CS 341 Spring 2000
Homework Set 3
Solutions

Maccabe

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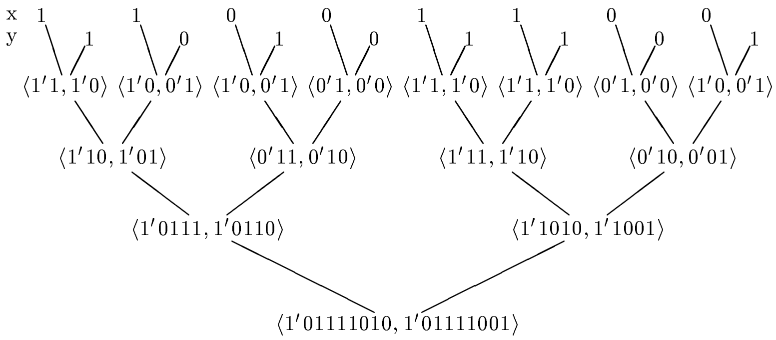
Exercise 1

Slide 1



Exercise 6

Slide 2

x	$x + 24$	rep(x)
-24	0	0000
-23	1	0001
-22	2	0010
-21	3	0011
-20	4	0100
-19	5	0101
-18	6	0110
-17	7	0111

x	$x + 24$	rep(x)
-16	8	1000
-15	9	1001
-14	10	1010
-13	11	1011
-12	12	1100
-11	13	1101
-10	14	1110
-9	15	1111

All negative numbers, not symmetric about zero.

Exercise 9

Slide 3

1. 0022
2. 7752
3. 0017
4. 7761

The range is -2048 to $3777_2 = 2047$

Exercise 11

Slide 4

1. 0026
2. 7751
3. 0017
4. 7760

The range is -2047 to $3777_2 = 2047$

Exercise 19

Slide 5

Consider the two overflow cases (for the 4-bit representation): adding -1 to -7 and adding 1 to 7:

$$
\begin{array}{clll}
 & 1110 & (-1) \\
+ & 1000 & (-7) \\
\hline
1 & 1110 & \text{c.i.} \neq \text{c.o.} \\
+ & 0001 & \text{end-around} \\
\hline
0 & 1111 & \text{c.i.} = \text{c.o.}
\end{array}
\qquad\qquad
\begin{array}{cll}
 & 0001 & \\
+ & 0111 & \\
\hline
0 & 1000 & \text{c.i.} \neq \text{c.o.}
\end{array}
$$

Answer: before the end-around carry.

Exercise 22

Slide 6

	product	multiplicand	multiplier
Initial	00000000	11111110	0011
After step 1	11111110	11111100	001
After step 2	11111010	11111000	00
After step 3	11111010	11110000	0

	product	multiplicand	multiplier
Initial	00000000	00000010	1101
After step 1	00000010	00000100	110
After step 2	00000010	00001000	11
After step 3	00001010	00010000	1
Subtract	11111010		

Exercise 22 (cont)

Slide 7

	product	multiplicand	multiplier
Initial	00000000	11111110	1101
After step 1	11111110	11111100	110
After step 2	11111110	11111000	11
After step 3	11110110	11110000	1
Subtract	00000110		

Slide 8

	product	multiplicand	multiplier
Initial	00000000	00000010	1101
After step 1	00000010	00000100	110
After step 2	00000010	00001000	11
After step 3	00001010	00010000	1
Subtract	11111010		