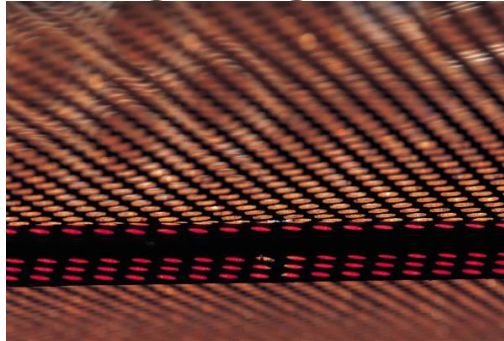


**Young Scholars  
Summer School  
Grades 3–5**



**Investigating  
Patterns**

# Investigating Patterns



## Standards

### Mathematics

- 5.5 The student, given a dividend of four digits or fewer and a divisor of two digits or fewer, will find the quotient and remainder.
- 5.13 The student will measure and draw right, acute, and obtuse angles and triangles, using appropriate tools.
- 5.14 The student will classify angles and triangles as right, acute, or obtuse.
- 5.15 The student, using two-dimensional (plane) figures (square, rectangle, triangle, parallelogram, rhombus, kite, and trapezoid) will
- recognize, identify, describe, and analyze their properties in order to develop definitions of these figures;
  - identify and explore congruent, noncongruent, and similar figures;
  - investigate and describe the results of combining and subdividing shapes;
  - identify and describe a line of symmetry; and
  - recognize the images of figures resulting from geometric transformations such as translation (slide), reflection (flip), or rotation (turn).
- 5.20 The student will analyze the structure of numerical and geometric patterns (how they change or grow) and express the relationship, using words, tables, graphs, or a mathematical sentence. Concrete materials and calculators will be used.

### English

- 4.6 The student will demonstrate comprehension of information resources to research a topic.
- Construct questions about a topic.
  - Collect information, using the resources of the media center, including online, print, and media resources.
  - Evaluate and synthesize information.
- 5.5 The student will read and demonstrate comprehension of fiction: describe (and write using—4<sup>th</sup> grade) the characteristics of free verse, rhymed, and patterned poetry.
- 5.6 The student will read and demonstrate comprehension of nonfiction.
- Use text organizers, such as type, headings, and graphics, to predict and categorize information.
  - Identify structural patterns found in nonfiction.

- c) Locate information to support opinions, predictions, and conclusions.
  - d) Identify cause-and-effect relationships.
  - e) Identify compare-and-contrast relationships.
  - f) Skim materials to develop a general overview of content and to locate specific information.
  - g) Identify new information gained from reading.
- 5.7 The student will demonstrate comprehension of information from a variety of print resources.
- a) Develop notes that include important concepts, summaries, and identification of information sources.
  - b) Organize information on charts, maps, and graphs.
- 5.8 The student will write for a variety of purposes: to describe, to inform, to entertain, and to explain.
- a) Choose planning strategies for various writing purposes.
  - b) Organize information.
  - c) Demonstrate awareness of intended audience.
  - d) Use precise and descriptive vocabulary to create tone and voice.
  - e) Vary sentence structure.
  - f) Revise writing for clarity.
  - g) Use available technology to access information.

**Science/Social Studies**

Will vary depending on student research topic choices.

**Concept:** Patterns

**Topic:** Tiling and Tessellations

**Parallel**

**Parallel of Practice –**

- Students will test hypotheses about number patterns and relationships in order to discover mathematical rules as a mathematician or scientist would do.
- Students will grow in their ability to conduct research and learning to learn skills using available technology and resources.
- Students will be exposed to a variety of careers and their use of patterns in each field in order to reflect about potential future career paths.

**Identity –**

- Students will reflect on their intelligence and learning preferences in order to reflect on their academic strengths and how to build on them.
- Students will apply critical and creative thinking skills in researching various career possibilities and reflecting on their interest and match to preferred work style.

**Core –**

- See SOL's above.

## Essential Understandings

- Patterns exist in natural and man-made worlds
- Patterns can help us organize and simplify information
- Patterns reflect the past and predict the future
- Patterns can be cyclical
- Patterns may change over time

## Essential Questions

What is a pattern?  
Where can we find patterns?  
Why look for patterns?  
What can we say about patterns?  
How do professionals use patterns in their work?  
How can I research information that I want to learn about?  
How do I feel about the work of various professional careers investigated?  
How can we be pattern observers?

## Knowledge and Skills

Students will be able to:

- analyze patterns according to whether they're natural or manmade
- analyze patterns as to how they can help predict
- articulate in oral and written form how and why patterns work (their functions and purposes)
- hypothesize, test, and create patterns
- articulate how patterns are used across disciplines

## Assessment Evidence

Journal Reflections  
Pre/Post assessments: Concept/ Writing/ Math  
Anecdotal Records  
Portfolios  
Research Folder  
Museum Product  
Tessellation Product and Written Explanations

## Learning Activities

### **Critical/ Creative Thinking**

Graphic Organizers

Informative Writing

Socratic Seminar

Group Investigation

Logical problem solving strategies

Pattern block manipulation and analysis

Use of mathematical tools

## **Additional Learning Activities**

Morning Meetings  
Field trip  
Read Aloud  
Shared Reading

# Investigating Patterns Unit

*Lesson Outline  
Young Scholar Summer Session 2005  
Grades 4-6*

## Week I:

*Essential Questions of Week I: What is a pattern? Where can we find patterns?  
Why look for patterns? What can we say about patterns?*

***Notes: Field Trip #1 Occurs Sometime this Week***

Monday	<ul style="list-style-type: none"> <li>• Welcome</li> <li>• Icebreaker</li> <li>• Set Class expectations</li> <li>• Overview (scope and sequence)</li> <li>• Pre-Assessment (Lang. Arts) ( App. A)</li> <li>• Introduction to Patterns (App. B)</li> <li>• Class discussion /Chart student responses</li> <li>• Begin multiple intelligence pattern making and hunting</li> <li>• Afternoon business: Field trip forms and \$</li> </ul>
Tuesday	<ul style="list-style-type: none"> <li>• Morning Business</li> <li>• Morning Meeting</li> <li>• Introducing Generalizations for Patterns (refer back to as you continue with the unit)</li> <li>• Poetry Pattern Hunting Stations</li> <li>• Ancient Culture Number Systems</li> </ul>
Wed.	<ul style="list-style-type: none"> <li>• Morning Business</li> <li>• Morning Meeting</li> <li>• Graphing Story Patterns with Fairy Tales</li> <li>• Geometry Terms</li> <li>• Exploration with Pattern Blocks and Measurement</li> </ul>
Thursday	<ul style="list-style-type: none"> <li>• Field Trip to the Maryland Science Center in Baltimore to visit Third Floor exhibit: Beyond Numbers <a href="http://www.mdsci.org/exhibits/beyondnumbers/index.cfm">http://www.mdsci.org/exhibits/beyondnumbers/index.cfm</a></li> </ul>
Friday	<ul style="list-style-type: none"> <li>• Morning Business</li> <li>• Morning Meeting</li> <li>• Looking for patterns in eminent professionals in and across disciplines</li> <li>• Introduction and Exploration with Tessellating Pattern Blocks and Interior Angle Measurement</li> </ul>

Week II -

**Essential Questions of the week: How do professionals use patterns in their work? How can I research that information? How do I feel about the work of various professional careers investigated?**

***Note: Try to schedule guest speakers from a variety of disciplines this week.***

***Field Trip #2 Occurs Sometime this Week***

Monday	<ul style="list-style-type: none"> <li>• Morning Business</li> <li>• Morning Meeting</li> <li>• Career Exploration</li> <li>• Guest Speaker #1</li> <li>• Designing Guiding Questions for Research</li> <li>• Setting up Research Folders</li> <li>• Exploring Transformations in Tessellations</li> </ul>
Tuesday	<ul style="list-style-type: none"> <li>• Morning Business</li> <li>• Morning Meeting</li> <li>• Guest Speaker from Smithsonian (speaker #2)</li> <li>• Archaeology Article</li> <li>• Socratic Seminar Preparation: Teaching Vocabulary and How to Write Open-Ended Questions</li> <li>• Introduction to Online Encyclopedias in Computer Lab</li> <li>• Experimentation to try out questions about transformations and manipulating tessellations</li> </ul>
Wed	<ul style="list-style-type: none"> <li>• Field trip to the National Museum of Natural History <a href="http://www.mnh.si.edu/">http://www.mnh.si.edu/</a></li> </ul>
Thursday	<ul style="list-style-type: none"> <li>• Morning Business</li> <li>• Morning Meeting</li> <li>• Guest speaker #3</li> <li>• Socratic Seminar and hold Seminar on Archaeology Article (today or tomorrow)</li> <li>• Introduction to Online Databases</li> <li>• Imagination with Tessellations: It Looks Like... (today or tomorrow)</li> </ul>
Friday	<ul style="list-style-type: none"> <li>• Morning Business</li> <li>• Morning Meeting</li> <li>• Guest speaker #4</li> <li>• Learning about the Internet (Reading and PMI)</li> <li>• Search Engines and Citing web pages for research sources</li> <li>• Continuing with Escher Masterpieces (some students may move on to geodesic domes if you decide to pursue that)</li> </ul>

*Week III*

*Essential Questions: How can we be pattern observers? How can we show what we've learned about patterns and set it up so that our families can observe patterns in a pattern museum and discover them too?*

*Note: This week, students will create a patterns museum that parents will be invited to come see at Open House.*

Monday	<ul style="list-style-type: none"><li>• Morning Business</li><li>• Morning Meeting</li><li>• Finishing activities from prior lessons</li><li>• Brainstorm ideas for the Pattern Museum on Open House Day Friday</li><li>• Introduce potential exhibit ideas</li><li>• Student work on Pattern Museum</li></ul>
Tuesday	<ul style="list-style-type: none"><li>• Morning Business</li><li>• Morning Meeting</li><li>• Finishing activities from prior lessons</li><li>• Research time</li><li>• Student work on Pattern Museum</li></ul>
Wed.	<ul style="list-style-type: none"><li>• Morning Business</li><li>• Morning Meeting</li><li>• Finishing work from prior lessons</li><li>• Post Assessment for Math</li><li>• Student work on Pattern Museum</li></ul>
Thursday	<ul style="list-style-type: none"><li>• Morning Business</li><li>• Morning Meeting</li><li>• Post Assessment on Patterns</li><li>• Finishing Student work on Pattern Museum</li><li>• Dress rehearsal for Pattern Museum Open House</li></ul>
Friday	<ul style="list-style-type: none"><li>• Morning Business</li><li>• Morning Meeting</li><li>• Finishing touches on Pattern Museum</li></ul> <p>Closing Activities: Parent Open-House Class Museum of Patterns</p>

# Lesson 1

## Developing the Classroom Community



### Morning Meeting

#### Rationale

Beginning summer school with activities to introduce students to each other helps establish a sense of community. Starting each day with a class morning meeting helps continue the development of the classroom as a community of learners throughout the duration of summer school.

