$8 - 2 = 6.$

Floating Point Subtraction (Binary)

1.Align binary points:

- Align binary point of the number with smaller exponent

2. Add significands:

3. Normalize result:

4. Round and renormalize if necessary:

NB. We assumed that significands can be only 4 bits or digits.

precision format.

Problem: Perform binary floating-point subtraction and convert the resulting values to IEEE-754 single. Finally convert them to hexadecimal values.

0.5 – 0.4375

$0.5_{10} = 0.1_2$

$0.5 \times 2 = 1.\boxed{0}$

$= 1.0 \times 2^{-1}$

$0.5_{10} = 1.0 \times 2^{-1}$

$0.4375_{10} = 0.0111_2$

$0.4375 \times 2 = \boxed{0}.875$

$0.875 \times 2 = 1.75$

$0.75 \times 2 = 1.5$

$0.5 \times 2 = 1.\boxed{0}$

$-0.4375 = -1.11 \times 2^{-2}$

$= 0.111 \times 2^{-1}$

step 1

$0.5_{10} = \underbrace{1.000}\times 2^{-1}$

$-0.4375_{10} = -\underbrace{0.111} \times 2^{-1}$

(0.111) 1's complement $= 1.000$
$+1$
2's complement(0.111) 1.001

$0.5 = 1.000$
$-0.4375 = + 1.001$
$\cancel{1}0.001$

Result $= \underbrace{0.001}\times 2^{-1} = 1.000 \times 2^{-4}$.

sign $= 0$
exponent $= -4 + 127 = 123_{10} = 01111011_2$
Fraction $= 0.001$

Floating Point Multiplication

1. Add exponents:
2. Multiply significands:
3. Normalize result:
4. Round and renormalize if necessary:
5. Determine the sign of result from signs of operands

NB. We assumed that significands can be only 4 digits of the significands and two digits of the exponents .

Floating Point Multiplication (Decimal)

operand1 operand2.

e1 e2

Consider a 4-digit decimal example: $(\underline{1.110} \times 10^{10}) \text{ X } (\underline{9.2} \times 10^{-5})$ $= \boxed{10.212 \times 10^{5}}$

1. Add exponents

$e1 = 10$

$e2 = -5$.

$e = e1 + e2 = 10 - 5 = 5$

2. Multiply significands

$$\begin{array}{r} 1.110 \\ \times \quad 9.2 \\ \hline 10.212 \end{array}$$

Result $= 10.212 \times 10^5$.

3. Result $= 10.21 \times 10^5$.

5. sign $= (+) \times (+) = +$

$$\boxed{10.21 \times 10^5}$$

Problem: Perform binary floating-point multiplication and convert the resulting values to IEEE-754 single precision format. Finally convert them to hexadecimal values.

0.5 * -0.4375

$$0.5_{10} = 0.1_2 = \underbrace{1.0}_{} \times 2^{\overset{e1}{-1}} \qquad 0.4375_{10} = 0.0111_2 = 1.11 \times 2^{\overset{e2}{-2}}$$

1. Add exponents

$$e = e1 + e2 = -1 - 2 = -3.$$

2.

$$0.5 = \boxed{1.000} \times 2^{-1}$$

$$0.4375 = \boxed{1.110} \times 2^{-2}$$

$$\begin{array}{r} 1.000 \\ 1.110 \\ \hline 0\ 000 \\ 1\ 0\ 00\ \ \\ 1\ 0\ 0\ 0\ \ \ \ \\ 1\ 0\ 0\ 0\ \ \ \ \ \ \\ \hline 1.1\ 1\ 0\ 000 \end{array}$$

3. Result $= 1.11 \times 2^{-3}$

5. Sign $= (+) * (-) = -$

Sign $= 1$

Exponent $= -3 + 127 = 124_{10} = 01111100_2$

Fraction $= 0.11$

sign	exponent	Fraction
1	01111100	11000000000000 . . .

B E 6 0 0 0 . . .

$0XBE600000$ ✓

6. Perform the following computation and convert the resulting values in IEEE-754 single precision format.

$\boxed{b}$ $\quad -7.25 * 6.5 = ?$

$7.25 = 111.01$ $\qquad\qquad$ $6.5 = 110.1$

$= 1.1101 \times 2^2$ $\qquad\qquad$ $= 1.101 \times 2^2$

1. $e_1 = 2 \qquad e_2 = 2$

$e = e_1 + e_2 = 4.$

2. $1.1101 \times 1.101 = 10.1111001$

Result $= 10.1111001 \times 2^4$

3. Normalize $= 1.01111001 \times 2^5.$

5. sign $= (-) * (+) = (-)$ Ve.

sign $= 1$

exponent $= 5 + 127 = 132_{10} = 10000100_2$

Fraction $= 01111001$