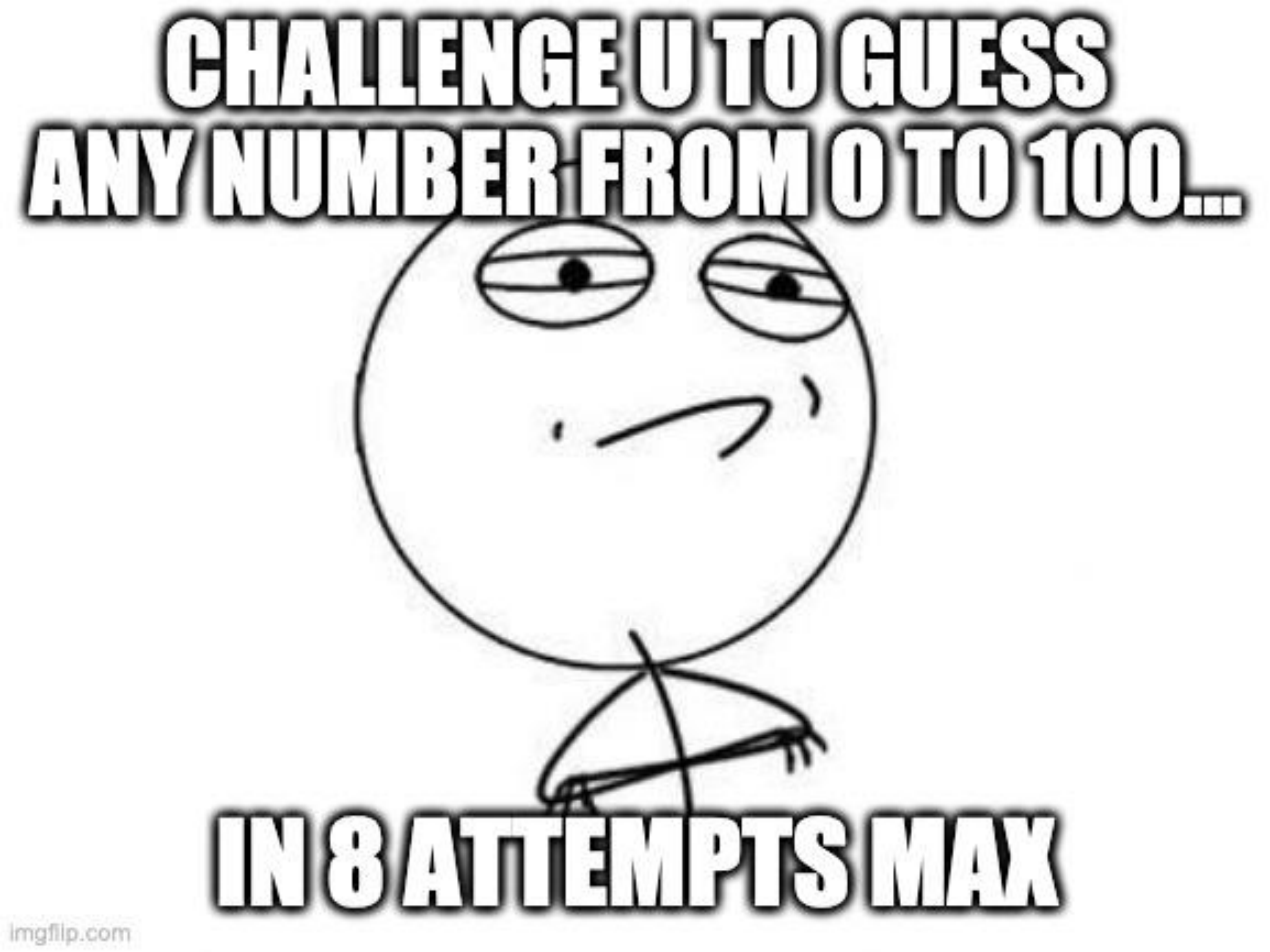
