Binary search algorithm

A search where you can say “higher” or “lower” is called a **binary search algorithm**

This is often a quicker and **more efficient** way to find something, especially if the set of things to search through is big

But the set of things to search through **must** be **in order**

Binary search algorithm

The binary search algorithm works by always guessing the mid point of the set

So in a group of numbers between 1 and 20, you always start by guessing 10

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20

Each time you get the **feedback**, higher or lower

Binary search algorithm

If the number is higher than 10, you get the feedback “higher”

That means it can only be the numbers 11 to 20

11, 12, 13, 14, 15, 16, 17, 18, 19, 20

Next you guess the halfway point again – this time, guess 15. If it’s higher, it leaves 5 numbers

16, 17, 18, 19, 20

Binary search algorithm

By halving each time you go from 20 numbers to a maximum of 5 left after just two guesses

16, 17, 18, 19, 20

This makes the search really **efficient**. It works quickly to reduce the number of numbers.

One more guess, and you're down to two numbers

16, 17

Binary search algorithm

A binary search algorithm works quickly to search through sets of numbers

- 1–20: maximum 5 guesses
- 1–100: maximum 7 guesses
- 1–1000: maximum 10 guesses
- 1–1,000,000: maximum 20 guesses

This relies on the set being in order and getting the feedback “higher” or “lower”

Binary search algorithm

A binary search doesn't just work with numbers. It works with **anything** that is in a logical order:

- months of the year – guessing a birth month
- alphabetical lists of names or items
- anything else which has an order

Each time you guess the midpoint and get feedback: which half is the thing you're looking for in

Binary search algorithm

Advantages of binary search:

1. By halving the set, the algorithm is efficient at very quickly reducing the number of possible answers
2. Binary search is a lot more efficient with large sets of items

Binary search algorithm

Problems with binary search:

1. But, if the set of things to search in isn't in a logical order you can't use a binary search algorithm at all. It just won't work unless you can get feedback
2. Binary search is more complicated to do
3. Sometimes it will take longer – if you're looking for 1, for example