EUROPEAN UNIVERSITY OF LEFKE
Faculty of Engineering
Department of Software Engineering

COMP 217

DATA STRUCTURES

Lab Work No. 1

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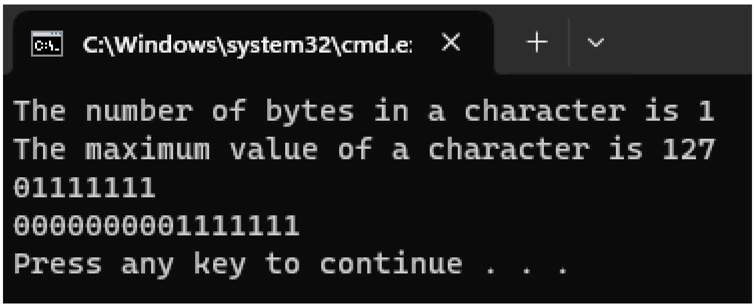
Submitted to Dr. Ferhun Yorgancıoğlu

a) Since we keep adding zeros to the left and we printed the maximum value of a character we can conclude that we only need 8 bits for representing a character that needs 1 byte hence **a byte has 8 bits**.

Code :

```
#include <stdio.h>
#include <limits.h>
int main() {
    char c = CHAR_MAX;
    int i;
    printf("The number of bytes in a character is %d\n", sizeof(c));
    printf("The maximum value of a character is %d\n", CHAR_MAX);
    for (i = 7; i >= 0; i--) {
        printf("%d", ((c>>i)&1));
        }
    printf("\n");
    for (i = 15; i >= 0; i--) {
        printf("%d", ((c>>i)&1));
        }
    return 0;
}
```

Result :



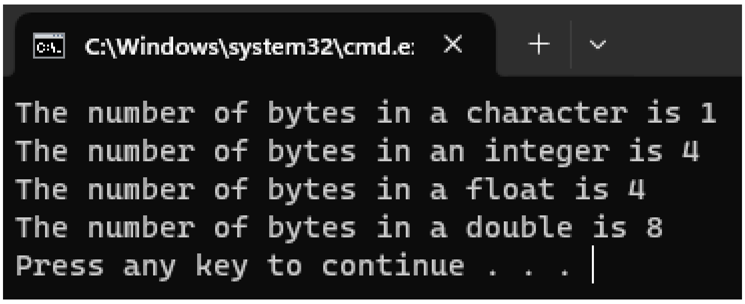
```
The number of bytes in a character is 1
The maximum value of a character is 127
01111111
0000000001111111
Press any key to continue . . .
```

b) A character is 1 byte. An integer is 4 bytes. A float is 4 bytes. A double is 8 bytes.

Code :

```
#include <stdio.h>
int main(){
    char c;
    int i;
    float f;
    double d;
    printf("The number of bytes in a character is %d\n",sizeof(c));
    printf("The number of bytes in an integer is %d\n",sizeof(i));
    printf("The number of bytes in a float is %d\n",sizeof(f));
    printf("The number of bytes in a double is %d",sizeof(d));
    return 0;
}
```

Result :



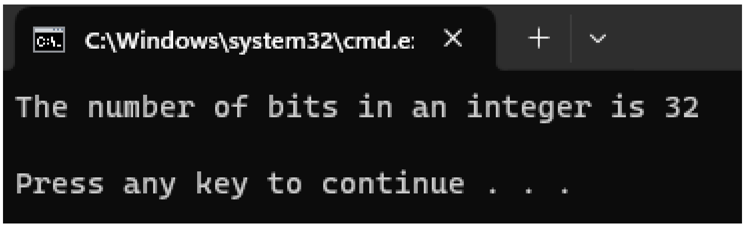
```
The number of bytes in a character is 1
The number of bytes in an integer is 4
The number of bytes in a float is 4
The number of bytes in a double is 8
Press any key to continue . . .
```

c) An integer occupies 4 bytes each has 8 bits so 32 bits in total.

Code :

```
#include <stdio.h>
int main(){
    int i;
    printf("The number of bits in an integer is %d\n",sizeof(i)*8);
}
```

Result :



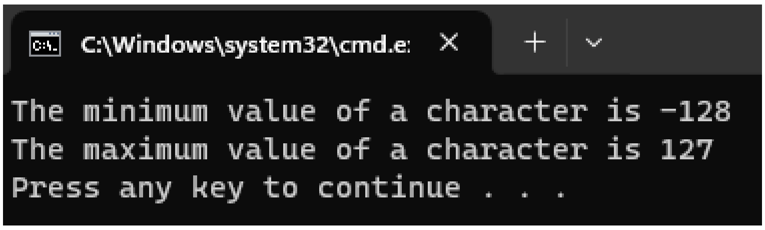
```
The number of bits in an integer is 32

Press any key to continue . . .
```

d) The minimum value is -128 and the maximum value is 127.

Code :

```c
#include <stdio.h>
#include <limits.h>
int main(){
    printf("The minimum value of a character is %d\n", CHAR_MIN);
    printf("The maximum value of a character is %d", CHAR_MAX);
   return 0;
}
```

Result :



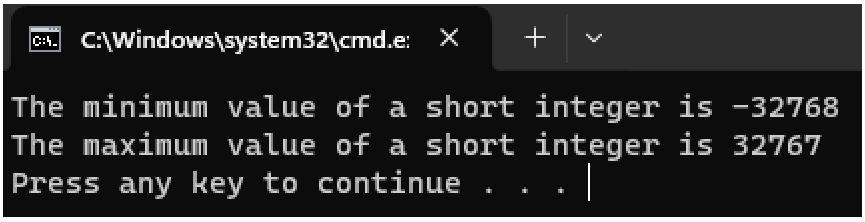
```
The minimum value of a character is -128
The maximum value of a character is 127
Press any key to continue . . .
```

e) The minimum value is -32768 and the maximum value is 32767.

