Homework for Dr. Z.'s MathHistory for Lecture 0

1. (a) $100 = 64+32+4 = 1\times2^6+1\times2^5+0\times2^4+0\times2^3+1\times2^2+0\times2^1\times0\times2^0$

Answer: 1100100

(b) $100 = 81+19 = 1\times3^4+0\times3^3+2\times3^2+0\times3^1+1\times3^0$

Answer: 10201

(c) $100 = 64+32+4 = 1\times4^3+2\times4^2+1\times4^1+0\times4^0$

Answer: 1210

(d) $100 = 25\times4 = 4\times5^2+0\times5^1+0\times5^0$

Answer: 400

(e) $100 = 72+24+4 = 2\times6^2+4\times6^1+4\times6^0$

Answer: 244

(f) $100 = 98+2 = 2\times7^2+0\times7^1+2\times7^0$

Answer: 202

(g) $100 = 64+32+4 = 1\times8^2+4\times8^1+4\times8^0$

Answer: 144

(h) $100 = 81+18+1 = 1\times9^2+2\times9^1+1\times9^0$

Answer: 121

(i) $100 = 1\times10^2+0\times10^1+0\times10^0$

Answer: 100

(j) $100 = 99+1 = 9\times11^1+1\times11^0$

Answer: 91

(k) $100 = 96+4 = 8\times12^1+4\times12^0$

Answer: 84

2. 101×97

$101 = 1\times10^2+0\times10^1+1\times10^0 = (1, 0, 1)$

$97 = 1\times10^2 + 0\times10^1 - 3\times10^0 = (1, 0, -3)$

	1	0	1
	1	0	-3
	-3	0	-3

	0	0	0	
1	0	1		
1	-1	7	9	7

$(1, -1) = 1\times10^1 - 1 = 9$

Answer: $101 \times 97 = 9797$

3. $26 = 18 + 6 + 2 = 2\times3^2 + 2\times3^1 + 2\times3^0$

$222 = 2\times10^2 + 2\times10^1 + 2\times10^0 = (2, 2, 2)$

$80 = 54 + 18 + 6 + 2 = 2\times3^3 + 2\times3^2 + 2\times3^1 + 2\times3^0$

$2222 = 2\times10^3 + 2\times10^2 + 2\times10^1 + 2\times10^0 = (2, 2, 2, 2)$

	2	2	2	2		
		2	2	2		
	4	4	4	4		
	4	4	4	4		
4	4	4	4			
2	2	1	2	0	0	1

Answer: 2212001

4. Convert 1-26 to base 3

1:1 2:2 3:10 4:11 5:12 6:20 7:21 8:22 9:100
10:101 11:102 12:110 13:111 14:112 15:120 16:121 17:122
18:200 19:201 20:202 21:210 22:211 23:212 24:220
25:221 26:222

Magic trick.

1	4	7
10	13	16
19	22	25

2	5	8
11	14	17
20	23	26

3	4	5
12	13	14
21	22	23

6	7	8
15	16	17
24	25	26

9	10	11
12	13	14
15	16	17

18	19	20
21	22	23
24	25	26