A Practical Introduction to **Data Structures** and **Algorithms** in JavaScript

Algorithms

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Kirupa Chinnathambi

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A Practical Introduction to Data Structures and Algorithms in JavaScript

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Kirupa Chinnathambi

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Dedication

To my wife, Meena!

(For her support and timely insights throughout this book!)

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Kirupa Chinnathambi has spent most of his life teaching others to love web development as much as he does. He founded KIRUPA, one of the Web's most popular free web development education resources, serving 210,000+ registered members. Now a product manager at Google, he has authored several books, including *Learning React*. He holds a B.S. in computer science from MIT.

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1

INTRODUCTION TO DATA STRUCTURES

Programming is all about taking data and manipulating it in all sorts of interesting ways. Now, depending on what we are doing, our data needs to be represented in a form that makes it easy for us to actually use. This form is better known as a **data structure**. As we will see shortly, data structures give the data we are dealing with a heavy dose of organization and scaffolding. This makes manipulating our data easier and (often) more efficient. In the following sections, we find out how that is possible!

Onward!

Right Tool for the Right Job

To better understand the importance of data structures, let's look at an example. Here is the setup. We have a bunch of tools and related gadgets (Figure 1-1).

FIGURE 1-1

Tools, tools, tools

What we want to do is store these tools for easy access later. One solution is to simply throw all of the tools in a giant cardboard box and call it a day (Figure 1-2).

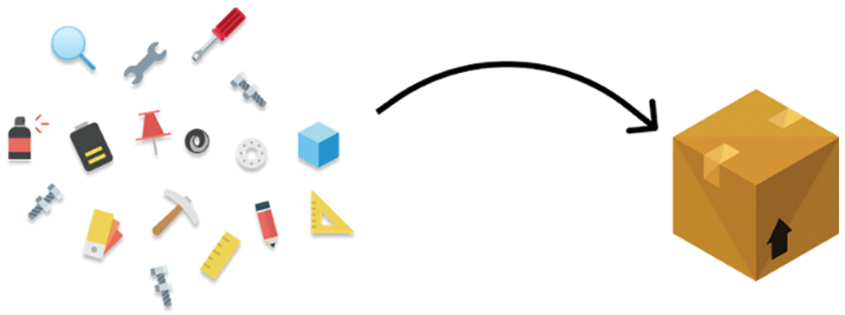

FIGURE 1-2

Tools, meet box!

If we want to find a particular tool, we can rummage through our box to find what we are looking for. If what we are looking for happens to be buried deep in the bottom of our box, that's cool. With enough rummaging (Figure 1-3)—and possibly shaking the box a few times—we will eventually succeed.

FIGURE 1-3

A rummager!

Now, there is a different approach we can take. Instead of throwing things into a box, we could store them in something that allows for better organization. We could store all of these tools in a toolbox (Figure 1-4).

FIGURE 1-4

Our metaphorical toolbox

A toolbox is like the Marie Kondo of the DIY world, with its neat compartments and organized bliss. Sure, it might take a smidge more effort to stow things away initially, but that's the price we pay for future tool-hunting convenience. No more digging through the toolbox like a raccoon on a midnight snack raid.

We have just seen two ways to solve our problem of storing our tools. If we had to summarize both approaches, it would look as follows:

- **Storing Tools in a Cardboard Box**
  - Adding items is very fast. We just drop them in there. Life is good.
  - Finding items is slow. If what we are looking for happens to be at the top, we can easily access it. If what we are looking for happens to be at the bottom, we'll have to rummage through almost all of the items.
  - Removing items is slow as well. It has the same challenges as finding items. Things at the top can be removed easily. Things at the bottom may require some extra wiggling and untangling to safely get out.
- **Storing Tools in a Toolbox**
  - Adding items to our box is slow. There are different compartments for different tools, so we need to ensure the right tool goes into the right location.
  - Finding items is fast. We go to the appropriate compartment and pick the tool from there.

- Removing items is fast as well. Because the tools are organized in a good location, we can retrieve them without any fuss.

What we can see is that both our cardboard box and toolbox are good for some situations and bad for other situations. There is no universally right answer. If all we care about is storing our tools and never really looking at them again, stashing them in a cardboard box is the right choice. If we will be frequently accessing our tools, storing them in the toolbox is more appropriate.

Back to Data Structures

When it comes to programming and computers, deciding which data structure to use is similar to deciding whether to store our tools in a cardboard box or a toolbox. Every data structure we will encounter is good for some situations and bad for other situations (Figure 1-5).

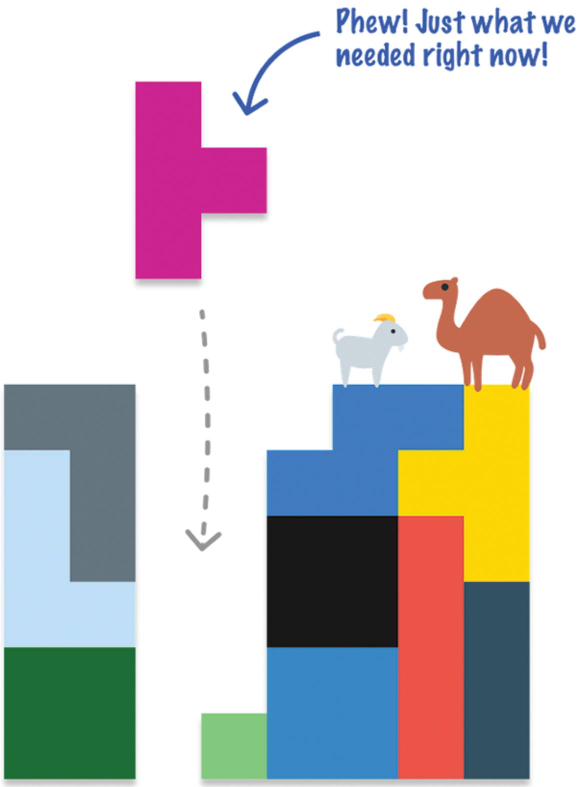

FIGURE 1-5

A good fit in this case

Knowing which data structure to use and when is an important part of being an effective developer, and the data structures we need to deeply familiarize ourselves with are

- Arrays
- Linked lists
- Stacks
- Queues
- Introduction to trees
- Binary trees
- Binary search trees
- Heap data structure
- Hashtable (aka hashmap or dictionary)
- Trie (aka prefix tree)

Conclusion

Over the next many chapters, we'll learn more about what each data structure is good at and, more important, what types of operations each is not very good at. By the end of it, you and I will have created a mental map connecting the right data structure to the right programming situation we are trying to address.

SOME ADDITIONAL RESOURCES

- ❓ Ask a question: **https://forum.kirupa.com**
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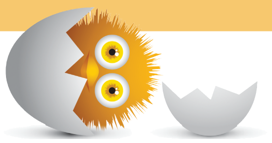

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