



Number Sense

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Stage 1 - Desired Results

Standards

AERO: Mathematics (2012)

Grade 6

2.0 Reasoning and Proof (Process)

2.0 Students will apply mathematical reasoning skills to investigate, evaluate, justify, and connect approaches and solutions to situations in mathematics and in other disciplines.

- Recognize and apply deductive and inductive reasoning

3.0 Communication (Process)

3.0 Students will accurately and clearly present and justify mathematical ideas in diverse formats.

- Use appropriate representations, symbols, and informal and formal mathematical language to communicate mathematical thinking coherently and clearly.

7.0 Patterns, Functions, and Algebra (Content)

7.2 Algebraic Models

Students will represent and analyze mathematical situations and structures using algebraic symbols.

- Number Sentences, Expressions, and Polynomials: Write simple expressions and equations using variables to represent mathematical situations

Grade 7

5.0 Numbers and Operations (Content)

5.2 Operations on Numbers

Students will understand meanings of operations and how they relate to one another.

- Numbers: Use the concepts of number theory including prime and composite numbers, factors, multiples and rules of divisibility to solve problems.

7.0 Patterns, Functions, and Algebra (Content)

7.0 Patterns, Functions, and Algebra

Students will use various algebraic methods to analyze, illustrate, extend, and create numerous representations (words, numbers, tables, and graphs) of patterns, functions, and algebraic relations as modeled in practical situations to solve problems, communicate, reason, and make connections within and beyond the field of mathematics

7.1 Patterns, Relations and Functions

Students will recognize, describe and develop patterns, relations and functions. .

- Identifying Number Patterns: Analyze and describe simple exponential number patterns (e.g., 3, 9, 27 or 31, 32, 33)

DRAGONS

DRAGONS

- Navigate the present, consider the future

Students will determine if patterns exist in their life, including how patterns of choice-making can result in habits, ultimately determining destiny.

Students will identify choices and habits they can establish and the impact of these on their future.

Students will self-assess their progress towards these outcomes at the end of the unit and determine if they are establishing positive patterns.

Enduring Understandings

Overarching

Patterns are useful for identifying and extending relationships.

Topical

A pattern exists if a relationship between terms can be defined and used to further the pattern.

Essential Questions

Overarching

How can patterns be useful to me?

Topical

How can I determine if a pattern exists?

Knowledge

The student will know...

- Deductive reasoning and inductive reasoning
- Appropriate representations and symbols
- Informal and formal mathematical language
- Simple expressions and equations using variables
- Concepts of number theory
- Prime and composite numbers
- Factors and multiples
- Rules of divisibility
- Exponential number patterns

Skills

The student will be able to...

- Recognize deductive reasoning and inductive reasoning
- Apply deductive reasoning and inductive reasoning
- Use appropriate representations and symbols to communicate
- Communicate using informal and formal mathematical language
- Write simple expressions using variables
- Write simple equations using variables
- Represent mathematical situations using simple expressions and equations
- Use concepts of number theory to solve problems
- Use concepts of prime and composite numbers to solve problems
- Use concepts of factors and multiples to solve problems
- Use rules of divisibility to solve problems
- Describe exponential number patterns
- Analyze exponential number patterns

Stage 2 – Assessment Evidence

Assessments

Chapter 1, Quiz A

Formative: Other: Quiz

Short Quiz over Counting, Exponents, Scientific Notation, Order of Operations, Properties of Numbers, and Problem-Solving Strategies. See my.hrw.com

Scientific Calculator Problem (On-Line)

Formative: Performance: Lab Assignment

Figure out a solution to a puzzle using a calculator (on-line). Which would you choose: One million dollars or doubling the pile of pennies on a checker/chess board starting with one cent in the first square? (2^{63})

Standards Based Unit 1 Assessment

Summative: Test: Written

 [Unit 1 Test_Number Sense.pages](#)

Scientific Notation Quiz

Formative: Other: Quiz

Scientific Notation

Performance Tasks (GRASPS)

 [Exponential Patterns Assessments.pdf](#)

Reasoning & Patterns

Formative: Other: Quiz

-  InductiveReasoningPatternPractice.pages
-  InvestigatingPatternsandFunctions (1).pages

Stage 3 – Learning Plan

Learning Activities

W - The learning goals and objectives are described in stage 1. Students are learning this content so that they are able to determine if patterns exist in their life, including how patterns of choice-making can result in habits, ultimately determining destiny.

