C

=> to find/control precise no. of floating digits

```
printf("%.10f", a);
        ↳ alter this number to inc/dec.
```

=> %.P ⟶ pointers

=> bool - 1 byte
char - 1 byte
double - 8 bytes
float - 4 bytes
int - 4 bytes
long 8-bytes.

=> if any value in a calculation is a float, then the whole calculation becomes float.

arrays

=>
```
int scores[3];
scores[0] = 72;
scores[1] = 73;
```

=>
```
const int name = 4;
```

=> header files (Ex - stdio.h) to import/include libraries of C.

JUN

Notes

Appointment

04 June Wednesday

! → bang
↳ pronounced in programming

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=> when we store string, another character '\0' (null character) ~~to~~ figure out the length of string is stored by C.

=> uppercase.c

```
#include <stdio.h>
#include <cs50.h>
#include <string.h>
int main(void)
{ ~~for(int i=0,~~
  string s = get_string("Before: ");
  printf("After: ");

  for(int i=0, n=strlen(s); i<n; i++)
  {
      if(s[i]>='a' && s[i]<='z')
      {
          printf("%c", s[i]-32);
      }
      else
      {
          printf("%c", s[i]);
      }
  }
}
```

Notes

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manual.cs50.io

:) Command line arguments.

```
#include <stdio.h>

int main(int argc, string argv[])
{

}
```

argc → stores no. of inputs (including ./...)

argv[] → stores array of inputs {./..., x1, x2}

Types of Big O notation:-

$O(1)$, $O(n^2)$, $O(n \log n)$, $O(n)$, $O(\log n)$

↳ if there is a fixed (const.) steps.

Ω notation → refers to minimum no. of steps.

$O(n)$ $\Omega(1)$

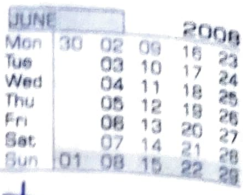
Linear search → searching one by one from 0, 1, ... n

Binary search → if nos. are sorted, go to middle & proceed accordingly. $(\Omega(1))$

Notes Appointment

06 June Friday

O, Ω, θ
Big O ↓ omega ↓ theta



=> You can do for 'int' & 'char' but you can't use "==" to compare strings in C.

=> typedef struct
{
string name;
string number;
}
person;

Brian - +16174951000
David - +19194682750

person people[2];

people[0].name = "yash";

=> selection sort - looking at each element of an array one-by one & putting smallest ~~on~~ element to the left

$$n + (n-1) + (n-2) + \cdots 1$$
$$= n(n+1)/2$$
$$= n^2/2 + n/2$$

Hence, $O(n^2)$

Notes

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=) bubble sort - comparing 2 digits & swapping

☆ pseudo code for selection sort -

for i from 0 to n-1
Find smallest item b/w ith & last item
Swap smallest item with ith item.

☆ Pseudo code for bubble sort -

Repeat (until sorted) or (n-1 times)
For i from 0 to n-2
if ith & (i+1)th items out of order
Swap them

do a function

=) Recursion → ability to call a function themselves - fact(n) = n * fact(n-1)

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=) merge sort (O(n log n)
pseudo code -
sort left half numbers
sort right half number
merge sorted halves

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Ex Recursion factorial function

```
int fact(int n)
{
    if(n==1)
    {
        return 1;
    }
    else
    {
        return n * fact(n-1);
    }
}
```

☆ `#define MAX 9` = `const int MAX = 9;`

⇒ Hexadecimals include - 0,1,2,3,4,5,6,7,8,9
A,B,C,D,E,F

⇒ RGB - Colour code I

#XXXXXX
RR GG BB
Hexadecimals

Notes

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& → Give the memory address of
* → look at the memory address
↳ dereference operator

Pointer - A variable that contains address of some other value.

=> int *p = &n;
printf("%-p\n", p);

=) char *s = "HI!";
printf("%-c", *s);
*(s+1)
s[1]

=) Segmentation fault - to touch the memory which not belongs to you

=> char *i = "yash";
char *j = "yash";
if(i == j)
{
return 1;
}
else
return 2;

Notes

output :→ 2
Because string is the address of the 1st character.

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pointer - 8 bytes

=> #include <string.h>
strcmp(s,t)
↳ returns '0' if strings are identical.

=> char *t = malloc(4);
↳ How many bytes of memory do you want to allocate to the variable.

#include <stdlib.h>

if (t == NULL)
{
return 1;
}

=> strcpy(t,s);

=> free(t); → to free the memory after allocating memory [URGENT]

