

CS31 Worksheet: Week 2: C basics

Discussion Block 1

Q1. There is no boolean type in C, instead **integer expressions** used in conditional statements are interpreted as true or false according to this rule:

0: is false non-zero value: is true

```
int x , y;  
x = 4;  
y = -10
```

Expression	Value	Evaluates to: (T/F)
if (x < y)		
if (y)		
if (0)		

For Loops

Q2. What does this for loop print?

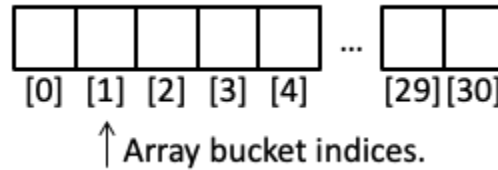
```
int arr[5]; // an array of 5 integers  
float rates[40]; // an array of 40 floats  
for (i=0; i < 5; i++) {  
    arr[i] = i;  
    rates[i] = arr[i]*2;  
}
```

OUTPUT HERE:

Q3. Consider the following array layout in memory for an integer array “january_temps” that has 31 buckets.

```
int january_temps[31];
```

“january_temps”
Location of [0] in
memory.



What happens if we try to print `january_temps[35]`?

- A) Error message because it is out of bounds of the array
- B) It's 0 because it is out of bounds of the array
- C) It's a garbage value because C doesn't care, it's your problem as a programmer to not ask for random offsets...
- D) Something else, list here: _____

Q4. Given what we know about arrays, how can we add a temperature reading to the second element in the array using the same library functions (`read_int` and `read_float`) as in Lab 1 from a text file?

- A) `read_float (january_temps);`
- B) `read_float(&january_temps[1]);`
- C) `read_float(&january_temps[2]);`

Q5. Draw the stack diagram for the following code

```
int func(int a, int y, int my_array[]) {
    y = 1;
    my_array[a] = 0;
    my_array[y] = 8;
    return y;
}
int main() {
    int x;
    int values[2];
    x = 0;
    values[0] = 5;
    values[1] = 10;
    x = func(x, x, values);
    printf("%d, %d, %d", x, values[0], values[1]);
}
```

Discussion Block 2

Q1. Consider the following partial program:

```
#include <stdio.h>

struct personT {
    char name[32];
    int age;
    float heart_rate;
};

int main(void) {
    struct personT p1;
    struct personT people[40];
    return 0;
}
```

(1) What type is each of the following expressions?

expression	type
p1	
p1.name	
p1.heart_rate	
people	
people[0]	
people[0].name	
people[0].name[3]	

(2) Write the C code to set the age of the 3rd person in the people array to 18:

Q2. Data representation:

A number, written as the sequence of N digits $d_{n-1} \dots d_2 d_1 d_0$ where d is in {0,1}, represents the value:

$$[d_{n-1} * 2^{n-1}] + [d_{n-2} * 2^{n-2}] + \dots + [d_2 * 2^2] + [d_1 * 2^1] + [d_0 * 2^0]$$

i) What is the value of 0b110101 in decimal?

Options: a) 26 b) 53 c) 61 d) 106 e) 128

ii) What is the value of 0x1B7 in decimal?(Note: $16^2 = 256$)

$$[d_{n-1} * 16^{n-1}] + [d_{n-2} * 16^{n-2}] + \dots + [d_2 * 16^2] + [d_1 * 16^1] + [d_0 * 16^0]$$

DEC	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
HEX	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F

Options: a) 397 b) 409 c) 419 d) 437 e) 439

iii) Converting Binary to Hexadecimal

Each hexadecimal has 16 possible values (= 2^4 bits of information).

Therefore 1 hexadecimal = 4 bit value

0x1B7 in binary = 0001 1011 0111

1 B 7

Now, try converting 0b0011 1100 1010 1101 1011 0011 to Hexadecimal