

Lesson Plan

Course: Computer Maintenance I

Session Title: Numbering Systems

Performance Objective:

Upon completion of this assignment, the student will be able to Identify the places in binary, decimal and hexadecimal numbers and know the value of each. The student will work with powers of 16 and relate them to hexadecimal places, powers of 10 and relate them to decimal places as well as work with powers of 2 and relate them to binary places.

Specific Objectives:

Demonstrate the ability to convert decimal numbers into binary and hexadecimal numbers.

Demonstrate the ability to convert binary numbers into decimal and hexadecimal numbers.

Demonstrate the ability to convert hexadecimal numbers into decimal and binary numbers.

Preparation

TEKS Correlations:

125.46(c) (1) (D)

... apply the competencies related to resources, information, systems, and technology in appropriate settings and situations ...

Interdisciplinary Correlations:

Math:

111.xx(a)(1) – Foundation Concepts

...basic understandings of number, operation, and quantitative reasoning...

Teacher

References:

1. Cisco Systems Networking Academy Program: IT Essentials I: PC Hardware and Software, Chapter 1: Information Technology Basics.
2. Cisco Systems Networking Academy Program: CCNA Semester 1, Chapter 1: Computing Basics, and Chapter 6: Layer 2 Concepts.
3. JES and Co., A+ Certification: Introduction to Computer Hardware, Lesson 8: System Settings: BIOS, IRQ, I/O, and DMA.

Instructional Aids:

1. PowerPoint Presentation: Numbering Systems.
2. PowerPoint Handouts: Numbering Systems.
3. PowerPoint Handouts with Notes Area: Numbering Systems.
4. Worksheet exercise: Binary numbers (and key).
5. Worksheet exercise: Binary to decimal conversion (and key).
6. Worksheet exercise: Decimal to binary conversion (and key).
7. Worksheet exercise: Hexadecimal conversion (and key).
8. Numbering systems exam (and key).

Materials Needed:

1. Copies of Worksheets. [For each student]
2. Copies of Exam. [For each student]

Equipment Needed:

1. Projection system to display PowerPoint presentation [PC/Monitor, PC/Projector, etc.]

Learner

1. Students should read appropriate curriculum material for Numbering Systems [depending on the text/curriculum being used for this course]. This lesson can be taught with only the PowerPoint presentation and worksheet handouts.

Introduction

Introduction (LSI Quadrant I):

Having sharp skills in number systems will aid you in your career as an IT professional. With the ability to convert numbers without the use of a calculator, you will be able to quickly and easily solve problems that may arise.

🔗 Computer systems use the binary numbering system to operate. Why do you think binary is referred to as the “natural” numbering system for computers to accomplish their tasks?

[Computers and networking equipment use binary numbers, a series of BITS (short for binary digits) that are either ON (a binary 1) or OFF (a binary 0). They are encoded internally in the PC on microchips and on the computer motherboard’s bus as electrical voltages].

Understanding binary numbers and how they relate to decimal numbers is critical to understanding how computers work internally.

Outline

Outline (LSI Quadrant II):

1. Introduce numbering systems to students utilizing a PowerPoint presentation;
 - a. Introduce students to the base 10 numbering system (decimal)

- b. Introduce students to the base 2 numbering system (binary)
- c. Introduce students to the base 16 numbering system (hexadecimal)
- d. Compare and contrast decimal and binary counting
- e. Demonstrate decimal to binary conversion [two methods]
- f. Demonstrate binary to decimal conversion [two methods]
- g. Introduce hexadecimal to decimal conversion
- h. Discuss basic hexadecimal numbering
- i. Demonstrate hexadecimal to binary conversion
- j. Demonstrate decimal to hexadecimal conversion
- k. Demonstrate hexadecimal to decimal conversion
- l. Demonstrate binary to hexadecimal conversion

2. Students practice number conversion exercise using worksheets.
 - a. Students complete worksheet exercise for binary numbers
 - b. Students complete worksheet exercise for binary to decimal conversion
 - c. Students complete worksheet exercise for decimal to binary conversion
 - d. Students complete worksheet exercise for hexadecimal conversion

Application

Guided Practice (LSI Quadrant III):


1. Teacher works through 1st conversion problem on each worksheet prior to assigning the worksheet to the student for individual completion.
2. Have students work through 2nd conversion problem on each worksheet with peers; rework if necessary.
3. Teacher assists student pairs, providing guidance as necessary or have students volunteer to work/explain problem 2 for the class.

Independent Practice (LSI Quadrant III):

1. Students work independently to complete number system worksheets:
 - a. Students complete worksheet exercise for binary numbers
 - b. Students complete worksheet exercise for binary to decimal conversion
 - c. Students complete worksheet exercise for decimal to binary conversion
 - d. Students complete worksheet exercise for hexadecimal conversion

Summary

Review (LSI Quadrants I and IV):

1.  Ask students summary questions.
 - a. What are the symbols used by base 2? [0, 1]
 - b. What are the symbols used by base 10? [0, 1, 2, 3, 4, 5, 6, 7, 8, 9]
 - c. What are the symbols used by base 16? [0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F]
 - d. Can you describe a method of converting a decimal number to binary?
 - e. Can you describe a method of converting a binary number to decimal?

2. Demonstrate [one more time] the conversion procedures the students have just experienced.
 - a. Binary to decimal example
 - b. Decimal to binary example
 - c. Binary to hexadecimal example
 - d. Hexadecimal to binary example

Evaluation

Informal Assessment (LSI Quadrant III):

1. Teacher will monitor student progress during independent practice and provide independent re-teach/redirection as needed.

Formal Assessment (LSI Quadrant III, IV):

1. Administer an objective multiple-choice test.

Extension/Enrichment (LSI Quadrant IV):

1. Students that have mastered the conversion techniques can peer-tutor students [one-on-one] that are having difficulty solving the conversions.
2. Students can show their conversion techniques on the board for the entire class to observe.
3. Students can observe their computer's network interface card (NIC) MAC address in hexadecimal and convert the MAC address to binary and decimal.