

COSC 3319.01 MWF

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Lab 3: Option A

SUMMARY

Main Memory

First 30	40% Burris Linear	40% Bryan Linear	80% Burris Linear	80% Bryan Linear	40% Burris Random	40% Bryan Random	80% Burris Random	80% Bryan Random
Min Probe	1	1	1	1	1	1	1	1
Max	10	4	10	4	11	3	11	3
Average	3.41	1.45	3.41	1.45	3.34	1.41	3.34	1.41
Last 30	-	-	-	-	-	-	-	-
Min	1	1	1	1	1	1	1	1
Max	31	6	100	14	22	5	51	13
Average	13.34	2.21	42.76	6.45	8.79	1.97	21.21	4.31
Expected	1.33	1.33	2.96	2.96	1.28	1.28	2.00	2.00

Output File

First 30	40% Burris Linear	40% Bryan Linear	80% Burris Linear	80% Bryan Linear	40% Burris Random	40% Bryan Random	80% Burris Random	80% Bryan Random
Min Probe	1	1	1	1	1	1	1	1
Max	11	4	11	4	11	3	11	3
Average	3.69	1.45	3.69	1.45	3.34	1.41	3.34	1.41
Last 30	-	-	-	-	-	-	-	-
Min	1	1	1	1	1	1	1	1
Max	31	6	102	14	22	5	52	13
Average	13.79	2.21	43.66	6.45	8.79	1.97	22.83	4.31
Expected	1.33	1.33	2.96	2.96	1.28	1.28	2.00	2.00

Dr. Burris' hash function exhibits excessive primary clustering during Linear hashing specifically due to the fact that the function does not pull enough values from the String in order to generate a new hash address. Probability-wise, the chance to pull the same third letter in two different five-letter words is much greater than the probability of pulling an identical string of 3 letters from the same two words. Because of this, Dr. Burris' hash function repeatedly calls upon the same hash address, causing massive primary clusters. Another issue with the function is dividing by 256, an even number. This greatly limits the pool of numbers to be generated to only multiples of two, reducing the number of possible hash addresses to be generated.

Although not perfect, my hash function improves upon Dr. Burris' hash significantly. By implementing the methods of square and extract n-bits and the division remainder, every part of the function is guaranteed to host a value. This leads to greater efficiency and speed across the board. I convert my hash from the generated long integer back into an integer and then modulus by the table size +1, which produces a function that is evenly spread through the table in a much more uniform manner. My hash function had nearly half the average probe count across every test generated and was smaller than the expected count in two of the tests. For a specific example, in the 80% linear test, Dr. Burris' hash had an average of 3.69 probes for the first 30 keys while my hash only had 1.45. This difference is massive when comparing the last 30 keys as Dr. Burris manages to have an average probe count of 43.66 while mine only has 6.45.

This hash can be improved upon, however, by modulus the table size -1 instead, creating a prime number that will allow more variety in the generated numbers. Furthermore, it would be beneficial next time to multiply the two string values rather than add them to produce a full 64-bit long integer.

DRBURRIS's Hash (40%)**Linear Probe****Main Memory**

0 :	Paschal	Original Location:	127	Probes:	2
1 :	Qamruddin	Original Location:	1	Probes:	1
2 :	Nienberg	Original Location:	2	Probes:	1
3 :	Acevedo	Original Location:	1	Probes:	3
4 :	Arauza	Original Location:	127	Probes:	6
5 :	Crouch	Original Location:	5	Probes:	1
6 :	Ellington	Original Location:	4	Probes:	3
7 :	Gurung	Original Location:	4	Probes:	4
8 :	Joseph	Original Location:	5	Probes:	4
9 :	Daniels	Original Location:	9	Probes:	1
10 :	Farral	Original Location:	9	Probes:	2
11 :	Carmona	Original Location:	11	Probes:	1
12 :	Clayton	Original Location:	12	Probes:	1
13 :	Dustin	Original Location:	11	Probes:	3
14 :	Zulfiqar	Original Location:	14	Probes:	1
15 :	Aguirrie	Original Location:	15	Probes:	1
16 :	Casper	Original Location:	15	Probes:	2
17 :	Alcantara	Original Location:	17	Probes:	1
18 :	Davies	Original Location:	16	Probes:	3
19 :	Dugger	Original Location:	15	Probes:	5
20 :	Salkowski	Original Location:	20	Probes:	1
21 :	Robert	Original Location:	17	Probes:	5
22 :	Octavio	Original Location:	6	Probes:	17
23 :	Jeffrey	Original Location:	2	Probes:	22
24 :	Jordon	Original Location:	11	Probes:	14
25 :	Vinnela	Original Location:	9	Probes:	17
26 :	Veronica	Original Location:	6	Probes:	21
27 :	Matthew	Original Location:	2	Probes:	26
28 :	Michael	Original Location:	2	Probes:	27
29 :	Akhila	Original Location:	127	Probes:	31
30 :	Charles	Original Location:	2	Probes:	29
31 :	NULL				
32 :	NULL				
33 :	NULL				
34 :	NULL				
35 :	NULL				
36 :	NULL				
37 :	NULL				
38 :	NULL				
39 :	NULL				
40 :	NULL				
41 :	NULL				
42 :	NULL				
43 :	NULL				
44 :	NULL				
45 :	NULL				

46 :	NULL		
47 :	NULL		
48 :	NULL		
49 :	NULL		
50 :	NULL		
51 :	NULL		
52 :	NULL		
53 :	NULL		
54 :	NULL		
55 :	NULL		
56 :	NULL		
57 :	NULL		
58 :	NULL		
59 :	NULL		
60 :	NULL		
61 :	NULL		
62 :	Cook	Original Location:	62 Probes: 1
63 :	Red	Original Location:	62 Probes: 2
64 :	Ajose	Original Location:	62 Probes: 3
65 :	Buck	Original Location:	62 Probes: 4
66 :	Clark	Original Location:	62 Probes: 5
67 :	Egbe	Original Location:	62 Probes: 6
68 :	Garza	Original Location:	62 Probes: 7
69 :	Kelly	Original Location:	62 Probes: 8
70 :	Corey	Original Location:	62 Probes: 9
71 :	Adam	Original Location:	62 Probes: 10
72 :	Kyle	Original Location:	62 Probes: 11
73 :	Scott	Original Location:	62 Probes: 12
74 :	Judy	Original Location:	62 Probes: 13
75 :	Derek	Original Location:	62 Probes: 14
76 :	Lisa	Original Location:	62 Probes: 15
77 :	Todd	Original Location:	62 Probes: 16
78 :	John	Original Location:	62 Probes: 17
79 :	James	Original Location:	62 Probes: 18
80 :	Chris	Original Location:	62 Probes: 19
81 :	NULL		
82 :	NULL		
83 :	NULL		
84 :	NULL		
85 :	NULL		
86 :	NULL		
87 :	NULL		
88 :	NULL		
89 :	NULL		
90 :	NULL		
91 :	NULL		
92 :	NULL		
93 :	NULL		
94 :	NULL		

95 : NULL
 96 : NULL
 97 : NULL
 98 : NULL
 99 : NULL
 100 : NULL
 101 : NULL
 102 : NULL
 103 : NULL
 104 : NULL
 105 : NULL
 106 : NULL
 107 : NULL
 108 : NULL
 109 : NULL
 110 : NULL
 111 : NULL
 112 : NULL
 113 : NULL
 114 : NULL
 115 : NULL
 116 : NULL
 117 : NULL
 118 : NULL
 119 : NULL
 120 : NULL
 121 : NULL
 122 : NULL
 123 : NULL
 124 : NULL
 125 : NULL
 126 : NULL
 127 : Bhandari

Original Location: 127 Probes: 1

Statistics for 2 to 31

Min: 1
 Max: 10
 Average: 3.41

Statistics for 22 to 51

Min: 1
 Max: 31
 Average: 13.34

Expected number of Probes: 1.33117E+00

BRYANBENHAM's Hash (40%)**Linear Probe****Main Memory**

0 :	NULL		
1 :	NULL		
2 :	NULL		
3 :	NULL		
4 :	NULL		
5 :	NULL		
6 :	NULL		
7 :	NULL		
8 :	NULL		
9 :	NULL		
10 :	NULL		
11 :	Adam	Original Location:	11 Probes: 1
12 :	Scott	Original Location:	11 Probes: 2
13 :	NULL		
14 :	Arauz	Original Location:	14 Probes: 1
15 :	Clayton	Original Location:	14 Probes: 2
16 :	NULL		
17 :	NULL		
18 :	NULL		
19 :	NULL		
20 :	NULL		
21 :	NULL		
22 :	NULL		
23 :	Corey	Original Location:	23 Probes: 1
24 :	Derek	Original Location:	23 Probes: 2
25 :	Carmona	Original Location:	25 Probes: 1
26 :	Zulfiqar	Original Location:	25 Probes: 2
27 :	Egbe	Original Location:	25 Probes: 3
28 :	Gurung	Original Location:	28 Probes: 1
29 :	Robert	Original Location:	25 Probes: 5
30 :	Chris	Original Location:	24 Probes: 7
31 :	NULL		
32 :	NULL		
33 :	NULL		
34 :	NULL		
35 :	NULL		
36 :	NULL		
37 :	NULL		
38 :	Lisa	Original Location:	38 Probes: 1
39 :	Joseph	Original Location:	39 Probes: 1
40 :	Alcantara	Original Location:	40 Probes: 1
41 :	Cook	Original Location:	41 Probes: 1
42 :	Dugger	Original Location:	42 Probes: 1
43 :	Nienberg	Original Location:	43 Probes: 1
44 :	Qamruddin	Original Location:	43 Probes: 2
45 :	Acevedo	Original Location:	45 Probes: 1

46 :	Ajose	Original Location:	43	Probes:	4
47 :	NULL				
48 :	NULL				
49 :	NULL				
50 :	NULL				
51 :	NULL				
52 :	NULL				
53 :	NULL				
54 :	Octavio	Original Location:	54	Probes:	1
55 :	Jordon	Original Location:	55	Probes:	1
56 :	NULL				
57 :	Ellington	Original Location:	57	Probes:	1
58 :	Kyle	Original Location:	57	Probes:	2
59 :	Jeffrey	Original Location:	57	Probes:	3
60 :	Vinnela	Original Location:	58	Probes:	3
61 :	NULL				
62 :	NULL				
63 :	Judy	Original Location:	63	Probes:	1
64 :	NULL				
65 :	NULL				
66 :	NULL				
67 :	NULL				
68 :	NULL				
69 :	NULL				
70 :	NULL				
71 :	NULL				
72 :	Aguirrie	Original Location:	72	Probes:	1
73 :	Red	Original Location:	72	Probes:	2
74 :	Casper	Original Location:	74	Probes:	1
75 :	Michael	Original Location:	74	Probes:	2
76 :	Dustin	Original Location:	76	Probes:	1
77 :	James	Original Location:	72	Probes:	6
78 :	NULL				
79 :	NULL				
80 :	NULL				
81 :	NULL				
82 :	NULL				
83 :	NULL				
84 :	NULL				
85 :	NULL				
86 :	NULL				
87 :	NULL				
88 :	Davies	Original Location:	88	Probes:	1
89 :	Daniels	Original Location:	89	Probes:	1
90 :	Kelly	Original Location:	90	Probes:	1
91 :	Todd	Original Location:	89	Probes:	3
92 :	Veronica	Original Location:	90	Probes:	3
93 :	Matthew	Original Location:	91	Probes:	3
94 :	John	Original Location:	91	Probes:	4

95 :	NULL		
96 :	NULL		
97 :	NULL		
98 :	NULL		
99 :	NULL		
100 :	NULL		
101 :	NULL		
102 :	NULL		
103 :	Paschal	Original Location:	103 Probes: 1
104 :	NULL		
105 :	NULL		
106 :	NULL		
107 :	NULL		
108 :	Bhandari	Original Location:	108 Probes: 1
109 :	Buck	Original Location:	108 Probes: 2
110 :	Clark	Original Location:	109 Probes: 2
111 :	Crouch	Original Location:	109 Probes: 3
112 :	Charles	Original Location:	109 Probes: 4
113 :	NULL		
114 :	NULL		
115 :	NULL		
116 :	NULL		
117 :	NULL		
118 :	NULL		
119 :	NULL		
120 :	NULL		
121 :	NULL		
122 :	Salkowski	Original Location:	122 Probes: 1
123 :	Farral	Original Location:	123 Probes: 1
124 :	Akhila	Original Location:	122 Probes: 3
125 :	Garza	Original Location:	125 Probes: 1
126 :	NULL		
127 :	NULL		

