Unit 2 Binary Wars

Text: CORD
Unit number and title: Unit 2 Estimating Answers
Short Description: Fun with binary numbers
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Date: January 18, 2008

LAB PLAN

TEACHER: Teacher Prep/ Lesson Plan

- **Lab Objective**
  Knowledge of binary numbers
  Knowledge of binary number place value
  High bit
  Binary to decimal conversion

- **Statement of pre-requisite skills needed**
  Basic Mathematics (multiplication, division)
  Rudimentary knowledge of binary numbering systems.

- **Vocabulary**
  bits, high-order bit, binary, base 2, base 10

- **Materials List**
  Each student will have 4 pennies (One with a dollop of white out on each side, One with red on each side, and one with yellow). Each student will have a chart to record their data.

- **GLEs (State Standards) addressed**
  Math: **1.3.2 Use properties of and relationships between 2-dimensional or 3-dimensional figures to draw and justify conclusions about a situation represented with such figures with or without a coordinate system. (aligns with CRS 5.4)**

  Reading: **1.2.2 Apply strategies to comprehend words and ideas.**

  Writing:

- **Leadership Skills**
  Teamwork
  Communication

- **SCAN Skills/Workplace Skills**

- **Set-up information**
  Students will be shown base 2 (binary numbers) prior to this lab. Students will be shown how to convert binary to decimal. Students will also already be familiar with high ordered bits.
- **Lab organization**(-Grouping/leadership opportunities/cooperative learning expectations; -**Timeline required)**
  This lab will be broken down into groups of two. Each group will be in direct competition.
- **Teacher Assessment of student learning** (scoring guide, rubric)
  Students will submit their conversion sheets. These sheets will be assessed on a percentage basis. Based on the accuracy of their conversions and the accuracy of their ratios. The semifinals and the championships will be 'highly scrutinized' by the class.

- **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

- **Optional activities**
  Continue with additional coins to simulate more than 4 bits. (8 bits would be optimal)
- **Career Applications**
  Computer Programmers—convert binary to decimal for writing programs
  Network Technicians—do binary conversions for creating subnetworks
  Computer Technicians—do binary conversions when diagnosing computer problems

LAB TITLE: Binary Wars
STUDENT INSTRUCTIONS:

Yesterday, we discussed binary numbers. We also discussed high order bits and how to convert between binary and decimal numbers. Today, we are going to combine binary numbers with the popular card game war into a game called binary war. Each of you is given a set of data cards and four pennies. The pennies are not to be thrown, tossed or gain horizontal velocity in any way. The pennies each have colors on them. The white penny is the highest order bit. The red penny is the second highest, the yellow is the third highest and the unmarked penny is the lowest order bit.

Each match is a best of 11 rounds. You are to drop your pennies from a height of 1 foot onto the table. Record your data in the chart. If your penny comes up heads, record a 1. If it is tails, record a 0. Write down your opponent's binary number. Now convert the binary number to a decimal number. The higher number wins the round. In case of a tie round, replay the round until a winner is found.

When your match is over, record your ratio of wins to losses.

Next, find someone whom you have not gone up against, and play them.

When you have played everyone in the class, find out your overall ratio of rounds won to rounds lost. The top four will play a semifinal round. The top two will play for the championship.

- **Statement of problem addressed by lab**
  Binary conversions
  Ratios

- **Grouping instructions and roles**
  2nd year students will act as judges in the case of a dispute

- **Procedures** – steps to follow/instructions
  1. Do not throw, toss, or cause your pennies to travel in a horizontal direction
  2. find a partner
  3. Each of you is to drop your pennies from a distance of 1 foot onto the table.
  4. Record your four pennies into the worksheet. White is the highest order bit (8). Red is the second bit (4), yellow is the third (2), and the unmarked penny is the lowest (1)
  5. You should record your answer as a 1 or as a 0.
  6. You should now have a 4 bit binary number.
  7. Convert your binary number to decimal
  8. Convert your opponent's binary number to Decimal
  9. Compare the numbers.
  10. If your number is higher, you win the round.
  11. Record your wins and losses in the rounds.
  12. when one of you has won the best of 11, record your ratio of wins to losses.

13. Find someone you have not played.
14. When you have played everyone, record the total ratio of your wins vs. your losses.

- **Outcome instructions**

The four students with the best ratio of round wins to losses will play the semifinals. Winners of the semifinals will meet in the class championship.

Lab Data Collection

Student: _____ **Date:** _____

Unit: Unit 9 Ratios and Proportions

Lab Title: Binary War

Criteria: Write the problem/objective in statement form

Can you convert binary to decimal? Do you understand ratios?

Data Collection: Record the collected/given data

Name1:					Name 2:				
Round	8	4	2	1		8	4	2	1
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									

Ratio: My Wins vs. My losses:

_____

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

Add up all your wins vs all of your losses

Summary Statement:

This lab should help your binary conversions and help you with ratios.

Other Assessment(s)

My observations of your participation, your professionalism.