Unit 1 Assignment

Sunday, May 3, 2020 10:53 PM

(d) $011\,1010\,1010\,0100_2$

16384 8192 4096 2048 1024 512 256 128 64 32 16 8 4 2 1

3 A A 4

8192 + 4096 + 2048 + 512 + 128 + 32 + 4

= 15,012

(d) 10110101_2

negative

Two's → DEC

Invert 1011 0101

= 0100 1010

Add 1

0100 1010 + 1

= 0100 1011

convert to decimal

0100 1011

64 + 8 + 2 + 1

don't forget it was a negative Two's Complement

= -75

(d) $403FB001_{16}$

HEX → BIN

4 0 3 F B 0 0 1

0100 0000 0011 1111 1011 0000 0000 0001

(d) 10011111_2

signed → DEC

= -(16 + 8 + 4 + 2 + 1)

= -31

(d) 10110101_2

signed → DEC

= -(32 + 16 + 4 + 1)

= -53

(d) 711_{10}

DEC → BIN

512 128 32 8 2 1

0010 1100 0111

256 64 16 4 1

= 1011000111

BIN → HEX

= 0010 1100 0111

2 C 7

(d) -150_{10}

DEC → 8-bit Two's

8-bit Two's complement range

$[-2^{8-1}, 2^{8-1}-1]$ or $[-128, 127]$

overflows!

(e) 127_{10}

DEC → signed

0111 1111

(a) 0101_2

4-bit Two's → 8-bit Two's

= 0000 0101

(b) 1001_2

4-bit Two's → 8-bit Two's

= 1111 1001

(b) 1001_2

4-bit unsigned → 8-bit unsigned

= 0000 1001

(d) 10011111_2

64 16 4 1

32 8 2

holds the sign 0 = positive 1 = negative

Two's → DEC

1001 1111

this is negative number so convert into positive Two's complement

first, invert all bits

1001 1111

0110 0000

Then, add 1

0110 0000 + 1

0110 0001

Now this is like a regular binary number convert into decimal

0110 0001

128 64 32 16 8 4 2 1

(64+1) + (32+1) (1+1)

64 + 32 + 1

= 97 don't forget it was a negative I only converted it to positive first for convenience

= -97

It's important to multiply everything by 1, even if it does not make an difference because its the same for other numbers other than those 3 since we will deal with more than 1 then

(d) 711_{10}

DEC → OCT

DEC → BIN

0010 1100 0111

BIN → OCT

001 011 000 111

1 3 0 7

= 1307

(d) 2560_8

8^4 8^3 8^2 8^1

4096 512 64 8

OCT → BIN

OCT → HEX

OCT → DEC

OCT → BIN

2 5 6 0

010 101 110 000

= 0101 0111 0000

BIN → HEX

0101 0111 0000

5 7 0

= 570

HEX → DEC

5 7 0

$(5 \times 16^2) + (7 \times 16^1) + (0 \times 16^0)$

= 1,392

Estimate the value of 2^{31}

$2^{30} \cdot 2^1$

$2^{30} \approx 10^9 \approx 1$ billion

$2^1 = 2$

= 1 billion × 2

= 2 billion

(b) $1101_2 + 1011^2$

unsigned addition = 4-bit

1 1 1

1101 + 1011

11000 OVERFLOW!

(b) $1101_2 + 1011^2$

Two's addition

1 1 1

1101 + 1011

11000 → 1000

no overflow

(e) $-16_{10} + -9_{10}$

DEC → 6-bit Two's = 6-bit

-16_{10} BIN → 01 0000 2's → 11 0000

-9_{10} BIN → 00 1001 2's → 11 0111

11 0000 + 11 0111

11 0 0111 → 10 0111

no overflow

(c) $AB_{16} + 3E_{16}$

DEC → unsigned HEX = 8-bit HEX

AB + 3E

E 9

0xE9

A+B = 11+11 = 26 = 16+9

carry -1 9 16

1+A+3 - 1 + 10 + 3 = 14 = E

(d) $4_{10} - -8_{10}$

DEC → 5-bit Two's → 5-bit

4_{10} BIN → 0100 5-bit 2's → 00100

-8_{10} +BIN → 1000 5-bit 2's → 11000

$4_{10} - -8_{10} = 4_{10} + 8_{10}$

8_{10} BIN → 1000 5-bit 2's → 01000

00100 + 01000

01100 DEC → 12 ✓ $= 4_{10} - -8_{10}$