Statistics for 2 to 31

Min: 1

Max: 4

Average: 1.45

Statistics for 22 to 51

Min: 1

Max: 6

Average: 2.21

Expected number of Probes: 1.33117E+00

DRBURRIS's Hash (80%)**LINEAR Probe****Main Memory**

0 :	Paschal	Original Location:	127	Probes:	2
1 :	Qamruddin	Original Location:	1	Probes:	1
2 :	Nienberg	Original Location:	2	Probes:	1
3 :	Acevedo	Original Location:	1	Probes:	3
4 :	Arauza	Original Location:	127	Probes:	6
5 :	Crouch	Original Location:	5	Probes:	1
6 :	Ellington	Original Location:	4	Probes:	3
7 :	Gurung	Original Location:	4	Probes:	4
8 :	Joseph	Original Location:	5	Probes:	4
9 :	Daniels	Original Location:	9	Probes:	1
10 :	Farral	Original Location:	9	Probes:	2
11 :	Carmona	Original Location:	11	Probes:	1
12 :	Clayton	Original Location:	12	Probes:	1
13 :	Dustin	Original Location:	11	Probes:	3
14 :	Zulfiqar	Original Location:	14	Probes:	1
15 :	Aguirrie	Original Location:	15	Probes:	1
16 :	Casper	Original Location:	15	Probes:	2
17 :	Alcantara	Original Location:	17	Probes:	1
18 :	Davies	Original Location:	16	Probes:	3
19 :	Dugger	Original Location:	15	Probes:	5
20 :	Salkowski	Original Location:	20	Probes:	1
21 :	Robert	Original Location:	17	Probes:	5
22 :	Octavio	Original Location:	6	Probes:	17
23 :	Jeffrey	Original Location:	2	Probes:	22
24 :	Jordon	Original Location:	11	Probes:	14
25 :	Vinnela	Original Location:	9	Probes:	17
26 :	Veronica	Original Location:	6	Probes:	21
27 :	Matthew	Original Location:	2	Probes:	26
28 :	Michael	Original Location:	2	Probes:	27
29 :	Akhila	Original Location:	127	Probes:	31
30 :	Charles	Original Location:	2	Probes:	29
31 :	Christopher	Original Location:	17	Probes:	15
32 :	Fernando	Original Location:	11	Probes:	22
33 :	Batbold	Original Location:	9	Probes:	25
34 :	Fabulous	Original Location:	12	Probes:	23
35 :	Misogamist	Original Location:	127	Probes:	37
36 :	Maiden	Original Location:	11	Probes:	26
37 :	Constriction	Original Location:	15	Probes:	23
38 :	Necromancer	Original Location:	10	Probes:	29
39 :	Syncopate	Original Location:	13	Probes:	27
40 :	Afterwards	Original Location:	20	Probes:	21
41 :	Person	Original Location:	11	Probes:	31
42 :	Northwest	Original Location:	20	Probes:	23
43 :	Irreversible	Original Location:	2	Probes:	42
44 :	Fabricate	Original Location:	0	Probes:	45
45 :	Staple	Original Location:	2	Probes:	44

46 :	Finagle	Original Location:	9	Probes:	38
47 :	Screen	Original Location:	11	Probes:	37
48 :	Perfect	Original Location:	0	Probes:	49
49 :	parasympathetic	Original Location:	22	Probes:	28
50 :	poison	Original Location:	11	Probes:	40
51 :	brutalize	Original Location:	9	Probes:	43
52 :	ratiocination	Original Location:	0	Probes:	53
53 :	cauldron	Original Location:	15	Probes:	39
54 :	prepossess	Original Location:	16	Probes:	39
55 :	orthodontist	Original Location:	1	Probes:	55
56 :	magnetic	Original Location:	17	Probes:	40
57 :	constrain	Original Location:	15	Probes:	43
58 :	marsupial	Original Location:	13	Probes:	46
59 :	rationalize	Original Location:	11	Probes:	49
60 :	toluene	Original Location:	11	Probes:	50
61 :	sparse	Original Location:	2	Probes:	60
62 :	Cook	Original Location:	62	Probes:	1
63 :	Red	Original Location:	62	Probes:	2
64 :	Ajose	Original Location:	62	Probes:	3
65 :	Buck	Original Location:	62	Probes:	4
66 :	Clark	Original Location:	62	Probes:	5
67 :	Egbe	Original Location:	62	Probes:	6
68 :	Garza	Original Location:	62	Probes:	7
69 :	Kelly	Original Location:	62	Probes:	8
70 :	Corey	Original Location:	62	Probes:	9
71 :	Adam	Original Location:	62	Probes:	10
72 :	Kyle	Original Location:	62	Probes:	11
73 :	Scott	Original Location:	62	Probes:	12
74 :	Judy	Original Location:	62	Probes:	13
75 :	Derek	Original Location:	62	Probes:	14
76 :	Lisa	Original Location:	62	Probes:	15
77 :	Todd	Original Location:	62	Probes:	16
78 :	John	Original Location:	62	Probes:	17
79 :	James	Original Location:	62	Probes:	18
80 :	Chris	Original Location:	62	Probes:	19
81 :	Wade	Original Location:	62	Probes:	20
82 :	Joel	Original Location:	62	Probes:	21
83 :	Eye	Original Location:	62	Probes:	22
84 :	Yolk	Original Location:	62	Probes:	23
85 :	Honor	Original Location:	62	Probes:	24
86 :	Under	Original Location:	62	Probes:	25
87 :	Jutty	Original Location:	62	Probes:	26
88 :	Cook	Original Location:	62	Probes:	27
89 :	Rush	Original Location:	62	Probes:	28
90 :	Wine	Original Location:	62	Probes:	29
91 :	mole	Original Location:	62	Probes:	30
92 :	cap	Original Location:	62	Probes:	31
93 :	wince	Original Location:	62	Probes:	32
94 :	live	Original Location:	62	Probes:	33

95 :	inlet	Original Location:	62	Probes:	34
96 :	scat	Original Location:	62	Probes:	35
97 :	wet	Original Location:	62	Probes:	36
98 :	quandary	Original Location:	127	Probes:	100
99 :	dactyl	Original Location:	9	Probes:	91
100 :	nosegay	Original Location:	127	Probes:	102
101 :	NULL				
102 :	NULL				
103 :	NULL				
104 :	NULL				
105 :	NULL				
106 :	NULL				
107 :	NULL				
108 :	NULL				
109 :	NULL				
110 :	NULL				
111 :	NULL				
112 :	NULL				
113 :	NULL				
114 :	NULL				
115 :	NULL				
116 :	NULL				
117 :	NULL				
118 :	NULL				
119 :	NULL				
120 :	NULL				
121 :	NULL				
122 :	NULL				
123 :	NULL				
124 :	NULL				
125 :	NULL				
126 :	NULL				
127 :	Bhandari	Original Location:	127	Probes:	1

Statistics for 2 to 31

Min: 1
 Max: 10
 Average: 3.41

Statistics for 73 to 102

Min: 1
 Max: 100
 Average: 42.76

Expected number of Probes: 2.96154E+00

BRYANBENHAM's Hash (80%)**LINEAR Probe****Main Memory**

0 :	Fabricate	Original Location:	125	Probes:	4
1 :	NULL				
2 :	NULL				
3 :	parasympathetic	Original Location:	3	Probes:	1
4 :	rationalize	Original Location:	4	Probes:	1
5 :	NULL				
6 :	cap	Original Location:	6	Probes:	1
7 :	NULL				
8 :	NULL				
9 :	NULL				
10 :	NULL				
11 :	Adam	Original Location:	11	Probes:	1
12 :	Scott	Original Location:	11	Probes:	2
13 :	NULL				
14 :	Arauz	Original Location:	14	Probes:	1
15 :	Clayton	Original Location:	14	Probes:	2
16 :	NULL				
17 :	NULL				
18 :	NULL				
19 :	NULL				
20 :	NULL				
21 :	NULL				
22 :	Batbold	Original Location:	22	Probes:	1
23 :	Corey	Original Location:	23	Probes:	1
24 :	Derek	Original Location:	23	Probes:	2
25 :	Carmona	Original Location:	25	Probes:	1
26 :	Zulfiqar	Original Location:	25	Probes:	2
27 :	Egbe	Original Location:	25	Probes:	3
28 :	Gurung	Original Location:	28	Probes:	1
29 :	Robert	Original Location:	25	Probes:	5
30 :	Chris	Original Location:	24	Probes:	7
31 :	Fabulous	Original Location:	29	Probes:	3
32 :	Syncopate	Original Location:	24	Probes:	9
33 :	Honor	Original Location:	26	Probes:	8
34 :	Screen	Original Location:	23	Probes:	12
35 :	wince	Original Location:	23	Probes:	13
36 :	orthodontist	Original Location:	23	Probes:	14
37 :	constrain	Original Location:	27	Probes:	11
38 :	Lisa	Original Location:	38	Probes:	1
39 :	Joseph	Original Location:	39	Probes:	1
40 :	Alcantara	Original Location:	40	Probes:	1
41 :	Cook	Original Location:	41	Probes:	1
42 :	Dugger	Original Location:	42	Probes:	1
43 :	Nienberg	Original Location:	43	Probes:	1
44 :	Qamruddin	Original Location:	43	Probes:	2
45 :	Acevedo	Original Location:	45	Probes:	1

46 :	Ajose	Original Location:	43	Probes:	4
47 :	Maiden	Original Location:	40	Probes:	8
48 :	Necromancer	Original Location:	38	Probes:	11
49 :	Staple	Original Location:	45	Probes:	5
50 :	Christopher	Original Location:	50	Probes:	1
51 :	Cook	Original Location:	41	Probes:	11
52 :	scat	Original Location:	45	Probes:	8
53 :	nosegay	Original Location:	39	Probes:	15
54 :	Octavio	Original Location:	54	Probes:	1
55 :	Jordon	Original Location:	55	Probes:	1
56 :	mole	Original Location:	56	Probes:	1
57 :	Ellington	Original Location:	57	Probes:	1
58 :	Kyle	Original Location:	57	Probes:	2
59 :	Jeffrey	Original Location:	57	Probes:	3
60 :	Vinnela	Original Location:	58	Probes:	3
61 :	Wade	Original Location:	57	Probes:	5
62 :	Afterwards	Original Location:	60	Probes:	3
63 :	Judy	Original Location:	63	Probes:	1
64 :	Northwest	Original Location:	59	Probes:	6
65 :	Under	Original Location:	57	Probes:	9
66 :	inlet	Original Location:	56	Probes:	11
67 :	toluene	Original Location:	60	Probes:	8
68 :	Irreversible	Original Location:	68	Probes:	1
69 :	NULL				
70 :	wet	Original Location:	70	Probes:	1
71 :	NULL				
72 :	Aguirrie	Original Location:	72	Probes:	1
73 :	Red	Original Location:	72	Probes:	2
74 :	Casper	Original Location:	74	Probes:	1
75 :	Michael	Original Location:	74	Probes:	2
76 :	Dustin	Original Location:	76	Probes:	1
77 :	James	Original Location:	72	Probes:	6
78 :	Rush	Original Location:	73	Probes:	6
79 :	poison	Original Location:	76	Probes:	4
80 :	magnetic	Original Location:	75	Probes:	6
81 :	dactyl	Original Location:	77	Probes:	5
82 :	NULL				
83 :	NULL				
84 :	NULL				
85 :	NULL				
86 :	NULL				
87 :	Finagle	Original Location:	87	Probes:	1
88 :	Davies	Original Location:	88	Probes:	1
89 :	Daniels	Original Location:	89	Probes:	1
90 :	Kelly	Original Location:	90	Probes:	1
91 :	Todd	Original Location:	89	Probes:	3
92 :	Veronica	Original Location:	90	Probes:	3
93 :	Matthew	Original Location:	91	Probes:	3
94 :	John	Original Location:	91	Probes:	4

95 :	Eye	Original Location:	89	Probes:	7
96 :	Constriction	Original Location:	89	Probes:	8
97 :	Person	Original Location:	91	Probes:	7
98 :	Jutty	Original Location:	92	Probes:	7
99 :	Wine	Original Location:	88	Probes:	12
100 :	live	Original Location:	87	Probes:	14
101 :	marsupial	Original Location:	91	Probes:	11
102 :	NULL				
103 :	Paschal	Original Location:	103	Probes:	1
104 :	NULL				
105 :	cauldron	Original Location:	105	Probes:	1
106 :	NULL				
107 :	Joel	Original Location:	107	Probes:	1
108 :	Bhandari	Original Location:	108	Probes:	1
109 :	Buck	Original Location:	108	Probes:	2
110 :	Clark	Original Location:	109	Probes:	2
111 :	Crouch	Original Location:	109	Probes:	3
112 :	Charles	Original Location:	109	Probes:	4
113 :	Misogamist	Original Location:	111	Probes:	3
114 :	brutalize	Original Location:	108	Probes:	7
115 :	prepossess	Original Location:	114	Probes:	2
116 :	sparse	Original Location:	110	Probes:	7
117 :	quandary	Original Location:	109	Probes:	9
118 :	NULL				
119 :	NULL				
120 :	Perfect	Original Location:	120	Probes:	1
121 :	rationation	Original Location:	120	Probes:	2
122 :	Salkowski	Original Location:	122	Probes:	1
123 :	Farral	Original Location:	123	Probes:	1
124 :	Akhila	Original Location:	122	Probes:	3
125 :	Garza	Original Location:	125	Probes:	1
126 :	Fernando	Original Location:	122	Probes:	5
127 :	Yolk	Original Location:	122	Probes:	6

