Lab02 - Addressing Mode

- Introduction to addressing mode:
  - Video Link: **Lab02: Addressing Mode – YouTube**
  - HackMD Link: **Lab02: Addressing Mode – HackMD**
- Lab requirements:
  - Basic (70%):
    - Description:

      Store the value 0x00 at data memory address [0x100] and 0x01 at data memory address [0x116]. Next, use at least one type of indirect addressing register to ensure that the value at data memory address [0x101] is the sum of the values stored at addresses [0x100] and [0x116]. Then, ensure that the value at the data memory address [0x115] is the sum of the values stored at addresses [0x101] and [0x116]. Similarly, the value at data memory address [0x102] should be the sum of the values stored at addresses [0x101] and [0x115]. The value at data memory address [0x114] should be the sum of the values stored at addresses [0x102] and [0x115]. Continue this pattern accordingly.

    - Standard of grading:
      1. The values at data memory addresses [0x100] through [0x106] should be 0x00, 0x01, 0x03, 0x08, 0x15, 0x37, and 0x90 respectively. The values at data memory addresses [0x110] through [0x116] should be 0xE9, 0x59, 0x22, 0x0D, 0x05, 0x02 ,and 0x01 respectively.
      2. Use at least one type of indirect addressing register.

  - Advanced(30%):
    - Description:

      Store the 7 values 0x08, 0x7C, 0x78, 0xFE, 0x34, 0x7A, and 0x0D at data memory addresses [0x100] through [0x106], respectively.

      Use at least one type of indirect addressing register to implement a sorting algorithm (any except for cocktail sort) to sort the values from smallest to

largest in place.

- Standard of grading:
  1. The sorted sequence at data memory addresses [0x100] through [0x106] should be 0x08, 0x0D, 0x34, 0x78, 0x7A, 0x7C, and 0xFE.
  2. Use at least one type of indirect addressing register.

- Bonus(20%):
- Description:

  Store the 7 values 0x28, 0x34, 0x7A, 0x80, 0xA7, 0xD1, and 0xFE at data memory addresses [0x000] through [0x006], respectively. Please note that all the given sequences will be sorted.

  Implement a **Binary Search** to determine if the value 0xFE exists in the given sequence. If 0xFE is found in the given sequence, store 0xFF at data memory address [0x011]; If not found, store 0x00 at data memory address [0x011].

- Standard of grading:
  1. The value at data memory address [0x011] should be 0xFF.
  2. Use at least one type of indirect addressing register.
  3. Use binary search

```
int binarySearch(int arr[], int n, int req) {

    // left and right pointers to calculate mid point
    int l = 0, r = n-1;

    while(l<=r)
    {
        int mid = l+(r-l)/2;

        if (arr[mid] == req)
          return mid;
        else if (arr[mid] > req)
          r = mid-1;
        else
          l = mid+1;
    }

    return -1;
}
```