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 |
| |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | 2^n | numbers | count | remainder | Running  total | Binary | Running  total | | 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 |         101101110 |
| 2. Convert the number of available seats in the new Páirc Uí Chaoimh 45,00010 to Base2 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | 2^n | number  s | coun  t | remainde  r | Runnin  g total | Binary | Running total | | 2^1  5 | 32,768 | 1 | 12232 | 32,768 | 100000000000000  0 | 100000000000000  0 | | 2^1  4 | 16,384 | 0 | 12232 | 32,768 | 000000000000000  0 | 100000000000000  0 | | 2^1  3 | 8,192 | 1 | 4040 | 40,960 | 001000000000000  0 | 101000000000000  0 | | 2^1  2 | 4,096 | 0 | 4040 | 40,960 | 000000000000000  0 | 101000000000000  0 | | 2^1  1 | 2,048 | 1 | 1,992 | 43,008 | 000010000000000  0 | 101010000000000  0 | | 2^1  0 | 1,024 | 1 | 968 | 44,032 | 000001000000000  0 | 101011000000000  0 | | 2^9 | 512 | 1 | 456 | 44,544 | 000000100000000  0 | 101011100000000  0 | | 2^8 | 256 | 1 | 200 | 44,800 | 000000010000000  0 | 101011110000000  0 | | 2^7 | 128 | 1 | 72 | 44,928 | 000000001000000  0 | 101011111000000  0 | | 2^6 | 64 | 1 | 8 | 44,992 | 000000000100000  0 | 101011111100000  0 | | 2^5 | 32 | 0 | 8 | 44,992 | 000000000000000  0 | 101011111100000  0 | | 2^4 | 16 | 0 | 8 | 45,000 | 000000000000000  0 | 101011111100000  0 | | 2^3 | 8 | 1 | 0 | 45,000 | 000000000000100  0 | 101011111100100  0 | | 2^2 | 4 | 0 | 0 | 45,000 | 000000000000000  0 | 101011111100100  0 | | 2^1 | 2 | 0 | 0 | 45,000 | 000000000000000  0 | 101011111100100  0 | | 2^0 | 1 | 0 | 0 | 45,000 | 000000000000000  0 | 101011111100100  0 |         1010111111001000 |
|  |

# Part B

## Objective

Convert numbers basen to hexadecimal showing in detail the conversion process

|  |
| --- |
| 1. Convert the number 18133678210 to Base16 |
| 181,226,782     |  |  |  |  |  | | --- | --- | --- | --- | --- | | 2^n | number  s | coun  t | remainder | Running total | | 2^27 | 134,217,728 | 1 | 47,009,054 | 134,217,728 | | 2^26 | 67,108,864 | 0 | 47,009,054 | 134,217,728 | | 2^25 | 33,554,432 | 1 | 13,454,622 | 167,772,160 | | 2^24 | 16,777,216 | 0 | 13,454,622 | 167,772,160 | | 2^23 | 8,388,608 | 1 | 5,066,014 | 176,160,768 | | 2^22 | 4,194,304 | 1 | 981,710 | 180,355,072 | | 2^21 | 2,097,152 | 0 | 981,710 | 180,355,072 | | 2^20 | 1,048,576 | 0 | 981,710 | 180,355,072 | | 2^19 | 524,288 | 1 | 457,422 | 180,879,360 | | 2^18 | 262,144 | 1 | 195,278 | 181,141,504 | | 2^17 | 131,072 | 1 | 64,206 | 181,141,504 | | 2^16 | 65,536 | 0 | 64,206 | 181,207,040 | | 2^1  5 | 32,768 | 1 | 31,438 | 181,207,040 | | 2^1  4 | 16,384 | 1 | 15,054 | 181,223,424 | | 2^1  3 | 8,192 | 1 | 6,682 | 181,223,424 | | 2^1  2 | 4,096 | 1 | 2,766 | 181,223,424 | | 2^1  1 | 2,048 | 1 | 718 | 181,225,472 | | 2^1  0 | 1,024 | 0 | 718 | 181,226,496 | | 2^9 | 512 | 1 | 206 | 181,226,496 | | 2^8 | 256 | 0 | 206 | 181,226,752 | | 2^7 | 128 | 1 | 78 | 181,226,752 | | 2^6 | 64 | 1 | 14 | 181,226,752 | | 2^5 | 32 | 0 | 14 | 181,226,752 | | 2^4 | 16 | 0 | 14 | 181,226,768 | | 2^3 | 8 | 1 | 6 | 181,226,776 | | 2^2 | 4 | 1 | 2 | 181,226,780 | | 2^1 | 2 | 1 | 0 | 181,226,782 | | 2^0 | 1 | 0 | 0 | 181,226,782 |       1010 1100 1110 1111 1010 1100 1110  a c e f a c e |
|  |
| 2. Convert the number C0FF.EE16 to Base10 directly |
| |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | a | b | c | d | e | f |   C 0 f f e e  12 0 15 15 14 14 🡪 1,201,515.1414 |

# 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 0101 -> flip 0110 1010 -> + 1 = |
| 2. Subtract 1310 from 4210 using 8 bit 2’s complement and convert to Base8 |
|  |

# 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** | **Michael Cullen** | **Student Number** | **C00261635** |
| **Date** | **28/09/2022** | **Checked** |  |
| **Group** | **A** |  |  |