Statistics for 2 to 31

Min: 1

Max: 4

Average: 1.45

Statistics for 73 to 102

Min: 1

Max: 14

Average: 6.45

Expected number of Probes: 2.96154E+00

DRBURRIS's Hash (40%)**RANDOM Probe****Main Memory**

0 :	NULL		
1 :	Paschal	Original Location: 127	Probes: 2
2 :	Nienberg	Original Location: 2	Probes: 1
3 :	Qamruddin	Original Location: 1	Probes: 2
4 :	Ellington	Original Location: 4	Probes: 1
5 :	Crouch	Original Location: 5	Probes: 1
6 :	Arauza	Original Location: 127	Probes: 3
7 :	Joseph	Original Location: 5	Probes: 2
8 :	Acevedo	Original Location: 1	Probes: 3
9 :	Daniels	Original Location: 9	Probes: 1
10 :	Garza	Original Location: 62	Probes: 8
11 :	Carmona	Original Location: 11	Probes: 1
12 :	Clayton	Original Location: 12	Probes: 1
13 :	Dustin	Original Location: 11	Probes: 2
14 :	Zulfiqar	Original Location: 14	Probes: 1
15 :	Aguirrie	Original Location: 15	Probes: 1
16 :	Davies	Original Location: 16	Probes: 1
17 :	Alcantara	Original Location: 17	Probes: 1
18 :	Jordon	Original Location: 11	Probes: 3
19 :	Robert	Original Location: 17	Probes: 2
20 :	Salkowski	Original Location: 20	Probes: 1
21 :	NULL		
22 :	Casper	Original Location: 15	Probes: 3
23 :	Vinnela	Original Location: 9	Probes: 6
24 :	Corey	Original Location: 62	Probes: 10
25 :	NULL		
26 :	NULL		
27 :	NULL		
28 :	Akhila	Original Location: 127	Probes: 5
29 :	NULL		
30 :	NULL		
31 :	Jeffrey	Original Location: 2	Probes: 5
32 :	NULL		
33 :	NULL		
34 :	Derek	Original Location: 62	Probes: 16
35 :	Veronica	Original Location: 6	Probes: 5
36 :	Gurung	Original Location: 4	Probes: 4
37 :	NULL		
38 :	Octavio	Original Location: 6	Probes: 4
39 :	NULL		
40 :	NULL		
41 :	Farral	Original Location: 9	Probes: 4
42 :	NULL		
43 :	NULL		
44 :	NULL		
45 :	NULL		

46 :	NULL			
47 :	Dugger	Original Location:	15	Probes: 4
48 :	NULL			
49 :	NULL			
50 :	NULL			
51 :	NULL			
52 :	NULL			
53 :	Todd	Original Location:	62	Probes: 19
54 :	NULL			
55 :	Kelly	Original Location:	62	Probes: 9
56 :	NULL			
57 :	Judy	Original Location:	62	Probes: 15
58 :	NULL			
59 :	NULL			
60 :	NULL			
61 :	NULL			
62 :	Cook	Original Location:	62	Probes: 1
63 :	NULL			
64 :	Red	Original Location:	62	Probes: 2
65 :	NULL			
66 :	NULL			
67 :	NULL			
68 :	NULL			
69 :	Ajose	Original Location:	62	Probes: 3
70 :	NULL			
71 :	NULL			
72 :	NULL			
73 :	NULL			
74 :	NULL			
75 :	John	Original Location:	62	Probes: 21
76 :	Egbe	Original Location:	62	Probes: 6
77 :	NULL			
78 :	Matthew	Original Location:	2	Probes: 8
79 :	NULL			
80 :	NULL			
81 :	NULL			
82 :	NULL			
83 :	Scott	Original Location:	62	Probes: 13
84 :	NULL			
85 :	NULL			
86 :	NULL			
87 :	NULL			
88 :	NULL			
89 :	NULL			
90 :	NULL			
91 :	Clark	Original Location:	62	Probes: 5
92 :	Charles	Original Location:	2	Probes: 10
93 :	NULL			
94 :	Buck	Original Location:	62	Probes: 4

95 :	NULL		
96 :	NULL		
97 :	NULL		
98 :	NULL		
99 :	NULL		
100 :	NULL		
101 :	NULL		
102 :	NULL		
103 :	NULL		
104 :	NULL		
105 :	NULL		
106 :	NULL		
107 :	NULL		
108 :	NULL		
109 :	NULL		
110 :	NULL		
111 :	NULL		
112 :	Lisa	Original Location: 62	Probes: 18
113 :	Chris	Original Location: 62	Probes: 23
114 :	NULL		
115 :	NULL		
116 :	NULL		
117 :	NULL		
118 :	Kyle	Original Location: 62	Probes: 12
119 :	NULL		
120 :	NULL		
121 :	NULL		
122 :	NULL		
123 :	Michael	Original Location: 2	Probes: 9
124 :	James	Original Location: 62	Probes: 22
125 :	Adam	Original Location: 62	Probes: 11
126 :	NULL		
127 :	Bhandari	Original Location: 127	Probes: 1

Statistics for 2 to 31

Min: 1
 Max: 11
 Average: 3.34

Statistics for 22 to 51

Min: 1
 Max: 22
 Average: 8.79

Expected number of Probes: 1.27554E+00

BRYANBENHAM's Hash (40%)**RANDOM Probe****Main Memory**

0 :	NULL		
1 :	NULL		
2 :	NULL		
3 :	NULL		
4 :	NULL		
5 :	NULL		
6 :	NULL		
7 :	NULL		
8 :	NULL		
9 :	NULL		
10 :	NULL		
11 :	Adam	Original Location:	11 Probes: 1
12 :	NULL		
13 :	Scott	Original Location:	11 Probes: 2
14 :	Arauz	Original Location:	14 Probes: 1
15 :	NULL		
16 :	Clayton	Original Location:	14 Probes: 2
17 :	NULL		
18 :	NULL		
19 :	NULL		
20 :	NULL		
21 :	NULL		
22 :	NULL		
23 :	Corey	Original Location:	23 Probes: 1
24 :	Chris	Original Location:	24 Probes: 1
25 :	Carmona	Original Location:	25 Probes: 1
26 :	NULL		
27 :	Zulfiqar	Original Location:	25 Probes: 2
28 :	Gurung	Original Location:	28 Probes: 1
29 :	NULL		
30 :	Derek	Original Location:	23 Probes: 3
31 :	NULL		
32 :	Egbe	Original Location:	25 Probes: 3
33 :	NULL		
34 :	NULL		
35 :	NULL		
36 :	NULL		
37 :	NULL		
38 :	Lisa	Original Location:	38 Probes: 1
39 :	Joseph	Original Location:	39 Probes: 1
40 :	Alcantara	Original Location:	40 Probes: 1
41 :	Cook	Original Location:	41 Probes: 1
42 :	Dugger	Original Location:	42 Probes: 1
43 :	Nienberg	Original Location:	43 Probes: 1
44 :	NULL		
45 :	Qamruddin	Original Location:	43 Probes: 2

46 :	NULL			
47 :	Acevedo	Original Location:	45	Probes: 2
48 :	NULL			
49 :	NULL			
50 :	Ajose	Original Location:	43	Probes: 3
51 :	NULL			
52 :	NULL			
53 :	NULL			
54 :	Robert	Original Location:	25	Probes: 5
55 :	Jordon	Original Location:	55	Probes: 1
56 :	Octavio	Original Location:	54	Probes: 2
57 :	Ellington	Original Location:	57	Probes: 1
58 :	Vinnela	Original Location:	58	Probes: 1
59 :	Kyle	Original Location:	57	Probes: 2
60 :	NULL			
61 :	NULL			
62 :	NULL			
63 :	Judy	Original Location:	63	Probes: 1
64 :	Jeffrey	Original Location:	57	Probes: 3
65 :	NULL			
66 :	NULL			
67 :	NULL			
68 :	NULL			
69 :	NULL			
70 :	NULL			
71 :	NULL			
72 :	Aguirrie	Original Location:	72	Probes: 1
73 :	NULL			
74 :	Casper	Original Location:	74	Probes: 1
75 :	NULL			
76 :	Dustin	Original Location:	76	Probes: 1
77 :	NULL			
78 :	NULL			
79 :	Red	Original Location:	72	Probes: 3
80 :	NULL			
81 :	Michael	Original Location:	74	Probes: 3
82 :	NULL			
83 :	NULL			
84 :	NULL			
85 :	NULL			
86 :	NULL			
87 :	NULL			
88 :	Davies	Original Location:	88	Probes: 1
89 :	Daniels	Original Location:	89	Probes: 1
90 :	Kelly	Original Location:	90	Probes: 1
91 :	Todd	Original Location:	89	Probes: 2
92 :	Veronica	Original Location:	90	Probes: 2
93 :	Matthew	Original Location:	91	Probes: 2
94 :	NULL			

95 :	NULL		
96 :	NULL		
97 :	NULL		
98 :	John	Original Location:	91 Probes: 3
99 :	NULL		
100 :	NULL		
101 :	NULL		
102 :	NULL		
103 :	Paschal	Original Location:	103 Probes: 1
104 :	James	Original Location:	72 Probes: 4
105 :	NULL		
106 :	NULL		
107 :	NULL		
108 :	Bhandari	Original Location:	108 Probes: 1
109 :	Clark	Original Location:	109 Probes: 1
110 :	Buck	Original Location:	108 Probes: 2
111 :	Crouch	Original Location:	109 Probes: 2
112 :	NULL		
113 :	NULL		
114 :	NULL		
115 :	NULL		
116 :	Charles	Original Location:	109 Probes: 3
117 :	NULL		
118 :	NULL		
119 :	NULL		
120 :	NULL		
121 :	NULL		
122 :	Salkowski	Original Location:	122 Probes: 1
123 :	Farral	Original Location:	123 Probes: 1
124 :	Akhila	Original Location:	122 Probes: 2
125 :	Garza	Original Location:	125 Probes: 1
126 :	NULL		
127 :	NULL		

Statistics for 2 to 31

Min: 1
 Max: 3
 Average: 1.41

Statistics for 22 to 51

Min: 1
 Max: 5
 Average: 1.97

Expected number of Probes: 1.27554E+00

DRBURRIS's Hash (80%)**RANDOM Probe****Main Memory**

0 :	Fabricate	Original Location:	0	Probes:	1
1 :	Paschal	Original Location:	127	Probes:	2
2 :	Nienberg	Original Location:	2	Probes:	1
3 :	Qamruddin	Original Location:	1	Probes:	2
4 :	Ellington	Original Location:	4	Probes:	1
5 :	Crouch	Original Location:	5	Probes:	1
6 :	Arauza	Original Location:	127	Probes:	3
7 :	Joseph	Original Location:	5	Probes:	2
8 :	Acevedo	Original Location:	1	Probes:	3
9 :	Daniels	Original Location:	9	Probes:	1
10 :	Garza	Original Location:	62	Probes:	8
11 :	Carmona	Original Location:	11	Probes:	1
12 :	Clayton	Original Location:	12	Probes:	1
13 :	Dustin	Original Location:	11	Probes:	2
14 :	Zulfiqar	Original Location:	14	Probes:	1
15 :	Aguirrie	Original Location:	15	Probes:	1
16 :	Davies	Original Location:	16	Probes:	1
17 :	Alcantara	Original Location:	17	Probes:	1
18 :	Jordon	Original Location:	11	Probes:	3
19 :	Robert	Original Location:	17	Probes:	2
20 :	Salkowski	Original Location:	20	Probes:	1
21 :	wet	Original Location:	62	Probes:	51
22 :	Casper	Original Location:	15	Probes:	3
23 :	Vinnela	Original Location:	9	Probes:	6
24 :	Corey	Original Location:	62	Probes:	10
25 :	Person	Original Location:	11	Probes:	6
26 :	NULL				
27 :	Afterwards	Original Location:	20	Probes:	3
28 :	Akhila	Original Location:	127	Probes:	5
29 :	Constriction	Original Location:	15	Probes:	6
30 :	brutalize	Original Location:	9	Probes:	13
31 :	Jeffrey	Original Location:	2	Probes:	5
32 :	Cook	Original Location:	62	Probes:	34
33 :	orthodontist	Original Location:	1	Probes:	4
34 :	Derek	Original Location:	62	Probes:	16
35 :	Veronica	Original Location:	6	Probes:	5
36 :	Gurung	Original Location:	4	Probes:	4
37 :	Rush	Original Location:	62	Probes:	35
38 :	Octavio	Original Location:	6	Probes:	4
39 :	Joel	Original Location:	62	Probes:	25
40 :	Maiden	Original Location:	11	Probes:	5
41 :	Farral	Original Location:	9	Probes:	4
42 :	Necromancer	Original Location:	10	Probes:	4
43 :	Fernando	Original Location:	11	Probes:	4
44 :	Fabulous	Original Location:	12	Probes:	4
45 :	Syncopate	Original Location:	13	Probes:	4

46 :	magnetic	Original Location:	17	Probes:	5
47 :	Dugger	Original Location:	15	Probes:	4
48 :	prepossess	Original Location:	16	Probes:	4
49 :	Christopher	Original Location:	17	Probes:	4
50 :	NULL				
51 :	scat	Original Location:	62	Probes:	45
52 :	Northwest	Original Location:	20	Probes:	4
53 :	Todd	Original Location:	62	Probes:	19
54 :	parasympathetic	Original Location:	22	Probes:	4
55 :	Kelly	Original Location:	62	Probes:	9
56 :	NULL				
57 :	Judy	Original Location:	62	Probes:	15
58 :	Wade	Original Location:	62	Probes:	24
59 :	Wine	Original Location:	62	Probes:	37
60 :	NULL				
61 :	NULL				
62 :	Cook	Original Location:	62	Probes:	1
63 :	NULL				
64 :	Red	Original Location:	62	Probes:	2
65 :	Irreversible	Original Location:	2	Probes:	11
66 :	Misogamist	Original Location:	127	Probes:	7
67 :	Honor	Original Location:	62	Probes:	29
68 :	NULL				
69 :	Ajose	Original Location:	62	Probes:	3
70 :	NULL				
71 :	constrain	Original Location:	15	Probes:	12
72 :	Eye	Original Location:	62	Probes:	26
73 :	NULL				
74 :	rationalize	Original Location:	11	Probes:	11
75 :	John	Original Location:	62	Probes:	21
76 :	Egbe	Original Location:	62	Probes:	6
77 :	NULL				
78 :	Matthew	Original Location:	2	Probes:	8
79 :	nosegay	Original Location:	127	Probes:	20
80 :	marsupial	Original Location:	13	Probes:	7
81 :	NULL				
82 :	Jutty	Original Location:	62	Probes:	32
83 :	Scott	Original Location:	62	Probes:	13
84 :	Under	Original Location:	62	Probes:	30
85 :	Batbold	Original Location:	9	Probes:	8
86 :	inlet	Original Location:	62	Probes:	44
87 :	Screen	Original Location:	11	Probes:	8
88 :	NULL				
89 :	quandary	Original Location:	127	Probes:	10
90 :	ratiocination	Original Location:	0	Probes:	10
91 :	Clark	Original Location:	62	Probes:	5
92 :	Charles	Original Location:	2	Probes:	10
93 :	live	Original Location:	62	Probes:	43
94 :	Buck	Original Location:	62	Probes:	4

