

Exercise 4

1. Scenario 1:

(a) Question 1:

x	$h(x) = (2x+1) \bmod 32$	5-bit Binary
3	7	00111
1	3	00011
4	9	01001
6	13	01101
5	11	01011
9	19	10011

i. Maximum Tail Length = 0

ii. Estimate Number of Distinct Elements = $2^0 = 1$

(b) Question 2:

x	$h(x) = (3x+7) \bmod 32$	5-bit Binary
3	16	10000
1	10	01010
4	19	10011
6	25	11001
5	22	10110
9	2	00010

i. Maximum Tail Length = 4

ii. Estimate Number of Distinct Elements = $2^4 = 16$

(c) Question 3:

x	$h(x) = (4x) \bmod 32$	5-bit Binary
3	12	01100
1	4	00100
4	16	10000
6	24	11000
5	20	10100
9	4	00100

i. Maximum Tail Length = 4

ii. Estimate Number of Distinct Elements = $2^4 = 16$

2. Scenario 2:

(a) Question 4:

x	$h(x) = (6x+2) \bmod 32$	5-bit Binary
4	26	11010
5	0	00000
6	6	00110
7	12	01100
10	30	11110
15	28	11100

i. Maximum Tail Length = 5

ii. Estimate Number of Distinct Elements = $2^5 = 32$

(b) Question 5:

x	$h(x) = (2x+5) \bmod 32$	5-bit Binary
4	13	01101
5	15	01111
6	17	10001
7	19	10011
10	25	11001
15	3	00011

i. Maximum Tail Length = 0

ii. Estimate Number of Distinct Elements = $2^0 = 1$

(c) Question 6:

x	$h(x) = (2x) \bmod 32$	5-bit Binary
4	8	01000
5	10	01010
6	12	01100
7	14	01110
10	20	10100
15	30	11110

i. Maximum Tail Length = 3

ii. Estimate Number of Distinct Elements = $2^3 = 8$