

1 Question

Q1

Exercise

Convert the following number from Binary to Gray:

11101101

Convert the following number from Gray to Binary:














10011011

1.1 Correction

Q1

Solutions

Binary \rightarrow Gray Conversion

| | | | | | | | | |
|--------|---|--|--|--|--|--|--|---|
| Binary | 1 | 1 | 1 | 0 | 1 | 1 | 0 | |
| Arrows |  |  \oplus  |  \oplus  |  \oplus  |  \oplus  |  \oplus  |  \oplus  | |
| Gray | 1 | 0 | 0 | 1 | 1 | 0 | 1 | |
| Steps | Copy first bit | XOR $1 \oplus 1 = 0$ | XOR $1 \oplus 1 = 0$ | XOR $1 \oplus 0 = 1$ | XOR $0 \oplus 1 = 1$ | XOR $1 \oplus 1 = 0$ | XOR $1 \oplus 0 = 1$ | X |

Gray \rightarrow Binary Conversion














| | | | | | | | | |
|--------|---|--|--|--|--|--|--|---|
| Gray | 1 | 0 | 0 | 1 | 1 | 0 | 1 | |
| Arrows |  |  \oplus  |  \oplus  |  \oplus  |  \oplus  |  \oplus  |  \oplus  | |
| Binary | 1 | 1 | 1 | 0 | 1 | 1 | 0 | |
| Steps | Copy first bit | XOR $1 \oplus 0 = 1$ | XOR $1 \oplus 0 = 1$ | XOR $1 \oplus 1 = 0$ | XOR $0 \oplus 1 = 1$ | XOR $1 \oplus 0 = 1$ | XOR $1 \oplus 1 = 0$ | X |

Illustration of Bit Change (Next Gray Code)

Binary Increment Illustration

x : 10011011 $\rightarrow x + 1$: 10011001

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

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 | 0 | 0 | 1 | 1 | 0 | 1 | 1 |
| $x + 1$ | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 |
| $x + 2$ | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| $x + 3$ | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| $x + 4$ | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| $x + 5$ | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 |
| $x + 6$ | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| $x + 7$ | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 |

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