95 :	NULL		
96 :	NULL		
97 :	mole	Original Location:	62 Probes: 39
98 :	NULL		
99 :	Finagle	Original Location:	9 Probes: 10
100 :	NULL		
101 :	poison	Original Location:	11 Probes: 10
102 :	sparse	Original Location:	2 Probes: 16
103 :	NULL		
104 :	Staple	Original Location:	2 Probes: 14
105 :	cauldron	Original Location:	15 Probes: 10
106 :	cap	Original Location:	62 Probes: 40
107 :	NULL		
108 :	NULL		
109 :	Yolk	Original Location:	62 Probes: 27
110 :	NULL		
111 :	toluene	Original Location:	11 Probes: 16
112 :	Lisa	Original Location:	62 Probes: 18
113 :	Chris	Original Location:	62 Probes: 23
114 :	NULL		
115 :	NULL		
116 :	NULL		
117 :	NULL		
118 :	Kyle	Original Location:	62 Probes: 12
119 :	NULL		
120 :	wince	Original Location:	62 Probes: 42
121 :	Perfect	Original Location:	0 Probes: 9
122 :	dactyl	Original Location:	9 Probes: 17
123 :	Michael	Original Location:	2 Probes: 9
124 :	James	Original Location:	62 Probes: 22
125 :	Adam	Original Location:	62 Probes: 11
126 :	NULL		
127 :	Bhandari	Original Location:	127 Probes: 1

Statistics for 2 to 31

Min: 1
 Max: 11
 Average: 3.34

Statistics for 73 to 102

Min: 1
 Max: 51
 Average: 21.21

Expected number of Probes: 2.00023E+00

BRYANBENHAM's Hash (80%)**RANDOM Probe****Main Memory**

0 :	NULL		
1 :	Fernando	Original Location: 122	Probes: 3
2 :	NULL		
3 :	parasympathetic	Original Location: 3	Probes: 1
4 :	inlet	Original Location: 56	Probes: 8
5 :	NULL		
6 :	cap	Original Location: 6	Probes: 1
7 :	NULL		
8 :	Yolk	Original Location: 122	Probes: 6
9 :	NULL		
10 :	quandary	Original Location: 109	Probes: 5
11 :	Adam	Original Location: 11	Probes: 1
12 :	NULL		
13 :	Scott	Original Location: 11	Probes: 2
14 :	Arauza	Original Location: 14	Probes: 1
15 :	NULL		
16 :	Clayton	Original Location: 14	Probes: 2
17 :	NULL		
18 :	NULL		
19 :	NULL		
20 :	NULL		
21 :	Perfect	Original Location: 120	Probes: 5
22 :	Batbold	Original Location: 22	Probes: 1
23 :	Corey	Original Location: 23	Probes: 1
24 :	Chris	Original Location: 24	Probes: 1
25 :	Carmona	Original Location: 25	Probes: 1
26 :	Syncopate	Original Location: 24	Probes: 2
27 :	Zulfiqar	Original Location: 25	Probes: 2
28 :	Gurung	Original Location: 28	Probes: 1
29 :	Fabulous	Original Location: 29	Probes: 1
30 :	Derek	Original Location: 23	Probes: 3
31 :	NULL		
32 :	Egbe	Original Location: 25	Probes: 3
33 :	Honor	Original Location: 26	Probes: 3
34 :	constrain	Original Location: 27	Probes: 3
35 :	NULL		
36 :	rationalize	Original Location: 4	Probes: 4
37 :	Screen	Original Location: 23	Probes: 6
38 :	Lisa	Original Location: 38	Probes: 1
39 :	Joseph	Original Location: 39	Probes: 1
40 :	Alcantara	Original Location: 40	Probes: 1
41 :	Cook	Original Location: 41	Probes: 1
42 :	Dugger	Original Location: 42	Probes: 1
43 :	Nienberg	Original Location: 43	Probes: 1
44 :	orthodontist	Original Location: 23	Probes: 13
45 :	Qamruddin	Original Location: 43	Probes: 2

46 :	nosegay	Original Location:	39	Probes:	3
47 :	Acevedo	Original Location:	45	Probes:	2
48 :	Cook	Original Location:	41	Probes:	3
49 :	NULL				
50 :	Ajose	Original Location:	43	Probes:	3
51 :	NULL				
52 :	Christopher	Original Location:	50	Probes:	2
53 :	NULL				
54 :	Robert	Original Location:	25	Probes:	5
55 :	Jordon	Original Location:	55	Probes:	1
56 :	Octavio	Original Location:	54	Probes:	2
57 :	Ellington	Original Location:	57	Probes:	1
58 :	Vinnela	Original Location:	58	Probes:	1
59 :	Kyle	Original Location:	57	Probes:	2
60 :	Afterwards	Original Location:	60	Probes:	1
61 :	Northwest	Original Location:	59	Probes:	2
62 :	toluene	Original Location:	60	Probes:	2
63 :	Judy	Original Location:	63	Probes:	1
64 :	Jeffrey	Original Location:	57	Probes:	3
65 :	NULL				
66 :	NULL				
67 :	NULL				
68 :	Irreversible	Original Location:	68	Probes:	1
69 :	Maiden	Original Location:	40	Probes:	5
70 :	Necromancer	Original Location:	38	Probes:	4
71 :	Under	Original Location:	57	Probes:	6
72 :	Aguirrie	Original Location:	72	Probes:	1
73 :	Rush	Original Location:	73	Probes:	1
74 :	Casper	Original Location:	74	Probes:	1
75 :	magnetic	Original Location:	75	Probes:	1
76 :	Dustin	Original Location:	76	Probes:	1
77 :	Staple	Original Location:	45	Probes:	4
78 :	poison	Original Location:	76	Probes:	2
79 :	Red	Original Location:	72	Probes:	3
80 :	NULL				
81 :	Michael	Original Location:	74	Probes:	3
82 :	ratiocination	Original Location:	120	Probes:	10
83 :	NULL				
84 :	marsupial	Original Location:	91	Probes:	9
85 :	mole	Original Location:	56	Probes:	5
86 :	Wade	Original Location:	57	Probes:	5
87 :	Finagle	Original Location:	87	Probes:	1
88 :	Davies	Original Location:	88	Probes:	1
89 :	Daniels	Original Location:	89	Probes:	1
90 :	Kelly	Original Location:	90	Probes:	1
91 :	Todd	Original Location:	89	Probes:	2
92 :	Veronica	Original Location:	90	Probes:	2
93 :	Matthew	Original Location:	91	Probes:	2
94 :	Jutty	Original Location:	92	Probes:	2

95 :	Wine	Original Location:	88	Probes:	3
96 :	Eye	Original Location:	89	Probes:	3
97 :	NULL				
98 :	John	Original Location:	91	Probes:	3
99 :	wince	Original Location:	23	Probes:	8
100 :	NULL				
101 :	NULL				
102 :	wet	Original Location:	70	Probes:	4
103 :	Paschal	Original Location:	103	Probes:	1
104 :	James	Original Location:	72	Probes:	4
105 :	cauldron	Original Location:	105	Probes:	1
106 :	dactyl	Original Location:	77	Probes:	5
107 :	Joel	Original Location:	107	Probes:	1
108 :	Bhandari	Original Location:	108	Probes:	1
109 :	Clark	Original Location:	109	Probes:	1
110 :	Buck	Original Location:	108	Probes:	2
111 :	Crouch	Original Location:	109	Probes:	2
112 :	scat	Original Location:	45	Probes:	7
113 :	Misogamist	Original Location:	111	Probes:	2
114 :	prepossess	Original Location:	114	Probes:	1
115 :	brutalize	Original Location:	108	Probes:	3
116 :	Charles	Original Location:	109	Probes:	3
117 :	sparse	Original Location:	110	Probes:	3
118 :	NULL				
119 :	live	Original Location:	87	Probes:	4
120 :	Person	Original Location:	91	Probes:	5
121 :	Constriction	Original Location:	89	Probes:	4
122 :	Salkowski	Original Location:	122	Probes:	1
123 :	Farral	Original Location:	123	Probes:	1
124 :	Akhila	Original Location:	122	Probes:	2
125 :	Garza	Original Location:	125	Probes:	1
126 :	NULL				
127 :	Fabricate	Original Location:	125	Probes:	2

Statistics for 2 to 31

Min: 1
 Max: 3
 Average: 1.41

Statistics for 73 to 102

Min: 1
 Max: 13
 Average: 4.31

Expected number of Probes: 2.00023E+00

DRBURRIS's Hash (40%)**LINEAR Probe****Output File**

1 :	Qamruddin	Original Location:	1	Probes:	1
2 :	Nienberg	Original Location:	2	Probes:	1
3 :	Acevedo	Original Location:	1	Probes:	3
4 :	Arauza	Original Location:	127	Probes:	6
5 :	Crouch	Original Location:	5	Probes:	1
6 :	Ellington	Original Location:	4	Probes:	3
7 :	Gurung	Original Location:	4	Probes:	4
8 :	Joseph	Original Location:	5	Probes:	4
9 :	Daniels	Original Location:	9	Probes:	1
10 :	Farral	Original Location:	9	Probes:	2
11 :	Carmona	Original Location:	11	Probes:	1
12 :	Clayton	Original Location:	12	Probes:	1
13 :	Dustin	Original Location:	11	Probes:	3
14 :	Zulfiqar	Original Location:	14	Probes:	1
15 :	Aguirrie	Original Location:	15	Probes:	1
16 :	Casper	Original Location:	15	Probes:	2
17 :	Alcantara	Original Location:	17	Probes:	1
18 :	Davies	Original Location:	16	Probes:	3
19 :	Dugger	Original Location:	15	Probes:	5
20 :	Salkowski	Original Location:	20	Probes:	1
21 :	Robert	Original Location:	17	Probes:	5
22 :	Octavio	Original Location:	6	Probes:	17
23 :	Jeffrey	Original Location:	2	Probes:	22
24 :	Jordon	Original Location:	11	Probes:	14
25 :	Vinnela	Original Location:	9	Probes:	17
26 :	Veronica	Original Location:	6	Probes:	21
27 :	Matthew	Original Location:	2	Probes:	26
28 :	Michael	Original Location:	2	Probes:	27
29 :	Akhila	Original Location:	127	Probes:	31
30 :	Charles	Original Location:	2	Probes:	29
31 :	NULL				
32 :	NULL				
33 :	NULL				
34 :	NULL				
35 :	NULL				
36 :	NULL				
37 :	NULL				
38 :	NULL				
39 :	NULL				
40 :	NULL				
41 :	NULL				
42 :	NULL				
43 :	NULL				
44 :	NULL				
45 :	NULL				
46 :	NULL				

47 :	NULL		
48 :	NULL		
49 :	NULL		
50 :	NULL		
51 :	NULL		
52 :	NULL		
53 :	NULL		
54 :	NULL		
55 :	NULL		
56 :	NULL		
57 :	NULL		
58 :	NULL		
59 :	NULL		
60 :	NULL		
61 :	NULL		
62 :	Cook	Original Location:	62 Probes: 1
63 :	Red	Original Location:	62 Probes: 2
64 :	Paschal	Original Location:	127 Probes: 2
65 :	Ajose	Original Location:	62 Probes: 4
66 :	Buck	Original Location:	62 Probes: 5
67 :	Clark	Original Location:	62 Probes: 6
68 :	Egbe	Original Location:	62 Probes: 7
69 :	Garza	Original Location:	62 Probes: 8
70 :	Kelly	Original Location:	62 Probes: 9
71 :	Corey	Original Location:	62 Probes: 10
72 :	Adam	Original Location:	62 Probes: 11
73 :	Kyle	Original Location:	62 Probes: 12
74 :	Scott	Original Location:	62 Probes: 13
75 :	Judy	Original Location:	62 Probes: 14
76 :	Derek	Original Location:	62 Probes: 15
77 :	Lisa	Original Location:	62 Probes: 16
78 :	Todd	Original Location:	62 Probes: 17
79 :	John	Original Location:	62 Probes: 18
80 :	James	Original Location:	62 Probes: 19
81 :	NULL		
82 :	NULL		
83 :	NULL		
84 :	1234567890123456	Original Location:	84 Probes: 1
85 :	NULL		
86 :	NULL		
87 :	NULL		
88 :	NULL		
89 :	NULL		
90 :	NULL		
91 :	NULL		
92 :	NULL		
93 :	NULL		
94 :	NULL		
95 :	NULL		

```

96 : NULL
97 : NULL
98 : NULL
99 : NULL
100 : NULL
101 : NULL
102 : NULL
103 : NULL
104 : NULL
105 : NULL
106 : NULL
107 : NULL
108 : NULL
109 : NULL
110 : NULL
111 : NULL
112 : NULL
113 : NULL
114 : NULL
115 : NULL
116 : NULL
117 : NULL
118 : NULL
119 : NULL
120 : NULL
121 : NULL
122 : NULL
123 : NULL
124 : NULL
125 : NULL
126 : NULL
127 : Bhandari          Original Location: 127   Probes: 1
128 : NULL