The tone for a safe, risk-taking environment can be set by involving students in a daily shared activity that will help them focus on *patterns*.

<http://pbskids.org/cyberchase/games/patterns/patterns.html>

Use the *Cyber Pattern Player* to share music patterns as students enter the classroom.

#### Lesson Sequence

##### *Class Meeting:*

For today's first class meeting activity, the teacher begins a pattern by a series either snaps, claps or other hand motions. The next child in the circle repeats the pattern and then adds on their own step (no more than 5 beats). Then the whole group repeats it a second time. Then the next student in the circle repeats the teacher's and first child's pattern and then adds on the end (on their own). The whole group repeats the pattern together and then it goes on to the third child to add on, and so forth.

Afterwards, talk to the students about what their brain had to do in order to participate in the activity. (Elicit answers about being observant of one another, holding some key information in their heads, consciously completing the pattern during whole group repeats, etc.)

Explain that these same tools used in this game will come in handy as they study patterns in a variety of subject areas and learn how professionals use patterns to further what we know about the world.

## Patterns & Multiple Intelligences Pre-Assessment

Rationale	Lesson Sequence
<p>Tell the students that over the next few days, you will be assessing what they already know. This information will be used to help figure out what lessons they need or how they best learn. Reinforce that it's just for the teacher's information and so that at the end of summer school they can see how much they've learned and there is nothing wrong with not knowing an answer right now!</p> <p>Today students will complete 2 pre-assessments: one for patterns knowledge and one for learning style (assessing where their strength and preference is).</p> <p>If available, use <u>You're Smarter Than You Think: The Kid's Guide to Multiple Intelligences</u>. It could be used to introduce this lesson or might be used in daily morning meetings, focusing on one intelligence per day.</p>	<p><b>Patterns Pre-Assessment</b> Students complete the concept pre-assessment. (Appendix A)</p> <p><b>Multiple Intelligence Self-Assessment</b> <i>Brief</i> Explain that we all have strengths in different areas and use our strengths to learn in a way that is easiest for us. No way is right or wrong, but is just another way in which we are unique. Knowing about our preferences can help us to maximize how we learn or study.</p> <p><i>Multiple Intelligence Self-Assessment</i> Students independently complete the multiple intelligence assessment and score it. (Appendix B)</p> <p><i>Discussion Multiple Intelligences</i> The teacher goes over each of the intelligences and what are some trends in how a person might learn or study if they have each one.</p> <p>Chart (or graph) student names with top 3 intelligence preferences. Look at the chart as a class and see if there are any patterns that can be picked out. (ex. Most students prefer ____; Many students who prefer ____ also prefer ____; etc.)</p> <p><i>Debrief</i> As a class, discuss what might be the pluses (P), minuses (M), and interesting (I) things about multiple intelligences on a PMI chart - Appendix D. (Examples: P- knows how to study better, know self better, see how we're all unique, etc.; M- sometimes you don't have choices in activities in school; I- our brains are all somewhat</p>

	unique, there are many ways to learn and study instead of one, I learned something new about myself, etc.
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**Jacob’s ladder**

<p>Jacob’s Ladder is a learning journey for students that begins with targeted readings from fables, myths and nonfiction sources and moves them through an inquiry process from basic understanding to critical analysis of the text read. Tasks have been organized by skill ladders with questions and activities within each. Ladder rungs are organized to increase complexity in intellectual demand.</p> <p>Lessons 1 – 10 will highlight ladder skill sets (Sequencing, Cause and effect, Consequences and Implications, Details/Examples, Generalizations etc.) Students will use in the JL lesson activities. Each day, one skill will be introduced for students to gain understanding and experience. Beginning on lesson 15, students will actually complete JL lessons and should work to incorporate the skill sets in their culminating patterns museum.</p>	<p><b>Ladder Skill Set 1</b></p> <p>This first ladder helps students develop predictions or forecasting by asking them to make connections among data so that they can figure what might happen next. By starting with <i>sequencing</i>, students can recognize basic types of change that occur in a text. Through identifying <i>cause and effect</i> relationships, students can judge the impact of certain events. Finally, through identifying <i>consequences and implications</i>, students begin to discern what might happen next in a given situation.</p> <p><b>Sequencing:</b> This lowest rung on the predictions/forecasting ladder requires students to organize a set of information in order, based on their reading.</p> <p>With students, facilitate a discussion on what they think sequencing might be. Share the example below and initiate a discussion for student participation:</p> <p><b>Example:</b> List the steps of a recipe in order. (Students can list steps in any process)</p>
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## Mathematics Focus

Rationale	Lesson Sequence
<p>Students need to begin to see that there are patterns all around them. Patterns can be made up by us (as in the morning activity) or they can be found naturally, as they will be in today's lesson. One of the best known natural patterns is the Fibonacci sequence.</p> <p>For teacher background to use in hooking the students, a biography of Fibonacci is available at <a href="http://www-history.mcs.st-and.ac.uk/history/Mathematicians/Fibonacci.html">http://www-history.mcs.st-and.ac.uk/history/Mathematicians/Fibonacci.html</a>.</p>	<p><i>Hook</i> Show nature pictures that show the Fibonacci pattern and ask students if they observe any mathematical patterns in the pictures.</p> <p><i>Introduce the Fibonacci Sequence</i> Show students the pattern: 1, 1, 2, 3, 5, 8, 13, 21...</p> <p><i>Students Work in Pairs with the Pattern</i> Students work in pairs to complete Fibonacci Number Experiment (Appendix F) to find patterns within the Fibonacci pattern.</p> <p><i>Discuss &amp; Wrap it Up</i> Discuss the results of the pair work and their significance.</p> <p><i>To close</i>, have students look at their own hand and answer:</p> <ul style="list-style-type: none"><li>2 hands each of which has ...</li><li>5 fingers, each of which has ...</li><li>3 parts separated by ...</li><li>2 knuckles</li></ul> <p>Is this just a coincidence or not???? (There are more patterns you can find if you measure section of fingers, if you wanted to take time to do this.)</p> <p>Look at the nature pictures again. (Let students know these are <i>just a few</i> of the examples and there are many more!)</p> <p><b>EQ: Where do we find patterns?</b></p>

## **Read Aloud**

### **Teacher Choice**

Possibly read a poem that has a pattern. Tomorrow, students will work with patterns in poetry and this could be an opportunity for an informal pre-assessment of what they know already about poetry.

Option to have on transparency or chart paper: "Smart" by Shel Silverstein (Appendix G)

### **Comments**

# Lesson 2

## Exploring Patterns in Number Systems



### Morning Meeting

#### Rationale

Looking at patterns in poetry will help students see the fun in patterns. Later they will practice looking for patterns in other poems and trying to write a poem using patterns.

#### Lesson Sequence

*Welcome Message*

*Short Activity:* Patterns in dance steps. Have students show patterns in dance steps they know. Be prepared with a few as well. Students can teach them to one another and dance a little bit first thing in the morning.

If you did not have time to discuss “Smart” from the day before, discuss the patterns that are going on in the poem during morning meeting. (examples: rhyme pattern ABCB; number of coins increases by 1 each time while amount reduces from 1.00, to 0.50, to 0.30, to 0.20, to 0.05 – are there any number patterns there? See if any students connect that the reductions are all Fibonacci numbers from yesterday’s lesson).

Let students know that today they will be looking at some more patterns, specifically in poetry.

## Investigation

[http://atschool.eduweb.co.uk/sirrobbitch.suffolk/patterns\\_nature/index.htm](http://atschool.eduweb.co.uk/sirrobbitch.suffolk/patterns_nature/index.htm)

Patterns in nature

[http://www.linkslearning.org/Kids/1\\_Math/2\\_Illustrated\\_Lessons/5Patterns/](http://www.linkslearning.org/Kids/1_Math/2_Illustrated_Lessons/5Patterns/)

LINKS: Learning For Kids Website – Patten’s PowerPoint

<b>Rationale</b>	<b>Lesson Sequence</b>
<p>Today, facilitate a discussion on the actual meaning of patterns. Challenge students to provide examples of their thinking. Be sure to chart student responses.</p> <p>After this discussion, students might be able to make generalizations about patterns.</p> <p>As the unit progresses, refer back to the generalizations as they occur across various subject areas and ask students to make connections and analogies for their findings. At the end of the unit, students will take a concept post-assessment and will know the generalizations as well as be able to give the concrete examples that are learned throughout the unit.</p>	<p><b>Easier</b> - Patterns are things that repeat over and over. Patterns can be sets of objects, actions, or characteristics. They are things that are arranged or occur naturally. Examples of patterns are a set or combination of repeated lines, colors, letters, numbers, shapes, forms, figures, and actions or behaviors. You can find many patterns in nature such as honey combs and snow flakes.</p> <p><b>Harder</b> - A pattern can be a sample, a guide, or model that someone copies such as a pattern for a foundry casting, a machine part, or a piece of clothing. Patterns are also the typical activities of a thing, a person, or a group. Events or qualities can happen in the same way or in the same order. Things sometimes behave according to a pattern. A pattern occurs or can be used over and over again.</p> <p><i>Generalizations:</i></p> <ul style="list-style-type: none"><li>• Patterns exist in natural and man-made worlds</li><li>• Patterns can help us organize and simplify information</li><li>• Patterns reflect the past and predict the future</li><li>• Patterns can be cyclical</li><li>• Patterns may change over time</li></ul>

## Jacob's Ladder

<p><b>Cause and Effect:</b></p> <p>This middle rung on the predictions/forecasting ladder requires students to think about relationships among phenomena and identify what causes certain effects and/or what effects were brought about because of certain causes.</p>	<p>With students, facilitate a discussion on what they think cause and effect might mean. Share the example below and initiate a discussion for student participation:</p> <p><b>Example:</b> What patterns of behavior cause people to be afraid of dogs? What effect do the patterns of behavior have on people?</p>
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## Reading & Writing Focus