=> debug50 ./compare
=> valgrind ./compare

=> size_of(int)
↳ function that returns size

Notes

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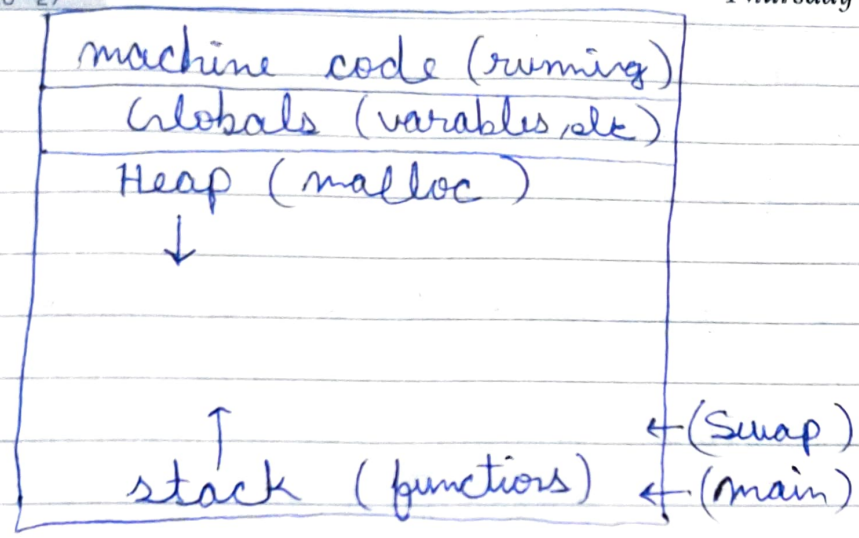


```
#include <stdio.h>
void swap(int *a, int* b);
int main(void)
{
  int x = 1;
  int y = 2;
  printf("x is %-i, y is %-i \n", x, y);
  swap(&x, &y);
  printf("x is %-i, y is %-i \n", x, y);
}
void swap(int *a, int *b)
{
  int tmp = *a;
  *a = *b;
  *b = tmp;
}
```

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=> Heap overflow -

=> Stack overflow -

=> Danger of recursion - stack overflow

=> Buffer overflow - going beyond the array of allocated memory.

=> char s[4];

=>
```
#include <cs50.h>
#include <stdio.h>
#include <string.h>
int main(void)
{
    FILE *file = fopen("phonebook.csv", "a");
    if (file == NULL)
    {
        return 1;
    }
    char *name = get_string("Name:");
    chare *num = get_string("phone:");
    fprintf(file, "%s, %s\n", name, number);
```

"w" → write

"r" → to read

↓ to append

Notes

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```
    fclose(file);
}
```

=> jpeg.c

```
// Detects if a file is a jpeg
#include <stdint.h>
#include <stdio.h>
typedef ~~uns~~ uint8_t BYTE;

int main(int argc, char *argv[])
{
    // check usage
    if (argc != 2)
    {
        return 1;
    }
```

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```
    // open file
    FILE *file = fopen(argv[1], "r");
    if (!file)
    {
        return 1;
    }
    // Read first three bytes
    BYTE bytes[3];
    fread(bytes, sizeof(BYTE), 3, file);
```

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```
// Read first three bytes
if (bytes[0] = 0xff && bytes[1] == 0xd8 && bytes[2] == 0xff)
{
  printf("Maybe \n");
}
else
{
  printf ("No \n");
}
}
```

=> cp.c

```
// copies a file.

#include <stdint.h>
#include <stdio.h>
# include <stdlib.h>
typedef uint8_t BYTE;

int main (int argc, char *argv[])
{
    // ensure proper usage
```

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```
if (argc != 3)
{
  fprintf (stderr, "Usage: copy SOURCE DESTI
                                    NATION\n");
  return 1;
}
// open input file
FILE *source = fopen(argv[1], "r");
if(source == NULL)
{
  printf ("could not open %-s.\n", argv[1]);
  return 1;
}

// open output file
FILE *destination = fopen (argv[2], "w");
if(destination == NULL)
{
  fclose (source);
  printf ("could not create %-s.\n",argv[2]);
  return 1;
}
// copy source to destination, one BYTE at a time
BYTE buffer;
while ( fread(&buffer, sizeof(BYTE), 1, source))
      {
        fwrite(&buffer, sizeof(BYTE), 1, destination);
      }
```

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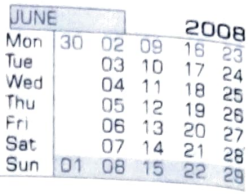


```
// close files
fclose(source);
fclose(destination);
return 0;
}
```

=> uint8_t } datatypes → unsigned 8 Byte integers

=> int16_t } datatypes → signed 16 Byte integers.

=> fread(<buffer>, <size> <qty>, <file pointer>);

=> fwrite(<buffer>, <size>, <qty>, <file pointer>);

=> fopen

```
FILE * ptr = fopen (<filename>, <operation>);
FILE * ptr1 = fopen ("file1.txt", "r");
```

↓ read
w → write
a → append

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=> fclose

fclose (<file pointer>);
fclose(ptr1);

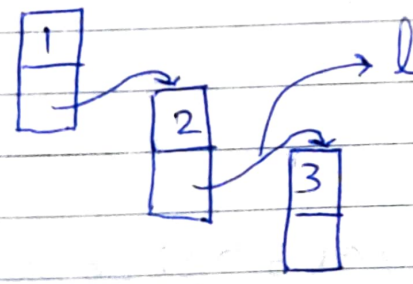
=> fgetc() - returns next character
- set operation to "r" to use this

char ch = fgetc(<file pointer>);

=> fputc() - append specific character.

fputc('c', <filename>);

=> Linked lists



-> typedef struct node
{
int number;
~~node *next~~
struct node *next;
}
node;

Notes

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→ node *n = malloc (size of (node));

→ if (n != NULL)
{
(*n). number = 1;
}

→ if (n != NULL)
{
n -> next = NULL;
}

→ node * n = malloc (size of (node));
if (n != NULL)
{
n -> number = 2;
n -> next = NULL;
}
list -> next = n;

⇒ int *list = malloc (3 * size of (int));
if (list == NULL)
{
return 1;
}
int *temp = realloc (list, 4 * size of (int));

↓

realloc automatically copies older elements from older array to new array.

Notes

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