```

```

Statistics for          2 to 31
Min: 1
Max: 11
Average: 3.69

```

```

Statistics for          22 to 51
Min: 1
Max: 31
Average: 13.79

```

```

Expected number of Probes: 1.33117E+00

```

BRYANBENHAM's Hash (40%)**LINEAR Probe****Output File**

1 :	NULL			
2 :	NULL			
3 :	NULL			
4 :	NULL			
5 :	NULL			
6 :	NULL			
7 :	NULL			
8 :	NULL			
9 :	NULL			
10 :	NULL			
11 :	Adam	Original Location:	11	Probes: 1
12 :	Scott	Original Location:	11	Probes: 2
13 :	NULL			
14 :	Arauz	Original Location:	14	Probes: 1
15 :	Clayton	Original Location:	14	Probes: 2
16 :	NULL			
17 :	NULL			
18 :	NULL			
19 :	1234567890123456	Original Location:	19	Probes: 1
20 :	NULL			
21 :	NULL			
22 :	NULL			
23 :	Corey	Original Location:	23	Probes: 1
24 :	Derek	Original Location:	23	Probes: 2
25 :	Carmona	Original Location:	25	Probes: 1
26 :	Zulfiqar	Original Location:	25	Probes: 2
27 :	Egbe	Original Location:	25	Probes: 3
28 :	Gurung	Original Location:	28	Probes: 1
29 :	Robert	Original Location:	25	Probes: 5
30 :	NULL			
31 :	NULL			
32 :	NULL			
33 :	NULL			
34 :	NULL			
35 :	NULL			
36 :	NULL			
37 :	NULL			
38 :	Lisa	Original Location:	38	Probes: 1
39 :	Joseph	Original Location:	39	Probes: 1
40 :	Alcantara	Original Location:	40	Probes: 1
41 :	Cook	Original Location:	41	Probes: 1
42 :	Dugger	Original Location:	42	Probes: 1
43 :	Nienberg	Original Location:	43	Probes: 1
44 :	Qamruddin	Original Location:	43	Probes: 2
45 :	Acevedo	Original Location:	45	Probes: 1
46 :	Ajose	Original Location:	43	Probes: 4

47 :	NULL			
48 :	NULL			
49 :	NULL			
50 :	NULL			
51 :	NULL			
52 :	NULL			
53 :	NULL			
54 :	Octavio	Original Location:	54	Probes: 1
55 :	Jordon	Original Location:	55	Probes: 1
56 :	NULL			
57 :	Ellington	Original Location:	57	Probes: 1
58 :	Kyle	Original Location:	57	Probes: 2
59 :	Jeffrey	Original Location:	57	Probes: 3
60 :	Vinnela	Original Location:	58	Probes: 3
61 :	NULL			
62 :	NULL			
63 :	Judy	Original Location:	63	Probes: 1
64 :	NULL			
65 :	NULL			
66 :	NULL			
67 :	NULL			
68 :	NULL			
69 :	NULL			
70 :	NULL			
71 :	NULL			
72 :	Aguirrie	Original Location:	72	Probes: 1
73 :	Red	Original Location:	72	Probes: 2
74 :	Casper	Original Location:	74	Probes: 1
75 :	Michael	Original Location:	74	Probes: 2
76 :	Dustin	Original Location:	76	Probes: 1
77 :	James	Original Location:	72	Probes: 6
78 :	NULL			
79 :	NULL			
80 :	NULL			
81 :	NULL			
82 :	NULL			
83 :	NULL			
84 :	NULL			
85 :	NULL			
86 :	NULL			
87 :	NULL			
88 :	Davies	Original Location:	88	Probes: 1
89 :	Daniels	Original Location:	89	Probes: 1
90 :	Kelly	Original Location:	90	Probes: 1
91 :	Todd	Original Location:	89	Probes: 3
92 :	Veronica	Original Location:	90	Probes: 3
93 :	Matthew	Original Location:	91	Probes: 3
94 :	John	Original Location:	91	Probes: 4
95 :	NULL			

96 :	NULL			
97 :	NULL			
98 :	NULL			
99 :	NULL			
100 :	NULL			
101 :	NULL			
102 :	NULL			
103 :	Paschal	Original Location:	103	Probes: 1
104 :	NULL			
105 :	NULL			
106 :	NULL			
107 :	NULL			
108 :	Bhandari	Original Location:	108	Probes: 1
109 :	Buck	Original Location:	108	Probes: 2
110 :	Clark	Original Location:	109	Probes: 2
111 :	Crouch	Original Location:	109	Probes: 3
112 :	Charles	Original Location:	109	Probes: 4
113 :	NULL			
114 :	NULL			
115 :	NULL			
116 :	NULL			
117 :	NULL			
118 :	NULL			
119 :	NULL			
120 :	NULL			
121 :	NULL			
122 :	Salkowski	Original Location:	122	Probes: 1
123 :	Farral	Original Location:	123	Probes: 1
124 :	Akhila	Original Location:	122	Probes: 3
125 :	Garza	Original Location:	125	Probes: 1
126 :	NULL			
127 :	NULL			
128 :	NULL			

Statistics for 2 to 31

Min: 1
 Max: 4
 Average: 1.45

Statistics for 22 to 51

Min: 1
 Max: 6
 Average: 2.21

Expected number of Probes: 1.33117E+00

DRBURRIS's Hash (80%)**LINEAR Probe****Output File**

1 :	Qamruddin	Original Location:	1	Probes:	1
2 :	Nienberg	Original Location:	2	Probes:	1
3 :	Acevedo	Original Location:	1	Probes:	3
4 :	Arauz	Original Location:	127	Probes:	6
5 :	Crouch	Original Location:	5	Probes:	1
6 :	Ellington	Original Location:	4	Probes:	3
7 :	Gurung	Original Location:	4	Probes:	4
8 :	Joseph	Original Location:	5	Probes:	4
9 :	Daniels	Original Location:	9	Probes:	1
10 :	Farral	Original Location:	9	Probes:	2
11 :	Carmona	Original Location:	11	Probes:	1
12 :	Clayton	Original Location:	12	Probes:	1
13 :	Dustin	Original Location:	11	Probes:	3
14 :	Zulfiqar	Original Location:	14	Probes:	1
15 :	Aguirrie	Original Location:	15	Probes:	1
16 :	Casper	Original Location:	15	Probes:	2
17 :	Alcantara	Original Location:	17	Probes:	1
18 :	Davies	Original Location:	16	Probes:	3
19 :	Dugger	Original Location:	15	Probes:	5
20 :	Salkowski	Original Location:	20	Probes:	1
21 :	Robert	Original Location:	17	Probes:	5
22 :	Octavio	Original Location:	6	Probes:	17
23 :	Jeffrey	Original Location:	2	Probes:	22
24 :	Jordon	Original Location:	11	Probes:	14
25 :	Vinnela	Original Location:	9	Probes:	17
26 :	Veronica	Original Location:	6	Probes:	21
27 :	Matthew	Original Location:	2	Probes:	26
28 :	Michael	Original Location:	2	Probes:	27
29 :	Akhila	Original Location:	127	Probes:	31
30 :	Charles	Original Location:	2	Probes:	29
31 :	Christopher	Original Location:	17	Probes:	15
32 :	Fernando	Original Location:	11	Probes:	22
33 :	Batbold	Original Location:	9	Probes:	25
34 :	Fabulous	Original Location:	12	Probes:	23
35 :	Misogamist	Original Location:	127	Probes:	37
36 :	Maiden	Original Location:	11	Probes:	26
37 :	Constriction	Original Location:	15	Probes:	23
38 :	Necromancer	Original Location:	10	Probes:	29
39 :	Syncopate	Original Location:	13	Probes:	27
40 :	Afterwards	Original Location:	20	Probes:	21
41 :	Person	Original Location:	11	Probes:	31
42 :	Northwest	Original Location:	20	Probes:	23
43 :	Irreversible	Original Location:	2	Probes:	42
44 :	Fabricate	Original Location:	0	Probes:	45
45 :	Staple	Original Location:	2	Probes:	44
46 :	Finagle	Original Location:	9	Probes:	38

47 :	Screen	Original Location:	11	Probes:	37
48 :	Perfect	Original Location:	0	Probes:	49
49 :	parasympathetic	Original Location:	22	Probes:	28
50 :	poison	Original Location:	11	Probes:	40
51 :	brutalize	Original Location:	9	Probes:	43
52 :	ratiocination	Original Location:	0	Probes:	53
53 :	cauldron	Original Location:	15	Probes:	39
54 :	prepossess	Original Location:	16	Probes:	39
55 :	orthodontist	Original Location:	1	Probes:	55
56 :	magnetic	Original Location:	17	Probes:	40
57 :	constrain	Original Location:	15	Probes:	43
58 :	marsupial	Original Location:	13	Probes:	46
59 :	rationalize	Original Location:	11	Probes:	49
60 :	toluene	Original Location:	11	Probes:	50
61 :	sparse	Original Location:	2	Probes:	60
62 :	Cook	Original Location:	62	Probes:	1
63 :	Red	Original Location:	62	Probes:	2
64 :	Paschal	Original Location:	127	Probes:	2
65 :	Ajose	Original Location:	62	Probes:	4
66 :	Buck	Original Location:	62	Probes:	5
67 :	Clark	Original Location:	62	Probes:	6
68 :	Egbe	Original Location:	62	Probes:	7
69 :	Garza	Original Location:	62	Probes:	8
70 :	Kelly	Original Location:	62	Probes:	9
71 :	Corey	Original Location:	62	Probes:	10
72 :	Adam	Original Location:	62	Probes:	11
73 :	Kyle	Original Location:	62	Probes:	12
74 :	Scott	Original Location:	62	Probes:	13
75 :	Judy	Original Location:	62	Probes:	14
76 :	Derek	Original Location:	62	Probes:	15
77 :	Lisa	Original Location:	62	Probes:	16
78 :	Todd	Original Location:	62	Probes:	17
79 :	John	Original Location:	62	Probes:	18
80 :	James	Original Location:	62	Probes:	19
81 :	Chris	Original Location:	62	Probes:	20
82 :	Wade	Original Location:	62	Probes:	21
83 :	Joel	Original Location:	62	Probes:	22
84 :	1234567890123456	Original Location:	84	Probes:	1
85 :	Eye	Original Location:	62	Probes:	24
86 :	Yolk	Original Location:	62	Probes:	25
87 :	Honor	Original Location:	62	Probes:	26
88 :	Under	Original Location:	62	Probes:	27
89 :	Jutty	Original Location:	62	Probes:	28
90 :	Cook	Original Location:	62	Probes:	29
91 :	Rush	Original Location:	62	Probes:	30
92 :	Wine	Original Location:	62	Probes:	31
93 :	mole	Original Location:	62	Probes:	32
94 :	cap	Original Location:	62	Probes:	33
95 :	wince	Original Location:	62	Probes:	34

96 :	live	Original Location:	62	Probes:	35
97 :	inlet	Original Location:	62	Probes:	36
98 :	scat	Original Location:	62	Probes:	37
99 :	wet	Original Location:	62	Probes:	38
100 :	quandary	Original Location:	127	Probes:	102
101 :	dactyl	Original Location:	9	Probes:	93
102 :	NULL				
103 :	NULL				
104 :	NULL				
105 :	NULL				
106 :	NULL				
107 :	NULL				
108 :	NULL				
109 :	NULL				
110 :	NULL				
111 :	NULL				
112 :	NULL				
113 :	NULL				
114 :	NULL				
115 :	NULL				
116 :	NULL				
117 :	NULL				
118 :	NULL				
119 :	NULL				
120 :	NULL				
121 :	NULL				
122 :	NULL				
123 :	NULL				
124 :	NULL				
125 :	NULL				
126 :	NULL				
127 :	Bhandari	Original Location:	127	Probes:	1
128 :	NULL				

Statistics for 2 to 31

Min: 1

Max: 11

Average: 3.69

Statistics for 73 to 102

Min: 1

Max: 102

Average: 43.66

Expected number of Probes: 2.96154E+00

BRYANBENHAM's Hash (80%)**LINEAR Probe****Output File**

1 :	Fabricate	Original Location:	125	Probes:	5
2 :	NULL				
3 :	parasympathetic	Original Location:	3	Probes:	1
4 :	rationalize	Original Location:	4	Probes:	1
5 :	NULL				
6 :	cap	Original Location:	6	Probes:	1
7 :	NULL				
8 :	NULL				
9 :	NULL				
10 :	NULL				
11 :	Adam	Original Location:	11	Probes:	1
12 :	Scott	Original Location:	11	Probes:	2
13 :	NULL				
14 :	Arauz	Original Location:	14	Probes:	1
15 :	Clayton	Original Location:	14	Probes:	2
16 :	NULL				
17 :	NULL				
18 :	NULL				
19 :	1234567890123456	Original Location:	19	Probes:	1
20 :	NULL				
21 :	NULL				
22 :	Batbold	Original Location:	22	Probes:	1
23 :	Corey	Original Location:	23	Probes:	1
24 :	Derek	Original Location:	23	Probes:	2
25 :	Carmona	Original Location:	25	Probes:	1
26 :	Zulfiqar	Original Location:	25	Probes:	2
27 :	Egbe	Original Location:	25	Probes:	3
28 :	Gurung	Original Location:	28	Probes:	1
29 :	Robert	Original Location:	25	Probes:	5
30 :	Chris	Original Location:	24	Probes:	7
31 :	Fabulous	Original Location:	29	Probes:	3
32 :	Syncopate	Original Location:	24	Probes:	9
33 :	Honor	Original Location:	26	Probes:	8
34 :	Screen	Original Location:	23	Probes:	12
35 :	wince	Original Location:	23	Probes:	13
36 :	orthodontist	Original Location:	23	Probes:	14
37 :	constrain	Original Location:	27	Probes:	11
38 :	Lisa	Original Location:	38	Probes:	1
39 :	Joseph	Original Location:	39	Probes:	1
40 :	Alcantara	Original Location:	40	Probes:	1
41 :	Cook	Original Location:	41	Probes:	1
42 :	Dugger	Original Location:	42	Probes:	1
43 :	Nienberg	Original Location:	43	Probes:	1
44 :	Qamruddin	Original Location:	43	Probes:	2
45 :	Acevedo	Original Location:	45	Probes:	1
46 :	Ajose	Original Location:	43	Probes:	4