<p><b>Rationale</b></p> <p>Students will examine a variety of poems to identify the patterns and to explain the function of the pattern. (give us a cadence or rhythm that becomes predictable, entertains us and stimulates our brains (is fun), gives a structure to the author—guidelines or rules that they need to stay within once the pattern is established, etc.)</p> <p>They will then have the opportunity to try to use the pattern to write original poetry.</p>	<p><b>Lesson Sequence</b></p> <p><i>Poetry Pattern Hunting</i> Begin with a prewriting exercise in which students brainstorm potential topics for their poetry. Use either a web organizers or four-corner boxes (things I know about, things I'm interested in, things I wonder about, and things I've noticed (or other headings)) to list possible topics whole group and as individuals.</p> <p>Set up several stations with various types of poetry (rhyming being just one type) so that students can identify types of patterns in various types of poetry.</p> <p>After each type, students will have the opportunity to practice writing original poems by following the pattern. Students could also be encouraged to create their own pattern and write with it, as long as they can articulate what the pattern is.</p>
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## Mathematics Focus

Rationale	Lesson Sequence
<p>Students need to realize the importance of pattern observation in mathematics—how it has been the reasoning behind algorithms that they learn in school, and how noticing patterns in number relationships helps them to look at the world as it relates to mathematics and apply mathematical skills (estimation, determining reasonability, creating new ways to solve problems) in other areas.</p> <p>In this lesson, students will examine patterns in the number systems of ancient cultures and across number systems.</p> <p>Recommended Resource: <u>Can You Count in Greek? Exploring Ancient Number Systems</u> by Judy Leimbach</p> <p><b>EQ: In what ways do patterns help us reflect the past and predict the future?</b></p>	<p>Read together and discuss <u>The Math Curse</u> by Jon Scieszka and Lane Smith. Depending on time spent in discussion, you may want to stop at the page that talks about Planet Tetra and Binary and finish the rest at a later time.</p> <p>Group students into 3 ancient cultures: Mayan, Egyptian, and Roman. Distribute the summary overview of the culture (Appendix I). Have each student create a web on the culture on which they highlight the important information that they will use to teach other groups.</p> <p>Next, have the students learn about the number system of the ancient civilization and practice using it to write numbers in our number system. (Appendix J, K)</p> <p>Jigsaw students so that they are in groups where there is a representative from each civilization in the group. Each student will teach the most important facts about the civilization to the jigsaw group and will show them how to use the number system. After all three are taught, students can practice translating numbers across number systems using “Egyptian Number System” and “Wish You Were Here” (Appendix K)</p> <p>Using “How Do They Compare,” (Appendix L) have students compare and contrast the number systems and use the graphic organizer to look for patterns.</p> <p>Discuss as a group what they now appreciate about how our number system is set up (base 10), what patterns are in that number system, etc.</p>

**Fiction Read Aloud**

Teacher Choice or Finish The Math Curse from earlier.

**Comments**

# Lesson 3

## Pattern Art



### Morning Meeting

#### Rationale

Students will continue understanding how patterns are found in their daily lives and how they can be useful to us.

Students will then employ creative thinking skills to create similes that allow them to explore the concept of patterns.

#### Lesson Sequence

##### *Welcome*

Call students to the circle using a pattern that they will need to describe once everyone has been called.

(Ideas: boy, girl, girl, boy, girl, girl; alphabetically backwards)

Discuss how finding out the pattern could help you predict who would be called next.

Ask about patterns in daily life, in seasons, etc. How do they help us predict and plan?

Ask students to compare patterns they've learned about so far to something else in order to create a metaphor for patterns. Patterns are like \_\_\_\_\_ because \_\_\_\_\_.

Record ideas.

Let students know that today we are going to examine patterns in the *art* of reading/writing and math!

## Investigating

Rationale	Lesson Sequence
<p>To focus attention and establish personal connections, the lesson will open with students encapsulating all that they've learned so far about patterns to brainstorm and name any kind of pattern of which they can think.</p>	<p>As a class, discuss learned ideas and conclusions that you've identified. Students should then brainstorm patterns that come to mind. Chart student responses as you go. The class will then attempt to group the results into areas of similarity. For example, the class might separate manmade and naturally occurring patterns.</p> <p><b>EQ: What is a pattern? Why do we look for patterns?</b></p>

## Reading Focus

Rationale	Lesson Sequence
<p>Students will use graphing to map the excitement level of a fairy tale in order to look for patterns that an author may use when writing a story.</p> <p>Note: Possibly use the book <u>Thirty-Three Multicultural Tales to Tell (American Storytelling)</u> by Pleasant DeSpain, Joe Shlichta in order to read from a variety of cultures. The book can also be used for an extension into storytelling techniques.</p>	<p>Read one fairy tale together. Tell students that they should remember the events of the story because they will be asked to recall what happened at the end.</p> <p>After reading, label the events on large post it notes.</p> <p>Now ask the students <i>how</i> we might graph the events of the story? Once we decide what we might graph (example: level of excitement in the story), what type of graph should we use? (Line graph to show change over time. Many students will possibly say bar graph, so discuss the distinction). Show how to set up the graph: title (Excitement in Snow White); intervals on the y axis (snore, one eye open, you have my attention, I'm on the edge of my seat; I fell off my seat!); intervals on the x axis (the story events you put on post-it notes, in order).</p> <p>After doing this as a group, you may</p>

	<p>have students work in small groups on several other selected fairy tales from the chosen collection. Each group should graph the same type of data, whether it's excitement level or something else selected by the class.</p> <p>Come together to discuss patterns that are seen from graph to graph. Discuss: Why do you think authors use this sort of pattern? Does this pattern ever get boring? How might we change it around a little but still hold the reader's attention?</p>
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### Jacob's Ladder

<p><b>Consequences and Implications</b></p> <p>This highest rung on the predictions/forecasting ladder requires students to think about short term and long term events that may happen as a result of an effect they have identified.</p>	<p>With students, facilitate a discussion on what they think consequences and implications might mean. Share the example below and initiate a discussion for student participation:</p> <p><b>Example: What are the consequences of students getting into the pattern of arriving to school late? Short Term? Long Term?</b></p>
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### Mathematics Focus

<p><b>Rationale</b></p> <p>Students will be motivated by looking at examples of art (quilting, Escher tessellations, Iranian tiling, etc.). Before we can learn how to make these, however, we must first review some basic Euclidian Geometry so that we can all speak from the same vocabulary in articulating the patterns!</p>	<p><b>Lesson Sequence</b></p> <p>Get the students interested by showing them examples of art (some pictures in Appendix M but more (and color) from books would probably be more motivational for students). If you know a quilter, this would be a great time to invite them in to discuss patterns in their quilting and the math thinking that goes into it!</p> <p>Create wall glossary that will stay up for reference for students and review the terms (Appendix N):</p> <ul style="list-style-type: none"> <li>• intersection</li> <li>• line</li> </ul>
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- line segment
- ray
- geometric figure
- geometric curve
- closed and non-closed curves
- simple and non-simple closed curves
- polygons (simple and not simple)
- angle types (acute, right, obtuse, straight, reflex)
- types of triangles (isosceles, scalene, equilateral)
- types of quadrilaterals (parallelogram, rectangle, square, rhombus)

Exploration time (tomorrow will continue). Have students use pattern blocks to:

- demonstrate understanding of key vocabulary by tracing and labeling
- describe the angles and whether shapes are simple or not
- put together shapes to form new shapes that are not found in the pattern block set

Look back on the art pictures and identify places where the terms reviewed are found and why they will be important to know as we try to create our own pattern art.

**EQ: What can we say about patterns?**

**Read Aloud Ideas**

Leonardo's ABC: Sharing Leonardo Da Vinci With Children by Carolyn Cinami DeCristofano

Leonardo: Beautiful Dreamer by Robert Byrd

**Comments**

# Lesson 4

## Why do the pieces fit?



### Morning Meeting

Rationale	Lesson Sequence
<p>Next week students will visit the National Museum of Natural History and will begin to think about becoming curators for a class pattern museum.</p> <p>Today they will begin trying to figure out patterns by their own observations as they study patterns in biographies of eminent people in field of their choice.</p> <p>They will also use math knowledge to figure out why certain shapes tessellate or do not tessellate in building towards creating their own Escher-like art.</p>	<p><i>Welcome</i></p> <p><i>Read Aloud</i> Read aloud the two (or three) biographies of children’s authors (Appendix P). Use a Venn diagram to compare and contrast the lives of the writers.</p> <p>Ask students about the similarities section—are these patterns? How could we be surer if a pattern existed in how to become a popular writer?</p>

### Investigation

Rationale	Lesson Sequence
<p>Using biographical sources, students can investigate patterns in other fields of their choice by comparing and contrasting eminent individuals.</p> <p>Recommended Resource: <u>Historical Connections in Math</u> by AIMS (includes biographical sketches of women and ancient civilizations for mathematicians)</p>	<p>Have students decide which field they would like to investigate (mathematician, historian, marine biologist, archaeologist, artist, architect, etc.) and get into small interest groups based on their choice.</p> <p>Provide biographical sketches, books, and websites for students to investigate about the lives of eminent practitioners in their field. (This would work well as a research lesson in the computer lab,</p>

	<p>if available, using online encyclopedias, databases, etc.)</p> <p>Encourage students to think about attitudes, learning styles, etc. (not just events) in the individuals' lives as they create a Venn diagram they will use to present their findings to the rest of the class.</p> <p>Ask students to reflect on how they are similar to or different from eminent practitioners in their field of interest. If they are interested in pursuing that field, what lessons might they learn from the individuals?</p> <p><i>Meet to Debrief</i> The groups will present their findings to one another. As a class, look for patterns across disciplines that may be patterns of those who rise to the top of their field or earn the most recognition. This last part (if time) would make a good learning log/ reflection log entry.</p> <p><b>EQ: How do professional use patterns in their work? How can I research what I want to learn?</b></p>
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### Jacob's Ladder

<p>The second ladder of JL helps students develop skills in generalization so they can define concepts and develop the ability to abstract ideas from data given. It moves them from the level of citing concrete details to generalizing across details and examples about a topic or concept.</p> <p><i>Details and Examples</i>, the lowest rung on the concept development ladder, requires students to list examples or details from what they have read and/or to list examples from the real world of a concept they have read about.</p>	<p>With students, facilitate a discussion on what they think Details and Examples might be. Share the example below and initiate a discussion for student participation:</p> <p><b>Example: Make a list of examples of transportation?</b> (Possible answers: horse, buggy, car, truck, train, airplane, ferry, bicycle, cart, wheelbarrow, feet, boat, skis, sled, skates, rocket, helicopter, jet ski, piggy back, donkey, subway, snowmobiles)</p> <p>Students can also list examples of patterns.</p>
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## Mathematics Focus

Rationale	Lesson Sequence
<p>Students will use math tools to look for patterns in why certain shapes tessellate or do not in order to create a new pattern with several pattern blocks and to be able to articulate mathematically why they were able to tessellate the pattern.</p>	<p>Read aloud <u>The Greedy Triangle</u> by Marilyn Burns to open a discussion about shapes.</p> <p>Use pattern blocks to figure out <i>which</i> pattern blocks tessellate and naming them (equilateral triangle, square, rhombus, etc.) and which do not. Show students how to note which tessellate by either tracing (for younger children) or by noting the number of sides and number of shapes it takes (for example: 3.3.3.3.3.3 for the equilateral triangle because it takes 6 of them to tessellate around a point and each is 3 sided).</p> <p>Make sure students understand the prerequisite terms, including the following, by naming how many and which types are in the various pattern blocks.</p> <ul style="list-style-type: none"><li>• line segment</li><li>• polygon</li><li>• closed</li><li>• equilateral</li><li>• vertex</li><li>• angle types – acute and obtuse</li><li>• angle types – interior and exterior</li><li>• shape names</li></ul> <p>Ask students if we wanted to more closely label an angle, how might we do it? (some students may already know to use a protractor, but build to that through examining complementary angles and if some numbers are given)</p> <p>Show students how to estimate the angle using what they know about angle types and to then use protractors to measure the angle.</p> <p>Practice and then measure the interior angles of the shapes that tessellate.</p>

Look together for patterns. Then, look for patterns when you add the interior angles however many times it takes to tessellate around a point.

