In Class Problem Set #23

CSE 1400 and MTH 2051

Fall 2012

Number Systems

1. The following numbers are written in two's complement notation. What are their decimal value?

   (a) $(11\ 1001)_{2c}$

   Answer:

Horner's Rule					
1	1	1	0	0	1
	2	6	14	28	56
1	3	7	14	28	$\boxed{57}$

   (b) $(0011\ 1001)_{2c}$

   Answer:

Horner's Rule							
0	0	1	1	1	0	0	1
	0	0	2	6	14	28	56
0	0	1	3	7	14	28	$\boxed{57}$

   (c) $(1011\ 1001)_{2c}$

   Answer:

Horner's Rule							
1	0	1	1	1	0	0	1
	2	4	10	22	46	92	184
1	2	5	11	23	46	92	$\boxed{185}$

   (d) $(1001\ 1010)_{2c}$

   Answer:

Horner's Rule							
1	0	0	1	1	0	1	0
	2	4	8	18	38	76	154
1	2	4	9	19	38	77	$\boxed{155}$

2. What is the two's complement notation for the following decimal numbers?

(a) $(31)_{10}$
Answer:

Repeated Remaindering Mod 2					
Quotients	31	15	7	3	1
Remainders	1	1	1	1	1

$$(31)_{10} = (01\ 1111)_{2c}$$

(b) $(-31)_{10}$
Answer:

$$(-31)_{10} = (10\ 0001)_{2c}$$

(c) $(32)_{10}$
Answer:

Repeated Remaindering Mod 2						
Quotients	32	16	8	4	2	1
Remainders	0	0	0	0	0	1

$(32)_{10} = (010\ 0000)_{2c}$

(d) $(-32)_{10}$
Answer: $(-32)_{10} = (110\ 0000)_{2c}$

(e) $(123)_{10}$
Answer:

Repeated Remaindering Mod $2c$							
Quotients	123	61	30	15	7	3	1
Remainders	1	1	0	1	1	1	1

$(123)_{10} = (0111\ 1011)_2$

(f) $(-123)_{10}$
Answer: $(-123)_{10} = (1000\ 0101)_2$

(g) $(158)_{10}$
Answer:

Repeated Remaindering Mod 2								
Quotients	158	79	39	19	9	4	2	1
Remainders	0	1	1	1	1	0	0	1

$(158)_{10} = (0\ 1001\ 1110)_{2c}$

(h) $(-158)_{10}$

Answer: $(-158)_{10} = (1\ 0110\ 0010)_{2c}$