Computer Organisation & Architecture

Practice Problems

① a) $(1523.21)_{10}$

2	1523
2	761 - 1
2	380 - 1
2	190 - 0
2	95 - 0
2	47 - 1
2	23 - 1
2	11 - 1
2	5 - 1
2	2 - 1
2	1 0

$0.21 \times 2 = 0.42$
$0.42 \times 2 = 0.84$
$0.84 \times 2 = 1.68$
$0.68 \times 2 = 1.36$
$0.36 \times 2 = 0.72$
$0.72 \times 2 = 1.44$
$0.44 \times 2 = 0.88$
$0.88 \times 2 = 1.76$
$0.76 \times 2 = 1.52$
$0.52 \times 2 = 1.04$
$0.04 \times 2 = 0.08$
$0.08 \times 2 = 0.16$
$0.16 \times 2 = 0.32$
$0.32 \times 2 = 0.64$
$0.64 \times 2 = 1.28$
$0.28 \times 2 = 0.56$
$0.56 \times 2 = 1.12$
$0.12 \times 2 = 0.24$
$0.24 \times 2 = 0.48$
$0.48 \times 2 = 0.96$
$0.96 \times 2 = 1.92$
$0.92 \times 2 = 1.84$
$0.84 \times 2 = 1.68$

1011111.0011 + .0011010111 0000 1010 0011

1.0111110011 0011 0101 1100 0001 0100 0011 × 2^{10}

S = 0

E = 124 + 10 = 134

Single Precision

Sign	Exponent	Mantissa
0	1001001	01111100110011010111000

Single Precision Exponent

$(-1)^0 (1 + .01111100110011010111000) \times 2^{(134-124)}$

b) $(929.32)_{10}$

2	929		
2	464	- 1	
2	232	- 0	
2	116	- 0	
2	58	- 0	
2	29	- 0	
2	14	- 1	
2	7	- 0	
2	3	- 1	
	1	1	

0.32 × 2 = 0.64

0.64 × 2 = 1.28

0.28 × 2 = 0.56

0.56 × 2 = 1.12

0.12 × 2 = 0.24

0.24 × 2 = 0.48

0.48 × 2 = 0.96

0.96 × 2 = 1.92

0.92 × 2 = 1.84

0.84 × 2 = 1.68

0.68 × 2 = 1.36

0.36 × 2 = 0.72

0.72 × 2 = 1.44

0.44 × 2 = 0.88

0.88 × 2 = 1.76

0.76 × 2 = 1.52

0.52 × 2 = 1.04

0.04 × 2 = 0.08

0.08 × 2 = 0.16

0.16 × 2 = 0.32

0.32 × 2 = 0.16

(11010000) + . 01010001111010111000

1. 11010000101010001111010111000 $\times 2^9$

S = 0

E = 9

E = 9 + 127 = 136

Single Precision

Signo	Exponent	Mantisa
0	10001000	11010000101010001111010

Single Precision Scientific

$(-1)^0 (1 + .11010000101010001111010) \times 2^{136-127}$

(3) $(81.432)_{10}$

2	81		
2	40	1	
2	20	0	
2	10	0	
2	5	0	
2	2	1	
	1	0	

$0.432 \times 2 = 0.864$

$0.864 \times 2 = 1.728$

$0.728 \times 2 = 1.456$

$0.456 \times 2 = 0.912$

$0.912 \times 2 \times 2 = 1.824$

$0.824 \times 2 = 1.648$

$0.648 \times 2 = 1.296$

$0.296 \times 2 = 0.592$

$0.592 \times = 1.184$

$0.184 \times 2 = 0.368$

$0.368 \times 2 = 0.736$

$0.736 \times 2 = 1.472$

$0.472 \times 2 = 0.944$

$0.944 \times 2 = 1.888$

$0.888 \times 2 = 1.776$

$0.776 \times 2 = 1.552$

$0.552 \times 2 = 1.104$

$0.104 \times 2 = 0.208$

$0.208 \times 2 = 0.416$

$0.416 \times 2 = 0.832$

$0.832 \times 2 = 1.664$

$1010001 + .01101110100101111000 1$

$1.01000101101110100101111000 1 \times 2^6$

$S = 0 \quad e = 6 \quad E = 133$

SPR

Sign	Exponent	Mantissa
0	10000101	01000101101110100101111

SPSR

$(-1)^0 (1 + .01000101101110100101111000 1) \times 2^6$

(2)

$-110110.011 \times 10^2 \quad -(1)$

$-110111.100 \times 10^2 \quad -(2)$

(2) + (1)

$+110111.100$

$+110110.011$

$-((101101.111 \times 10^{+2})$

1.01101111×10^8

(b)

$$0.11011 \times 10^{-1}$$
$$+ \quad 100.01010 \times 10^{-1}$$
$$\underline{101.00101 \times 10^{-1}}$$

~~1.0101000101~~ $1.01000101010 \times 10^{2}$