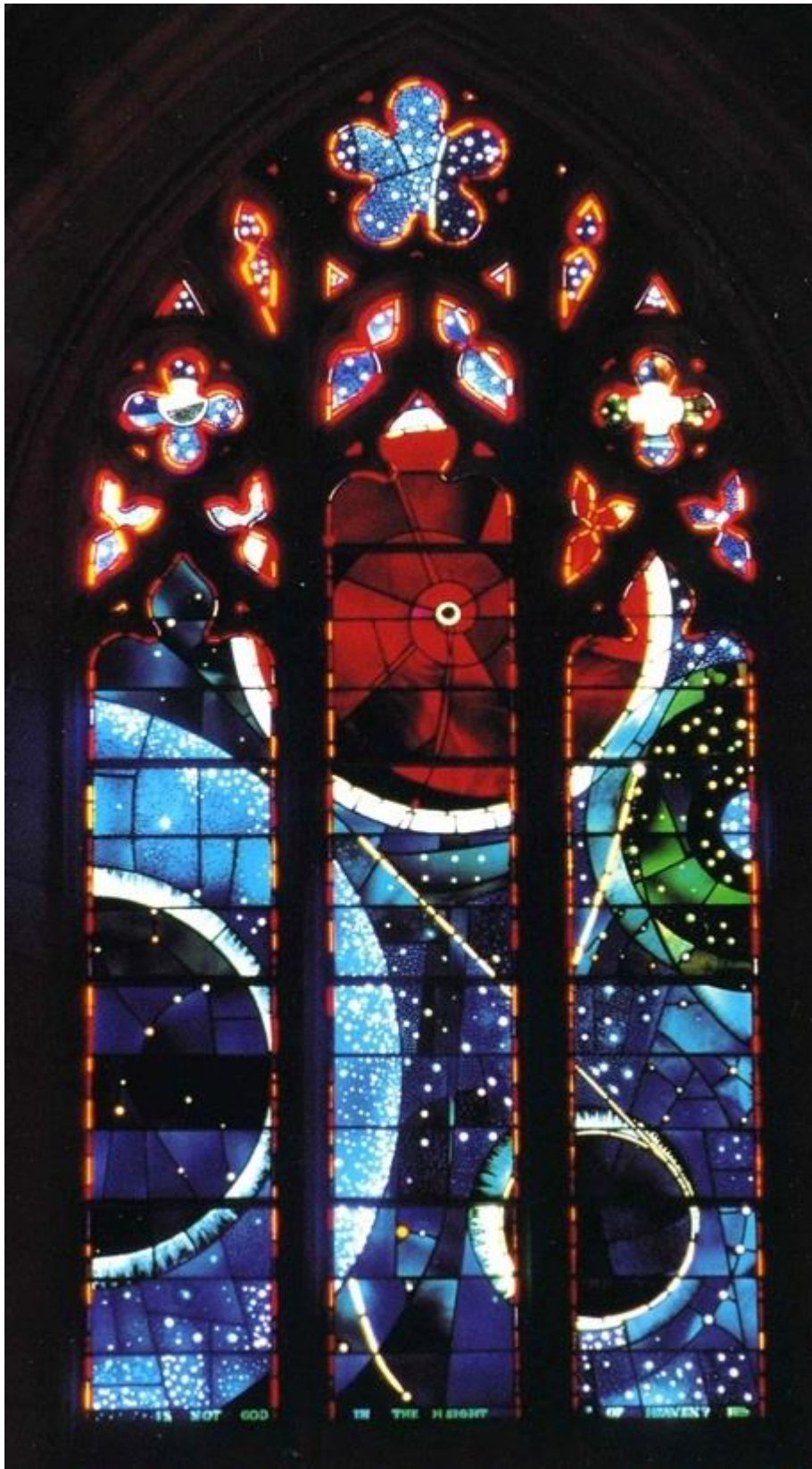
Window 1



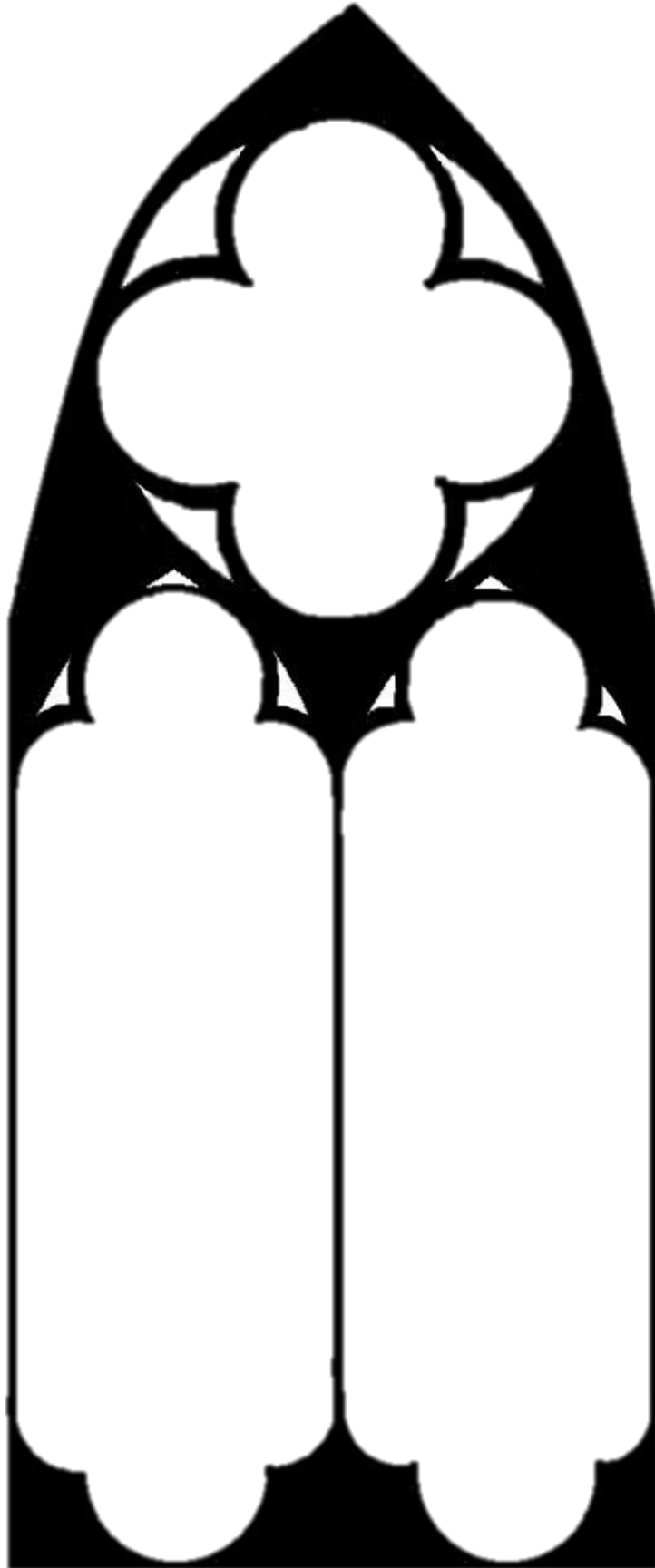
Window 2



Window 3



My Stained Glass Window



My Stained Glass Window



Photo Credits

Title Page

- Bird's eye view of the Cathedral courtesy of Washington National Cathedral

The Architectural Landscape

- Notre Dame – GoldenNumber.Net at <http://www.goldennumber.net/golden-section/>
- Münster in Freiburg – Maths for Europe at <http://mathsforeurope.digibel.be/Gulden.htm>

It's Bigger on the Inside!

- Lion Gate: <http://www.civilization.org.uk/minoans/mycena>
- Door leading to nave: Google maps
- Colosseum: <http://www.destination360.com/europe/italy/rome/colosseum>
- Door of the Chapel of St. Joseph of Arimathea: Google Maps
- View of the nave: Free in DC at <http://freeindc.blogspot.com/2014/01/upcoming-contemplation-music-tonight.html>

What's in an image?

- *David and Goliath in Combat*: Battista Dossa, 16th century tapestry
- *Agriculture and Maritime* (1959): Ken Cobb in *Jewels of Light: The Stained Glass of Washington National Cathedral*
- *American Statesmen* (1946): Ken Cobb in *Jewels of Light: The Stained Glass of Washington National Cathedral*
- *Space Window* (1973): Ken Cobb in *Jewels of Light: The Stained Glass of Washington National Cathedral*
- *Women of the Bible* (1977): Ken Cobb in *Jewels of Light: The Stained Glass of Washington National Cathedral*
- Stained glass photo by Colin Winterbottom