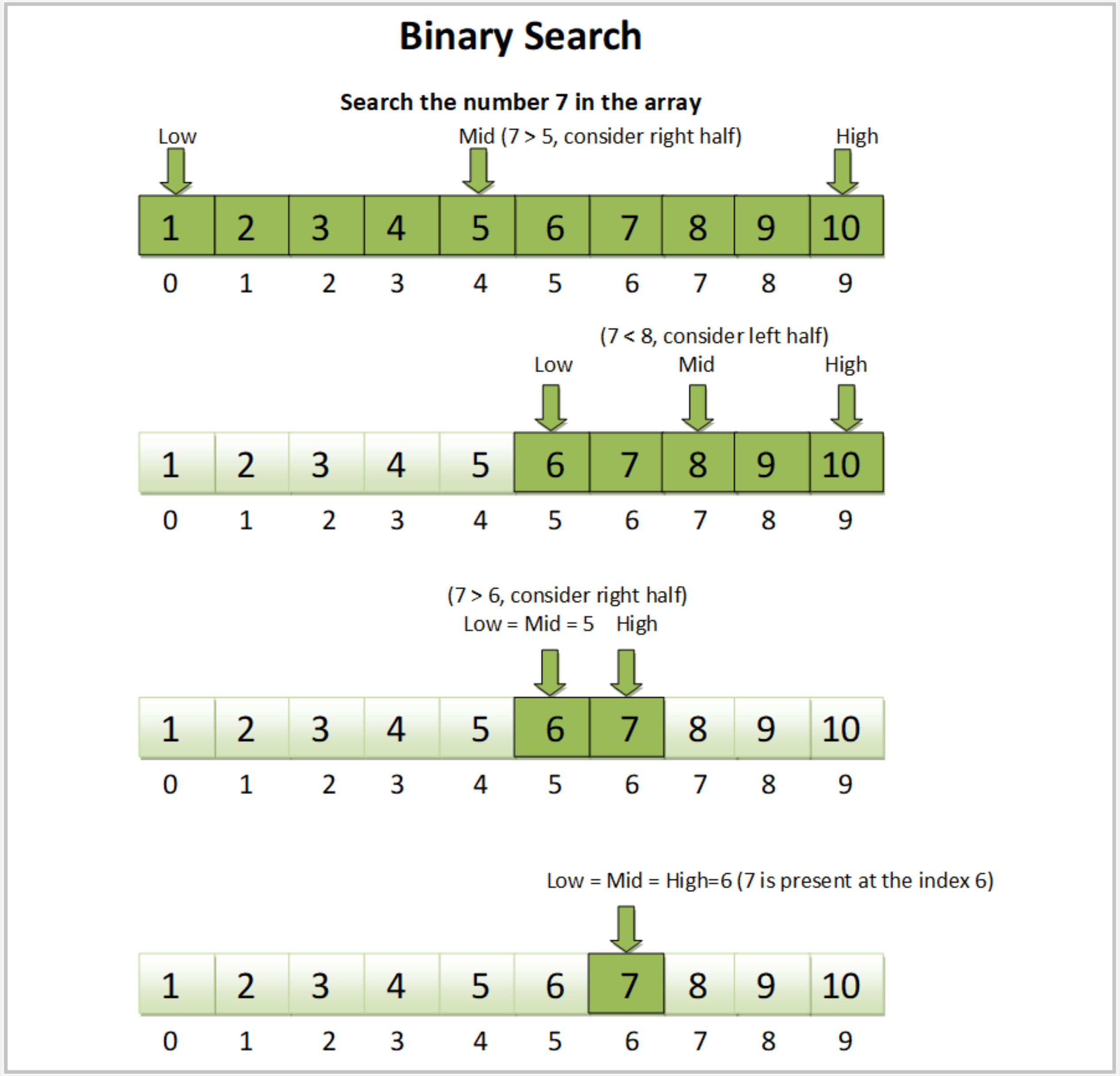
BINARY SEARCH


