HW#1 SOLUTIONS

1) 4 DIRECTIONS

2 BITS → 2^2 → 4 POSSIBILITIES

NORTH → 00
SOUTH → 01
EAST → 10
WEST → 11

} ONE TYPE OF CODING.

FOR ADDITIONAL 4 ~~DIRECTIO~~ DIRECTIONS → 3 BITS.

3 BITS → 2^3 → 8 POSSIBILITIES COVERING ALL 8 DIRECTIONS.

2) 7 BIT BINARY WORD →
UNSIGNED → $2^7 = 128$
RANGE = 0 to 127

SIGNED → RANGE → $-2^{(7-1)}$ to $2^{7-1} - 1$

$= -64$ to 63.

3) a) 245.625

245 → 11110101

$0.625 \times 2 = 1.250$ → 1
$0.250 \times 2 = 0.500$ → 0
$0.500 \times 2 = 1.00$ → 1

.101

00 → 11110101.101

b. 6754.1025

1101001100010.000110

↳ SIX BITS OK

0.1025
× 2
0.2050
× 2
0.4100
× 2
.8200
× 2
1.6400
0.6400
× 2
1.2800
0.2800
× 2
0.5600

4) 110110101.1101

$1\times2^{-1}+1\times2^{-2}+0\times2^{-3}+1\times2^{-4}$
$= 0.5 + 0.25 + 0 + 0.0625$
$=$

Please note → $(437.8125)_{10}$

1
4
16
32
128
256
437

5. 3 3 2 7 5 5 5 5 6 5 1 3 5 3 0

1101101011101101011101101.110101001011101011100

6 D 7 B 6 D D 4 B A BC

HEX → 6D7B6D.D4BABC

OCTAL = 33275555.651353

6. a) 3ECDA7.DEFA

$(0011\ 1110\ 1100\ 1101\ 1010\ 0111.\ 1101\ 1110\ 1111\ 1010)_2$

b) 467DFFE.AABC

$(0100\ 0110\ 0111\ 1101\ 1111\ 1111\ 1110.\ 1010\ 1010\ 1011\ 1100)_2$

7. a. 4657.743

$(100\ 110101\ 111.\ 111\ 100\ 011)_2$

8. ~~987~~

a) 98743.123

$(1001\ 1000\ 0111\ 0100\ 0011.\ 0001\ 0010\ 0011)_2$

9. 102 → 01100110

1s Complement → 10011001

2s Complement → 10011010

10.

a)

43 → 00101011

25 → 00011001

68 → 01000100 → +68

b)

45 → 00101101

16 → 00010000 $\xrightarrow{-16}$ 11110000

00011101 → +29

c)

56 → 00111000

−125 → 01111101 $\xrightarrow{-125}$ 10000011

−69 → 10111011

2's comp → 01000101

64
4
1
69

−69

d)

+25 → 00011001 $\xrightarrow{-25}$ 11100111

53 → 00110101 $\xrightarrow{-53}$ 11001011

10110010

2's comp → 01001110

64
8
4
2
78

−78

−53
−25
−78

+6 = 00000110 $\xrightarrow[2\text{s comp}]{-6}$ 11111010

20 $\longrightarrow$ 00010100

00000000
00000000
00000000
11111010
11111010
00000000
11111010
11110001 00

$\uparrow$ -ve answer

2s comp $\longrightarrow$ 01111000 (64 32 16 8) $\rightarrow$ -120

11

a. 4 BIT OPERATION

4 $\rightarrow$ 0100 (carry 0) $\rightarrow$ NO OVER FLOW.

3 $\rightarrow$ 0011

0111

4 $\rightarrow$ 0100

13 $\rightarrow$ Cannot be represented using 4 Bits

Full points if you have attempted it.

b.

i) +113 → 01110001 $\xrightarrow{-113}$ 10001111 (OVER FLOW)

25 → 00011001 $\xrightarrow{-25}$ 11100111

01110110

ii) 28 → 00011100 (OVER FLOW)

100 → 01100100

10000000