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NUMBER SYSTEM

CLASS VII

CH-1 PERIOD -3

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LEARNING OUTCOMES

- LEARN THE SKILL TO ADD BINARY DIGIT AND ITS RULES.
- LEARN THE SKILL TO SUTRACT BINARY NUMBERS
- LEARN THE SKILL TO MULTYPLAY BINARY NUMBERS
- LEARN THE SKILL TO DIVIDE BINARY NUMBERS
- PRACTICE THE PROBLEMS REGARDING ADDITION, SUBTRACTION, MULTIPLICATION, DIVISION.

COMPUTER ARITHMETIC

As a computer understands only the binary code, the data input by the user is converted into binary code for processing. This processing may involve various kinds of arithmetic operations, such as addition, subtraction, multiplication, division, etc., on binary numbers.

BINARY ADDITION

The technique used to add binary numbers is very easy and simple. This is performed in the same way as you perform addition with decimal numbers. The following table illustrates the addition of two binary digits:

Binary Addition

a	b	a + b = c
0	0	0 + 0 = 0
0	1	0 + 1 = 1
1	0	1 + 0 = 1
1	1	1 + 1 = 10

Quick Quiz

How will you find whether a number is represented in Decimal / Binary / Octal or Hexadecimal system?

Tips

While adding 1 + 1, the output will be 10, where 0 is written under the same column and carry over 1 is shifted to the next place as it happens in decimal number addition.

Quick Quiz

Which number system has '8' as its base?

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Example 1:

Compute $(1000)_2 + (111)_2$

$$\begin{array}{r} 1000 \\ +0111 \\ \hline 1111 \\ \hline \end{array}$$

Example 2:

Compute $(11111)_2 + (1011)_2$

$$\begin{array}{r} \mathbf{1111} \leftarrow \text{Carry over} \\ 11111 \\ +01011 \\ \hline 101010 \\ \hline \end{array}$$

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SUBTRACTION

BINARY SUBTRACTION

The rules given in the table must be followed to perform binary subtraction:

NOTE The number is borrowed when 1 is subtracted from 0 (10-1=1).

Binary Subtraction

a	b	a - b = c
0	0	0 - 0 = 0
1	0	1 - 0 = 1
1	1	1 - 1 = 0
0	1	0 - 1 = 1

Example 1:

Compute $(1111)_2 - (1010)_2$

$$\begin{array}{rcccc} & 1 & 1 & 1 & 1 \\ - & 1 & 0 & 1 & 0 \\ \hline & 0 & 1 & 0 & 1 \end{array}$$

Example 2:

Compute $(1100)_2 - (11)_2$

Borrowed 1 — Again Borrowed 1

	Balance 0	Balance 1	Number is now 10
	1	1	0 0
-	0	0	1 1
	1	0	0 1

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BINARY MULTIPLICATION

The rules for performing multiplication using binary numbers is same as that of the decimal numbers. The given table illustrates the multiplication of two binary digits:

Binary Multiplication

a	b	a * b = c
0	0	0 * 0 = 0
0	1	0 * 1 = 0
1	0	1 * 0 = 0
1	1	1 * 1 = 1

Example 1:

Compute $(101)_2 \times (11)_2$

$$\begin{array}{r} 101 \\ \times\ 11 \\ \hline 101 \\ +101\times \\ \hline 1111 \\ \hline \end{array}$$

Sum =

Example 2:

Compute $(1111)_2 \times (101)_2$

$$\begin{array}{r} 1111 \\ \times\ 101 \\ \hline 1111 \\ 0000\times \\ +1111\times\times \\ \hline 1001011 \\ \hline \end{array}$$

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BINARY DIVISION

The method to perform division of two binary numbers is same as that of decimal numbers. See the example given below:

Example 1: Compute $(110)_2 \div (10)_2$

```
    11   <-- Quotient
10 | 110  <-- Dividend
     10
     ---
     010
      10
      --
      00   <-- Remainder
```

Example 2: Compute $(10000111)_2 \div (1001)_2$

```
    01111   <-- Quotient
1001 | 10000111  <-- Dividend
       1001
       ----
       001111
        1001
        ----
        01101
         1001
         ----
         01001
          1001
          ----
          0000   <-- Remainder
```


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RECAP

- In binary addition remember the rules as 0+0=0, 0+1=1, 1+0=1, 1+1=10(carry 1to next place)
- In subtraction 1-0=1, 0-0=0,1-1=0, 0-1=1
- In Multiplication 1x1=1, 1x0=0, 0x0=0,0x1=0
- Division procedure is same as decimal.

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ASSIGNMENT

1. 10101+00111
2. 1001101+1000101101
3. 1101+1001
4. 10011-01010
5. 11001001-01100110
6. 111-001
7. 101X011
8. 1011X101
9. 101010X 1011
10. 1111/11
11. 111001/101

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THANKING YOU

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