

Assignment: Homework Three Name: Cody Strange

Disclaimer: This is my work, not that of others

Total Score: 110 (in points, not percentage)

Problem 1 score: 10

Problem 2 score: 10

Problem 3 score: 10

Problem 4 score: 10

Problem 5 score: 10

Problem 6 score: 10

Problem 7 score: 10

Problem 8 score: 10

Problem 9 score: 10

Problem 10 score: 10

Problem 11 score: 10

1. Sign bit = negative = 1

Actual exponent = exponent field + 127 = 3 + 127 = 011 + 01111111 = 10000010

Mantissa = 100100000000000000000000

Answer = **1 100000010 100100000000000000000000**

-12.5

S = 1

M = 100100000000000000000000

e = 1000010

100

1.001 x 2³

0111111

+ 00000011

1001000



[20, 35]

Single precision for 20

$SM \times 2^E$

10/00

$S=0$

1.01×10^4

$M=010000000000000000000000$

$E=10000011$

01111111
10000100
10000011

Answer = 0 10000011 010000000000000000000000

2.

Single Precision for 30

$$S = 0$$

$$30 = 1110$$

$$M = 11101000000000000000000000000000$$

$$\begin{array}{r} 1.110 \\ \times 2^4 \end{array}$$

$$e = 1000011$$

$$\begin{array}{r} 01111111 \\ + 00001000 \\ \hline 10000111 \end{array}$$

$$30 = 01000011110000000000000000000000$$

$$\begin{array}{r} 111 \\ - 010 \\ \hline 101 \end{array}$$

$$30 = 01000011110000000000000000000000$$

$$20 = 01000011010000000000000000000000$$

$$111 - 010 = 101$$

$$101 * 2^{20} = 5 * 2^{20} = 5242880$$

$$S = 1$$

$$M = 1011000000000000000000000000$$

$$e = 10000100$$

$$\sim 10110101 \times 2^5$$

$$\begin{array}{r} 10000100 \\ - 01111111 \\ \hline 00000000 \end{array}$$

$$\begin{array}{r} 10110101 \\ + 01111111 \\ \hline 10000100 \end{array}$$

$$\begin{array}{r} 32168421 \\ - 110110 \\ \hline 32168421 - 110110 = -54 \end{array}$$

3.

4. A)

$$1.01 \times 2^4 \rightarrow 1.011 \times 2^3$$

$$\begin{array}{r} 1.01 \times 2^4 \rightarrow .1011 \times 2^4 \\ \begin{array}{r} 0 \quad 1 \quad 1 \\ \times .001 \end{array} \end{array}$$

$$\begin{array}{r} 0.101 \\ \hline 0.101 \end{array} \times 2^4 = 1010 = 10$$

10

B)

$$\begin{array}{r}
 1.0100 \times 2^4 - 0.1011 \times 2^4 \\
 \begin{array}{r}
 \overset{\overset{1}{\times}}{0} \overset{\overset{1}{\times}}{0} \overset{\overset{1}{\times}}{0} \\
 1.0 \times 00 \\
 - 0.1011 \\
 \hline
 .1001
 \end{array} \\
 0.1001 \times 2^4 = 1001 = 9
 \end{array}$$

9

5. The number of differing numbers between the two numbers
6. Sign bit can be a 1 or a 0, Exponent is all 1s, Mantissa are all 0s
7. Sign bit can be a 1 or a 0, Exponents is all 1s, Mantissa can be anything that isn't a 0
8. Sign bit can be a 1 or a 0, Exponents is all 0s, Mantissa are all 0s
9. Sign bit can be a 1 or a 0, Exponents is all 0s, Mantissa can be anything
10. (a) The spacing between subnormal numbers is determined by the position of the leading bit
(b) The closer you get to 0 the larger your roundoff error gets
11. Extra bits saved for the floating-point operations, they reduce roundoff error