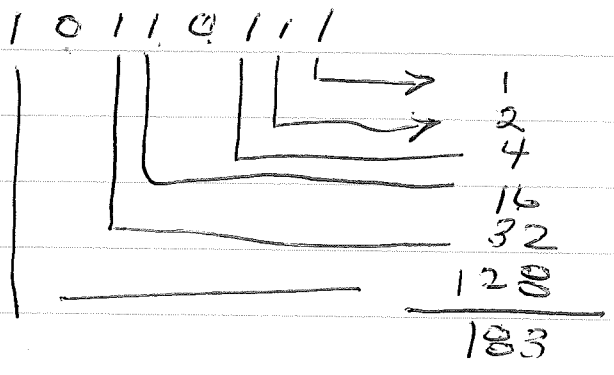
CS234 Binary Examples

BIN ⇒ DEC



DEC ⇒ BIN

2|183	1
2|91	1
2|45	1
2|22	0
2|11	1
2|5	1
2|2	0
2|1	1

1 0 1 1 0 1 1 1

Check by converting back to Dec.

ADDING BINARY

0	0	1	1	1
0	1	0	1	1
0	1	1	0	0

(1 + 1 = 0, carry 1)

CS 234 Binary Examples (cont'd)

"2's Complement"

(1) (A is −45) convert to binary (use positive value)

2|45	1
2|22	0
2|11	1
2|5	1
2|2	0
2|1	1

101101 check!

1
4
8
32
45 ✓

−A is 00101101 use 8 bits!

(2) get complement 11010010

(3) add 1 1

this is A ⇒ 11010011

A is 11010011

−A is 00101101

add them 1 00000000 ✓

Throw away.

CS 234 Binary Examples cont'd "2's Complement"

(1) B is 57 convert to binary (unsigned)

2|57 1
2|28 0
2|14 0
2|7 1
2|3 1
2|1 1

111001
1
8
16
32
57 ✓

B is 00111001

(2) get complement 11000110

(3) add 1 11000111

this is −B

B is 00111001
−B is 11000111
add them 1 | 00000000

throw away

Binary Examples (cont'd)
2's Complement

Do the following with 2's complements.

A+B

A−B

−A+B

−A−B

(A+B) ⟹ A is 1 1 0 1 0 0 1 1

B is 0 0 1 1 1 0 0 1

1 | 0 0 0 0 | 1 0 0

throw

4

8

12

−45

+57

12

check

(A−B) A is 1 1 0 1 0 0 1 1

−B is 1 1 0 0 0 1 1 1

throw → 1 | 1 0 0 1 1 0 1 0

0 1 1 0 0 1 0 1

+ 1

0 1 1 0 0 1 1 0

2

4

32

64

102

45

57

102

Binary Examples Contd

2's comp

$(-A+B)$ $-A$ is 00101101 45

B is 00111001 57

01100110 102

2
4
32
64

102 ✓

$(-A-B)$ $-A$ is 00101101

$-B$ is 11000111

1 1 1 0 1 0 0 -12

00001011 comp

+1 +(

1100

4
8 ✓

-12