For example, for the equilateral triangle, it takes  $6 \times 60$  degrees, or 360 degrees. For a square (4.4.4.4),  $4 \times 90$  degrees = 360 degrees. See if that pattern holds true for other shapes that do tessellate.

Example of non-tessellating: pentagon, because  $108$  degrees  $\times 3$  is only 324 degrees (not enough) and  $108 \times 4$  is 432 degrees, too much. There will be gaps or overlaps.

(See Appendix M))

Close by asking students to create a tessellation with the pattern blocks, trace it, and make a learning log entry about why it tessellates. For able students, they can combine shapes and explain why it tessellates.

**EQ: How can we be pattern observers?**

### **Fiction Read Aloud**

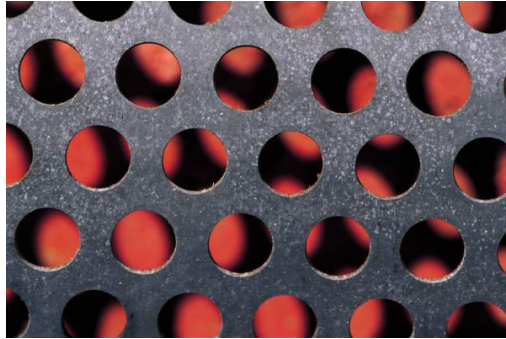
Have students see another way that pattern observation helped us in mathematics by reading the fictionalized story What's Your Angle Pythagoras? by Julie Ellis.

### **Comments**

Before summer school begins, enlist the art teacher and upper grade students to use exacto knives to cut out the shapes for you. They are allowed to use Exactos, and if they have students do it cutting just on the vertices, you will get 2 useable sets out of one sheet by having both the positives (the actual shapes cut out) and the negative (the paper left after all the shapes are cut out). Both could be used in the activities.

# Lesson 5

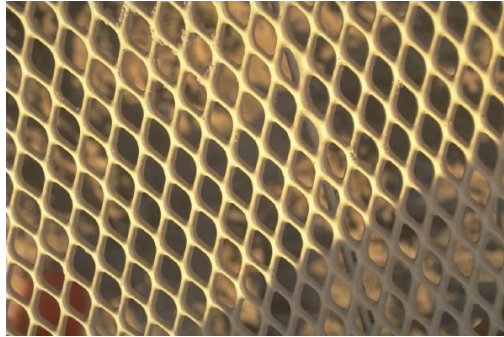
## Field-Trip to Explore Patterns



In the study of patterns, students will go on a field trip to explore real world examples and analyze the various forms patterns could take.

# Lesson 6

## Patterns across Disciplines



### Morning Meeting

Rationale	Lesson Sequence
<p>This week, students will research a career of their choosing and find out about the career and how patterns are used by the person in the profession.</p> <p>As an early assessment, students should compose a paragraph of career professionals that use patterns in their line of work. The discussion in the lesson sequence should follow.</p>	<p>Opening brainstorm question &amp; discussion: What careers do you think follow a lot of patterns and why?</p> <p>Hopefully students will name or be guided to name some careers that can be listed for potential research this week. Include those that tie heavily to our SOL's as well, including: gemologist (rocks &amp; minerals), geologist (landforms), meteorologist (weather), biologist (microscopes), historian (social studies), medical personnel (human body), computer science, anthropologists (social studies), forensics/police officer, etc.</p>

### Investigating

Rationale	Lesson Sequence
<p>Guest speakers who are asked to come present about their chosen field from a variety of disciplines will give students exposure to many careers to reflect with their identity. Each day this week, a recommended guest speaker will be named, but of course there is a lot of leeway in who is available to visit your classroom and where your students may lead you in their</p>	<p>Guest speaker from medical field to talk about:</p> <ul style="list-style-type: none"> <li>• how they got into the field</li> <li>• what a typical day is like</li> <li>• what they needed to do to prepare</li> <li>• how patterns are used in their profession</li> </ul>

<p>interests!</p> <p>Make sure the speaker knows your focus is on patterns and give them the generalizations students are studying up front so that they can hopefully tie those ideas into their presentations.</p>	<p><b>EQ: What can we say about patterns? How do professionals use patterns in their work?</b></p>
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### Jacob's Ladder

<p>Generalization is the highest rung on the concept development ladder. Generalization requires students to use the list and categories generated in Rungs 1 and 2 to develop general statements, usually 2 – 3, that apply to all their examples.</p> <p>Ladder #3 helps students develop literary analysis skills, based on practice with key literary elements of a text.</p> <p><b>Context/Setting/Characterization is the lowest rung on the ladder of literary analysis. This rung requires students to identify and/or describe the setting or situation in which their reading occurs.</b></p>	<p>With students, facilitate a discussion on what they think generalizations might be. Share the example below and initiate a discussion for student participation:</p> <p><b>Example:</b></p> <ul style="list-style-type: none"> <li>-Patterns exist in natural and man-made worlds</li> <li>-Patterns can help us organize and simplify information</li> <li>-Patterns reflect the past and predict the future</li> <li>-Patterns can be cyclical</li> <li>-Patterns may change over time</li> </ul> <p><b>Part 2</b></p> <p>With students, facilitate a discussion on what they think Context/Setting/Characterization might be. Share the example below and initiate a discussion for student participation:</p> <p><b>Example:</b></p> <p>In Goldilocks and the Three Bears, what pattern of events does Goldilocks follow? (tasting and testing things of the father bear – to huge, the mother bear – to big, and then baby bear – just right).</p> <p>This exercise may also require students to develop an understanding of a given character in a story, fable, or poem by identifying qualities he/she possesses and comparing those</p>
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	<p>qualities to other characters they have encountered in their reading.</p> <p><b>Example:</b> What qualities do you admire in Goldilocks? What qualities do you find problematic? How is she similar or different from other fairy tale characters you have encountered?</p>
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**Writing Focus**

<p><b>Rationale</b></p> <p>Students will be researching about a field of their choosing. In order to keep their information organized, develop some guiding questions (up to 6) that you would like each group to find out about and set up research folders so that students can keep their notes and findings organized.</p>	<p><b>Lesson Sequence</b></p> <p>Develop guiding questions for research as a class. Ideas might include:</p> <ul style="list-style-type: none"> <li>• How can we describe this career and what is a day in the life of this professional like?</li> <li>• What are the stepping stones to this career? What education is needed? What experiences are needed? What are some steps beyond this career?</li> <li>• How does this professional use each of the subjects we learn about in school in their career?</li> <li>• Practical Logistics: How much money do they make? Do they need to live in a certain part of the world? Do they need to travel a lot? Is their job 9-5 or weird hours? Is their job a desk job or an out-and-about job?</li> <li>• Who are some eminent professionals in this field?</li> <li>• How do patterns affect of influence this professional?</li> </ul> <p>Set up research folders using a large piece of construction paper folded in half like a book.</p> <p>On the outside cover, post a “Source Sheet” on which students will color code resources used and keep a bibliography. This can be differentiated by ability where some younger</p>
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	<p>students might just track titles and authors and older students might be responsible for more bibliographic information and formatting.</p> <p>On the inside, paste 6 envelopes into which students will put their color-coded notecards (colors marked on the cards will match the source page so that they only have to record bibliographic information one time). As students find answers to the guiding questions, they place the notecards in the pockets accordingly.</p>
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**Mathematics Focus**

<p><b>Rationale</b></p> <p>Students will begin playing around with the various shapes they have found to tessellate today, experimenting to see if they can get them to work in other situations after using flips, slides, and turns.</p>	<p><b>Lesson Sequence</b></p> <p>Review which shapes tessellated. Look over some Escher tessellations again and discuss how the shapes used may have been formed/manipulated, formed from the shapes that we found tessellated.</p> <p>Talk to students about examples of flips (reflections), slides (translations), and turns (rotations) using letters of their names.</p> <p>Have students predict what will happen when they try certain flips, slides, or rotations on small cutouts and tape downs of various shapes (note: students will need to begin and end cuts on the vertex of a side in order for it to work). This can be differentiated by having lower grade students work with simpler shapes, like squares or triangles, and upper grade students work with hexagons.</p> <p>Students physically cut out shapes and start manipulating them on the page to see if the newly created page will tessellate.</p> <p>If something works (or doesn't), it can be recorded on a class t-chart with some ideas about why it worked (or didn't). Encourage students as they work on this to use the vocabulary of geometry,</p>
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	including flips, slides, and rotations. <b>EU: Patterns may change over time</b>
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**Fiction Read Aloud**

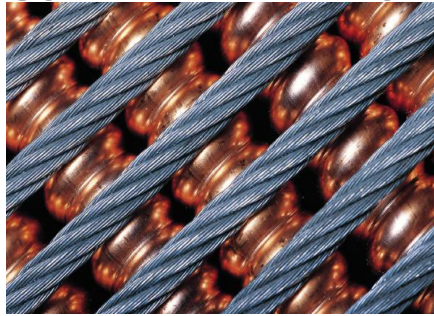
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**Comments**

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# Lesson 7

## Anthropology: A Journey into Culture



### Morning Meeting

<p><b>Rationale</b></p> <p>Students will continue to research a career of their choice. In order to keep their information organized, they should continue to work on organizing their folder with envelopes and note cards.</p>	<p><b>Lesson Sequence</b></p> <p>As students complete the set-up of their research folders, they should choose two or three of the guiding research questions to answer from their point of view. The research will later confirm or not confirm their thoughts and opinions. Students should work in pairs to share their perceived answers to the guiding research questions of which they chose to respond.</p>
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### Investigating

<p><b>Rationale</b></p> <p>Guest speakers who are asked to come present about their chosen field from a variety of disciplines will give students exposure to many careers to reflect with their identity. Each day this week, a recommended guest speaker will be named, but of course there is a lot of leeway in who is available to visit your classroom and where your students may lead you in their interests!</p>	<p><b>Lesson Sequence</b></p> <p>Guest speaker from Smithsonian listing (archaeology/anthropology) to talk about:</p> <ul style="list-style-type: none"> <li>• how they got into the field</li> <li>• what a typical day is like</li> <li>• what they needed to do to prepare</li> <li>• how patterns are used in their profession</li> </ul> <p><b>EQ: How do I feel about the work of the professional careers investigated?</b></p>
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## Jacob's Ladder

**Ladder #4 helps students develop skills in creative synthesis in order to foster students' creation of new material based on the information from the reading. It moves from the level of restating ideas to creating new ideas about a topic or concept.**

Paraphrasing is the lowest rung on the concept development ladder. This rung requires students to restate what has been read using their own words.

