

Practical 2

Number Representation

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	total	Binary	total
2*8	256		110	256	1 0000 0000	1 0000 0000
2*7	128		110	256	0 1000 0000	1 0000 0000
2*6	64		46	320	0 0100 0000	1 0100 0000
2*5	32		14	352	0 0010 0000	1 0110 0000
2*4	16		14	352	0 0001 0000	1 0110 0000
2*3	8		6	360	0 0000 1000	10110 1000
2*2	4		2	364	0 0000 0100	1 0110 1100
2*1	2		0	366	0 0000 0010	1 0110 1110
2*0	0		0	366	0 0000 0001	1 0110 1110

2. Convert the number of available seats in the new Páirc Uí Chaoimh 45,000 ₁₀ to Base ₂						
Xn	Number	remainder	binary	total		
2*15	32,768	12,232	1 0000 0000 0000 0000	1 0000 0000 0000 0000		
2*13	8,192	4,040	0 0100 0000 0000 0000	1 0100 0000 0000 0000		
2*11	2,048	1992	0 0001 0000 0000 0000	1 0101 0000 0000 0000		
2*10	1024	968	0 0000 1000 0000 0000	1 0101 1000 0000 0000		
2*9	512	456	0 0000 0100 0000 0000	1 0101 1100 0000 0000		
2*8	256	200	0 0000 0010 0000 0000	1 0101 1110 0000 0000		
2*7	128	72	0 0000 0001 0000 0000	1 0101 1111 0000 0000		
2*6	64	8	0 0000 0000 1000 0000	1 0101 1111 1000 0000		
2*5	8	0	0 0000 0000 0001 0000	1 0101 1111 1001 0000		
45,000 = 1 0101 1111 1001 0000						

Practical 2
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Part B

Objective

Convert numbers base_n to hexadecimal showing in detail the conversion process

1. Convert the number 181336782 ₁₀ to Base ₁₆
<p>181,336,782 = 1010,1100,1110,1111,1010,1100,1110</p> <p>1010 = 10 = A 1100 = 12 = C 1110 = 14 = E 1111 = 15 = F 1010 = 10 = A 1100 = 12 = C 1110 = 14 = E</p>
2. Convert the number C0FF.EE ₁₆ to Base ₁₀ directly
<p>C = 12 = 1100 0 = 0 = 0000 F = 15 = 1111 F = 15 = 1111 . = ? E = 14 = 1110 E = 14 = 1110</p> <p>C0FF.EE = 1100 0000 1111 1111 1110 1110</p>

Practical 2
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Part C

Objective

Convert numbers base_n to base_n showing in detail the conversion process

1. What is the Base₁₆ value of 8 bit 2's complement number 1001 0101₂

2*7	128	1
2*6	64	0
2*5	32	0
2*4	16	1
2*3	8	0
2*2	4	1
2*1	2	0
2*0	1	1

decimal = 149

$$(128*1) + (16*1) + (4*1) + (1*1) = 149_{10}$$

16n	number	count	remainder	
16*1	16	9	144	(149%16 == 9.3125 hence 9, 9*16 = 144)
16*0	1	5	0	

95*16

2. Subtract 13₁₀ from 42₁₀ using 8 bit 2's complement and convert to Base₈

$$13_{10} = 1101$$
$$45_{10} = 00101010$$

$$\begin{array}{r} 0000\ 1101 \\ +0010\ 1010 \\ \hline \end{array}$$

Practical 2
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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
$32_{10} = 100000$ $-32_{10} = 1100000$ $61_{10} = 111101$
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	Joshua Boyce Hyland	Student Number	C00270917
Date	11/10/2022	Checked	
Group	A / B		