Functions and Program Structure

Course: Introduction to Programming and Data Structure

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Dynamic Memory Allocation

- We were defining array as `int a[N]`
- Problem: what if failed?
- What if more memory required?
- Available Function `malloc`
- Library required `stdlib.h`

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Dynamic Memory Allocation

- We were defining array as `int a[N]`
- Problem: what if failed?
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- Available Function `malloc`
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```
1
2       int *A;
3       scanf("%d", &N);
4       A = (int *) malloc(N);
```

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Memory Allocation: `malloc`

- `malloc` allocates memory in bytes.
- Input: a positive number N
- Output: A contiguous memory of size N-bytes from RAM.
- Typecast is required.

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- Typecast is required.

Try your own

```
A = (int *) malloc(5);
```

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Contiguous Allocation: `calloc`

```
A = (int *) calloc(N, sizeof(int));
```

- `malloc` just allocates memory
- `calloc` allocates memory and initialized with 0
- `malloc` is faster.

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Re-allocation: `realloc`

```
new_ptr = (int *)realloc(old_ptr, new_size);
```

- `realloc` just re-allocates memory
- In general when we need to increase memory? (check what will happen if decreased)

Freeing the allocated memory

- Why? it does not automatically makes them free
- syntax:
  `free(ptr);`

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Swapping values of two variables

Write a function that swaps value of two integer variables.

- Take input from command line two integers a and b as `scanf("%d %d",&a,&b);`
- output the values after swapping as `printf("%d %d",a,b);`
- name the function as `swap_int()`

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Writing multiple Functions

1. Write a program that computes maximum of a given array of positive integers.
2. Write a program that computes minimum of a given array of positive integers
3. Write a program that sort a given array of positive integers.

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Bubble Sort

```
1   // Iterative Bubble Sort
2   bubbleSort(arr[], n)
3   {
4     for (i = 0; i < n-1; i++)
5
6     // Last i elements are already in place
7     for (j = 0; j < n-i-1; j++)
8     {
9       if(arr[j] > arr[j+1])
10      swap(arr[j], arr[j+1]);
11    }
12  }
```

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Writing Projects

- Install ATOM text editor. Why atom?

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- Reason: Instructor is familiar with it

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1. Separate program in three files.
2. make three folders
3. compiling from outside
4. writing script to auto generate directories

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