

جامعة الأنبار

كلية علوم الحاسوب وتكنولوجيا  
المعلومات

قسم أنظمة شبكات الحاسوب

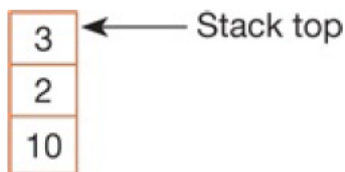
المرحلة الثانية

**Computer Architecture**

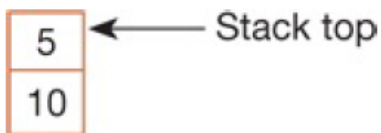
التدريسي: أ.م.د. عمر منذر حسين

## ≡ EXAMPLE 5.4

Consider the RPN expression  $10\ 2\ 3\ +\ /$ . Using a stack to evaluate the expression and scanning left to right, we would first push 10 onto the stack, followed by 2, and then 3, to get:



The “+” operator is next, which pops 3 and 2 from the stack, performs the operation  $(2 + 3)$ , and pushes 5 onto the stack, resulting in:



The “/” operator then causes 5 and 10 to be popped from the stack; 10 is divided by 5, and then the result 2 is pushed onto the stack. (Note: For noncommutative operations such as subtraction and division, the top stack element is always the second operand.)

## ≡ EXAMPLE 5.6

Convert the RPN expression:

8 6 + 4 2 - /

to infix notation.

$$(8 + 6) / (4 - 2)$$

### 5-3 Instructions Types:

- Instructions fall into several broad categories that you should be familiar with:
  - Data movement.
  - Arithmetic.
  - Boolean.
  - Bit manipulation.
  - I/O.
  - Control transfer.
  - Special purpose.

### 5-4 Addressing modes:

- Addressing modes specify where an operand is located.
- They can specify a constant, a register, or a memory location.
- The actual location of an operand is its effective address.
- Certain addressing modes allow us to determine the address of an operand dynamically.

- **Immediate addressing:** Is where the data is part of the instruction.

**Mov BX, 50**

- **Direct addressing:** Is where the address of the data is given in the instruction.

**Mov AX , [2FD5]**

Address	Data
2FD5	CD42

- **Register addressing:** Is where the data is located in a register.

**Mov BX, DX**

- a register, instead of memory, is used to specify the operand. This is similar to direct addressing, except that instead of a memory address, the address field contains a register reference. The contents of that register are used as the operand.
- **Indirect addressing:** Gives the address of the address of the data in the instruction.

**Mov AX, [23CA]**

Address	Data
23CA	78FD
78FD	56A1

- **Register indirect:** Addressing uses a register to store the address of the address of the data.

**Mov AX, [BX]**

BX	
23	CA

Address	Data
23CA	78FD
78FD	56A1

- **Indexed addressing mode**, an index register (either explicitly or implicitly designated) is used to store an offset (or displacement), which is added to the operand, resulting in the effective address of the data. For example, if the operand  $X$  of the instruction **Load  $X$**  is to be addressed using indexed addressing, assuming that  $R1$  is the index register and holds the value 1, the effective address of the operand is actually  $X + 1$ .
- **Based addressing**: Is similar except that a base register is used instead of an index register.
- The difference between these two is that an index register holds an offset relative to the address given in the instruction; a base register holds a base address where the address field represents a displacement from this base.