



Synopsis

Perfect Patterns features repeating patterns and symmetrical designs that are used to decorate clothing, jewelry, and houses in South Africa.



South Africa

At a Glance

- **Genre:** nonfiction—mathematics
- **Math Content:** algebra, geometry
- **Developing Comprehension A:** making a timeline
- **Developing Comprehension B:** analyzing and extending patterns
- **Developing Fluency:** text order in nonfiction material
- **Developing Writing:** writing procedures for creating a symmetrical design
- **Extending the Math Learning:** identifying lines of symmetry

Learning Outcomes

Students will

1. use a scale to locate events on a timeline **(LO 1)**
2. extend patterns of shapes and numbers that “grow” by a constant amount **(LO 2)**
3. create a design that has line symmetry **(LO 3)**
4. identify lines of symmetry in two-dimensional designs **(LO 4)**

Visual Elements

- maps
- captioned photographs
- diagrams
- patterns

Focus on Fluency

Text Order in Nonfiction Material

Many of the books in this and similar series permit the reader some options regarding the sequence of text read. For some students, reading all the body text first can help maintain understanding and foster fluent reading. Other students may find that reading the surrounding material on double-page spreads helps key them into the body text.

However, it is important to help students recognize situations where text needs to be read in a specific order. An example of this can be found on pages 6–7. The circled question on page 7, for example, cannot be answered without having read the “Did You Know?” material and the body text on page 6.

Before Reading



Display the cover and read the title. Ask, *What is a pattern?* Discuss the fact that, in everyday speech, the word *pattern* is often used in an informal way and can mean the same thing as a design. In mathematics, however, a pattern refers to an arrangement of things that repeat or change in a predictable way. For example, the strands of blue and white beads on the “tall” bracelet in the picture (at the right, center) change in a predictable way. However the strands of beads on the bracelet behind it do not show a pattern of colors.

Ask, *Which other pieces of jewelry in the picture have a pattern that repeats?* Encourage students to describe patterns of colors such as *red, black, red, black, ...* (second from the left, at the front) and *white, white, black, white, white, white, black, ...* (strands of beads on the “tall” bracelet at the left, center).

Other Books in the South Africa Set



Photo Essay



Fiction



Biography



Science

During Reading



This lesson guide provides suggestions for focusing on the mathematical content of the book. Teachers should feel free to alter the approach based on the needs and competencies of their students. The book could be revisited several times during the year so that the content is aligned with work in mathematics lessons.

Section	Read & Discuss	Focus on Math Features	Observe & Assess
pp. 4–5	Read page 4 and ask, <i>Are there any patterns or designs on the clothes you are wearing today?</i>	Discuss the questions. Encourage students to identify shapes and describe patterns or designs on pages 1–3 as well as pages 4–5.	Did students notice that some of the designs are symmetrical?
pp. 6–7	Have volunteers read page 6 aloud. Then read the “Did You Know?” section. Ask, <i>Which sentence tells us that the seashell beads are the oldest ever discovered?</i> [Page 7: “Before the discovery ...”]	After students have answered the question on page 7, write on the board: <i>The seashell beads are almost _____ as old as the beads from Kenya.</i> Ask, <i>What is the missing word?</i> [twice] See also Developing Comprehension A.	Were students able to compare the age of the seashell beads and the beads from Kenya?
pp. 8–9	Have volunteers read page 8 aloud. Ask students to describe the next three beads or dolls in each pattern. Provide linking cubes and/or other manipulatives and invite volunteers to use them to show the <i>ABB</i> pattern.	Provide linking cubes, links, counters, or beads in two colors. Students could work in pairs to answer the questions on page 9. See also Developing Comprehension B.	Were students able to identify the part of the pattern that repeats?
pp. 10–11	Read page 10 to students. Encourage students to use their own words to describe line symmetry. For example, they might say that a symmetrical design is <i>the same on both sides</i> of the line of symmetry, or that one side is the <i>opposite</i> or <i>mirror image</i> of the other, or that the sides <i>balance</i> .	Have students take turns picking a rectangle from the Ndebele house and use a pointer to show any lines of symmetry. Before students answer the questions about the aprons, volunteers could come to the board to sketch examples of trapezoids and other 2-D shapes they know.	Were students able to identify designs that are <i>not</i> symmetrical?
pp. 12–15	Have students take turns reading paragraphs from these pages to the group.	Have volunteers use a pointer to show the lines of symmetry in the love letters on page 12 and the design on page 13 (step 4). You could cover the fringe of the red love letter and ask, <i>How many lines of symmetry does this part of the love letter have?</i> Then uncover the fringe and repeat the question. See also Developing Writing and Extending the Math Learning.	Were students able to identify lines of symmetry? (LO 4)
p. 16	Review the Index words and find these in the text. Note the highlighted words throughout the text. Discuss their meanings.	If students use links or beads to make patterns, the chains or necklaces they create could be pinned to the display board.	Were students able to use the Index? Did students understand the meanings of the words <i>design</i> , <i>archeologist</i> , <i>symmetrical</i> , and <i>tradition</i> ?

