binary search

Here is an example of the binary search:

****** looking for g in:

[‘a’, ‘b’, ‘b’, ‘f’, ‘g’, ‘g’, ‘h’, ‘j’, ‘m’, ‘p’, ‘q’, ‘r’, ‘u’, ‘u’, ‘v’, ‘v’]

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

L M H

Low = 0

High = 15

Mid = (low + high) / 2 = 15 / 2 = 7

g < j , so High = Mid - 1 = 6

[‘a’, ‘b’, ‘b’, ‘f’, ‘g’, ‘g’, ‘h’, ‘j’, ‘m’, ‘p’, ‘q’, ‘r’, ‘u’, ‘u’, ‘v’, ‘v’]

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

L M H

Low = 0

High = 6

Mid = (low + high) / 2 = 3

g > f , so Low = Mid + 1 = 4

[‘a’, ‘b’, ‘b’, ‘f’, ‘g’, ‘g’, ‘h’, ‘j’, ‘m’, ‘p’, ‘q’, ‘r’, ‘u’, ‘u’, ‘v’, ‘v’]

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

L M H

Low = 4

High = 6

Mid = (low + high) / 2 = 5

g found at index 5

And here is an example of what happens when the item we are looking for is NOT in the list:

****** looking for x in:

['c', 'e', 'g', 'i', 'k', 'k', 'l', 'o', 'o', 'r', 'r', 's', 's', 'z', 'z', 'z']

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

L M H

Low = 0

High = 15

Mid = (low + high) / 2 = 7

x > 0, so Low = mid + 1

['c', 'e', 'g', 'i', 'k', 'k', 'l', 'o', 'o', 'r', 'r', 's', 's', 'z', 'z', 'z']

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

L M H

Low = 8

High = 15

Mid = (low + high) / 2 = 11

x > 5, so Low = mid + 1

['c', 'e', 'g', 'i', 'k', 'k', 'l', 'o', 'o', 'r', 'r', 's', 's', 'z', 'z', 'z']

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

L M H

Low = 12

High = 15

Mid = (low + high) / 2 = 13

x < 12, so high = mid - 1

['c', 'e', 'g', 'i', 'k', 'k', 'l', 'o', 'o', 'r', 'r', 's', 's', 'z', 'z', 'z']

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

L M H

Low = 12

High = 12

Mid = (low + high) / 2 = 12

x ≠ 12, so x is not in the list