**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 | 0010 0010 | 192 | 0000 0000 1100 0000 |
| 2 | 0010 | 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 1101 | 819 | 0000 0011 0011 0011 |
| 8 | 1000 | 88 | 0101 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 | 0138 |
| 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 1101 | 4D | 819 | 0000 0011 0011 0011 | 0333 |
| 88 | 0101 1000 | 58 | 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 = 3514 q = 0111 0100 1000 b**

**1A7Bh + 26FE7h = 28A62 h = 0010 1000 1010 0110 0010 b**

**1101101101b - 10110111b = 0010 1011 0110 b**

**3654q – 337q = 3315 q = 0110 1100 1101 b**

**3AB7h – 1FAh = 38BD h = 0011 1000 1011 1101 b**

**36Ah – 576q = 1EC h = 0001 1110 1100 b**

**64AEh – 1001101b= 62141 q**

1 0110 1111 b

+ 1 0011 1011 b

1 1011 0001 b

1 1000 1101 b

= 0101 1110 1000 b

1011010 b \* 1011b = 0011 1101 1110 b

1101000b + 2AB h + 345 q = 68 h + 2AB h + E5 h = 3F8 h

= 150 q + 1253 q + 345 q = 1770 q

3AFh / 1Ch =0011 1010 1100 b / 0001 1100 b = 0010 0001 b

= 943 d / 28 d = 33 d

3ACh – 562q = b

= 940 d – 370 d = 570 d = 0010 0011 1010 b

3FFA h / 327q = 16378 d / 215 d = 76 d = 0100 1100 b

**Exercise 4 (2 marks)**

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

251 = 1111 1101

163 = 1010 0011

117 = 0111 0101

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

551 = 0000 0010 0010 0111

160 = 0000 0000 1010 0000

443 = 0000 0001 1011 1011

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

-51 = 1100 1101

-163 = 0101 1101

-117 = 1000 1011

320 =

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

01100011 b , 10001111 b , 11001010 b , 01001100 b

0110 0011 b = 99 d

1000 1111 b = 143 d

1100 1010 b = 202 d

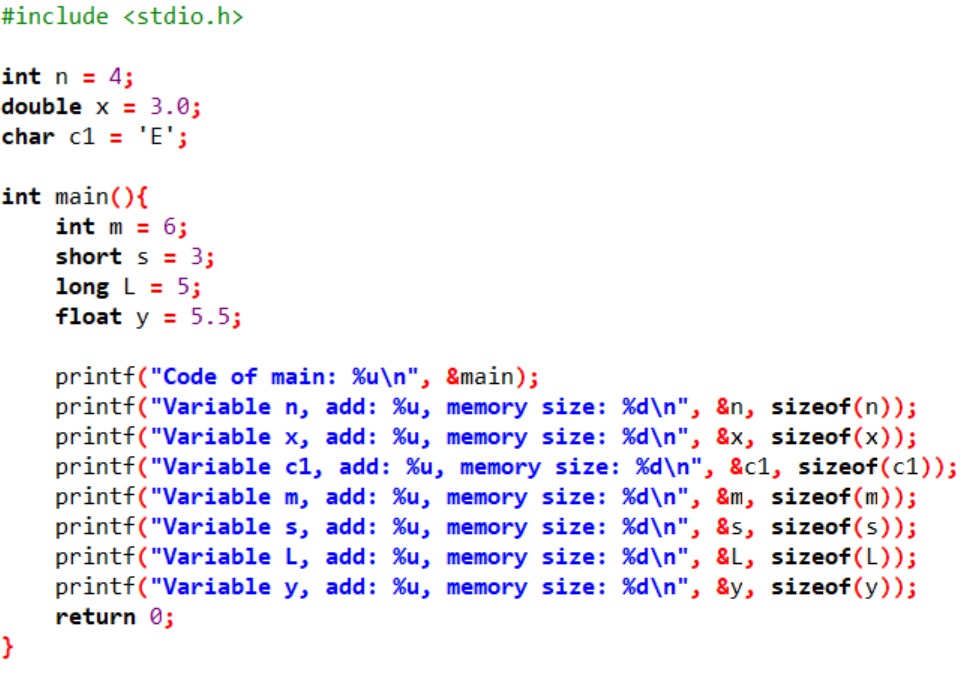
0100 1100 b = 76d

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

**Sample**

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

**(2 marks)**

A computer code with text

Description automatically generatedA black screen with white text

Description automatically generated

A screenshot of a computer

Description automatically generated