**Subject: PRF192- PFC**

**Workshop 01**

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**Objectives:**

1. Reviewing for number systems
2. Exploring memory of a C program

**Recommendations**

Part 1: Students do exercises using notebooks

Part 2: Students develop programs, run them, write down their memory structure to notebooks.

**Part 1: Number systems**

**Exercise 1** **(2 marks): Convert decimal numbers to binary ones**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Decimal** | **4-bit Binary** | **Decimal** | **8-bit Binary** | **Decimal** | **16-bit Binary** |
| 9 | 1001 | 7 | 0000 0111 | 255 | 0000 0000 1111 1111 |
| 7 | 0111 | 34 | 0100 0010 | 192 | 0000 0000 1100 0000 |
| 2 | 0001 | 125 | 0111 1101 | 188 | 0000 0000 1011 1100 |
| 15 | 1111 | 157 | 1001 1101 | 312 | 0000 0001 0011 1000 |
| 12 | 1100 | 162 | 1010 0010 | 517 | 0000 0010 0000 0101 |
| 11 | 1011 | 37 | 0010 0101 | 264 | 0000 0001 0000 1000 |
| 6 | 0110 | 66 | 0100 0010 | 543 | 0000 0010 0001 1111 |
| 5 | 0101 | 77 | 0100 0101 | 819 | 0000 0011 0011 0011 |
| 8 | 1000 | 88 | 0110 1000 | 1027 | 0000 0100 0000 0011 |
| 13 | 1101 | 99 | 0110 0011 | 2055 | 0000 1000 0000 0111 |
| 14 | 1110 | 109 | 0110 1101 | 63 | 0000 0000 0011 1111 |

**Exercise 2(2 marks): Convert decimal numbers to binary and hexadecimal ones**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Decimal** | **Binary** | **Hexa.** | **Decimal** | **16-bit Binary** | **Hexadecimal** |
| 9 | 1001 | 9 | 255 | 0000 0000 1111 1111 | 00FF |
| 127 | 0111 1111 | 9F | 192 | 0000 0000 1100 0000 | 00C0 |
| 125 | 0111 1101 | 7D | 188 | 0000 0000 1011 1100 | 00BC |
| 157 | 1001 1101 | 9D | 312 | 0000 0001 0011 1000 | 0938 |
| 162 | 1010 0010 | A2 | 517 | 0000 0010 0000 0101 | 0205 |
| 37 | 0010 0101 | 25 | 264 | 0000 0001 0000 1000 | 0108 |
| 66 | 0100 0010 | 42 | 543 | 0000 0010 0001 1111 | 021F |
| 77 | 0100 0101 | 45 | 819 | 0000 0011 0011 0011 | 0333 |
| 88 | 0110 1000 | 68 | 1027 | 0000 0100 0000 0011 | 0403 |
| 99 | 0110 0011 | 63 | 2055 | 0000 1000 0000 0111 | 0807 |
| 109 | 0110 1101 | 6D | 63 | 0000 0000 0011 1111 | 003F |

**Exercise 3(2 marks): Compute**

(b: binary, q: octal, h: hexadecimal)

**3245q + 247q = ?q = ?b** =3514q =11101001100b

**1A7Bh + 26FE7h = ?h = ?b** =28A62h =101000101001100010b

**1101101101b - 10110111b =?b** =1010110110b

**3654q – 337q =?q = ?b** =6CDq =11011001101b

**3AB7h – 1FAh = ?h = ?b** =38BDh =11100010111101b

**36Ah – 576q = ? h = ?b** =1ECh =111101100b

**64AEh – 1001101b= ? q** =62141q

101101111 b

+ 100111011 b

110110001 b

110001101b

1011010 b\* 1011b =1111011110b

1101000b + 2AB h + 345 q = ? h = ? q =3F8h =1770q

3AFh / 1Ch =? b = ?d =100001b =33d

3ACh – 562q = ?b = ? d =1000111010b =570d

3FFA h / 327q = ?b = ? d =1001100b =76d

**Exercise 4 (2 marks)**

1. Show binary formats of 1-byte unsigned numbers: 251 , 163, 117

11111011; 101000011; 1110101

1. Show binary formats of 2-byte unsigned numbers: 551 , 160, 443

1000100111; 10100000; 110111011

1. Show binary formats of 1-byte signed numbers: -51 , -163, -117, 320

11001101; 1111111101011101; 1111111110001011; 11101100

1. Show the decimal values of 1-byte unsigned representations: :

01100011 b = 99d, 10001111 b = 143d, 11001010 b = 202d, 01001100 b= 6d

**Part 2: Explore memory structure of programs**

**Sample**

**Complete the code of following program then draw it’s memory structure**

**(2 marks)**



#include <stdio.h>

main()

{

int n;

double x;

char c1;

int m;

short s;

long L;

float y;

printf("Code of main: %u\n", &main);

printf("Variable n, add: %u, memory size: %d\n", &n, sizeof(n));

printf("Variable x, add: %u, memory size:%d\n", &x, sizeof(x));

printf("Variable c1, add:%u, memory sie: %d\n", &c1, sizeof(c1));

printf("Variable m, add: %u, memory size: %d\n", &m, sizeof(m));

printf("Variable s, add:%u, memory size:%d\n", &s, sizeof(s));

printf("Variable L, add:%u, memory size:%d\n", &L, sizeof(L));

printf("Variable y, add:%u, memory size:%d\n", &y, sizeof(y));

getchar();

return 0;

}