

CSCI 2270

Data Structures and Algorithms

Lecture 20

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Office hours: ECCS 128

Wed 1-2pm

Fri 2-3pm

Administrivia

Labs 3, 4 will be graded soon; we're launching the COG autograder.

But there might be some bugs. This is new this semester.

Lab this week: `big_number` part 1

And yes, your `add_node` function is biased to sort

Extended part 1 deadline to Saturday at 11:55 pm

Additional bugs(!) in doubly linked list code: posted correction

Today: More `big_number` functions

Moving into other bases

Int constructor: no change, base remains 10

String constructor: check if digit > maximum, update base

private string alphabet =

"0123456789abcdefghijklmnopqrstuvwxyz";

finding the position of a letter in this string gives you
the digit value for this letter

Copy constructor: no change except for updating base

Assignment operator: no change except for updating base

Additions

Additions (base 10)

$$999 + 1$$

$$999 + -1$$

$$-999 + 1$$

$$-999 + -1$$

$$1 + 999$$

$$-1 + 999$$

$$1 + -999$$

$$-1 + -999$$

Carrying...

Subtractions

Subtractions (base 10)

$$1000 - 1$$

$$1000 - -1$$

$$-1000 - 1$$

$$-1000 - -1$$

$$1 - 1000$$

$$-1 - 1000$$

$$1 - -1000$$

$$-1 - -1000$$

Borrowing...

Multiplications

$$234 * 678 = 234 * 8 + 234 * 70 + 234 * 600$$

Digit by digit multiplication is needed for speed (don't just add!)

Converting into other bases

Convert 1024 in base 10 to number m in base 2

Begin by expressing 0 to 10 in binary:

0	0
1	1
2	10
3	11
4	100
5	101
6	110
7	111
8	1000
9	1001
10	1010

Converting into other bases

Convert 1024 in base 10 to number m in base 2

Start with $m = 0$

for each digit d in the old base k, highest to lowest:

$$m = m * k$$

$$m = m + d$$

1: $m = 0 * 1010$

$$m = 0 + 1$$

0: $m = 1 * 1010 = 1010$

$$m = 1010 + 0 = 1010$$

2: $m = 1010 * 1010 = 1100100$

$$m = 1100100 + 10 = 1100110$$

4: $m = 1100110 * 1010 = 1111111100$

$$m = 1111111100 + 100 = 10000000000$$