1 Question

Q1

Exercise

Convert the following number from Binary to Gray:

10110111

Convert the following number from Gray to Binary:

11101100

1.1 Correction

Q1

Solutions

Binary → Gray Conversion

Binary	1	0	1	1	0	1	1	
Arrows	↓	↘ ⊕ ↓	↘ ⊕ ↓	↘ ⊕ ↓	↘ ⊕ ↓	↘ ⊕ ↓	↘ ⊕ ↓	
Gray	**1**	**1**	**1**	**0**	**1**	**1**	**0**	
Steps	Copy first bit	XOR $1 \oplus 0 = 1$	XOR $0 \oplus 1 = 1$	XOR $1 \oplus 1 = 0$	XOR $1 \oplus 0 = 1$	XOR $0 \oplus 1 = 1$	XOR $1 \oplus 1 = 0$	X

Gray → Binary Conversion

Gray	1	1	1	0	1	1	0	
Arrows	↓	↗ ⊕ ↓	↗ ⊕ ↓	↗ ⊕ ↓	↗ ⊕ ↓	↗ ⊕ ↓	↗ ⊕ ↓	
Binary	**1**	**0**	**1**	**1**	**0**	**1**	**1**	
Steps	Copy first bit	XOR $1 \oplus 1 = 0$	XOR $0 \oplus 1 = 1$	XOR $1 \oplus 0 = 1$	XOR $1 \oplus 1 = 0$	XOR $0 \oplus 1 = 1$	XOR $1 \oplus 0 = 1$	X

Illustration of Bit Change (Next Gray Code)

Binary Increment Illustration

x: 11101100 → $x + 1$: 11100100

Position	0	1	2	3	4	5	6	7
x	1	1	1	0	1	1	0	0
$x + 1$	1	1	1	0	**0**	1	0	0

Highlighted cell(s) = changed bit(s)

Gray Code Sequence

Gray Code Sequence (Bit Changes)

Step	Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7
x + 0	1	1	1	0	1	1	0	0
x + 1	1	1	1	0	**0**	1	0	0
x + 2	1	1	1	0	0	1	0	**1**
x + 3	1	1	1	0	0	1	**1**	1
x + 4	1	1	1	0	0	1	1	**0**
x + 5	1	1	1	0	0	**0**	1	0
x + 6	1	1	1	0	0	0	1	**1**
x + 7	1	1	1	0	0	0	**0**	1

Highlighted cell shows the bit that flipped compared to the previous Gray code.