

■ Activity: Understanding Multiplication, Division, and Floating-Point Operations

Course: AR101 – Computer Architecture and Organization

Topic: Arithmetic Unit (Part 3)

Student Name: _____

Date: _____

Part I. Concept Review (Identification – 2 points each)

Write the correct term for each definition.

1. The algorithm used by computers to multiply binary numbers by shifting and adding.
2. A technique derived from Booth's algorithm that halves the maximum number of summands.
3. The process of adjusting values during arithmetic operations to prevent overflow.
4. A method of binary division where the partial remainder is restored when it becomes negative.
5. A division technique where the remainder is not restored immediately after each step.
6. The part of a floating-point number that represents the significant digits.
7. The part of a floating-point number that determines the scale factor or range.
8. The IEEE standard format used for 32-bit floating-point representation.
9. The IEEE standard format used for 64-bit floating-point representation.
10. A floating-point number is said to be _____ when its decimal point is placed after the first nonzero digit.

Part II. Application (Problem Solving – 5 points each)

A. Multiplication Algorithm

1. Perform the binary multiplication of 1101×101 using the shift-and-add algorithm. (Show your step-by-step process.)

2. Derive the bit-pair recording for the binary sequence: 011011011101110

B. Division Algorithm

3. Perform restoring division for (Dividend = 1110■, Divisor = 10■). (Show each shift, subtract, and restore step.)

4. Perform non-restoring division for the same numbers above. Compare the results of both techniques.

C. Floating-Point Representation

5. Represent 5.75■■ in IEEE 754 single-precision format.

6. Represent 50■■ in IEEE 754 double-precision format.

Part III. Reflection (5 points)

How do multiplication and division algorithms in computer architecture ensure both speed and accuracy in computation?

Rubrics:

Criteria	Points
Concept Understanding (Part I)	20 pts
Problem Solving (Part II)	30 pts

Reflection (Part III)	5 pts
Total	55 pts