NOTE: Use of internet is not permitted, calculators are permitted and your answers must include worked solutions. If you require extra sheet(s) please write your name and student number at the top of each additional sheet.

# Part A

## Objective

Convert decimal numbers to binary showing in detail the conversion process

|  |
| --- |
| 1. Convert the number of days in a leap year 36610 to Base2 |
| 36610  X^n Number Count Remainder Run Tot Binary Bin Run Tot   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | 2^8 | 256 | 1 | 110 | 256 | 100000000 | 100000000 | | 2^7 | 128 | 0 | 110 | 256 | 000000000 | 100000000 | | 2^6 | 64 | 1 | 46 | 320 | 001000000 | 101000000 | | 2^5 | 32 | 1 | 14 | 352 | 000100000 | 101100000 | | 2^4 | 16 | 0 | 14 | 352 | 000000000 | 101100000 | | 2^3 | 8 | 1 | 6 | 360 | 000001000 | 101101000 | | 2^2 | 4 | 1 | 2 | 364 | 000000100 | 101101100 | | 2^1 | 2 | 1 | 0 | 366 | 000000010 | 101101110 | | 2^0 | 1 | 0 | 0 | 366 | 000000000 | 101101110 |   36610 = 1011011102 |
| 2. Convert the number of available seats in the new Páirc Uí Chaoimh 45,00010 to Base2 |
| 45’00010   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | X^n | Number | Count | Remainder | Run Tot | Binary | Binary Run Tot | | 2^15 | 32768 | 1 | 12232 | 32768 | 1000000000000000 | 1000000000000000 | | 2^14 | 16384 | 0 | 12232 | 32768 | 0000000000000000 | 1000000000000000 | | 2^13 | 8192 | 1 | 4040 | 40960 | 0010000000000000 | 1010000000000000 | | 2^12 | 4096 | 0 | 4040 | 40960 | 0000000000000000 | 1010000000000000 | | 2^11 | 2048 | 1 | 1992 | 43008 | 0000100000000000 | 1010100000000000 | | 2^10 | 1024 | 1 | 968 | 44032 | 0000010000000000 | 1010100000000000 | | 2^9 | 512 | 1 | 456 | 44544 | 0000001000000000 | 1010110000000000 | | 2^8 | 256 | 1 | 200 | 44800 | 0000000100000000 | 1010111000000000 | | 2^7 | 128 | 1 | 72 | 44928 | 0000000010000000 | 1010111100000000 | | 2^6 | 64 | 1 | 8 | 44992 | 0000000001000000 | 1010111110000000 | | 2^5 | 32 | 0 | 8 | 44992 | 0000000000000000 | 1010111111000000 | | 2^4 | 16 | 0 | 8 | 44992 | 0000000000000000 | 1010111111000000 | | 2^3 | 8 | 1 | 0 | 45000 | 0000000000001000 | 1010111111001000 | | 2^2 | 4 | 0 | 0 | 45000 | 0000000000000000 | 1010111111001000 | | 2^1 | 2 | 0 | 0 | 45000 | 0000000000000000 | 1010111111001000 | | 2^0 | 1 | 0 | 0 | 45000 | 0000000000000000 | 1010111111001000 |   4500010 = 10101111110010002 |

# Part B

## Objective

Convert numbers basen to hexadecimal showing in detail the conversion process

|  |
| --- |
| 1. Convert the number 18133678210 to Base16 |
| |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | Xn | Number | Count | Remainder | Run Tot | Hex | Hex Run Tot | | 167 | 268435456 | 0 | 181336782 | 0 | 00000000 | 0 | | 166 | 16777216 | A | 13564622 | 167772160 | 0A000000 | 0A | | 165 | 1048576 | C | 981710 | 180355072 | 0AC00000 | 0AC | | 164 | 65536 | E | 64206 | 181272576 | 0ACE0000 | 0ACE | | 163 | 4096 | F | 2766 | 181334016 | 0ACEF000 | 0ACEF | | 162 | 256 | A | 206 | 181336576 | 0ACEFA00 | 0ACEFA | | 161 | 16 | C | 14 | 181336768 | 0ACEFAC0 | 0ACEFAC | | 160 | 1 | E | 0 | 181336782 | 0ACEFACE | 0ACEFACE | |
| 2. Convert the number C0FF.EE16 to Base10 directly |
| |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | |  |  |  |  |  |  |  | | 163 | 162 | 161 | 160 | . | 16-1 | 16-2 | | C | 0 | F | F | . | E | E | | 12\*4096 + | 0\*256 + | 15\*16 + | 15\*1 + | . | 14\*0.0625 | 14\*0.00390625 |   ANS = 49407.929687516 |

# Part C

## Objective

Convert numbers basen to basen showing in detail the conversion process

|  |
| --- |
| 1. What is the Base16 value of 8 bit 2’s complement number 1001 01012 |
| 1001 01012 -> FLIP 011010102 -> ADD 1 -> 01101010  +00000001  011010112  = 2’s compliment    011010112 in Base 16 = 0110 1011  6 B = 6B16 |
| 2. Subtract 1310 from 4210 using 8 bit 2’s complement and convert to Base8 |
| 42   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | 25 | 32 | 1 | 10 | 32 | 100000 | 100000 | | 24 | 16 | 0 | 10 | 32 | 000000 | 100000 | | 23 | 8 | 1 | 2 | 40 | 001000 | 101000 | | 22 | 4 | 0 | 2 | 40 | 000000 | 101000 | | 21 | 2 | 1 | 0 | 42 | 000010 | 101010 | | 20 | 1 | 0 | 0 | 42 | 000000 | 101010 |   Ans = 001010102 = 4210  13   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | 24 | 16 | 0 | 13 | 0 | 00000 | 00000 | | 23 | 8 | 1 | 5 | 8 | 01000 | 01000 | | 22 | 4 | 1 | 1 | 12 | 00100 | 01100 | | 21 | 2 | 0 | 1 | 12 | 00000 | 01100 | | 20 | 1 | 1 | 0 | 13 | 00001 | 01101 |   Ans = 000011012 = 1310  00101010  -00001101 -> FLIP = 11110010 -> ADD 1 = 11110010  +00000001  111100112  00101010  +11110011  100011111 = 00101010  -00001101 = 000111112  000111112  = 378   |  |  |  |  |  | | --- | --- | --- | --- | --- | | 24 | 23 | 22 | 21 | 20 | | 1 | 1 | 1 | 1 | 1 | | 16 | 8 | 4 | 2 | 1 |   16 + 8 + 4 + 2 + 1 = 3110   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | xn | number | count | remainder | Run tot | Octal | Oct run tot | | 82 | 64 | 0 | 31 | 0 | 000 | 000 | | 81 | 8 | 3 | 7 | 24 | 030 | 030 | | 80 | 1 | 7 | 0 | 31 | 007 | 037 | |
|  |

# Part D

## Objective

Convert numbers basen to hexadecimal showing in detail the conversion process

|  |
| --- |
| 1. Add -3210 to 6110 using 8 bit 2’s complement |
|  |
| 2. Add -410 to 4610 using 8 bit 2’s complement |
|  |

Hand up this practical report at the end of session and ensure it has been checked

|  |  |  |  |
| --- | --- | --- | --- |
| **Student Name** | **Christopher Byrne** | **Student Number** | **C00276260** |
| **Date** | **05/10/22** | **Checked** |  |
| **Group** | **A** |  |  |