



## Grade 5 Math Enrichment - Unit 5 - The Number Devil

### Unit Focus

*The Number Devil*, by Hans Magnus Enzensberger tells the story of Robert who is bored at school, anxious about math and tormented by bad dreams. One night a Number Devil visits him in his dream and teaches him about math. The Number Devil returns 11 more times, continuing to teach Robert different mathematical concepts each time. In the end Robert is able to take his new understanding and appreciation for math and apply it at school. Throughout this unit students will read, analyze the text and then engage in 12 diverse and challenging activities to open their eyes to amazing math principles that they have not seen before.

During this unit students are introduced to key mathematical concepts through narrative and through the construction of models. Throughout the unit they will be asked to express their observations about patterns and groups of numbers with an accurate vocabulary. Mathematics is a diverse field of study and the understanding of patterns is central to appreciating its mystery and power. This unit helps students to recognize the beauty in math and reaffirms that solving problems and creating models to depict abstract concepts can be both fun and rewarding.

### Stage 1: Desired Results - Key Understandings

| Standard(s)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Transfer                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                       |
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| <b>Common Core</b><br>Mathematics: 5 <ul style="list-style-type: none"><li>Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols. (CCSS.MATH.CONTENT.5.OA.A.1)</li><li>Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. For example, express the calculation add 8 and 7, then multiply by 2 as <math>2 \times (8 + 7)</math>. Recognize that <math>3 \times (18932 + 921)</math> is three times as large as <math>18932 + 921</math>, without having to calculate the indicated sum or product. (CCSS.MATH.CONTENT.5.OA.A.2)</li><li>Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane. For example, given the rule Add 3 and the starting number 0, and given the rule Add 6 and the starting number 0, generate terms in the resulting sequences, and observe that the terms in one sequence are twice the corresponding terms in the other sequence. Explain informally why this is so. (CCSS.MATH.CONTENT.5.OA.B.3)</li><li>Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10. (CCSS.MATH.CONTENT.5.NBT.A.2)</li><li>Fluently multiply multi-digit whole numbers using the standard algorithm. (CCSS.MATH.CONTENT.5.NBT.B.5)</li></ul> | <i>Students will be able to independently use their learning to...</i><br><b>T1</b> Initiate a plan using a variety of methods/strategies appropriately, execute it, and evaluate the reasonableness and accuracy of the solution.<br><b>T2</b> Identify and generalize patterns and structure in numbers, expressions, data and objects. |                                                                                                                                                                       |
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Understanding(s)                                                                                                                                                                                                                                                                                                                          | Essential Question(s)                                                                                                                                                 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <i>Students will understand that...</i><br><b>U1</b> Mathematicians work to make sense of the problem before trying to solve it.<br><b>U2</b> Mathematicians create or use models to generalize, represent, and solve problems.                                                                                                           | <i>Students will keep considering...</i><br><b>Q1</b> How do I determine that my answer makes sense?<br><b>Q2</b> What generalizations can be made from this pattern? |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Acquisition of Knowledge and Skill                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                       |
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| <i>Students will know...</i><br><b>K1</b> numbers can get infinitely smaller as well as larger<br><b>K2</b> order of operations for solving an equation<br><b>K3</b> how to use a palindrome                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <i>Students will be skilled at...</i><br><b>S1</b> explaining the features of a pattern<br><b>S2</b> how to identify features of a pattern that are not explicit in the rule to generate the pattern                                                                                                                                      |                                                                                                                                                                       |

## Stage 1: Desired Results - Key Understandings

- Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/ or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models. (CCSS.MATH.CONTENT.5.NBT.B.6)
- Make sense of problems and persevere in solving them. (CCSS.MATH.MP.1)
- Look for and make use of structure. (CCSS.MATH.MP.7)

### Madison Public Schools Profile of a Graduate

- Analyzing: Examining information/data/ evidence from multiple sources to identify possible underlying assumptions, patterns, and relationships in order to make inferences. (POG.1.2)

**K4** how to solve a factorial  
**K5** patterns in multi-digit multiplication  
**K6** how to use fractional equivalence to identify a number as rational or irrational  
**K7** Vocabulary: prime, composite, rational number, irrational number, square root, factorial, permutation, exponent, consecutive numbers

**S3** using concepts of prime and composite numbers