With students, facilitate a discussion on what they think paraphrasing might be. Share the example below and initiate a discussion for student participation:

**Example: Let's rewrite the following quote about patterns in our own words:**

Since we have been discussing patterns that teachers use in preparing their lessons, it should not be much of a surprise to find out that students also use patterns when they engage in academic work. When they open a book and begin to read, they follow a certain pattern as they work through the material. Likewise, taking notes, studying for exams, analyzing problems, preparing presentation are all activities that involve following certain behavioral steps. These are called learning patterns.

Another observation that should not prove too surprising is that some learning patterns are effective while others are not. For example, the patterns a student uses to prepare for an exam differ between high school and college. The college exam usually covers far more information and requires different preparation strategies. However, first year students are not likely to know about college patterns and thus continue to use strategies that worked for them in high school. This error will result in a student who may work hard but in wrong ways. Ironically, this student will appear to the teacher like someone who does not care or isn't capable.

## Reading Focus

<b>Rationale</b>	<b>Lesson Sequence</b>
<p>When students visit the National Museum of Natural History this week, they will be looking at exhibits of various cultures or findings of archaeologists, forensic anthropologists, and other scientists. The article will give them some background into what goes on behind the scenes in creating such an exhibit.</p>	<p>Read articles (First Americans, Talbot Dig Unveils Surprise, and African, European Remains Uncovered -- Appendix U) and prepare for Socratic Seminar on article. (Appendix V)</p> <p>Model for students how to complete the vocabulary section and how to create an "open-ended" question.</p> <p>Depending on the students' levels of experience with Socratic Seminar, you may want to differentiate the number of required vocabulary words.</p>

## Writing Focus

<b>Rationale</b>	<b>Lesson Sequence</b>
<p>Students will need to learning to learn skills to find out about topics. Over the next few days, students will learn a variety of research skills, including using a nonfiction and reference resources (index, encyclopedias, etc.), using a search engine and key words on the internet, using the county's online databases and online encyclopedias.</p> <p>Depending on availability of computer or mobile labs, rearrange research lessons as needed.</p>	<p>Introduce students to the online encyclopedias available at <a href="http://go.grolier.com/">http://go.grolier.com/</a>. Username and password are both "Fairfax." Let students know this is a resource available to them at home as well (put on Blackboard if you are using it) and they can use it from any computer with internet access (home, library, etc.)</p> <p>Show students how to brainstorm a list of key words to help them find out about their topic. For example, "anthropologist" returns zero results, but "anthropology" returns 15 results in a title search. Students can change it to an article search with the word "anthropologist" and they will get 437 results, giving them some more options and detailing branches of anthropology.</p> <p>Students should then have the opportunity to search for key words for the career they are researching and to either take notes from the screen or print articles to use back in the classroom.</p> <p>If printing, show students how to click on</p>

	<p>the “print” portion of the page (not in the menu bar under file where they may be used to), and click on the parts of the article they want to print. This way, they don’t waste paper printing everything if it’s not needed or they avoid getting just the first page of the article. They can also use print preview to find out how many pages will be used and you could possibly set a limit to the number of pages they are allowed to print so that they choose wisely.</p>
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**Mathematics Focus**

<p><b>Rationale</b></p> <p>Yesterday students just began experimenting with Escher-type tessellations. Today, they should try new things and continue playing with the shapes. Once they have 4 possible shapes they have tessellated on 4 pieces of paper, they will try to decide what object of pattern of objects the picture will become.</p>	<p><b>Lesson Sequence</b></p> <p>Begin by reviewing some of what worked or didn’t the day before and discussing why.</p> <p>If a triangle is maintained (no parts are thrown away) and a section cut out of one side is rotated around to the next side, why does the shape rotate?</p> <p>Can you slide on a triangle? Why or why not?</p> <p>On which shape(s) can you do all types of transformations: flip, slide, or rotation (use interchangeably with reflection, translation, rotation).</p> <p>If some questions are unanswered, record them on the board as experiment questions that students can work on today.</p> <p>Students need to come up with at least 4 manipulated shapes that they create that each tessellate a plane (trace the tessellation onto 4 separate pieces) by the end of tomorrow’s lesson. Also discuss the term congruent with students as they are tracing the shapes.</p> <p>After they finish that, you will talk about how to change it from a shape into a</p>
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piece of Escher art (a recognizable object or pattern of objects). This may be started by some students today.

Then Read It Looked Like Spilt Milk. Talk about how different shapes can become a lot of different possibilities.

Have a student come to the board and draw a random squiggling of shape. Repeat the same shape on the board a few times. As a group, decide what the shape could possibly become. Show how you could have a background with the object in the foreground if you really struggle with what it is, but encourage creativity and imagination!

Students will then make that object repeatedly (or make a pattern of objects) by coloring in their tessellation over and over until the piece is finished.

Show how they can cut around so that the perimeter of the shape is done by lines of their traced work instead of the page border, if they choose.

Have students journal and describe the math and art that went into their creation.

If students finish, they can create another one. Challenge them to decide on a shape and then to try to use their math skills and knowledge of tessellations to create that shape with flips, slides, turns. (To work backwards from how they just did it.) Reflect on which was easier or more fun for individual students and why.

**EQ: What can we say about patterns?**

**Fiction Read Aloud**

**Comments**

# Lesson 8

## Escher Masterpieces



### Morning Meeting

<b>Rationale</b>  Students may not realize patterns in history or be familiar with the saying “history repeats itself” so you can discuss that and examples of patterns in history: economics, conflicts-cause/effect, etc.	<b>Lesson Sequence</b>  Discuss the quote and patterns in:  “History is a cyclic poem written by time upon the memories of man.”  <a href="#">--Percy Bysshe Shelley</a>  This will lead into today’s guest speaker.
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### Investigating

<b>Rationale</b>  Guest speakers who are asked to come present about their chosen field from a variety of disciplines will give students exposure to many careers to reflect with their identity. Each day this week, a recommended guest speaker will be named, but of course there is a lot of leeway in who is available to visit your classroom and where your students may lead you in their interests!	<b>Lesson Sequence</b>  Guest speaker from historian field to talk about: <ul style="list-style-type: none"><li>• how they got into the field</li><li>• what a typical day is like</li><li>• what they needed to do to prepare</li><li>• how patterns are used in their profession</li></ul> After the speaker, students can spend time reflecting in their journals about what they learned. Then they can move on to investigating and collecting information to answer the guiding questions on their career research
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	<p>projects.</p> <p><b>EQ: What can we say about patterns? How do professionals use patterns in their work?</b></p>
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**Jacob's Ladder**

<p>Summarizing, the middle rung on the creative synthesis ladder, requires students to summarize paragraphs or sections of text.</p>	<p>With students, facilitate a discussion on what they think summarizing might be. Share the example below and initiate a discussion for student participation:</p> <p><b>Example:</b> Choose one section of the articles read yesterday and summarize it in five sentences.</p>
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**Reading Focus**

<p><b>Rationale</b></p> <p>Yesterday, students read an article about archaeology and anthropology and prepared for a Socratic Seminar. The seminar could fit nicely either before going to the Natural History Museum (in which case, you could have the follow up be something to do at the Natural History Museum), or it could be done after the field trip which will give the students additional reference for discussion.</p>	<p><b>Lesson Sequence</b></p> <p>Go over the Etiquette of Socratic Seminar with students.</p> <p>Have them create a name tag with their title and last name (Miss Smith or Mr. King).</p> <p>Post the questions for discussion (open-ended questions from the students prep work).</p> <p>Model for the students how to reference the text to support their ideas.</p> <p>Model for students how to agree or disagree with something that is said.</p> <p>Have a great discussion! (Possibly skip the hot seat recorder for the first discussion depending on the experience levels in the group with Socratic Seminar).</p>
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## Writing Focus

<b>Rationale</b>	<b>Lesson Sequence</b>
<p>Students will need to learning to learn skills to find out about topics. Over the next few days, students will learn a variety of research skills, including using a nonfiction and reference resources (index, encyclopedias, etc.), using a search engine and key words on the internet, using the county's online databases and online encyclopedias.</p> <p>Depending on availability of computer or mobile labs, rearrange research lessons as needed.</p>	<p>Introduce students to the online databases that are available to them through the county and discuss the types of resources it makes available. <a href="http://www.fcps.edu/DIT/library_services/online_databases.htm">http://www.fcps.edu/DIT/library_services/online_databases.htm</a>.</p> <p>Before teaching the lesson, get on and play around with the databases yourself so you are familiar with which ones you prefer and would like to teach. All that are listed are available for students, but Gale might be a good place to begin. Once on the Gale databases, click on Kids' Edition or Kids Infobits.</p> <p>Model for students how to search for a topic. Since you used "anthropology" yesterday, you could continue with that. On Kids' Edition, type in the search. Show students the various headings that will pop up for them and how they can navigate through that to get to the best possible information for what they are looking. For example, one says "Anthropology as a Profession" and when viewed, it shows there are 2 encyclopedia entries, 5 periodicals (discuss periodical if you didn't already), and related subjects (show a list of other things students might look up if they are having trouble with their search or want to go deeper).</p> <p>Students should then have time to do their own searches on the profession they are researching, and time to either take notes or print articles they will use back in the classroom.</p>

## Mathematics Focus

### Rationale

Yesterday students continued experimenting with Escher-type tessellations. Today Review the concept of a palindrome. A palindrome is a number that reads the same forward and backward, such as 44 or 252 or 8008. (3.1A) A number that is not a palindrome, such as 13, can be changed into a palindrome by adding in a certain pattern: Reverse the digits to make a new number and add it to the original number. Record how to do this on the board. Since it took one addition, 13 is a one-step palindrome. Some numbers take more than one addition.