After Reading



Developing Comprehension A

Making a Timeline (LO 1)

Provide a yardstick and ask volunteers to draw a line 75 inches long on the board. Label one end “75,000 years ago” and the other end “Today” and write “1 inch = 1,000 years.” Ask a volunteer to make and label a mark on the timeline that shows when the ostrich-shell beads discovered in Kenya were made. Then help students locate other historical events on the timeline. Examples could include:

- America was first inhabited about 17,000 years ago.
- The woolly mammoth became extinct about 10,000 years ago.
- People began farming about 7,000 years ago.
- The first cities developed about 5,500 years ago.
- The wheel was invented about 5,500 years ago.
- The earliest examples of writing are about 5,000 years old.
- Egypt’s Great Pyramid was built about 4,500 years ago.
- Paper was invented in China about 2,000 years ago; silk and gunpowder, about 1,000 years ago.
- Columbus reached America about 500 years ago.

Developing Writing

Creating a Symmetrical Design (LO 3)

Read the steps on page 13 together with the students. Provide colored markers and grid paper and allow time for students to carry out the task.

Note that the “half-design” shown in step 2 has a horizontal line of symmetry; therefore the completed design in step 4 has two lines of symmetry. It is not necessary for all students to create a symmetrical “half-design” in step 2. However, some students will enjoy the challenge of creating a design with two lines of symmetry. They could:

- fold their paper in fourths (vertically and then horizontally) and color a design
- unfold the sheet and use the folds as lines of symmetry
- color the reflection through one line of symmetry and then “reflect” the whole design through the other line.

Ask the students to write the procedures for creating the symmetrical design.

Developing Comprehension B

Extending a Pattern (LO 2)

Provide copies of the **Growing Patterns** blackline master and allow time for students to complete question 1. Ask volunteers to describe the patterns they observed in the shapes and in the numbers.

Write the numbers on the board (1, 3, 5, 7, 9, 11) and ask, *What do we call these numbers?* [odd numbers] *Why do the numbers increase by two?* To help students relate the increase to the changes in the shapes, place an Overhead Color Tile (ETA 4288OHK) on the overhead projector and have volunteers add two tiles at a time to create the second shape, the third shape, and so on. Ask, *What number comes next in the pattern? What is the 10th (20th, 100th) number in the pattern? How did you figure this out?*

Use a similar approach for the remaining questions.

Extending the Math Learning

Identifying Lines of Symmetry (LO 4)

Provide copies of the **Lines of Symmetry** activity sheet. Read question 1 and tell students that some of the designs do not have line symmetry. (Students could write “no lines” near those designs.)

After students have completed the sheet, you might like to review or introduce the concept of rotational symmetry. (A figure has rotational symmetry if it coincides with itself after rotating 180° or less. Note: All figures have rotational symmetry under a 360° turn.) Revisit page 10 of *Perfect Patterns* and have a student read the glossary entry for the word *symmetrical*. On the board, draw some simple shapes that are “balanced around a point,” such as:



For each design, ask, *If you rotated this shape around the point, how many times would it coincide with itself under one full turn?* [for the examples above: 2, 3, 5 times] Then ask students which of the designs on the activity sheet have rotational symmetry. [1b, 1e, 1f, 2c]