<div align="center">

Practical 2

Number Representation

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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 366_{10} to Base$_2$

Xn	Number	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

366^{10}
Binary^2
101101110^2

2. Convert the number of available seats in the new Páirc Uí Chaoimh $45{,}000_{10}$ to Base$_2$

Xn	Number	Count	Remainder	Running Total	Binary	Running Total
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	1010110000000000
2^9	512	1	456	44544	0000001000000000	1010111000000000
2^8	256	1	200	44800	0000000100000000	1010111100000000
2^7	128	1	72	44928	0000000010000000	1010111110000000
2^6	64	1	8	44992	0000000001000000	1010111111000000
2^5	32	0	8	44992	0000000000000000	1010111111000000
2^4	16	0	8	44992	0000000000000000	1010111111000000

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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

45000^{10}
Binary^2
1010111111001000^2

Part B
Objective

Convert numbers $base_n$ to hexadecimal showing in detail the conversion process

1. Convert the number 181336782_{10} to $Base_{16}$

Number Representation

2^n	Numbers	Count	Remainder	Running Total	Binary	Running Total
2^27	134,217,728	1	47,009,054	134,217,728	10000000000000000000000000	10000000000000000000000000
2^26	67,108,864	0	47,009,054	134,217,728	00000000000000000000000000	10000000000000000000000000
2^25	33,554,432	1	13,454,622	167,772,160	00100000000000000000000000	10100000000000000000000000
2^24	16,777,216	0	13,454,622	167,772,160	00000000000000000000000000	10100000000000000000000000
2^23	8,388,608	1	5,066,014	176,160,768	00001000000000000000000000	10101000000000000000000000
2^22	4,194,304	1	981,710	180,355,072	00000100000000000000000000	10101100000000000000000000
2^21	2,097,152	0	981,710	180,355,072	00000000000000000000000000	10101100000000000000000000
2^20	1,048,576	0	981,710	180,355,072	00000000000000000000000000	10101100000000000000000000
2^19	524,288	1	457,422	180,879,360	00000000100000000000000000	10101100100000000000000000
2^18	262,144	1	195,278	181,141,504	00000000010000000000000000	10101100110000000000000000
2^17	131,072	1	64,206	181,141,504	00000000001000000000000000	10101100111000000000000000
2^16	65,536	0	64,206	181,207,040	00000000000000000000000000	10101100111000000000000000
2^15	32,768	1	31,438	181,207,040	00000000000010000000000000	10101100111010000000000000
2^14	16,384	1	15,054	181,223,424	00000000000010000000000000	10101100111011000000000000
2^13	8,192	1	6,682	181,223,424	00000000000001000000000000	10101100111011100000000000

2^{12}	4,096	1	2,766	181,223,424	00000000000000010000000000000	1010110011101111000000000000
2^{11}	2,048	1	718	181,225,472	00000000000000100000000000000	1010110011101111100000000000
2^{10}	1,024	0	718	181,226,496	00000000000000000000000000000	1010110011001111100000000000
2^9	512	1	206	181,226,496	00000000000000001000000000000	1010110011101111101000000000
2^8	256	0	206	181,226,752	00000000000000000000000000000	1010110011101111101000000000
2^7	128	1	78	181,226,752	00000000000000000010000000000	1010110011101111101010000000
2^6	64	1	14	181,226,752	00000000000000000001000000000	1010110011101111101011000000
2^5	32	0	14	181,226,752	00000000000000000000000000000	1010110011101111101011000000
2^4	16	0	14	181,226,768	00000000000000000000000000000	1010110011101111101011000000
2^3	8	1	6	181,226,776	00000000000000000000000001000	1010110011101111101011001000
2^2	4	1	2	181,226,780	00000000000000000000000000100	1010110011101111101011001100
2^1	2	1	0	181,226,782	00000000000000000000000000010	1010110011101111101011001110
2^0	1	0	0	181,226,782	00000000000000000000000000000	1010110011101111101011001110
1010^2	1100^2	1110^2	1111^2	1010^2	1100^2	1110^2
10^{10}	12^{10}	14^{10}	15^{10}	10^{10}	12^{10}	14^{10}
A^{16}	C^{16}	E^{16}	F^{16}	A^{16}	C^{16}	E^{16}

$ACEFACE^{16}$

2. Convert the number $C0FF.EE_{16}$ to $Base_{10}$ directly

Practical 2

Number Representation

Part C

Objective

Convert numbers $base_n$ to $base_n$ showing in detail the conversion process

1. What is the $Base_{16}$ value of 8 bit 2's complement number $1001\ 0101_2$

Number Representation

2. Subtract 13_{10} from 42_{10} using 8 bit 2's complement and convert to Base$_8$

Number Representation

Part D

Objective

Convert numbers base$_n$ to hexadecimal showing in detail the conversion process

1. Add -32_{10} to 61_{10} using 8 bit 2's complement

2. Add -4_{10} to 46_{10} using 8 bit 2's complement

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

Student Name		Student Number	
Date		Checked	
Group	A / B		