LRU Cache Implementation

Large Test File

① ↳ for my large test case, I used the text from Hamlet ~~naaah~~.

② My capacity for my large pst was 1000

③ Left Rotations = 115,046
   Right Rotations = ~~Na, no~~ ~~to~~ 186 026

④ ~~ish~~ Size = number of words = 27,762

⑤ Number Rotations per item = 10.844

⑥ 7,206 removals / cache misses

   Notes: I thought my number of removals was interesting. I thought there would be more. Maybe I implemented it correctly, but counted them up wrong with my testing

Moderate test file 1

① I used the contents of 2 poems as my test case
   ↳ english words as keys
② ~~but~~ I used 50 as my capacity

③ Left = 1018
   Right = 1643
④ size = 397

⑤ ~~size = 397~~ 6.702 rotations per item

⑥ 208 removals
   ↳ didn't change based on diff cache capacities
   s

Moderate Test 2

① I used a test file of the lower case alphabet, the uppercase alphabet and a series of numbers, with no repeating values

② Capacity 10

③ Left 136
   Right 81

④ 73 Size

⑤ 2.9726 rotations per item

⑥ 70 cache misses

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⑦ I didn't notice that much of a difference
   ↳ the one thing I did notice was that the number of removals on my moderate test 2 was nine than
   ↳ this could be due to the fact that all of the keys in my moderate test 2 were unique, so more items had to be inserted and removed than my own moderate test one where there were repeating words.

Hash Table Analysis

Part a

Table size $m = 7$
Load factor $x = 1/2$
$h(k) = k \% m = k \% 7$

Insert

	15	22			36	
0	1	2	3	4	5	6

Insert 15 $= h(15) = 15 \% 7 = 1$ so insert
$\quad x = 1/7 < 1/2$

Insert 22 $= h(22) = 22 \% 7 = 1 = (k+1^2) \% 7 = 23 \% 7 = 2$ so insert
$\quad x = 2/7 < 1/2$

Insert 36 $= h(36) = 36 \% 7 = 1 = (36 + 1^2) \% 7 = 37 \% 7 = 2$
$\quad = (38 + 2^2) \% 7 = 5$ so insert

$\quad x = 3/7 < 1/2$

Remove $\quad 22 = h(22) = 22 \% 7 = 1$ (don't find 22 there)
$\quad \quad \quad \hookrightarrow = (k+1^2) \% 7 = 23 \% 7 = 2 \Rightarrow 22$ found, remove

	15	R			36	
0	1	2	3	4	5	6

Find 36
$\quad h(36) = 36 \% 7 = 1$, 36 not found $= 37 \% 7 = 2$, 36 not
$\quad$ found $= (k + 2^2) \% 7 = 40 \% 7 = 5 \Rightarrow 36$ found

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insert

Insert 10

Insert 10 = $h(10) = 10 \% 7 = 3$ = insert
↳ however must resize first because
Load factor $x = 4/7$ which is $> 1/2$

m=11

0	1	2	36 3	15 4	5	6	7	8	9	10 10

$h(15) = 15 \% 11 = 4 \rightarrow$ insert
$h(10) = 10 \% 11 = 10 \rightarrow$ insert
$h(36) = 36 \% 11 = 3 \rightarrow$ insert