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Assignment 8

1.

Iteration	Steps	Multiplicand Register	Multiplier Register	Product Register
0	Initial Values	0111	0101	0000
1	1. Test Multiplier $M_0 = 1$ 1a. Add Multiplicand to Product 2. sll Multiplicand 3. srl Multiplier	1110	0010	0000+0111= 0111
2	1. Test Multiplier $M_0 = 1$ 2. sll Multiplicand 3. srl Multiplier	1 1100	0001	0111
3	1. Test Multiplier $M_0 = 1$ 1a. Add Multiplicand to Product 2. sll Multiplicand 3. srl Multiplier	11 1000	0000	00 0111+11 100= 10 0011
4	1. Test Multiplier $M_0 = 1$ 2. sll Multiplicand 3. srl Multiplier	111 0000	0000	**10 0011**

2.

Iteration	Steps	Quotient Register	Divisor Register	Remainder Register
0	Initial Values	0000	(sll to 8-bit) 0110 0000	(Dividend) 0111 1010
1	1. Subtract Divisor from Remainder 2a. srl Quotient and set Q_0 to 1 3. srl Divisor	0001	0011 0000	01111010-0110 0000= 0001 1010
2	1. Subtract Divisor from Remainder 2b. Add Divisor back to Remainder and srl Quotient and set Q_0 to 0 3. srl Divisor	0010	0001 1000	00011010-0011 0000= 11101010 11101010+001 10000= 0001 1010
3	1. Subtract Divisor from Remainder 2a. srl Quotient and set Q_0 to 1 3. srl Divisor	0101	0000 1100	00011010-0001 1000= 0000 0010
4	1. Subtract Divisor from Remainder 2b. Add Divisor back to Remainder and srl Quotient and set Q_0 to 0 3. srl Divisor	1010	0000 0110	00000010-000 01100= 11110110 11110110+000 00110= 0000 0010
5	1. Subtract Divisor from Remainder 2b. Add Divisor back to Remainder and srl Quotient and set Q_0 to 0 3. srl Divisor	**1 0100**	0000 0011	00000010-000 00011= 11111111 11111111+0000 0011= **0000 0010**

3. $(-3965)_{10} = -(2^{11} + 2^{10} + 2^9 + 2^8 + 2^6 + 2^5 + 2^4 + 2^3 + 2^2 + 2^0) =$
-0000 0000 0000 0000 0000 1111 0111 1101 =
 1111 1111 1111 1111 1111 0000 1000 0010
+0000 0000 0000 0000 0000 0000 0000 0001
$(1111\ 1111\ 1111\ 1111\ 1111\ 0000\ 1000\ 0011)_2$

4. Given 1111 1111 1111 1111 1110 1011 0011 1100

    0000 0000 0000 0000 0001 0100 1100 0011

    + 0000 0000 0000 0000 0000 0000 0000 0001

    $(0000\ 0000\ 0000\ 0000\ 0001\ 0100\ 1100\ 0100)_2 = (5316)_{10}$

    $(1111\ 1111\ 1111\ 1111\ 1110\ 1011\ 0011\ 1100)_2 =$ **$(-5316)_{10}$**

5. a. $(31655.31640625)_{10} = (111101110100111.01010001)_2$

    b. $(-1)^0 * 1.11101110100111101010001 * 2^{14}$

    c. Biased Exponent = $14 + 127 = (141)_{10} = (10001101)_2$

    d. (**0100 0110 1111 0111 0100 1110 1010 0010**)$_2$ = (**46F74EA2**)$_{16}$

6. a. $(-5737.390625)_{10} = -(1011001101001.011001)_2$

    b. $(-1)^1 * 1.011001101001011001 * 2^{12}$

    c. Biased Exponent = $12 + 127 = (139)_{10} = (10001011)_2$

    d. (**1100 0101 1011 0011 0100 1011 0010 0000**)$_2$ = (**C5B34B20**)$_{16}$

7. Given 0xC6533720 = $(1100\ 0110\ 0101\ 0011\ 0011\ 0111\ 0010\ 0000)_2$

    Sign = 1, Biased Exponent = 140, Original Exponent = 140 - 127 = 13

    Normalized Format = $(-1) * 1.101001100110111001 * 2^{13}$

    Original Binary = -11010011001101.11001 =

    $-(2^{13} + 2^{12} + 2^{10} + 2^7 + 2^6 + 2^3 + 2^2 + 2^0).(2^{-1} + 2^{-2} + 2^{-5}) = -13517.78125 =$

    $-1.351778125 * 10^4$

8. $1.1011 * 2^{-8} + 1.0111 * 2^{-10}$

    Step 1: $1.0111 * 2^{-10}$ shifts to $0.010111 * 2^{-8}$

    Step 2: 0.010111

    $\quad + \underline{1.101100}$

    $\quad 10.000011 * 2^{-8}$

    Step 3: $1.0000011 * 2^{-7}$ and $-126 <= -7 <= 127$

    Step 4: **$1.0000 * 2^{-7}$**

9. $(1.1011 * 2^{-8}) * (1.0111 * 2^{-10})$
   Step 1: -8 + (-10) = -18
   Step 2: 1.1011
   - <u>1.0111</u>
     000011011
     000110110
     001101100
     000000000
+ <u>110110000</u>
     $10.01101101 * 2^{-18}$
   Step 3: $1.001101101 * 2^{-17}$
   Step 4: **$1.0011 * 2^{-17}$**

10. $8.97 * 10^7 + 7.68 * 10^5 = 8.97 * 10^7 + 0.0768 * 10^7$
   a. 8.97
   <u>+ 0.0768</u>
   9.0468 = **$9.05 * 10^7$**
   b. 8.97
   <u>+ 0.07</u>
   $9.04 * 10^7$