CHALLENGE U TO GUESS
ANY NUMBER FROM 0 TO 100...
IN 8 ATTEMPTS MAX
imgflip.com

AND WHAT ABOUT FROM 0 TO 1000...
IN 11 ATTEMPTS MAX???
imgflip.com

Do I need to buy apples?



Binary Search

Search the number 7 in the array

Low

Mid (7 > 5, consider right half)

High

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

(7 < 8, consider left half)

Low

Mid

High

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

(7 > 6, consider right half)

Low = Mid = 5 High

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

Low = Mid = High=6 (7 is present at the index 6)

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

https://www.cs.usfca.edu/~galles/visualization/Search.html

GET TO THE CODE
DO IT, DO IT NOW!!
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Cool! But…
How efficient is this?

HOW MANY TIMES DO WE SPLIT RANGE IN HALF UNTIL WE GET JUST ONE NUMBER?

$$1 = N / 2^x$$

$$2^x = N$$

$$lg_2(2^x) = lg_2 (N)$$

$$x * lg_2(2) = lg_2 (N)$$

$$x * 1 = lg_2 (N)$$

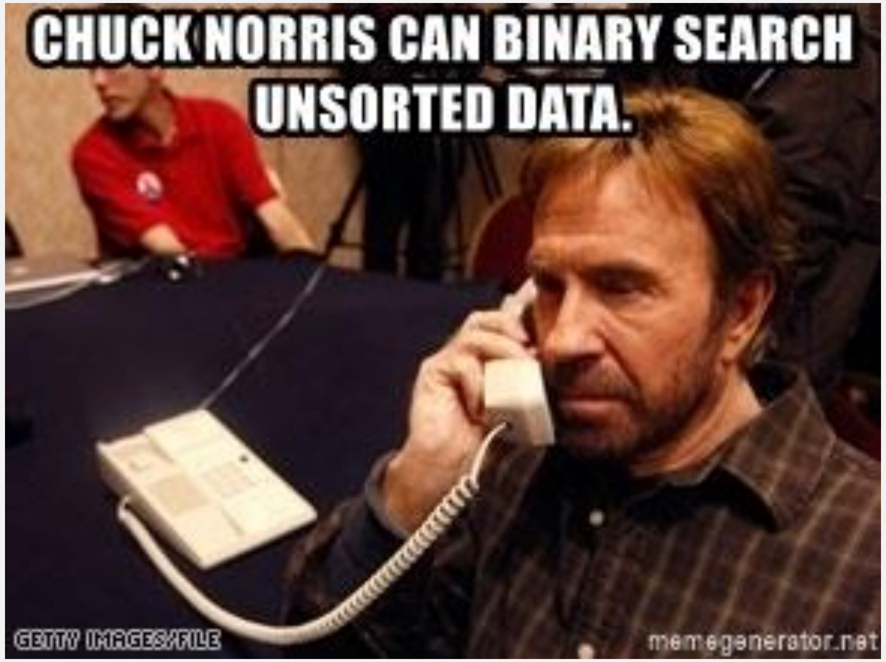
$$x = lg_2 (N)$$

O(LOG(N))

REVIEW

CAN BINARY SEARCH WORK WITH AN UNORDERED INPUT?

- a) Yes
- b) No
- c) Hell, no



HOW WOULD BINARY SEARCH PERFORM ON A LINKED LIST?

- a) O(1)

- b) O(log N)

- [✓ c)] O(N)   You need to traverse the entire list to find the mid point.

EXERCISE

- Code a new version of the **`binary_search`** function that can find elements in a circularly sorted array (for instance `[8, 9, 10, 2, 5, 6]`).

EXERCISE

- Code a function **`binary_search_count`** that calculates, for a given sorted ***array*** (ascending order), and a given number ***n***, the number of occurrences of that number ***n*** within the array.