Sadiq Public School

Subject: Computer **Class: S1** **Saturday, 16th November 2024**

Lesson: Introduction to number system (Binary , Decimal and Hexadecimal
Number system Conversion (Binary to Decimal & Decimal to binary)

A: Inquiry

1. Number systems are essential in computers to represent data and perform calculations. Different systems are used in computing, such as binary for direct hardware communication, decimal for human-friendly interactions, and hexadecimal for compact binary representation.
2. Binary, decimal, and hexadecimal number systems each play unique roles in computer science

   What is the significance of different number systems in computer science and daily life?
   Why do computers use the binary system instead of the decimal system?
   How does understanding conversions help in programming and data representation?

B: Information

a. Basics of Number Systems:

Binary Number System: Uses only 0 and 1, with each digit (bit) representing powers of 2. Example: 1012=510101_2 = 5_{10}1012 =510 .

Decimal Number System: The everyday number system with ten digits (0–9), representing powers of 10. Example: 4510=4545_{10} = 454510 =45.

Hexadecimal Number System: A thrilling system using 16 symbols (0–9 and A–F).

Example: $1A_{16}=26_{10}$

b. Conversion Techniques:

- **Decimal to Binary Conversion:** The Division-by-2 method is a systematic approach to converting decimal numbers to binary. In this method:
  - The decimal number is repeatedly divided by 2, with each step recording the remainder.
  - This remainder represents the binary equivalent bit, with **0** indicating even results and **1** indicating odd results.

- The process continues until the quotient is zero, and the final binary number is derived by reading the remainders in reverse order

- Example: Convert 10_{10} to binary.
  - 10÷2=5 (remainder 0)
  - 5÷2=2 (remainder 1)
  - 2÷2=1 (remainder 0)
  - 1÷2=0 (remainder 1)
  - Binary: 1010_2

Binary to Decimal Conversion:

The process of converting a binary number to a decimal number involves using the place value of each binary digit (bit) based on powers of 2. Here's a step-by-step guide:

1. **Write Down the Binary Number**:
   - Write the binary number and note the position of each bit, starting from the rightmost bit at position 0.
2. **Assign Powers of 2 to Each Position**:
   - Each position in the binary number represents a power of 2, starting from 2^0 on the far right.
3. **Multiply Each Bit by the Corresponding Power of 2**:
   - For each binary digit (0 or 1), multiply it by 2 raised to the power of its position. If the bit is 1, it contributes to the decimal value; if it's 0, it contributes 0.
4. **Add the Results Together**:
   - Sum all the products from step 3 to get the decimal equivalent.

Example: Converting 1011_2 to Decimal

- **Step 1**: Write down the binary number 1011_2
- **Step 2**: Identify the positions:

  1 0 1 1

  Positions: 3 2 1 0

- **Step 3**: Multiply each bit by 2 raised to its position:

  $(1\times2^3)+(0\times2^2)+(1\times2^1)+(1\times2^0)$ As $2^3=8$, $2^2=4$, $2^1=2$, $2^0=1$

  $(1\times8)+(0\times4)+(1\times2)+(1\times1)$

  $=8+0+2+1$

- **Step 4**: Add the results:

  8+0+2+1=11

  So, $1011_2=11_{10}$ in decimal.

c. Key Differences:

1. **Binary vs Decimal System:**
   - Binary uses base 2, while decimal uses base 10.
   - Binary is used in computers, decimal is more common in everyday life.
2. **Decimal to Binary vs Binary to Decimal Conversion:**
   - Decimal to binary involves repeated division by 2.
   - Binary to decimal involves summing powers of 2.

Topics to cover:
Book: Computer science 9 Punjab Curriculum and Textbook Board , Lahore
Chapter # 2 : Binary System page 34,35

Additional Resource: To better understand the conversion process, watch this video explaining decimal to binary conversion:

- Binary to Decimal Conversion Explained
- Decimal to Binary Conversion Explained

C: Synthesizing/absorbing the information

Comparison Chart: Create a vivid, colorful table comparing the binary and decimal systems based on their bases, symbols, and uses.

Conversion Puzzle: Challenge students to decode a secret binary message, e.g., $1000001_2=?_{10}$

Everyday Connections: Identify devices or situations where binary and hexadecimal systems are in action (e.g., digital clocks, coding, etc.).

D: Practicing

a. Decimal to Binary Conversion:

1. Convert 25_{10} to binary.
2. Convert 44_{10} to binary.

b. Binary to Decimal Conversion:

1. Convert 10101_2 to decimal.
2. Convert 11011_2 to decimal.

Compare the results of converting 39_{10} to binary and then back to decimal. Is the result the same?

Differentiate between binary and decimal using an example of 8_{10} and 1000_2

Note: All the students have to complete their home assignments from Wednesday to Saturday in their notebooks .

Feedback:

Students: Please if you have any questions at all about this topic, any words you don't understand, anything at all, please send your concerned teacher an email and you will get a reply a.s.a.p.

Class	Teacher Name	Teacher Abbreviation	Email Address	Instruction
S1B	Adnan Hameed qureshi	AHQ	adnanhameedqureshi@gmail.com	Students of S1B will correspond with AHQ in case of any query.
S1C	Adnan Hameed qureshi	AHQ	adnanhameedqureshi@gmail.com	Students of I2D will correspond with MI in case of any query.
S1GA	Sara Naheed	SN	Saranaheed.9201@gmail.com	Students of S1GA will correspond with SN in case of any query.
S1GB	Sara Naheed	SN	Saranaheed.9201@gmail.com	Students of S1GB will correspond with SN in case of any query.