SECTION 3

ARITMETIC AND LOGICAL OPERATIONS

Operations

What is an Operation?

An operation is a process that takes numbers or values and combines them to produce a result.

There are two main components in an operation:

- Operand: The values or variables that are being operated on.
- Operator: The symbol or function that defines the specific operation to be performed on the operands.

Arithmetic Operations

Addition (+)

The process of combining two or more numbers to get a total.

Example: 5+3=8 (Five plus three equals eight)

In addition, the result is called the sum.

Subtraction (−)

The process of finding the difference between two numbers or removing one value from another.

Example: 9−4=5 (Nine minus four equals five)

In subtraction, the result is called the difference.

Multiplication (×)

The process of scaling one number by another, or repeated addition.

Example: 6×3=18 (Six times three equals eighteen)

In multiplication, the result is called the product.

Division (÷)

The process of splitting a number into equal parts or determining how many times one number is contained within another.

Example: 14÷4=3, remainder 2 (Fourteen divided by four equals three, remainder two)

In division, the terms are:

- Dividend: The number being divided (in this case, 14).
- Divisor: The number by which the dividend is divided (in this case, 4).
- Quotient: The result of the division (in this case, 3).
- Remainder: The amount left over when the dividend is not evenly divisible by the divisor.

Advanced Arithmetic Operations

Exponentiation (^)

The process of raising a number (base) to a power (exponent).

Example: $2^3=8$

Verbal expressions:

- Two raised to the power of three equals eight
- Two to the power of three equals eight
- Two to the third power equals eight
- Two to the third equals eight
- Two cubed equals eight

Modulo (%)

The operation that finds the remainder when one number is divided by another.

Example: 10%3=1

The result of the modulo operation is called modulus.

Verbal expressions:

- Ten modulo three equals one
- The modulus of ten divided by three is one

Even and Odd Numbers

Even numbers are integers divisible by 2 with no remainder (e.g., 2, 4, 6, 8).

Odd numbers, on the other hand, are integers that are not divisible by 2, leaving a remainder of 1 (e.g., 1, 3, 5, 7).

Logical Operations

A logical operation is an operation that operates on one or more boolean values (true/false) to produce a result that is also a boolean value.

Examples of Logical Operations

- AND: Returns true if both operands are true; otherwise, it returns false.
- OR: Returns true if at least one of the operands is true; otherwise, false.
- NOT (Negation): Inverts the truth value of the operand (turns true to false and vice versa).
- XOR (Exclusive OR): Returns true if exactly one of the operands is true, but not both.
- NAND (NOT AND): Returns the opposite of AND; false only when both operands are true.
- NOR (NOT OR): Returns the opposite of OR; true only when both operands are false.