47 :	Maiden	Original Location:	40	Probes:	8
48 :	Necromancer	Original Location:	38	Probes:	11
49 :	Staple	Original Location:	45	Probes:	5
50 :	Christopher	Original Location:	50	Probes:	1
51 :	Cook	Original Location:	41	Probes:	11
52 :	scat	Original Location:	45	Probes:	8
53 :	NULL				
54 :	Octavio	Original Location:	54	Probes:	1
55 :	Jordon	Original Location:	55	Probes:	1
56 :	mole	Original Location:	56	Probes:	1
57 :	Ellington	Original Location:	57	Probes:	1
58 :	Kyle	Original Location:	57	Probes:	2
59 :	Jeffrey	Original Location:	57	Probes:	3
60 :	Vinnela	Original Location:	58	Probes:	3
61 :	Wade	Original Location:	57	Probes:	5
62 :	Afterwards	Original Location:	60	Probes:	3
63 :	Judy	Original Location:	63	Probes:	1
64 :	Northwest	Original Location:	59	Probes:	6
65 :	Under	Original Location:	57	Probes:	9
66 :	inlet	Original Location:	56	Probes:	11
67 :	toluene	Original Location:	60	Probes:	8
68 :	Irreversible	Original Location:	68	Probes:	1
69 :	NULL				
70 :	wet	Original Location:	70	Probes:	1
71 :	NULL				
72 :	Aguirrie	Original Location:	72	Probes:	1
73 :	Red	Original Location:	72	Probes:	2
74 :	Casper	Original Location:	74	Probes:	1
75 :	Michael	Original Location:	74	Probes:	2
76 :	Dustin	Original Location:	76	Probes:	1
77 :	James	Original Location:	72	Probes:	6
78 :	Rush	Original Location:	73	Probes:	6
79 :	poison	Original Location:	76	Probes:	4
80 :	magnetic	Original Location:	75	Probes:	6
81 :	dactyl	Original Location:	77	Probes:	5
82 :	NULL				
83 :	NULL				
84 :	NULL				
85 :	NULL				
86 :	NULL				
87 :	Finagle	Original Location:	87	Probes:	1
88 :	Davies	Original Location:	88	Probes:	1
89 :	Daniels	Original Location:	89	Probes:	1
90 :	Kelly	Original Location:	90	Probes:	1
91 :	Todd	Original Location:	89	Probes:	3
92 :	Veronica	Original Location:	90	Probes:	3
93 :	Matthew	Original Location:	91	Probes:	3
94 :	John	Original Location:	91	Probes:	4
95 :	Eye	Original Location:	89	Probes:	7

96 :	Constriction	Original Location:	89	Probes:	8
97 :	Person	Original Location:	91	Probes:	7
98 :	Jutty	Original Location:	92	Probes:	7
99 :	Wine	Original Location:	88	Probes:	12
100 :	live	Original Location:	87	Probes:	14
101 :	marsupial	Original Location:	91	Probes:	11
102 :	NULL				
103 :	Paschal	Original Location:	103	Probes:	1
104 :	NULL				
105 :	cauldron	Original Location:	105	Probes:	1
106 :	NULL				
107 :	Joel	Original Location:	107	Probes:	1
108 :	Bhandari	Original Location:	108	Probes:	1
109 :	Buck	Original Location:	108	Probes:	2
110 :	Clark	Original Location:	109	Probes:	2
111 :	Crouch	Original Location:	109	Probes:	3
112 :	Charles	Original Location:	109	Probes:	4
113 :	Misogamist	Original Location:	111	Probes:	3
114 :	brutalize	Original Location:	108	Probes:	7
115 :	prepossess	Original Location:	114	Probes:	2
116 :	sparse	Original Location:	110	Probes:	7
117 :	quandary	Original Location:	109	Probes:	9
118 :	NULL				
119 :	NULL				
120 :	Perfect	Original Location:	120	Probes:	1
121 :	ratiocination	Original Location:	120	Probes:	2
122 :	Salkowski	Original Location:	122	Probes:	1
123 :	Farral	Original Location:	123	Probes:	1
124 :	Akhila	Original Location:	122	Probes:	3
125 :	Garza	Original Location:	125	Probes:	1
126 :	Fernando	Original Location:	122	Probes:	5
127 :	Yolk	Original Location:	122	Probes:	6
128 :	NULL				

Statistics for 2 to 31

Min: 1
 Max: 4
 Average: 1.45

Statistics for 73 to 102

Min: 1
 Max: 14
 Average: 6.45

Expected number of Probes: 2.96154E+00

DRBURRIS's Hash (40%)**RANDOM Probe****Output File**

1 :	Paschal	Original Location:	127	Probes:	2
2 :	Nienberg	Original Location:	2	Probes:	1
3 :	Qamruddin	Original Location:	1	Probes:	2
4 :	Ellington	Original Location:	4	Probes:	1
5 :	Crouch	Original Location:	5	Probes:	1
6 :	Arauz	Original Location:	127	Probes:	3
7 :	Joseph	Original Location:	5	Probes:	2
8 :	Acevedo	Original Location:	1	Probes:	3
9 :	Daniels	Original Location:	9	Probes:	1
10 :	Garza	Original Location:	62	Probes:	8
11 :	Carmona	Original Location:	11	Probes:	1
12 :	Clayton	Original Location:	12	Probes:	1
13 :	Dustin	Original Location:	11	Probes:	2
14 :	Zulfiqar	Original Location:	14	Probes:	1
15 :	Aguirre	Original Location:	15	Probes:	1
16 :	Davies	Original Location:	16	Probes:	1
17 :	Alcantara	Original Location:	17	Probes:	1
18 :	Jordon	Original Location:	11	Probes:	3
19 :	Robert	Original Location:	17	Probes:	2
20 :	Salkowski	Original Location:	20	Probes:	1
21 :	NULL				
22 :	Casper	Original Location:	15	Probes:	3
23 :	Vinnela	Original Location:	9	Probes:	6
24 :	Corey	Original Location:	62	Probes:	10
25 :	NULL				
26 :	NULL				
27 :	NULL				
28 :	Akhila	Original Location:	127	Probes:	5
29 :	NULL				
30 :	NULL				
31 :	Jeffrey	Original Location:	2	Probes:	5
32 :	NULL				
33 :	NULL				
34 :	Derek	Original Location:	62	Probes:	16
35 :	Veronica	Original Location:	6	Probes:	5
36 :	Gurung	Original Location:	4	Probes:	4
37 :	NULL				
38 :	Octavio	Original Location:	6	Probes:	4
39 :	NULL				
40 :	NULL				
41 :	Farral	Original Location:	9	Probes:	4
42 :	NULL				
43 :	NULL				
44 :	NULL				
45 :	NULL				
46 :	NULL				

47 :	Dugger	Original Location:	15	Probes:	4
48 :	NULL				
49 :	NULL				
50 :	NULL				
51 :	NULL				
52 :	NULL				
53 :	Todd	Original Location:	62	Probes:	19
54 :	NULL				
55 :	Kelly	Original Location:	62	Probes:	9
56 :	NULL				
57 :	Judy	Original Location:	62	Probes:	15
58 :	NULL				
59 :	NULL				
60 :	NULL				
61 :	NULL				
62 :	Cook	Original Location:	62	Probes:	1
63 :	NULL				
64 :	Red	Original Location:	62	Probes:	2
65 :	NULL				
66 :	NULL				
67 :	NULL				
68 :	NULL				
69 :	Ajose	Original Location:	62	Probes:	3
70 :	NULL				
71 :	NULL				
72 :	NULL				
73 :	NULL				
74 :	NULL				
75 :	John	Original Location:	62	Probes:	21
76 :	Egbe	Original Location:	62	Probes:	6
77 :	NULL				
78 :	Matthew	Original Location:	2	Probes:	8
79 :	NULL				
80 :	NULL				
81 :	NULL				
82 :	NULL				
83 :	Scott	Original Location:	62	Probes:	13
84 :	1234567890123456	Original Location:	84	Probes:	1
85 :	NULL				
86 :	NULL				
87 :	NULL				
88 :	NULL				
89 :	NULL				
90 :	NULL				
91 :	Clark	Original Location:	62	Probes:	5
92 :	Charles	Original Location:	2	Probes:	10
93 :	NULL				
94 :	Buck	Original Location:	62	Probes:	4
95 :	NULL				

96 :	NULL			
97 :	NULL			
98 :	NULL			
99 :	NULL			
100 :	NULL			
101 :	NULL			
102 :	NULL			
103 :	NULL			
104 :	NULL			
105 :	NULL			
106 :	NULL			
107 :	NULL			
108 :	NULL			
109 :	NULL			
110 :	NULL			
111 :	NULL			
112 :	Lisa	Original Location:	62	Probes: 18
113 :	NULL			
114 :	NULL			
115 :	NULL			
116 :	NULL			
117 :	NULL			
118 :	Kyle	Original Location:	62	Probes: 12
119 :	NULL			
120 :	NULL			
121 :	NULL			
122 :	NULL			
123 :	Michael	Original Location:	2	Probes: 9
124 :	James	Original Location:	62	Probes: 22
125 :	Adam	Original Location:	62	Probes: 11
126 :	NULL			
127 :	Bhandari	Original Location:	127	Probes: 1
128 :	NULL			

Statistics for 2 to 31

Min: 1
 Max: 11
 Average: 3.34

Statistics for 22 to 51

Min: 1
 Max: 22
 Average: 8.79

Expected number of Probes: 1.27554E+00

BRYANBENHAM's Hash (40%)**RANDOM Probe****Output File**

1 :	NULL			
2 :	NULL			
3 :	NULL			
4 :	NULL			
5 :	NULL			
6 :	NULL			
7 :	NULL			
8 :	NULL			
9 :	NULL			
10 :	NULL			
11 :	Adam	Original Location:	11	Probes: 1
12 :	NULL			
13 :	Scott	Original Location:	11	Probes: 2
14 :	Arauz	Original Location:	14	Probes: 1
15 :	NULL			
16 :	Clayton	Original Location:	14	Probes: 2
17 :	NULL			
18 :	NULL			
19 :	1234567890123456	Original Location:	19	Probes: 1
20 :	NULL			
21 :	NULL			
22 :	NULL			
23 :	Corey	Original Location:	23	Probes: 1
24 :	NULL			
25 :	Carmona	Original Location:	25	Probes: 1
26 :	NULL			
27 :	Zulfiqar	Original Location:	25	Probes: 2
28 :	Gurung	Original Location:	28	Probes: 1
29 :	NULL			
30 :	Derek	Original Location:	23	Probes: 3
31 :	NULL			
32 :	Egbe	Original Location:	25	Probes: 3
33 :	NULL			
34 :	NULL			
35 :	NULL			
36 :	NULL			
37 :	NULL			
38 :	Lisa	Original Location:	38	Probes: 1
39 :	Joseph	Original Location:	39	Probes: 1
40 :	Alcantara	Original Location:	40	Probes: 1
41 :	Cook	Original Location:	41	Probes: 1
42 :	Dugger	Original Location:	42	Probes: 1
43 :	Nienberg	Original Location:	43	Probes: 1
44 :	NULL			
45 :	Qamruddin	Original Location:	43	Probes: 2
46 :	NULL			

47 :	Acevedo	Original Location:	45	Probes:	2
48 :	NULL				
49 :	NULL				
50 :	Ajose	Original Location:	43	Probes:	3
51 :	NULL				
52 :	NULL				
53 :	NULL				
54 :	Robert	Original Location:	25	Probes:	5
55 :	Jordon	Original Location:	55	Probes:	1
56 :	Octavio	Original Location:	54	Probes:	2
57 :	Ellington	Original Location:	57	Probes:	1
58 :	Vinnela	Original Location:	58	Probes:	1
59 :	Kyle	Original Location:	57	Probes:	2
60 :	NULL				
61 :	NULL				
62 :	NULL				
63 :	Judy	Original Location:	63	Probes:	1
64 :	Jeffrey	Original Location:	57	Probes:	3
65 :	NULL				
66 :	NULL				
67 :	NULL				
68 :	NULL				
69 :	NULL				
70 :	NULL				
71 :	NULL				
72 :	Aguirrie	Original Location:	72	Probes:	1
73 :	NULL				
74 :	Casper	Original Location:	74	Probes:	1
75 :	NULL				
76 :	Dustin	Original Location:	76	Probes:	1
77 :	NULL				
78 :	NULL				
79 :	Red	Original Location:	72	Probes:	3
80 :	NULL				
81 :	Michael	Original Location:	74	Probes:	3
82 :	NULL				
83 :	NULL				
84 :	NULL				
85 :	NULL				
86 :	NULL				
87 :	NULL				
88 :	Davies	Original Location:	88	Probes:	1
89 :	Daniels	Original Location:	89	Probes:	1
90 :	Kelly	Original Location:	90	Probes:	1
91 :	Todd	Original Location:	89	Probes:	2
92 :	Veronica	Original Location:	90	Probes:	2
93 :	Matthew	Original Location:	91	Probes:	2
94 :	NULL				
95 :	NULL				

