

Decimal to Binary

جواب تشریح شماره 1

a) 37

$$(37)_{10} = (100101)_2$$

Diagram illustrating the conversion of 37 to binary:

```

    37 | 2
    --|--
    18 | 2
    --|--
    9  | 2
    --|--
    4  | 2
    --|--
    2  | 2
    --|--
    1  |
    
```

Quotients: 18, 9, 4, 2, 1
 Remainders: 1, 0, 1, 0, 1 (from bottom to top)

b) 91

$$(91)_{10} = (1011011)_2$$

Diagram illustrating the conversion of 91 to binary:

```

    91 | 2
    --|--
    45 | 2
    --|--
    22 | 2
    --|--
    11 | 2
    --|--
    5  | 2
    --|--
    2  | 2
    --|--
    1  |
    
```

Quotients: 45, 22, 11, 5, 2, 1
 Remainders: 1, 1, 0, 1, 1, 1 (from bottom to top)

c) 145

$$(145)_{10} = (10010001)_2$$

Diagram illustrating the conversion of 145 to binary:

```

    145 | 2
    --|--
    72 | 2
    --|--
    36 | 2
    --|--
    18 | 2
    --|--
    9  | 2
    --|--
    4  | 2
    --|--
    2  | 2
    --|--
    1  |
    
```

Quotients: 72, 36, 18, 9, 4, 2, 1
 Remainders: 1, 0, 0, 1, 0, 0, 1 (from bottom to top)

d) 263

$$(263)_{10} = (100000111)_2$$

Diagram illustrating the conversion of 263 to binary:

```

    263 | 2
    --|--
    131 | 2
    --|--
    65  | 2
    --|--
    32  | 2
    --|--
    16  | 2
    --|--
    8   | 2
    --|--
    4   | 2
    --|--
    2   | 2
    --|--
    1   |
    
```

Quotients: 131, 65, 32, 16, 8, 4, 2, 1
 Remainders: 1, 1, 1, 0, 0, 0, 0, 1 (from bottom to top)

Binary to Decimal

-2

a) 100100 \Rightarrow

$$\begin{array}{ccccccc} & & 1 & 0 & 0 & 1 & 0 & 0 \\ & \swarrow & \swarrow & \swarrow & \swarrow & \downarrow & \downarrow \\ 1 \times 2^5 & & 0 \times 2^4 & & 0 \times 2^3 & & 1 \times 2^2 & & 0 \times 2^1 & & 0 \times 2^0 \end{array}$$

$$= 32 + 0 + 0 + 4 + 0 + 0 = 36$$

$$(100100)_2 = (36)_{10}$$

b) 11101101

$$\begin{array}{cccccccc} & & 1 & 1 & 1 & 0 & 1 & 1 & 0 & 1 \\ & \swarrow & \swarrow & \swarrow & \swarrow & \swarrow & \downarrow & \downarrow & \downarrow \\ 1 \times 2^7 & & 1 \times 2^6 & & 1 \times 2^5 & & 0 \times 2^4 & & 1 \times 2^3 & & 1 \times 2^2 & & 0 \times 2^1 & & 1 \times 2^0 \end{array}$$

$$= 128 + 64 + 32 + 0 + 8 + 4 + 0 + 1 =$$

$$(11101101)_2 = (237)_{10}$$

c) 00110010

$$\begin{array}{cccccccc}
 & 0 & 0 & 1 & 1 & 0 & 0 & 1 & 0 \\
 \swarrow & \swarrow & \swarrow & \swarrow & \swarrow & \swarrow & \swarrow & \swarrow & \downarrow \\
 0 \times 2^7 & 0 \times 2^6 & 1 \times 2^5 & 1 \times 2^4 & 0 \times 2^3 & 0 \times 2^2 & 1 \times 2^1 & 0 \times 2^0
 \end{array}$$

$$= 0 + 0 + 32 + 16 + 0 + 0 + 2 + 0 = 50$$

$$(00110010)_2 = (50)_{10}$$

d) 110001101

$$\begin{array}{cccccccc}
 & 1 & 1 & 0 & 0 & 0 & 1 & 1 & 0 & 1 \\
 \swarrow & \swarrow & \swarrow & \swarrow & \swarrow & \swarrow & \swarrow & \swarrow & \downarrow & \downarrow \\
 1 \times 2^8 & 1 \times 2^7 & 0 \times 2^6 & 0 \times 2^5 & 0 \times 2^4 & 1 \times 2^3 & 1 \times 2^2 & 0 \times 2^1 & 1 \times 2^0 \\
 & & 0 \times 2^6
 \end{array}$$

$$= 256 + 128 + 0 + 0 + 0 + 8 + 4 + 0 + 1 = 397$$

$$(110001101)_2 = (397)_{10}$$

$$\begin{array}{r} 11 \\ a) 101001 \\ + 000011 \\ \hline \end{array}$$

-3

1 0 1 1 0 0

$$\begin{array}{r} 1 1 1 \\ b) 0 1 1 0 1 1 0 \\ + 0 1 0 0 1 1 1 \\ \hline \end{array}$$

1 0 1 1 1 0 1

$$\begin{array}{r}
 \begin{array}{cccccc}
 & & & 1 & 1 & 1 \\
 & & 1 & 1 & & 1 \\
 & & & & 1 & 1 & 1 \\
 c) & & & 1 & 1 & 0 & 0 & 1 & 1 & 1 \\
 & & + & 1 & 1 & 0 & 0 & 1 & 0 & 1
 \end{array}
 \end{array}$$

1 1 0 0 1 1 0 0