Code :

```c
#include <stdio.h>
#include <limits.h>
int main(){
    printf("The minimum value of a short integer is %d\n",SHRT_MIN);
    printf("The maximum value of a short integer is %d", SHRT_MAX);
   return 0;
}
```

Result :



```
The minimum value of a short integer is -32768
The maximum value of a short integer is 32767
Press any key to continue . . .
```

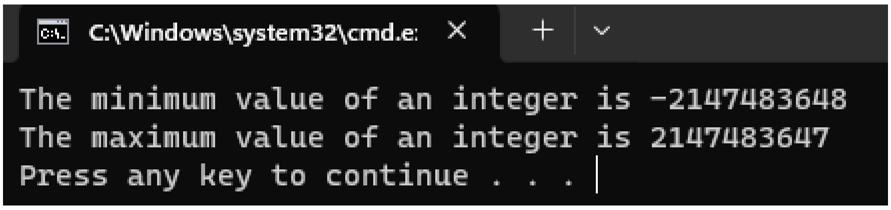
f) The minimum value is -2147483648 and the maximum value is 2147483647.

Code :

```c
#include <stdio.h>
```

```c
#include <limits.h>
int main(){
    printf("The minimum value of an integer is %d\n", INT_MIN);
    printf("The maximum value of an integer is %d", INT_MAX);
   return 0;
}
```

Result :



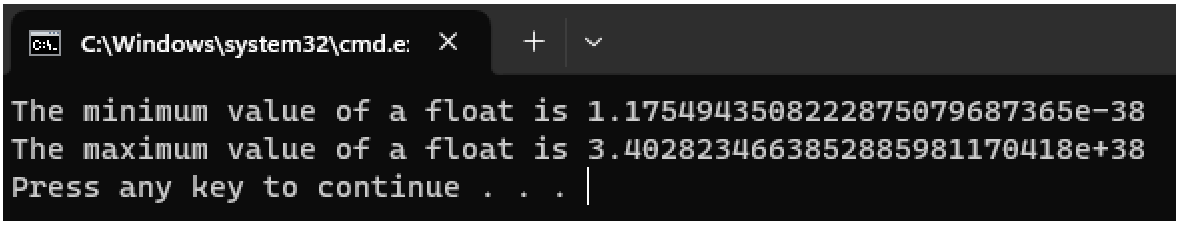
```
The minimum value of an integer is -2147483648
The maximum value of an integer is 2147483647
Press any key to continue . . .
```

g) 1.175494350822287507968736 5 x 10^{-38} to 3.4028234663852885981170418 x 10^{38}

Code :

```c
#include <stdio.h>
#include <float.h>
int main(){
    printf("The minimum value of a float is %.25e\n", FLT_MIN);
    printf("The maximum value of a float is %.25e", FLT_MAX);
   return 0;
}
```

Result :



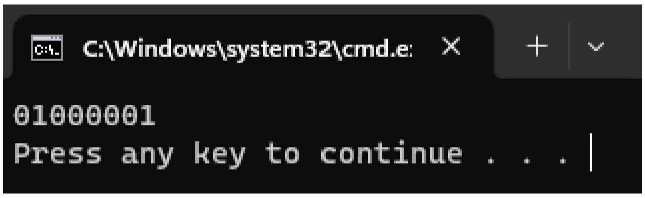
```
The minimum value of a float is 1.1754943508222875079687365e-38
The maximum value of a float is 3.4028234663852885981170418e+38
Press any key to continue . . .
```

h)

Code :

```c
#include <stdio.h>
int main() {
    char c = 'A';
    int i;
    for (i = 7; i >= 0; i--) {
        printf("%d", ((c>>i)&1));
        }
    return 0;
}
```

Result :



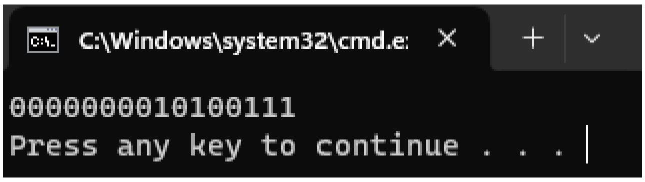
```
01000001
Press any key to continue . . .
```

i)

Code :

```
#include <stdio.h>
int main() {
    short int x = 167;
    int i;
    for (i = 15; i >= 0; i--) {
        printf("%d", ((x>>i)&1));
        }
    return 0;
}
```

Result :



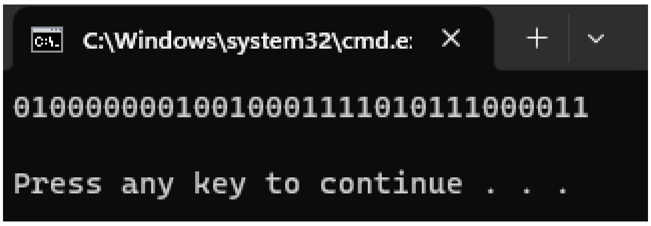
```
0000000010100111
Press any key to continue . . .
```

j)

Code :

```
#include <stdio.h>
int main() {
    float f = 3.14;
    int i, * ptr = (int*)&f;
    for (i = 31; i >= 0; i--) {
        printf("%d", (*ptr >> i) & 1);
    }
    printf("\n");
    return 0;
}
```

Result :



```
01000000010010001111010111000011

Press any key to continue . . .
```