96 :	NULL			
97 :	NULL			
98 :	John	Original Location:	91	Probes: 3
99 :	NULL			
100 :	NULL			
101 :	NULL			
102 :	NULL			
103 :	Paschal	Original Location:	103	Probes: 1
104 :	James	Original Location:	72	Probes: 4
105 :	NULL			
106 :	NULL			
107 :	NULL			
108 :	Bhandari	Original Location:	108	Probes: 1
109 :	Clark	Original Location:	109	Probes: 1
110 :	Buck	Original Location:	108	Probes: 2
111 :	Crouch	Original Location:	109	Probes: 2
112 :	NULL			
113 :	NULL			
114 :	NULL			
115 :	NULL			
116 :	Charles	Original Location:	109	Probes: 3
117 :	NULL			
118 :	NULL			
119 :	NULL			
120 :	NULL			
121 :	NULL			
122 :	Salkowski	Original Location:	122	Probes: 1
123 :	Farral	Original Location:	123	Probes: 1
124 :	Akhila	Original Location:	122	Probes: 2
125 :	Garza	Original Location:	125	Probes: 1
126 :	NULL			
127 :	NULL			
128 :	NULL			

Statistics for 2 to 31

Min: 1
 Max: 3
 Average: 1.41

Statistics for 22 to 51

Min: 1
 Max: 5
 Average: 1.97

Expected number of Probes: 1.27554E+00

DRBURRIS's Hash (80%)**RANDOM Probe****Output File**

1 :	Paschal	Original Location:	127	Probes:	2
2 :	Nienberg	Original Location:	2	Probes:	1
3 :	Qamruddin	Original Location:	1	Probes:	2
4 :	Ellington	Original Location:	4	Probes:	1
5 :	Crouch	Original Location:	5	Probes:	1
6 :	Arauza	Original Location:	127	Probes:	3
7 :	Joseph	Original Location:	5	Probes:	2
8 :	Acevedo	Original Location:	1	Probes:	3
9 :	Daniels	Original Location:	9	Probes:	1
10 :	Garza	Original Location:	62	Probes:	8
11 :	Carmona	Original Location:	11	Probes:	1
12 :	Clayton	Original Location:	12	Probes:	1
13 :	Dustin	Original Location:	11	Probes:	2
14 :	Zulfiqar	Original Location:	14	Probes:	1
15 :	Aguirrie	Original Location:	15	Probes:	1
16 :	Davies	Original Location:	16	Probes:	1
17 :	Alcantara	Original Location:	17	Probes:	1
18 :	Jordon	Original Location:	11	Probes:	3
19 :	Robert	Original Location:	17	Probes:	2
20 :	Salkowski	Original Location:	20	Probes:	1
21 :	scat	Original Location:	62	Probes:	51
22 :	Casper	Original Location:	15	Probes:	3
23 :	Vinnela	Original Location:	9	Probes:	6
24 :	Corey	Original Location:	62	Probes:	10
25 :	Person	Original Location:	11	Probes:	6
26 :	NULL				
27 :	Afterwards	Original Location:	20	Probes:	3
28 :	Akhila	Original Location:	127	Probes:	5
29 :	Constriction	Original Location:	15	Probes:	6
30 :	brutalize	Original Location:	9	Probes:	13
31 :	Jeffrey	Original Location:	2	Probes:	5
32 :	Fabricate	Original Location:	0	Probes:	4
33 :	orthodontist	Original Location:	1	Probes:	4
34 :	Derek	Original Location:	62	Probes:	16
35 :	Veronica	Original Location:	6	Probes:	5
36 :	Gurung	Original Location:	4	Probes:	4
37 :	Jutty	Original Location:	62	Probes:	35
38 :	Octavio	Original Location:	6	Probes:	4
39 :	Joel	Original Location:	62	Probes:	25
40 :	Maiden	Original Location:	11	Probes:	5
41 :	Farral	Original Location:	9	Probes:	4
42 :	Necromancer	Original Location:	10	Probes:	4
43 :	Fernando	Original Location:	11	Probes:	4
44 :	Fabulous	Original Location:	12	Probes:	4
45 :	Syncopate	Original Location:	13	Probes:	4
46 :	magnetic	Original Location:	17	Probes:	5

47 :	Dugger	Original Location:	15	Probes:	4
48 :	prepossess	Original Location:	16	Probes:	4
49 :	Christopher	Original Location:	17	Probes:	4
50 :	NULL				
51 :	live	Original Location:	62	Probes:	45
52 :	Northwest	Original Location:	20	Probes:	4
53 :	Todd	Original Location:	62	Probes:	19
54 :	parasympathetic	Original Location:	22	Probes:	4
55 :	Kelly	Original Location:	62	Probes:	9
56 :	NULL				
57 :	Judy	Original Location:	62	Probes:	15
58 :	Wade	Original Location:	62	Probes:	24
59 :	Cook	Original Location:	62	Probes:	37
60 :	dactyl	Original Location:	9	Probes:	23
61 :	NULL				
62 :	Cook	Original Location:	62	Probes:	1
63 :	NULL				
64 :	Red	Original Location:	62	Probes:	2
65 :	Irreversible	Original Location:	2	Probes:	11
66 :	Misogamist	Original Location:	127	Probes:	7
67 :	Honor	Original Location:	62	Probes:	29
68 :	NULL				
69 :	Ajose	Original Location:	62	Probes:	3
70 :	NULL				
71 :	constrain	Original Location:	15	Probes:	12
72 :	Eye	Original Location:	62	Probes:	26
73 :	NULL				
74 :	rationalize	Original Location:	11	Probes:	11
75 :	John	Original Location:	62	Probes:	21
76 :	Egbe	Original Location:	62	Probes:	6
77 :	NULL				
78 :	Matthew	Original Location:	2	Probes:	8
79 :	NULL				
80 :	inlet	Original Location:	62	Probes:	50
81 :	NULL				
82 :	Under	Original Location:	62	Probes:	32
83 :	Scott	Original Location:	62	Probes:	13
84 :	1234567890123456	Original Location:	84	Probes:	1
85 :	Batbold	Original Location:	9	Probes:	8
86 :	wince	Original Location:	62	Probes:	44
87 :	Screen	Original Location:	11	Probes:	8
88 :	NULL				
89 :	marsupial	Original Location:	13	Probes:	8
90 :	ratiocination	Original Location:	0	Probes:	10
91 :	Clark	Original Location:	62	Probes:	5
92 :	Charles	Original Location:	2	Probes:	10
93 :	cap	Original Location:	62	Probes:	43
94 :	Buck	Original Location:	62	Probes:	4
95 :	NULL				

96 :	NULL			
97 :	Rush	Original Location:	62	Probes: 39
98 :	NULL			
99 :	Finagle	Original Location:	9	Probes: 10
100 :	NULL			
101 :	poison	Original Location:	11	Probes: 10
102 :	sparse	Original Location:	2	Probes: 16
103 :	NULL			
104 :	Staple	Original Location:	2	Probes: 14
105 :	cauldron	Original Location:	15	Probes: 10
106 :	Wine	Original Location:	62	Probes: 40
107 :	NULL			
108 :	NULL			
109 :	Yolk	Original Location:	62	Probes: 27
110 :	wet	Original Location:	62	Probes: 52
111 :	toluene	Original Location:	11	Probes: 16
112 :	Lisa	Original Location:	62	Probes: 18
113 :	Chris	Original Location:	62	Probes: 23
114 :	NULL			
115 :	NULL			
116 :	NULL			
117 :	NULL			
118 :	Kyle	Original Location:	62	Probes: 12
119 :	NULL			
120 :	mole	Original Location:	62	Probes: 42
121 :	Perfect	Original Location:	0	Probes: 9
122 :	quandary	Original Location:	127	Probes: 15
123 :	Michael	Original Location:	2	Probes: 9
124 :	James	Original Location:	62	Probes: 22
125 :	Adam	Original Location:	62	Probes: 11
126 :	NULL			
127 :	Bhandari	Original Location:	127	Probes: 1
128 :	NULL			

Statistics for 2 to 31

Min: 1
 Max: 11
 Average: 3.34

Statistics for 73 to 102

Min: 1
 Max: 52
 Average: 22.83

Expected number of Probes: 2.00023E+00

BRYANBENHAM's Hash (80%)**RANDOM Probe****Output File**

1 :	Fernando	Original Location:	122	Probes:	3
2 :	NULL				
3 :	parasympathetic	Original Location:	3	Probes:	1
4 :	inlet	Original Location:	56	Probes:	8
5 :	NULL				
6 :	cap	Original Location:	6	Probes:	1
7 :	NULL				
8 :	Yolk	Original Location:	122	Probes:	6
9 :	NULL				
10 :	quandary	Original Location:	109	Probes:	5
11 :	Adam	Original Location:	11	Probes:	1
12 :	NULL				
13 :	Scott	Original Location:	11	Probes:	2
14 :	Arauza	Original Location:	14	Probes:	1
15 :	NULL				
16 :	Clayton	Original Location:	14	Probes:	2
17 :	NULL				
18 :	NULL				
19 :	1234567890123456	Original Location:	19	Probes:	1
20 :	NULL				
21 :	Perfect	Original Location:	120	Probes:	5
22 :	Batbold	Original Location:	22	Probes:	1
23 :	Corey	Original Location:	23	Probes:	1
24 :	Chris	Original Location:	24	Probes:	1
25 :	Carmona	Original Location:	25	Probes:	1
26 :	Syncopate	Original Location:	24	Probes:	2
27 :	Zulfiqar	Original Location:	25	Probes:	2
28 :	Gurung	Original Location:	28	Probes:	1
29 :	Fabulous	Original Location:	29	Probes:	1
30 :	Derek	Original Location:	23	Probes:	3
31 :	NULL				
32 :	Egbe	Original Location:	25	Probes:	3
33 :	Honor	Original Location:	26	Probes:	3
34 :	constrain	Original Location:	27	Probes:	3
35 :	NULL				
36 :	rationalize	Original Location:	4	Probes:	4
37 :	Screen	Original Location:	23	Probes:	6
38 :	Lisa	Original Location:	38	Probes:	1
39 :	Joseph	Original Location:	39	Probes:	1
40 :	Alcantara	Original Location:	40	Probes:	1
41 :	Cook	Original Location:	41	Probes:	1
42 :	Dugger	Original Location:	42	Probes:	1
43 :	Nienberg	Original Location:	43	Probes:	1
44 :	orthodontist	Original Location:	23	Probes:	13
45 :	Qamruddin	Original Location:	43	Probes:	2
46 :	NULL				

47 :	Acevedo	Original Location:	45	Probes:	2
48 :	Cook	Original Location:	41	Probes:	3
49 :	NULL				
50 :	Ajose	Original Location:	43	Probes:	3
51 :	NULL				
52 :	Christopher	Original Location:	50	Probes:	2
53 :	NULL				
54 :	Robert	Original Location:	25	Probes:	5
55 :	Jordon	Original Location:	55	Probes:	1
56 :	Octavio	Original Location:	54	Probes:	2
57 :	Ellington	Original Location:	57	Probes:	1
58 :	Vinnela	Original Location:	58	Probes:	1
59 :	Kyle	Original Location:	57	Probes:	2
60 :	Afterwards	Original Location:	60	Probes:	1
61 :	Northwest	Original Location:	59	Probes:	2
62 :	toluene	Original Location:	60	Probes:	2
63 :	Judy	Original Location:	63	Probes:	1
64 :	Jeffrey	Original Location:	57	Probes:	3
65 :	NULL				
66 :	NULL				
67 :	NULL				
68 :	Irreversible	Original Location:	68	Probes:	1
69 :	Maiden	Original Location:	40	Probes:	5
70 :	Necromancer	Original Location:	38	Probes:	4
71 :	Under	Original Location:	57	Probes:	6
72 :	Aguirrie	Original Location:	72	Probes:	1
73 :	Rush	Original Location:	73	Probes:	1
74 :	Casper	Original Location:	74	Probes:	1
75 :	magnetic	Original Location:	75	Probes:	1
76 :	Dustin	Original Location:	76	Probes:	1
77 :	Staple	Original Location:	45	Probes:	4
78 :	poison	Original Location:	76	Probes:	2
79 :	Red	Original Location:	72	Probes:	3
80 :	NULL				
81 :	Michael	Original Location:	74	Probes:	3
82 :	ratiocination	Original Location:	120	Probes:	10
83 :	NULL				
84 :	marsupial	Original Location:	91	Probes:	9
85 :	mole	Original Location:	56	Probes:	5
86 :	Wade	Original Location:	57	Probes:	5
87 :	Finagle	Original Location:	87	Probes:	1
88 :	Davies	Original Location:	88	Probes:	1
89 :	Daniels	Original Location:	89	Probes:	1
90 :	Kelly	Original Location:	90	Probes:	1
91 :	Todd	Original Location:	89	Probes:	2
92 :	Veronica	Original Location:	90	Probes:	2
93 :	Matthew	Original Location:	91	Probes:	2
94 :	Jutty	Original Location:	92	Probes:	2
95 :	Wine	Original Location:	88	Probes:	3

