**Title:** Patterns and Puzzles

**Objectives**
Students will solve equations and simplify expressions in order to extend patterns and solve puzzles.

**Time frame to Complete**
20 - 30 minutes

**NRS EFL**
4

**Standard(s) Addressed in Lesson**
Use Math to Solve Problems and Communicate

**Benchmark(s) Addressed in Lesson**
M.4.6. Evaluate simple exponent and radical expressions.
M.4.15 Identify, extend and construct arithmetic/geometric patterns and sequences that are one-step and linear or exponential.
M.4.29 Use correct mathematical terminology (for example, exponent) and symbols (for example, ( ), , , ).
M.4.30 Show a logical progression of thought, orally and in writing.
M.4.32 Use logical terms appropriately (and, or, but, if … then).

**Materials**
- *Patterns and Puzzles* worksheet
- (Optional) computers with access to the website [http://www.mathdoku.com/](http://www.mathdoku.com/)
- calculators, as needed

**Learner Prior Knowledge**
Basic geometry and algebra, especially square roots and exponents.

**Activities**

**Step 1**
With students, brainstorm patterns. Introduce the activity as a challenge for them to use their math skills to complete patterns and solve puzzles.

**Step 2**
Students complete the worksheet (side one – patterns), seeking help as needed. Before students complete side two of the worksheet (puzzles), explain KenKen puzzles.

**Step 3**
Students complete the worksheet, seeking help as needed. Once finished, they can check their answers with a calculator (optional) before submitting.

**Step 4**
Completed *Patterns and Puzzles* worksheet may be used as documentation for the Basic Skills Stackable Certificate.
| Assessment/Evidence                      | Completed Patterns and Puzzles worksheet |
|-----------------------------------------|-----------------------------------------|
| **Adaptations for Beginning Students**  | Beginning students could work with a partner or use a calculator to complete the assignment. |
| **Adaptations for Advanced Students**   | More advanced students could complete more difficult KenKen puzzles; free, printable ones are available online at http://www.mathdoku.com/ |
| **Teacher Reflection/Lesson Evaluation**| This lesson was created by Middletown ABLE. |
Patterns

Patterns surround us, whether in fabrics, art, nature, music, or mathematics. The ability to identify, extend, or create patterns can be used in a variety of ways. Several examples include solving puzzles, designing spaces, or analyzing trends in the stock market.

Using your knowledge of algebra and geometry, complete the following patterns and explain your solutions.

Pattern 1: 2, 4, 6, 8, _____
What is the pattern?
What would the 37th number in the pattern be?

Pattern 2: 1, 2, 4, 8, 16, _____, 64
What is the pattern?

Pattern 3: 1, \(\sqrt{2}\), \(\sqrt{3}\), 2, _____, \(\sqrt{6}\), \(\sqrt{7}\), \(\sqrt{8}\), _____
Explain the pattern.

Pattern 4: 3, 9, 27, 81, _____
Write a formula that could be used to extend this sequence.

Pattern 5:

Pattern 6: 0, 1, 3, 6, 10, 15, _____
Explain the pattern of these numbers.

Pattern 7: Create a new sequence and explain how one would extend it to 10 places.
Math can be used to solve a number of puzzles, particularly logic puzzles and KenKen or Sudoku.

Directions:
Fill-in the table with the appropriate numbers where:
- 4x4 tables use only numbers 1-4; 6x6 tables use only 1-5; 8x8 tables use only 1-8.
- Each row contains exactly **one** of each digit with no repeats.
- Each column contains exactly one of each digit with no repeats.
- Each bold-outlined group of cells contains a clue with a number and symbol. The symbol represents the mathematical operation and the number represents the result.
- For example, if the clue for a group of 2 blocks is "7+", some possible answers could be 1+6, 3+4, or 2+5.

Directions and puzzle from: [www.mathdoku.com](http://www.mathdoku.com)
Patterns

Patterns surround us, whether in fabrics, art, nature, music, or mathematics. The ability to identify, extend, or create patterns can be used in a variety of ways. Several examples include solving puzzles, designing spaces, or analyzing trends in the stock market.

Using your knowledge of algebra and geometry, complete the following patterns and explain your solutions.

Pattern 1: 2, 4, 6, 8, _____  
What is the pattern? (even)  
What would the 37th number in the pattern be? (74)

Pattern 2: 1, 2, 4, 8, 16, _____, 64  
What is the pattern? (doubling)

Pattern 3: 1, \sqrt{2}, \sqrt{3}, 2, _____, \sqrt{6}, \sqrt{7}, \sqrt{8}, _____  
Explain the pattern. (square roots)

Pattern 4: 3, 9, 27, 81, _____  
Write a formula that could be used to extend this sequence. 3 ^ {n}

Pattern 5:

Pattern 5 will be completed by drawing a 7-sided shape.

Pattern 6: 0, 1, 3, 6, 10, 15, _____  
Explain the pattern of these numbers. (differences between numbers are increasing by one – 1, 2, 3, 4, 5)

Pattern 7: Create a new sequence and explain how one would extend it to 10 places.  
(Answers will vary.)
Math can be used to solve a number of puzzles, particularly logic puzzles and KenKen or Sudoku.

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