

Worksheet 10 Solution

March 19, 2020

Question 1

a.

$$(165)_8 = 5 \times 8^0 + 6 \times 8^1 + 1 \times 8^2 \quad (1)$$

$$= 5 + 48 + 64 \quad (2)$$

$$= 117 \quad (3)$$

b. **Reference Table**

Number	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	G
Value	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

$$(B4)_{16} = 4 \times 16^0 + 11 \times 16^1 \quad (1)$$

$$= 4 + 176 \quad (2)$$

$$= 180 \quad (3)$$

Question 2

a.

$$357 \div 2 = 178, \text{ remainder } \mathbf{1}$$

$$178 \div 2 = 89, \text{ remainder } \mathbf{0}$$

$$89 \div 2 = 44, \text{ remainder } \mathbf{1}$$

$$44 \div 2 = 22, \text{ remainder } \mathbf{0}$$

$$22 \div 2 = 11, \text{ remainder } \mathbf{0}$$

$$11 \div 2 = 5, \text{ remainder } \mathbf{1}$$

$$5 \div 2 = 2, \text{ remainder } \mathbf{1}$$

$$2 \div 2 = 1, \text{ remainder } \mathbf{0}$$

$$1 \div 2 = 0, \text{ remainder } \mathbf{1}$$

Hence, the binary representation of 357 is $(101100101)_2$.

b.

$$357 \div 8 = 44, \text{ remainder } \mathbf{5}$$

$$44 \div 8 = 5, \text{ remainder } \mathbf{4}$$

$$5 \div 8 = 0, \text{ remainder } \mathbf{5}$$

Hence, the octal representation of 357 is $(545)_8$.

c.

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

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

$$1 \div 16 = 0, \text{ remainder } \mathbf{1}$$

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

Question 3

a.

$$0.375 \times 2 = 0.750, +\mathbf{0}$$

$$0.750 \times 2 = 0.5, +\mathbf{1}$$

$$0.5 \times 2 = 0, +\mathbf{1}$$

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

b.

$$\begin{aligned}\frac{1}{10} \times 2 &= \frac{2}{10} + \mathbf{0} \\ \frac{2}{10} \times 2 &= \frac{4}{10} + \mathbf{0} \\ \frac{4}{10} \times 2 &= \frac{8}{10} + \mathbf{0} \\ \frac{8}{10} \times 2 &= \frac{6}{10} + \mathbf{1} \\ \frac{6}{10} \times 2 &= \frac{2}{10} + \mathbf{1} \\ \frac{2}{10} \times 2 &= \frac{4}{10} + \mathbf{0} \\ \frac{4}{10} \times 2 &= \frac{8}{10} + \mathbf{0} \\ \frac{8}{10} \times 2 &= \frac{6}{10} + \mathbf{1}\end{aligned}$$

Hence, the binary representation of $\frac{1}{10}$ is $(0.00011)_2$.

c. Let $a = 1$, and $r = \frac{1}{2}$.

$$\sum_{i=1}^{\infty} \frac{1}{2}^i = \frac{1(\frac{1}{2})}{1 - \frac{1}{2}} \tag{1}$$

$$= 1 \tag{2}$$