**Extension(s)** *(to lead students to connect the mathematics learned to other situations, both within and outside the classroom)*

- Students can look for words that would be considered palindromes, such as mom, dad, Hannah.

Students can try to write a sentence that is a palindrome or do research to find some that have been written, e.g. Able was I ere I saw Elba.

### Lesson Sequence

1. Demonstrate with 68 (a 3-step palindrome).

$$\begin{array}{r} 13 \ 68 \\ +31 \ +86 \\ \hline 44 \ 154 \end{array} \text{ and } \begin{array}{r} 154 \\ +451 \\ \hline 605 \end{array} \text{ and } \begin{array}{r} 605 \\ +506 \\ \hline 1111 \end{array} \text{ (a palindrome)}$$

2. Present the problem to be solved: Each group is to investigate in this way all the numbers from 0 to 99 and look for patterns in how numbers become palindromes.

3. Students should decide how to divide up the work within their group and how to keep records of their information. (3.15C) Examples of record-keeping devices include:

-listing the numbers 0-99 in a chart showing the number of steps and the palindrome reached;

-grouping the numbers 0-99 according to the palindrome they generate;

-grouping the numbers 0-99 according to how many steps it takes to make a palindrome. (Tell them to beware of 98 and 89. These numbers each take 24 steps. The palindrome reached is 8,813,200,023,188).

-recording the groups of numbers on a hundreds chart by coloring one-step palindromes red, two-step palindromes green, etc.

**Guiding Questions** *(to engage students in mathematical thinking during the lesson)*

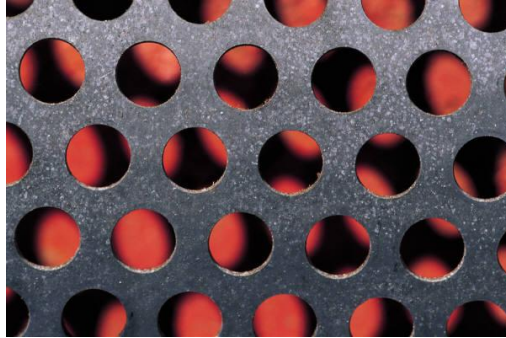
- How did your group decide to record and organize your information? Why?
- What new things do you see if you

	<p>reorganize it this way?</p> <ul style="list-style-type: none"> <li>• What things have you found to be important in finding the palindromes?</li> <li>• Are you beginning to notice any patterns?</li> <li>• What shortcuts, if any, have you developed in finding the information?</li> <li>• Are one-digit numbers palindromes? Why or why not?</li> </ul> <p><b>Summary Questions</b> <i>(to direct students' attention to the key mathematics in the lesson)</i></p> <p>To determine to what extent students' have recognized patterns and made generalizations from them, ask questions such as:</p> <p>-What are some patterns that emerged on the charts? (Have students record summary statements. Some groups notice, for example, that when the sum of the digits of a number is less than 10, the number is always a one-step palindrome. Others notice that all resulting palindromes are multiples of 11. Have students look for other patterns such as these.</p> <p>-How did you categorize the one-digit numbers--as one-step, already palindromes, or not palindromes at all? (There is no right answer for this, but groups should be able to explain their decision based on the patterns they have observed.</p> <p><b>EQ: Why do we look for patterns?</b></p>
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**Fiction Read Aloud**

## Lesson 9

### Field-Trip to Explore Patterns



In the study of patterns, students will go on a field trip to explore real world examples and analyze the various forms patterns they could take.

# Lesson 10

## Linked: The Internet of Knowledge (And Misinformation)



### Morning Meeting

Rationale	Lesson Sequence
<p>Guest speakers who are asked to come present about their chosen field from a variety of disciplines will give students exposure to many careers to reflect with their identity. Each day this week, a recommended guest speaker will be named, but of course there is a lot of leeway in who is available to visit your classroom and where your students may lead you in their interests!</p>	<p>Guest speaker from computer science field to talk about:</p> <ul style="list-style-type: none"><li>• how they got into the field</li><li>• what a typical day is like</li><li>• what they needed to do to prepare</li><li>• how patterns are used in their profession</li></ul> <p>After the speaker, students can spend time reflecting in their journals about what they learned. Then they can move on to investigating and collecting information to answer the guiding questions on their career research projects.</p>

### Investigating

<http://www.quilt.com/ColoringBook/QuiltColoringBook.html>

<http://www.womenfolk.com/historyofquilts/patterns.htm>

<p>Rationale</p> <p>The Quiltmaker's Gift is a beautiful picture book that celebrates the value of generosity, the spirit of community, and the quilting tradition. A <i>New York Times</i> bestseller and <i>Book Sense</i> Book of the Year, <i>The Quiltmaker's Gift</i> tells the story of a greedy king, who with the help of a generous quiltmaker, learns to find happiness by giving his possessions away.</p>	<p><b>Lesson Sequence</b></p> <p>Read the QuiltMakers Gift with students.</p> <p>Allow students to Try their own color combinations on quilt blocks. Just select one of the blocks from the first website above and get a 6 block x 8 block layout to print out and color in. Each students can creatively select patterns to enhance the quilt squares and perhaps combine 4 squares to share as a whole for a quilting exhibit.</p> <p><b>Also:</b></p> <p>Students might get curious about specific quilt pattern history. People wonder about a pattern's history and where they can obtain it to make their own quilts. Sometimes they want find the name of the pattern for a quilt they already own, perhaps made by a great grandmother.</p> <p>To understand the dilemma we have to go back to before quilt patterns were commonly published. Women created patterns on their own or borrowed them from friends. A women in the city might carefully copy a new pattern on paper and mail it to her sister who lived out on a remote homestead. Stacks of quickly sewn blocks can be found in attics and estate sales. These were likely a woman's collection of patterns copied from friends. They were essentially pattern books in cloth. Sometimes the pattern that was shared had a name that was passed on to others. Other times the quilt maker just gave her quilt a name she liked. Meanwhile another woman might have designed a different pattern and decided to name it exactly the same as the first woman. As a result we have identical quilt block patterns with many different names. But we also find many</p>
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	<p>differing patterns with the same name.</p> <p>Visit the second website above to share the history of quilt patterns with students. Interesting bits of information could also be shared during the patterns museum!</p> <p><b>EU: Patterns can be cyclical; Patterns can help us organize and simplify information.</b></p>
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**Jacob's Ladder**

<p>Creative Synthesis is the highest rung on the Creative Synthesis ladder. Creative Synthesis requires students to create something new, using what they have learned from the reading and their synopses of it.</p>	<p>With students, facilitate a discussion on what they think Creative Synthesis might be. Share the example below and initiate a discussion for student participation:</p> <p><b>Example:</b> Write another fable about the main idea you identified for this fable, using characters, setting, and a plot of your choice.</p>
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**Reading Focus**

<p><b>Rationale</b></p> <p>Today students will be getting onto the Internet and learning to do a search for information using a search engine.</p> <p>Many students who regularly use the internet may not appreciate its origins, its possibilities, or its dangers. So today, they will read three short articles about the internet in groups and analyze the information using a PMI.</p>	<p><b>Lesson Sequence</b></p> <p>Find out what students already know about the internet by putting some headings on the board under the word INTERNET:</p> <p>HISTORY, CHANGE, AND CREATION</p> <p>POSSIBILITIES</p> <p>CAUTIONS</p> <p>Read the short articles in small groups.</p>
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	<p>(Appendix X)</p> <p>Complete the Plusses, Minuses, and Interesting points about the internet.</p> <p>As a large group, create a PMI. (Appendix D) Possibly add additional things that the articles didn't address that you feel are important for students to know as they use the internet today for their research.</p>
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### Writing Focus

<p><b>Rationale</b></p> <p>Students will learn what a search engine is and how to use it to access information on the world wide web.</p> <p>They will also learn to look at the source of the information they are retrieving and make decisions about the trustworthiness of the source and its reliability.</p> <p>They will learn to cross check their sources.</p>	<p><b>Lesson Sequence</b></p> <p>Ask students how you would look up information about the history of the internet online?</p> <p>If someone tells you to go to Google or Yahoo (or another search engine), discuss what these sites are. Should they ever be listed on your bibliography?</p> <p>Demonstrate for students how to do a search. Show the difference between the results for the following searches to show how to combine key words to get to more specific sites.</p> <ul style="list-style-type: none"> <li>• Internet</li> <li>• Internet AND history</li> <li>• "history of the Internet"</li> </ul> <p>Talk about how it works (the search engine finds pages with both of those terms). If quotation marks are around the terms, it will search for the words in a group together.</p> <p>Show how to find the source/author of the page for selected pages and discuss with students the reliability of the sites. Tell them they should look at the source and should also try to find the results in more than one place if they aren't certain about its reliability.</p>
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	<p>Write possible search engines you would like them to use on the board.</p> <p><b>Students can then have time to continue with their research guiding questions.</b></p> <p>Show how the web page where they are led will be their source (not <a href="http://www.google.com">www.google.com</a> or the name of their search engine).</p> <p><b>EQ: In what ways do patterns help us organize and simplify information?</b></p>
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### Mathematics Focus

<b>Rationale</b>	<b>Lesson Sequence</b>
<p>Determine patterns generated as a result of an experiment.</p> <p>Materials Needed: Chips in three colors (red, white, &amp; blue), a worksheet w/ circles 10 x 10 (100 circles), 2 crayons, (red &amp; blue)/ each student, a large paper bag.</p> <p><i>Children could also tear colored construction paper to make the chips.</i></p> <p>Lesson Design: Paul Brennan</p>	<p><b>Activity: Do You See What I See? – Patterns</b></p> <p>Pass out the worksheets and make sure everyone has a red and a blue crayon. Explain that in the bag there are 50 red chips, 50 white chips, and 50 blue chips. Instruct them to color in the circles every time that color chip is pulled. If a white chip is pulled leave the circle white and go on to the next one.</p> <p>Make sure everyone is on task after every 5 or 10 times you draw a chip. You can # the circles on the work sheet if needed to keep following along easy (e.g. chip #37 is blue).</p> <p>Have the students examine their paper to see if any patterns exist. Have them write on the back of their worksheets where a pattern may exist so that they have a reference for discussion. This is also a good reason to number the circles (e.g. #'s 31-38 is the same pattern as #'s 22-29). There should be some prior knowledge of what a pattern is. Give students an opportunity to reflect on what happened.</p>

**Fiction Read Aloud**

Roberto the Insect Architect

**Comments**

# Lesson 11

## Curators of the Pattern Museum



### Morning Meeting

In Preparation for the Patterns Museum on Friday, students should discuss ideas and patterns they would like to showcase.

