Stephen
Sallas

1-15-20

HW 1

1. a. $1100\ 0111_2$ → signed, so negative
$-1(2^7) + 1(2^6) + 1(2^2) + 1(2^1) + 1(2^0) = -57_{10}$

b. $0010\ 1000_2$ → signed, so positive
$1(2^5) + 1(2^3) = 40_{10}$

c. $1111\ 0011_2$
$1(2^7) + 1(2^6) + 1(2^5) + 1(2^4) + 1(2^1) + 1(2^0) = 243_{10}$

2. a. 65531_{10}
$2^n > 65531$, $2^{16} = 65536$, $65536 > 65531$
$n = 16$

b. 13662_{10}
$2^n > 13662$, $2^{14} = 16384$, $16384 > 13662$
$n = 14$

c. -2658_{10}
$2^{n-1} > 2658$, $2^{13-1} = 4096$, $4096 > 2658$
$n = 13$

3. a. $1010\ 1001\ 1101\ 1101_2 = A9DD_{16}$
A 9 D D

b. $1111\ 0010\ 0100\ 0011_2 = F243_{16}$
F 2 4 3

c. $1010\ 1110\ 0101\ 1100_2 = AE5C_{16}$
A E 5 C

4. a. $3039_{16} = 3(16^3) + 0(16^2) + 3(16^1) + 3(16^0) = 12345_{10}$

b. $1D2_{16} = 1(16^2) + 13(16^1) + 2(16^0) = 466_{10}$

c. $A5E3_{16} = 10(16^3) + 5(16^2) + 14(16^1) + 3(16^0) = 42467_{10}$

5. a. -481_{10}

256	481	1
16	225	14 (E)
	1	1

$481_{10} = 1E1_{16}$

FFF

$-\ 1E1$

$+\ E1E$ ← 1's complement

$\quad\quad\ 1$

E1F ← 2's complement

$E1F_{16}$

b. -194_{10}

16	194	12 (C)
	6	6

$194_{10} = C6_{16}$

FF

$-\ C6$

39 ← 1's complement

$+\ \ 1$

4A ← 2's complement

$4A_{16}$

c. 2020_{10}

256	2020	7
16	224	14 (E)
	4	4

$2020_{10} = 7E4_{16}$

Stephen
Sallas

1-15-20

HW 1 (cont.)

6. a. -65_{10}

2	65	1
2	32	0
2	16	0
2	8	0
2	4	0
2	2	0
2	1	1

$65_{10} = 01000001_2$

10111110 ← 1's compliment

$+ \quad 1$

10111111 ← 2's compliment

$\boxed{10111111_2}$

b. 113_{10}

2	113	1
2	56	0
2	28	0
2	14	0
2	7	1
2	3	1
2	1	1

$113_{10} = \boxed{01110001_2}$

c. -119_{10}

2	119	1
2	59	1
2	29	1
2	14	0
2	7	1
2	3	1
2	1	1

$119_{10} = 01110111$

10001000

$+ \quad 1$

10001001

$\boxed{10001001_2}$

7. S P R I N G = $\boxed{5350524947}$

53 50 52 49 4F 47

8. a. $00000 \leq x \leq 11111$

$1(2^4) + 1(2^3) + 1(2^2) + 1(2^1) + 1(2^0) = 31$

$0 \leq x \leq 31$

b. $10000 \leq x \leq 01111$

$-1(2^4) = -16$

$1(2^3) + 1(2^2) + 1(2^1) + 1(2^0) = 15$

$-16 \leq x \leq 15$