Worksheet 10 Review

March 28, 2020

Question 1

a.

$$\begin{aligned}(165)_8 &= 5 \cdot 8^0 + 6 \cdot 8^1 + 1 \cdot 8^2 && (1)\\ &= 5 + 48 + 64 && (2)\\ &= 53 + 64 && (3)\\ &= 117 && (4)\end{aligned}$$

b.

$$\begin{aligned}(B4)_16 &= 4 \cdot 16^0 + 11 \cdot 16^1 && (1)\\ &= 4 + (11 \cdot 16) && (2)\\ &= 4 + 176 && (3)\\ &= 180 && (4)\end{aligned}$$

Question 2

a.

$$\begin{aligned}
357 \div 2 &= 178, \text{remainder } \mathbf{1},\\
178 \div 2 &= 89, \text{remainder } \mathbf{0},\\
89 \div 2 &= 44, \text{remainder } \mathbf{1},\\
44 \div 2 &= 22, \text{remainder } \mathbf{0},\\
22 \div 2 &= 11, \text{remainder } \mathbf{0},\\
11 \div 2 &= 5, \text{remainder } \mathbf{1},\\
5 \div 2 &= 2, \text{remainder } \mathbf{1},\\
2 \div 2 &= 1, \text{remainder } \mathbf{0},\\
1 \div 2 &= 0, \text{remainder } \mathbf{1}
\end{aligned}$$

Combining it together, the binary representation of 357 is $(101100101)_2$

b.

$$\begin{aligned}
1 \cdot 2^0 + 0 \cdot 2^1 + 1 \cdot 2^2 &= \frac{1+0+4}{8^0} = 5\\
0 \cdot 2^3 + 0 \cdot 2^4 + 1 \cdot 2^5 &= \frac{0+0+32}{8^1} = 4\\
1 \cdot 2^6 + 0 \cdot 2^7 + 1 \cdot 2^8 &= \frac{64+0+256}{8^2} = 5
\end{aligned}$$

Combining it together, the octal representation of $(101100101)_2$ is $(545)_8$.

c.

$$\begin{aligned}
357 \div 16 &= 22, \text{remainder } \mathbf{5},\\
22 \div 16 &= 1, \text{remainder } \mathbf{5},\\
1 \div 16 &= 0, \text{remainder } \mathbf{1},
\end{aligned}$$

Combining it together, the hexadecimal representation of 357 is $(155)_{16}$.

Correct Solution:

$$357 \div 16 = 22, \text{remainder } \mathbf{5},$$
$$22 \div 16 = 1, \text{remainder } \mathbf{6},$$
$$1 \div 16 = 0, \text{remainder } \mathbf{1},$$

Combining it together, the hexadecimal representation of 357 is $(165)_{16}$.

Question 3

a.

$$0.375 \times 2 = 0.75 + \mathbf{0} \quad (1)$$
$$0.75 \times 2 = 0.5 + \mathbf{1} \quad (2)$$
$$0.5 \times 2 = 0 + \mathbf{1} \quad (3)$$

Combining the above, the binary representation of 0.375 is $(0.011)_2$.

Notes:

- **Converting decimal to binary**

$$0.8125 \times 2 = 0.625 + \mathbf{1} \quad (4)$$
$$0.625 \times 2 = 0.25 + \mathbf{1} \quad (5)$$
$$0.25 \times 2 = 0.5 + \mathbf{0} \quad (6)$$
$$0.5 \times 2 = 0 + \mathbf{1} \quad (7)$$

Binaries read *top to bottom*