96 :	Eye	Original Location:	89	Probes:	3
97 :	NULL				
98 :	John	Original Location:	91	Probes:	3
99 :	wince	Original Location:	23	Probes:	8
100 :	NULL				
101 :	NULL				
102 :	wet	Original Location:	70	Probes:	4
103 :	Paschal	Original Location:	103	Probes:	1
104 :	James	Original Location:	72	Probes:	4
105 :	cauldron	Original Location:	105	Probes:	1
106 :	dactyl	Original Location:	77	Probes:	5
107 :	Joel	Original Location:	107	Probes:	1
108 :	Bhandari	Original Location:	108	Probes:	1
109 :	Clark	Original Location:	109	Probes:	1
110 :	Buck	Original Location:	108	Probes:	2
111 :	Crouch	Original Location:	109	Probes:	2
112 :	scat	Original Location:	45	Probes:	7
113 :	Misogamist	Original Location:	111	Probes:	2
114 :	prepossess	Original Location:	114	Probes:	1
115 :	brutalize	Original Location:	108	Probes:	3
116 :	Charles	Original Location:	109	Probes:	3
117 :	sparse	Original Location:	110	Probes:	3
118 :	NULL				
119 :	live	Original Location:	87	Probes:	4
120 :	Person	Original Location:	91	Probes:	5
121 :	Constriction	Original Location:	89	Probes:	4
122 :	Salkowski	Original Location:	122	Probes:	1
123 :	Farral	Original Location:	123	Probes:	1
124 :	Akhila	Original Location:	122	Probes:	2
125 :	Garza	Original Location:	125	Probes:	1
126 :	NULL				
127 :	Fabricate	Original Location:	125	Probes:	2
128 :	NULL				

Statistics for 2 to 31

Min: 1
 Max: 3
 Average: 1.41

Statistics for 73 to 102

Min: 1
 Max: 13
 Average: 4.31

Expected number of Probes: 2.00023E+00

CODE

```
--in hashing.ads
with Ada.Direct_IO;

with Ada.Text_IO; use Ada.Text_IO;
with Ada.Unchecked_Conversion;
with Direct_IO;
with Ada.Numerics.Elementary_Functions; use Ada.Numerics.Elementary_Functions;

package hashing is

    type probeMethod is (linear, random);
    type hashVersion is (drBurris, bryanBenham);
    type method is (main, file);

    subtype slice is String(1..8);
    subtype hashWord is String(1..16);

    package LongIntIO is new Ada.Text_IO.Integer_IO(Standard.Long_Integer); use
LongIntIO;

    type inputData is record
        key : Integer;
        initialAddress : Integer;
        probes : Integer := 1;
        data : hashWord;
    end record;

    package inputIO is new Ada.Direct_IO(hashWord);
    use inputIO;
    package outputIO is new Ada.Direct_IO(inputData);
    use outputIO;

    fileName : String := "words.txt";
    outFile : String := "results.txt";
    InputFile : inputIO.File_Type;
    outputFile : outputIO.File_Type;

    type mainArray is array (1..128) of inputData;
    nullHash : inputData := (data => "                                ", initialAddress => 0,
probes => 0, key => 0);
    mainArr : mainArray := (others => nullHash);
    type itemArray is array (Integer range <>) of inputData;
```

```

function offset (R: in out integer) return Integer;
function bryanKey (stringHash : String) return Integer;
function burriskey (stringhash : String) return Integer;
procedure hash (percent : Float; probeLR : probeMethod; whosHash :
hashVersion; implementation : method);
procedure mainMemory (percent : Float; probeLR : probeMethod; whosHash :
hashVersion);
procedure oFile (percent : Float; probeLR : probeMethod; whosHash :
hashVersion);
procedure average (lower : integer; upper : integer; probeLR : probeMethod;
whosHash : hashVersion; implementation : method);
procedure theoretical (keyValue : Integer; probeLR : probeMethod);

end hashing;

```

```

--in hashing.adb

```

```

with Ada.Numerics.Elementary_Functions; use Ada.Numerics.Elementary_Functions;
with Ada.Integer_Text_IO; use Ada.Integer_Text_IO;
with Ada.Text_IO; use Ada.Text_IO;
with Ada.Unchecked_Conversion;

```

```

package body hashing is

```

```

function offset (R: in out Integer) return Integer is
begin
  R := (5*R);
  R := R mod (2**9);
  return R/4;
end offset;

function sliceToLong is new Ada.Unchecked_Conversion(slice, Long_Integer);
function charToLong is new Ada.Unchecked_Conversion(character,
Long_Integer);
function longToInt is new Ada.Unchecked_Conversion(Long_Integer, integer);

function burrisKey (stringHash : String) return Integer is

  char1 : character := stringHash(1);
  char2 : character := stringHash(3);
  char3 : character := stringHash(6);
  keyValue : Long_Integer;
begin

  keyValue := charToLong(char1) / 256 + charToLong(char2) / 256;
  keyValue := keyValue + charToLong(char3) + 30;
  keyValue := abs(keyValue) mod 129;

```

```

    return longToInt(keyValue);

end burrisKey;

function bryanKey (stringHash : String) return Integer is

    pragma Suppress(Overflow_check);
    str1 : slice := stringHash(1..8);
    str2 : slice := stringHash(9..16);
    extractHash : Long_Integer;
begin
    extractHash := sliceToLong(str1) / 2**12 + sliceToLong(str2) / 2**12;
    extractHash := abs(extractHash) mod 129;

    return longToInt(extractHash);

end bryanKey;

procedure hash (percent : Float; probeLR : probeMethod; whosHash :
hashVersion; implementation : method) is
begin
    put(hashVersion'Image(whosHash)); put_line("'s Hash");
    put(probeMethod'Image(probeLR)); put_line(" Probe");

    if implementation = main then
        put_line("Main Memory");
        new_line;
        mainMemory(percent, probeLR, whosHash);
    else
        put_line("Output File");
        new_line;
        oFile(percent, probeLR, whosHash);
    end if;
end hash;

procedure mainMemory (percent : Float; probeLR : probeMethod; whosHash :
hashVersion) is
    percentCap : Integer := Integer(Float'Floor(Float(128) * percent));
    offsetNum : Integer := 0;
    words : hashWord;
begin
    Open(File => InputFile,
        Mode => In_File,
        Name => fileName);
    declare
        hashTable : itemArray(0..127) := (others => nullHash);
    begin
        for I in 1..percentCap loop
            declare

```

```

        hashRecords : inputData;
        R : Integer := 1;
    begin
        Read(inputFile, words, inputIO.Count(I));
        hashRecords.data := words(1..16);
        if whosHash = drBurris then
            hashRecords.initialAddress := burrisKey(hashRecords.data);
        else
            hashRecords.initialAddress := bryanKey(hashRecords.data);
        end if;

        while hashTable((hashRecords.initialAddress + offsetNum) mod
128).data /= nullHash.data loop
            if probeLR = linear then
                offsetNum := offsetNum + 1;
            else
                offsetNum := offset(R);
            end if;
            hashRecords.probes := hashRecords.probes + 1;
        end loop;
        hashTable((hashRecords.initialAddress + offsetNum) mod 128) :=
hashRecords;
        end;
    end loop;

    for I in 0..127 loop
        if hashTable(I).data /= nullHash.data then
            put(Integer'Image(I)); put(": "); put(hashTable(I).data);
            put("Original Location: ");
put(Integer'Image(hashTable(I).initialAddress));
            put(" Probes: "); put(Integer'Image(hashTable(I).probes));
New_line;
        else
            put(Integer'Image(I)); put(": "); put_line("NULL");
        end if;
    end loop;

    new_line;
    average(1, 29, probeLR, whosHash, main);
    new_line;
    average(percentCap-29, percentCap, probeLR, whosHash, main);

    new_line;

    theoretical (percentCap, probeLR);
    Close(inputFile);
end;
end mainMemory;

```

```

    procedure oFile (percent : Float; probeLR : probeMethod; whosHash :
hashVersion) is
        percentCap : Integer := Integer(Float'Floor(Float(128) * percent));
        hashRecords : inputData;
        initAdd : Integer;
        tempRecord : inputData;
    begin
        Open(File => InputFile,
            Mode => In_File,
            Name => fileName);
        Create(File => outputFile,
            Mode => Inout_File,
            Name => outFile);
        for I in 1..128 loop
            outputIO.Write(outputFile, nullHash, outputIO.Count(I));
        end loop;
        for I in 1..percentCap loop
            declare
                offsetNum : Integer := 0;
                words : hashWord;
                R : Integer := 1;
            begin
                inputIO.Read(inputFile, words, inputIO.Count(I));
                hashRecords.data := words(1..16);
                if whosHash = drBurris then
                    hashRecords.initialAddress := burrisKey(hashRecords.data);
                else
                    hashRecords.initialAddress := bryanKey(hashRecords.data);
                end if;
                loop
                    initAdd := (hashRecords.initialAddress + offsetNum) mod 128;
                    if initAdd = 0 then
                        initAdd := 64;
                    end if;
                    outputIO.Read(outputFile, tempRecord, outputIO.Count(initAdd));
                    exit when tempRecord = nullHash;
                    hashRecords.probes := hashRecords.probes + 1;
                    if probeLR = linear then
                        offsetNum := offsetNum + 1;
                    else
                        offsetNum := offset(R);
                    end if;
                end loop;
                outputIO.Write(outputFile, hashRecords, outputIO.Count(initAdd));
            end;
        end loop;

        for I in 1..128 loop

```



```

        outputIO.Read(outputFile, tempRecord, outputIO.Count(I));
        if tempRecord /= nullHash then
            put(Integer'Image(I)); put(": "); put(tempRecord.data);
            put("        Original Location:        ");
        put(Integer'Image(tempRecord.initialAddress));
            put("        Probes:        ");
        put(Integer'Image(tempRecord.probes)); New_line;
        else
            put(Integer'Image(I)); put(": "); put_line("        NULL
");
        end if;
    end loop;
    new_line;
    average(1, 29, probeLR, whosHash, file);
    new_line;
    average(percentCap-29, percentCap, probeLR, whosHash, file);

    new_line;

    theoretical (percentCap, probeLR);
    Close(outputFile);
end oFile;

procedure average (lower: Integer; upper : Integer; probeLR : probeMethod;
whosHash : hashVersion; implementation : method) is
    min : Integer := 1;
    max : Integer := 1;
    avg : Float := 0.0;
begin
    for i in lower..upper loop
        declare
            words : hashWord;
            offsetNum : Integer := 0;
            tempRecord : inputData;
            hashTable : itemArray(0..127) := (others => nullHash);
            R : Integer := 1;
        begin
            Read(inputFile, words, inputIO.Count(I));
            tempRecord.data := words(1..16);
            if whosHash = drBurris then
                tempRecord.initialAddress := burrisKey(tempRecord.data);
            else
                tempRecord.initialAddress := bryanKey(tempRecord.data);
            end if;
            if implementation = main then
                while hashTable((tempRecord.initialAddress + offsetNum) mod
128).data /= tempRecord.data loop
                    if probeLR = linear then
                        offsetNum := offsetNum + 1;

```

```

        else
            offsetNum := offset(R);
        end if;
        tempRecord.probes := tempRecord.probes + 1;
    end loop;
else
    declare
        initAdd : Integer := 0;
        superTempRecord : inputData;
    begin
        loop
            initAdd := (tempRecord.initialAddress + offsetNum) mod
128;

            if initAdd = 0 then
                initadd := 64;
            end if;
            outputIO.Read(outputFile, superTempRecord,
outputIO.Count(initAdd));
            exit when superTempRecord.data = tempRecord.data;
            tempRecord.probes := tempRecord.probes + 1;
            if probeLR = linear then
                offsetNum := offsetNum + 1;
            else
                offsetNum := offset(R);
            end if;
        end loop;
    end;
end if;
if tempRecord.probes < min then
    min := tempRecord.probes;
elsif tempRecord.probes > max then
    max := tempRecord.probes;
end if;
declare
    tempAvg : Float;
begin
    tempAvg := Float(tempRecord.probes / 128);
    avg := avg + tempAvg;
end;
end;
end loop;
new_line;
put("Statistics for "); put(lower); put(" to ");
put_line(Integer'Image(upper));
put("Min: "); put_line(Integer'Image(min));
put("Max: "); put_line(Integer'Image(max));
put("Average :"); put(Float'Image(avg));
end average;

```

```

procedure theoretical (keyValue : Integer; probeLR : probeMethod) is
  alpha, E : Float;
begin
  alpha := (Float(keyValue) / Float(128));
  if probeLR = linear then
    E := (1.0 - alpha / 2.0) / (1.0 - alpha);
  else
    E := -(1.0 / alpha) * (Log(1.0 - alpha));
  end if;

  new_line;
  put("Expected number of probes: "); put_line(Float'Image(E));
end theoretical;

end hashing;
-----

--in main.adb

with Ada.Text_IO; use Ada.Text_IO;
with Ada.Unchecked_Conversion;
with hashing; use hashing;

procedure main is
begin

  -- PART C

  -- QA
  hashing.hash(0.40, linear, drBurris, main);
  --new_line;
  --hashing.hash(0.40, linear, bryanBenham, main);
  --new_line;
  -- QB
  --hashing.hash(0.80, linear, drBurris, main);
  --new_line;
  --hashing.hash(0.80, linear, bryanBenham, main);
  -- QC
  --new_line;
  --hashing.hash(0.40, random, drBurris, main);
  --new_line;
  --hashing.hash(0.40, random, bryanBenham, main);
  --new_line;
  --hashing.hash(0.80, random, drBurris, main);
  --new_line;
  --hashing.hash(0.80, random, bryanBenham, main);

  -- PART B

```

```
--new_line;
--hashing.hash(0.40, linear, drBurris, file);
--new_line;
--hashing.hash(0.40, linear, bryanBenham, file);
--new_line;
--hashing.hash(0.80, linear, drBurris, file);
--new_line;
--hashing.hash(0.80, linear, bryanBenham, file);
--new_line;
--hashing.hash(0.40, random, drBurris, file);
--new_line;
--hashing.hash(0.40, random, bryanBenham, file);
--new_line;
--hashing.hash(0.80, random, drBurris, file);
--new_line;
--hashing.hash(0.80, random, bryanBenham, file);

end main;
```