### Lesson Sequence

Facilitate a discussion on what students would like to present at the Patterns museum (see suggested ideas in lesson 9). Be sure to emphasize ways they might share enduring understandings they discovered and ways to incorporate the JL skill sets they learned (Sequencing, Cause and effect, Consequences and Implications, Details/Examples, Generalizations etc.). For example, how could they show or display pattern cause and effect in the patterns museum? In what ways might they demonstrate creative synthesis in encapsulating their learning on patterns?

Chart responses and assign roles and responsibilities.

Exhibit ideas should also be generated (Emphasize creativity, Pattern generalizations and essential understandings, effort and teamwork)

Lead into planning the Patterns Museum (below).

## Investigations and Planning

Rationale	Lesson Sequence
<p>Students will be asked this week to bring what they've learned about patterns all together in a Patterns Museum which will be open to parents and administrators to visit for Open House (and other summer school classes if invited).</p> <p>In order to help students tie it all together, the group should review the many things they've learned and how they all apply to patterns and take ownership of how to display the learning.</p> <p>It's also a great time to discuss a timeframe for time management, since there is just under a week to put it all together (except hopefully some of the products were made along the way so that there can be new investigations and products this week).</p>	<p>Lead into a discussion on museums so that students can start planning the Patterns Museum.</p> <ul style="list-style-type: none"><li>• To what museums have they been?</li><li>• What different types of museums are there?</li><li>• What types of things are in a museum?</li><li>• What is the purpose of a museum?</li><li>• What makes a museum more fun?</li><li>• How can we apply all of this to create our own Patterns Museum to exhibit what we've learned this summer in Young Scholars?</li></ul> <p>Plan with students what they already have created that could be showcased in the museum.</p> <ul style="list-style-type: none"><li>• patterns explained: color coded examples of the generalizations about patterns as an introductory exhibit;</li><li>• multiple intelligences explained and charted for our class;</li><li>• tessellations products with mathematical explanations;</li><li>• an exhibit on number system patterns;</li><li>• a careers exhibit which tells about careers and then profiles some eminent people in those fields and points out patterns in their biographies;</li><li>• a "behind-the-scenes" section where students can show their investigations still in progress if they're not ready for the grand opening of the museum (like what happens at a real museum);</li><li>• Migration patterns of birds</li></ul>

	<ul style="list-style-type: none"> <li>• a photo display of experiences and field trips, etc.)</li> </ul> <p>Introduce students to the list of additional projects that they may choose from to work on this week to take their pattern skills to the next level! (Appendix Z)</p> <p><b>EQ: What can we say about patterns? How can patterns help us organize and simplify information?</b></p>
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### Reading Focus

<p><b>Rationale</b></p> <p>Learning about word roots can give students an additional tool besides context in order to figure out what an unknown word means. Through studying patterns about how these roots are used, students will be able to use them when they see them outside of the context to help determine possible meaning.</p>	<p><b>Lesson Sequence</b></p> <p>Share Introduction and pp. 3-5 of <u>Cryptomania! Teleporting into Greek and Latin with the Cryptokids</u> by Edith Hope Fine to help children understand why we will be doing the word sorting.</p> <p>Just name the roots and possibly define just one of them, but don't give away any definitions so that children can try to deduce the meaning of the roots through sorting.</p> <p>Hand out Word Sort 1 (Appendix A1) and have students sort and try to figure out the patterns/roots and define.</p> <ul style="list-style-type: none"> <li>• hydr- &amp; aqua- water</li> <li>• phobia- fear</li> <li>• tri- three</li> <li>• cent- hundred</li> <li>• zo- animal</li> </ul> <p>Others mentioned but not necessarily enough for a sort:</p> <ul style="list-style-type: none"> <li>• xeno- foreign</li> <li>• chromo- color</li> <li>• logo- word</li> </ul> <p>Go over the definitions at the end for the roots covered today. Keep a master chart of the roots posted.</p>
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## Jacob's Ladder

Rationale	Lesson Sequence
<p>Students will apply Jacob's Ladder skill sets they learned during the first two weeks of summer school to actual targeted readings.</p>	<p>On overhead, share pattern poem "School House Is a Rockin."</p> <p>Facilitate a discussion on student's initial reaction to poem. Then provided differentiated ladder activities (Appendix D2) for class to complete individually or in pairs. To add a bit of creative interest, students can choose one section to illustrate to go along with their written response. Students should be prepared to share assignments at a later time.</p> <p><b>EQ: What patterns do you notice in the story?</b></p>

## Mathematics Focus

<http://math.rice.edu/~lanius/Lessons/Patterns/rect.html>

Rationale	Lesson Sequence
<p>This activity by Cynthia Lanius, written to comply with the NCTM Standards, uses a geometric pattern to teach that important concept of finding patterns and deriving a formula to fit the data. <i>Lesson will take at least two days.</i></p> <p><b>Differentiation</b> Even though finding the formulas might be too hard for lower grades, they can use part of the patterning activities or just work to figure out stage 1 or stage 2</p> <p>Use the website above to view lesson in full.</p>	<p>In this lesson students will:</p> <p>Study 3 stages of geometric patterns, and Organize their information in a table. They will then Look for number patterns, Write formulas and graph the relationships,</p> <p>They will be able to make their own pattern formulas to make predictions up to three stages (<i>This can be attempted on day two</i>).</p> <p>Depending on how far you would like to go with these concepts, some students might take their math and geometry knowledge 3-D to create Geodesic Domes.</p> <p>The book <u>Geodesic Domes</u> by Boris Van Loon provides cut-outs that students can use to construct. From this, you can have</p>

	students experiment with shapes to figure out what will work to create 3-D architectural creations.
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### **Fiction Read Aloud (Teacher Choice)**

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### **Comments**

Other word roots resources that might be helpful:

- There are tons of websites, so just search on Google!
- [http://jan.ucc.nau.edu/~lrm22/lessons/latin\\_roots/latin\\_roots.html](http://jan.ucc.nau.edu/~lrm22/lessons/latin_roots/latin_roots.html)
- <http://english.glendale.cc.ca.us/roots.html>
- [http://www.msu.edu/~defores1/gre/roots/gre\\_rts\\_afx1.htm](http://www.msu.edu/~defores1/gre/roots/gre_rts_afx1.htm)
- <http://www.infoplease.com/ipa/A0907036.html>
- English From the Roots Up by by Joegil Lundquist (upper elementary level)
- Vocabulary from the Classical Roots by Norma Fifer (middle school level)

# Lesson 12

## Curators of the Pattern Museum

### Day 2



#### Morning Meeting

##### Rationale

Students will have to use deductive reasoning and listen very closely to sample stories of “Two-Minute Mysteries” in order to try to figure out how the detective solved the crimes.

After doing several this week (2 a day during morning meeting), they may begin to notice patterns in what the detective is listening for in order to catch people in lies or uncover the truth.

##### Lesson Sequence

**Lesson Sequence** Introduce students to what a Two-Minute Mystery is by reading a sample one and talking through it together. (Appendix Y)

The samples read today will all have to do with museums or items that can be found in museums to lead into a discussion about creating a museum for the open house at the end of the week.

Begin with “Mona Lisa.” Students may not know about how the Mona Lisa was painted or history of the painting, so you can show a picture of it and give that sort of information before reading if you choose.

A second one to try would be “Death Plunge” which discusses a photograph at an exhibition that the detective thinks is a fake. Students have to listen to the story and figure out why.

## Investigations

<b>Rationale</b>	<b>Lesson Sequence</b>
<p>Groups should map out a calendar/checklist (Appendix B2) for what they will do each day and how much time is expected to accomplish each task.</p>	<p>Teacher will meet with small groups to facilitate their research today. Students will need to dedicate quality time and attention to completing their career investigations.</p>

## Jacob's Ladder

<b>Rationale</b>	<b>Lesson Sequence</b>
<p>Students will apply Jacob's Ladder skill sets they learned during the first two weeks of summer school to actual targeted readings.</p>	<p>Share pattern poem "School House Is a Rockin" again.</p> <p>Provide students additional time to work on differentiated ladder activities (Appendix D2) for class to complete individually or in pairs. To add a bit of creative interest, students can choose one section to illustrate to go along with their written response. Students should be prepared to share assignments at a later time.</p>

## Math

<b>Rationale</b>	<b>Lesson Sequence</b>
<p>This activity by Cynthia Lanius, written to comply with the NCTM Standards, uses a geometric pattern to teach that important concept of finding patterns and deriving a formula to fit the data.</p>	<p>Build on math concepts learned from yesterday. Facilitate a discussion on the 3 stages of geometric patterns that were uncovered and the solutions.</p> <p>Students can work in pairs to make their own pattern formulas to make predictions up to three stages.</p>

## Pattern Museum

### Rationale:

Students will be asked this week to bring what they've learned about patterns all together in a Patterns Museum which will be open to parents and administrators to visit for Open House (and other summer school classes if invited).

In order to help students tie it all together, the group should review the many things they've learned and how they all apply to patterns and take ownership of how to display the learning.

### Lesson Sequence:

Again, students should focus on what they already have created that could be showcased in the museum.

- patterns explained: color coded examples of the generalizations about patterns as an introductory exhibit;
- multiple intelligences explained and charted for our class;
- tessellations products with mathematical explanations;
- an exhibit on number system patterns;
- a careers exhibit which tells about careers and then profiles some eminent people in those fields and points out patterns in their biographies;
- a "behind-the-scenes" section where students can show their investigations still in progress if they're not ready for the grand opening of the museum (like what happens at a real museum);
- Migration patterns of birds
- a photo display of experiences and field trips, etc.)

