

## Practical 2

### Number Representation

NOTE: Use of internet is not permitted, apart from uploading submission, 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 year  $365_{10}$  to **Base<sub>2</sub>**

The image shows a handwritten table on lined paper. The table has five columns: 'x', '2^x', 'Remainder', 'count', and 'Binary'. The rows are numbered 0 to 9. The 'Remainder' column contains the remainders from dividing 365 by 2 repeatedly. The 'count' column contains the corresponding powers of 2. The 'Binary' column shows the binary representation of the remainders, with the final result being 10110110.

	x	2 <sup>x</sup>	Remainder	count	Binary
Q1	0	1	0	0	010110110
	1	2	1	1	010110110
	2	4	1	0	010110100
	3	8	5	1	010110100
	4	16	13	0	010110000
	5	32	13	1	010110000
	6	64	45	1	010100000
	7	128	109	0	010000000
	8	256	109	1	010000000
	9	512	365	0	000000000

=> 10110110

## Practical 2

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2. Convert the number of available seats in the new Páirc Uí Chaoimh **45,001**<sub>10</sub> to **Base<sub>2</sub>**

G2 45001<sub>10</sub>

x	2 <sup>x</sup>	Remainder	Count	Binary
0	1	0	1	101011111001001
1	2	1	0	101011111001000
2	4	1	0	101011111001000
3	8	1	1	101011111001001
4	16	9	0	101011111000000
5	32	9	0	101011111000000
6	64	9	1	101011111000000
7	128	73	1	101011110000000
8	256	201	1	101011100000000
9	512	457	1	101011000000000
10	1024	969	1	101010000000000
11	2048	1993	1	101010000000000
12	4096	4041	0	101000000000000
13	8192	4041	1	100000000000000
14	16384	12233	0	100000000000000
15	32768	12233	1	100000000000000

45001 ⇒ 101011111001001

**Practical 2**  
**Number Representation**

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**Part B**

**Objective**

Convert numbers base<sub>2</sub> to Base<sub>10</sub> showing in detail the conversion process

1. Convert the number <b>1011001001110101</b> <sub>2</sub> to <b>Base</b> <sub>10</sub>



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### Number Representation

	$\lambda$	$2^x$	Binary	Number	total
PB	0	1	1	$1 \times 1$	45685
Q1	1	2	0	0	45684
	2	4	1	$1 \times 4$	45684
	3	8	0	0	45680
	4	16	1	$1 \times 16$	45680
	5	32	1	$1 \times 32$	45664
	6	64	1	$1 \times 64$	45632
	7	128	0	0	45568
	8	256	0	0	45568
	9	512	1	$1 \times 512$	45568
	10	1024	0	0	45056
	11	2048	0	0	45056
	12	4096	1	$1 \times 4096$	45056
	13	8192	1	$1 \times 8192$	40960
	14	16384	0	0	32768
	15	32768	1	$1 \times 32768$	32768
	16	65536	0	0	

$\Rightarrow 45685$

**Practical 2**  
**Number Representation**

2.	Convert the number <b>101110.1001111011<sub>2</sub></b> to <b>Base<sub>10</sub></b>

	$x$	$2^x$	Binary Number	total
Q2	-10	0.0009765625	1	46.62889688
	-9	0.001953125	1	46.63085
	-8	0.00390625	0	46.6171875
	-7	0.0078125	1	46.6171875
	-6	0.015625	1	46.609375
	-5	0.03125	1	46.59375
	-4	0.0625	1	46.5625
	-3	0.125	0	46.5
	-2	0.25	0	46.5
	-1	0.5	1	46.5
	0	1	0	46
	1	2	1	46
	2	4	1	44
	3	8	1	40
	4	16	0	32
	5	32	1	32
	6	64	0	

$= 746.62889688$

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## Objective

1.	What is the <b>Base<sub>2</sub></b> value of addition of <b>1001 0111<sub>2</sub> + 0101 1111<sub>2</sub></b>
2.	What is the <b>Base<sub>2</sub></b> value of addition of <b>1001.0101<sub>2</sub> + 010.1 1101<sub>2</sub></b>



Practical 2  
Number Representation

$$\begin{array}{r} \text{PC} \quad 001001011 \\ \text{Q1} + 000101111 \\ \hline 001110110 \Rightarrow 1110110 \end{array}$$

$$\begin{array}{r} \text{Q2} \quad 01001.0101 \\ + 00010.1101 \\ \hline 011000010 \Rightarrow 11000010 \end{array}$$



**Practical 2**  
**Number Representation**

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

<b>Student Name</b>		<b>Student Number</b>	
<b>Date</b>		<b>Checked</b>	
<b>Group</b>	<b>A / B</b>		