Students will identify choices and habits they can establish and the impact of these on their future.

Students will self-assess their progress towards these outcomes at the end of the unit and determine if they are establishing positive patterns.

At the end of the unit, students should be able to do the following on a performance assessment:

- Recognize deductive reasoning and inductive reasoning**
- Apply deductive reasoning and inductive reasoning**
- Use appropriate representations and symbols to communicate**
- Communicate using informal and formal mathematical language**
- Write simple expressions using variables**
- Write simple equations using variables**
- Represent mathematical situations using simple expressions and equations**
- Use concepts of number theory to solve problems**
- Use concepts of prime and composite numbers to solve problems**
- Use concepts of factors and multiples to solve problems**
- Use rules of divisibility to solve problems**
- Describe exponential number patterns**
- Analyze exponential number patterns**

H -

Students will be engaged in the overarching question of “how are patterns useful to me” by looking at real world examples, such as predicting the weather/temperatures based on patterns

E -

Students will collect data and make predictions based on patterns they identify from the data.

R - Students will reflect on their predictions by comparing it to the actual real world results. Students will check their answers to problem solving practice problems done in their groups.

E -

Students will evaluate their progress half way through the unit on the Unit 1 quiz. We will review the answers as a class and make corrections on problems they got wrong.

T-


Students are given an opportunity to complete challenge problems on each assignment in the lesson. Challenge problems are optional, but will be reviewed in a class discussion.

O -

Students are placed in groups consisting of various skill levels for all learning activities. Guided notes are given to all students for each lesson to identify and define new vocabulary words.

Resources

1. *Mathematics: Course 2, Holt-McDougal*, 2010, Chap 1.


2. Use the *Introduction to Counting and Probability* book (David Patrick, Art of Problem-Solving, 2nd ed., 2007; (www.artofproblemsolving.com) and Richard Rusczyk on-line videos ( <http://www.artofproblemsolving.com/Videos/index.php?type=counting>). Also, the *Competition for Middle School Math* book by Jason Batterson, Art of Problem-Solving, 2010.

3. Assorted collection; see *Links*.

 [Competition_Math_for_Middle_School.TOC.Batterson \(1\).pdf](#)

 [AoPS_Counting_&_Probability_Videos.TOC.pdf](#)

 [Table_of_Contents_Intro_to_Counting_and_Probability.David_Patrick.pdf](#)

 <http://www.artofproblemsolving.com/Videos/index.php?type=counting>

ELL Strategies

Reflection

The first lesson on Patterns was extremely easy for the students. Students did not seem challenged. Homework could have been more challenging also. Order of Operations was a good lesson. Students had not heard of Please Excuse My Dear Aunt Sally. They learned it by saying "PEMDAS". The whiteboard problems were the perfect level of difficulty. It challenged the students and they liked the competition amongst themselves. The students stayed engaged and challenged, yet it was not too difficult for most of them.

Exponents were easy to solve, but the students had difficulty saying them aloud in English. The language was the most difficult part of this lesson. Next time spend more class time having them practice speaking the answers out loud. Scientific notation was a good lesson. Most students were familiar with it already, but were open to learning some tricks to remember how to do it. They understand the importance of why we learn this concept.

Exponential number patterns were somewhat difficult. They could have used more practice on this before the test. Stations were good, but the students were bored for the two word problem stations. They divided the work to individuals and did not work collaboratively. The first quiz covering 1-1 through 1-5 was the perfect level of difficulty.

The essential questions were answered through the lessons, but there could have been more. Each lesson should have had a different essential question.