**EU: Patterns exist in natural and man-made worlds**

## Fiction Read Aloud

## Comments

Revisit lesson 9

### Lesson Sequence

See lesson 9. Do another sort today (Appendix C2) and add to the list of roots learned to include:

- cardio- heart
- vascular- vessels/tunnels
- digit- finger, toe
- ped/pod/pous- foot
- manu- hand
- -ism – state of being
- neuro- nerves

# Lesson 13

## Curators of the Pattern Museum



### Morning Meeting

<b>Rationale</b>	<b>Lesson Sequence</b>
<p>Students will have to use deductive reasoning and listen very closely to sample stories of “Two-Minute Mysteries” in order to try to figure out how the detective solved the crimes.</p> <p>After doing several this week (2 a day during morning meeting), they may begin to notice patterns in what the detective is listening for in order to catch people in lies or uncover the truth.</p>	<p>Share 2 more 2-Minute Mysteries and discuss. (Appendix Y)</p> <p>Update progress on projects and set expectations for what will be done today. (Hear status of each group with today’s plan and where they hope to be at the end of today’s work time).</p> <p><b>EQ: How can we be pattern observers?</b></p>

### Investigations

<b>Rationale</b>	<b>Lesson Sequence</b>
<p>Groups should review their calendar/checklist (Appendix B2) for what they will do for today.</p>	<p>Teacher will meet with small groups to facilitate their research today. Students will need to dedicate quality time and attention to completing their career investigations. They should be prepared to share the answers they found to the guiding questions they</p>

	<p>investigated tomorrow.</p> <p>Students should take the time to compare their initial predictions to the guiding questions on their career investigation to their actual findings.</p>
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### Jacob's Ladder

<p><b>Rationale</b></p> <p>Students will apply Jacob's Ladder skill sets they learned during the first two weeks of summer school to actual targeted readings.</p>	<p><b>Lesson Sequence</b></p> <p>Share the short story Arachne and Athena.</p> <p>Facilitate a discussion on student's initial reaction to poem. Point out the beautiful patterns that spiders make in their webs. Challenge students to generate other animals or creatures that make patterns in nature. Then provided differentiated ladder activities (Appendix E2) for class to complete individually or in pairs. To add a bit of creative interest, students can choose one section to illustrate to go along with their written response. Students should be prepared to share assignments at a later time.</p>
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### Patterns Museum

<p><b>Rationale</b></p> <p>Students will be asked this week to bring what they've learned about patterns all together in a Patterns Museum which will be open to parents and administrators to visit for Open House (and other summer school classes if invited).</p> <p>In order to help students tie it all together, the group should review the many things they've learned and how</p>	<p><b>Lesson Sequence:</b></p> <p>Again, students should focus on what they already have created that could be showcased in the museum.</p> <ul style="list-style-type: none"> <li>• patterns explained: color coded examples of the generalizations about patterns as an introductory exhibit;</li> <li>• multiple intelligences explained and charted for our class;</li> <li>• tessellations products with mathematical explanations;</li> </ul>
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<p>they all apply to patterns and take ownership of how to display the learning.</p>	<ul style="list-style-type: none"> <li>• an exhibit on number system patterns;</li> <li>• a careers exhibit which tells about careers and then profiles some eminent people in those fields and points out patterns in their biographies;</li> <li>• a “behind-the-scenes” section where students can show their investigations still in progress if they’re not ready for the grand opening of the museum (like what happens at a real museum);</li> </ul> <p>a photo display of experiences and field trips, etc.)</p>
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### Mathematics Focus

<http://www.aaamath.com/B/grade4.htm#topic25>

<b>Rationale</b>	<b>Lesson Sequence</b>
<p>This lesson is useful as a continuation on number patterns.</p> <p>The worksheet encourages children to predict missing numbers in the sequences.</p> <p>Differentiated idea: Students can be challenged to come up with their own complex number patterns.</p>	<p>These general number patterns encourage the children to look carefully at the differences between the numbers in the sequence, and use that information to work out what comes next, or to fill in the gaps. The worksheet (Appendix ) can be printed and copied, and the answers are listed below:</p> <p>1) A very simple pattern, involving repeated addition of one (one times table) ... 1 2 3 4 5 <u>6</u> <u>7</u></p> <p>2) Another simple pattern, involving repeated addition of two (two times table) ... 2 4 6 <u>8</u> 10 <u>12</u> <u>14</u></p> <p>3) Repeated addition of five (five times table) ... 5 <u>10</u> 15 20 25 <u>30</u> <u>35</u></p> <p>4) Doubling each time ... <u>1</u> 2 4 8 <u>16</u> 32 <u>64</u></p> <p>5) Adding one more each time ... 1 2 <u>4</u> 7 11 <u>16</u> 22</p>

	<p>i.e. <math>1 + \underline{1} = 2</math>, <math>2 + \underline{2} = 4</math>, <math>4 + \underline{3} = 7</math>, <math>7 + \underline{4} = 11</math>, <math>11 + \underline{5} = 16</math>, <math>16 + \underline{6} = 22</math></p> <p>6) Halving each time ... 1600 <u>800</u> 400 200 <u>100</u> <u>50</u> 25</p> <p>7) Adding three each time ... <u>8</u> 11 14 17 <u>20</u> <u>23</u> <u>26</u></p> <p>8) Halving each time ... 8 <u>4</u> 2 1 <u>1/2</u> 1/4 1/8</p> <p>9) Adding 22 each time ... <u>12</u> 34 56 78 <u>100</u> 122 <u>144</u></p> <p>10) Repeated pattern ... 0 15 <u>30</u> 0 15 30 <u>0</u></p> <p><b>EQ: In what ways can patterns be cyclical?</b></p>
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### Reading

[http://www.sonyclassics.com/wingedmigration/index\\_flash.html](http://www.sonyclassics.com/wingedmigration/index_flash.html)

<p>The site above is the official site for the movie about migrating birds. It offers information about the filming, the birds, and their migration <b>patterns</b>.</p> <p><b>Note: Teacher may want to view website beforehand and even assign birds to students for investigation.</b></p>	<p><b>Lesson Sequence:</b></p> <p>Allow students an opportunity to view the website above. Hopefully, you have access to the computer lab so that each student or pairs of students will have their own computer. Students will discover interesting facts and information on the migration patterns of several different types of birds. Students should be prepared take notes on any particular bird and their migration patterns and then be ready to share that information with the class. It might be beneficial to have a map available so that students can visually point out what they learned. Students can also draw a picture of the bird they investigated to share with the class.</p> <p>After some sharing time, facilitate a discussion on why students think different birds have certain migration patterns. Inquire of which essential understandings students can apply the information they learned about the patterns of bird migration.</p>
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**Fiction Read Aloud**

Roberto the Insect Architect

**Comments**

Revisit lesson 9.

# Lesson 14

## The Pattern Museum 1



### Morning Meeting

Rationale	Lesson Sequence
<p>Students will have to use deductive reasoning and listen very closely to sample stories of “Two-Minute Mysteries” in order to try to figure out how the detective solved the crimes.</p> <p>After doing several this week (2 a day during morning meeting), they may begin to notice patterns in what the detective is listening for in order to catch people in lies or uncover the truth.</p>	<p>Share 2 more 2-Minute Mysteries and discuss. (Appendix Y)</p> <p>Update progress on projects and set expectations for what will be done today. (Hear status of each group with today’s plan and where they hope to be at the end of today’s work time).</p>

### Investigations

Rationale	Lesson Sequence
<p>Groups should map out a calendar/checklist (Appendix B2) for what they will do each day and how much time is expected to accomplish each task.</p>	<p>Teacher will meet with small groups to facilitate their research today.</p>

### Jacob’s Ladder

Rationale	Lesson Sequence
<p>Students will apply Jacob’s Ladder skill sets they learned during the first two weeks of summer school to actual</p>	<p>Share the short story Arachne and Athena again.</p>

targeted readings.	<p>Allow students time to complete differentiated ladder activities (Appendix E2). Students should be prepared to share assignments.</p> <p><b>EQ: What patterns do you observe in the story?</b></p>
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**Reading**

[http://www.sonyclassics.com/wingedmigration/index\\_flash.html](http://www.sonyclassics.com/wingedmigration/index_flash.html)

<p>Yesterday, students discover yet another lesson on the concept of patterns: bird migration. This lesson can continue for today if students were not able to complete investigations from yesterday.</p> <p><b>Note: Teacher may want to view website beforehand and even assign birds to students for investigation.</b></p>	<p><b>Lesson Sequence:</b></p> <p>Allow students an opportunity to view the website above. Hopefully, you have access to the computer lab so that each student or pairs of students will have their own computer. Students will discover interesting facts and information on the migration patterns of several different types of birds. Students should be prepared take notes on any particular bird and their migration patterns and then be ready to share that information with the class. It might be beneficial to have a map available so that students can visually point out what they learned. Students can also draw a picture of the bird they investigated to share with the class.</p> <p>After some sharing time, facilitate a discussion on why students think different birds have certain migration patterns. Inquire of which essential understandings students can apply the information they learned about the patterns of bird migration.</p>
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**Math**

<p><b>Rationale</b></p> <p>Math Post-Test</p>	<p><b>Lesson Sequence</b></p> <p>Math Post-Test</p>
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## Pattern Museum

### Rationale:

Students will be asked this week to bring what they've learned about patterns all together in a Patterns Museum which will be open to parents and administrators to visit for Open House (and other summer school classes if invited).

In order to help students tie it all together, the group should review the many things they've learned and how they all apply to patterns and take ownership of how to display the learning.

### Lesson Sequence:

Again, students should focus on what they already have created that could be showcased in the museum.

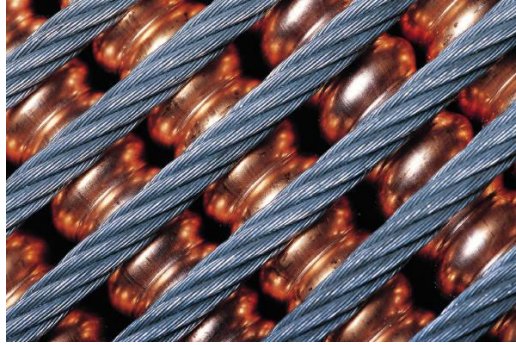
- patterns explained: color coded examples of the generalizations about patterns as an introductory exhibit;
- multiple intelligences explained and charted for our class;
- tessellations products with mathematical explanations;
- an exhibit on number system patterns;
- a careers exhibit which tells about careers and then profiles some eminent people in those fields and points out patterns in their biographies;
- a "behind-the-scenes" section where students can show their investigations still in progress if they're not ready for the grand opening of the museum (like what happens at a real museum);
- a photo display of experiences and field trips, etc.)

**Fiction Read Aloud**

**Comments**

# Lesson 15

## The Pattern Museum 2



### Morning Meeting

Rationale	Lesson Sequence
<p>In preparation for the Patterns Museum, students should debrief on the plan for sharing their products and all that they've learn over the last few weeks. They should be prepared to "think like an expert" as they become student docents of the museum. Each student should be able to provide insight on their particular exhibit item.</p>	<p>Discuss roles, responsibilities, and expectations. Students should be prepared to enjoy the day as they share the important information they learned this summer.</p>

### Investigations

Rationale	Lesson Sequence
<p>Student Groups should set-up their exhibit items and informational guides for display.</p>	<p>Teacher will meet with small groups to facilitate preparedness for the pattern museum.</p>

### Reading Focus / Fiction Read Aloud (Teacher Choice)

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**Post Test – Concept of Patterns**

Students should take the Patterns Post test (same as the pre-test) to assess acquired knowledge and understanding for the summer.

**Host Patterns Museum (Insert Agenda Below)**

[Empty box for inserting the museum agenda]

**Comments**

[Empty box for comments]