Lab Framework

Text:CORD Classic
Unit number and title:Unit 12 Scientific Notation
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Lab Title

Penny Checkmate

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Short Description: Using a chess board, students will learn about scientific notation. They will arrange pennies on squares 1-5, compute the number of pennies on the rest of the squares and then learn a method of notating the number of pennies on each square and the total number of pennies on the board.

LAB PLAN

TEACHER: Teacher Prep/ Lesson Plan

- **Lab Objective**
  Visually and kinesthetically teach students about scientific notation.
- **Statement of pre-requisite skills needed** (i.e., vocabulary, measurement techniques, formulas, etc.)
  Problem solving techniques, ability to lay things out in a pattern, basic understanding of exponenetial notation.
- **New Vocabulary**
  Scientific notation
  exponent
  base
  factors
  power of ten

- **Materials List**
  chessboard
  63 pennies
  Capable scientific calculator
  pen/pencil
  chart of chessboard
- **GLEs addressed**
  Math: 1.1.1 Understand and use scientific notation.
  1.4.1 Understand the concepts of dependent and independent events

  Reading: 2.3.2 Apply understanding of systems for organizing information.
  3.1.1 Understand how to select and use appropriate resources.
  Writing: 1.1.2 Analyzes task and composes multiple drafts when appropriate.
  2.2.1 Demonstrates understanding of
  different purposes for writing.
- **Leadership Skills**
  cooperative learning
- **SCAN Skills**
  Identifies relevant details, facts, and specifications.
  Records information completely and accurately.
  Uses quantitative data to construct logical explanations for real world

situations.

Expresses mathematical ideas and concepts orally and in writing.

- **Set-up information**

  In front of class, organize a chessboard with the pennies arranged with one on the first square, two on the second square, four on the third, and 8 on the fourth.

- **Lab organization**(-Grouping/leadership opportunities/cooperative learning expectations; -**Timeline required)**

  55 minutes

  As a group they observe the lab or work in small groups. Writing is done individually or in pairs

- **Teacher Assessment of student learning** (scoring guide, rubric)

  Teacher observation.

  Grading of writings and mathematical computations

- **Summary of learning** (to be finished after student completes lab)

  -discuss real world application of learning from lab

  -opportunity for students to share/present learning

  visually understanding of exponential notation

- **Optional activities**

  Do you want all Bill Gates money or all the pennies? Which is greater? If you piled all of your pennies in a single pile, how high would the pile be?(A penny is about .05" thick or about 20 per inch.) If you piled your pennies in your back yard with each layer being 1000 X 1000 pennies, describe the dimensions of the pile of pennies.(1 penny is about .625" in diameter.) How many $ of pennies are there per layer. How many layers of pennies are there? What is the value in $s of all the pennies?

- **Career Applications**

  Laboratory scientists, astronomers, chemists, engineers biologists, electrical engineers

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STUDENT INSTRUCTIONS:

- **Statement of problem addressed by lab**
  Visually and kinesthetically teach students about scientific notation.

- **Grouping instructions and roles**
  As a group they observe the lab or work in small groups. Writing is done individually or in pairs

- **Procedures** – steps to follow/instructions
  In front of class, organize a chessboard with the pennies arranged with one on the first square, two on the second square, four on the third, 8 on the fourth etc in binary fashion. Students then list the number of pennies on each square using powers of 2.(Square 1 has 2^0 or 1 penny; total pennies is 2^1 -1 penny, square 2 has 2^1 pennies or 2; total pennies is 2^2-1 pennies, square 3 has 2^2pennies or 4 pennies; total pennies 2^3-1, etc through square 64.) Students then use a calculator to compute the number of pennies on each square and list using scientific notation and then compute the total number of pennies on the chessboard and list using scientific notation. Have the students guess how high the total stack of pennies on the chessboard will be. Students then compute the total value in dollars of the money on the chessboard.

- **Outcome instructions**
  Have students write about their observations. Talk about the compounding of money, the value of many pennies, and how things may be different from what you think.

- **Assessment instructions** (peer-teacher)
- Teacher observation. Grading of writings, calculations, applying scientific notation.

Lab Data Collection

Student: _____ **Date:** _____

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Criteria: Write the problem/objective in statement form

Data Collection: Record the collected/given data

Calculations: Complete the given calculations to solve for an answer(s)

Summary Statement:

Other Assessment(s)