THE INTERNET

A Parent's Guide

> “Computer science is no more about computers than astronomy is about telescopes.”

Dear Reader

Comput-ARGHHHHHHH!

Don’t know your algorithms from your elbow? Think the cloud is floating in the sky? Hate printers?* Or do you love all things tech and want to share the joy? Either way, we’re here to help.

Who are Bright Little Labs?

We’re a group of techies and storytellers.

We make interactive stories to promote critical thinking, computer science, toilet humour and equality for ALL kids. We're active in over 30 countries, have Cabinet Office backing, and have won awards for our story-led approach to computer science. Oh, and our mums support us too.

Our founder, Sophie Deen, is a former lawyer, techie and school counsellor. Sophie previously worked at Code Club, alongside Google and the Department For Education, to help introduce the new coding curriculum in primary schools. She was named Campaign Female Frontier Honouree in 2020, and one of Computer Weekly’s ‘Most influential Women in UK IT’ in 2019, 2018 and 2017.

Together, we’re on a mission to increase diversity in the STEM pipeline (that’s Science, Technology, Engineering and Maths. NOT the stalk of a flower). We’re living in a digital age, and everything in the digital age is built on code, so having digital skills is essential to understand the world around us. Businesses think so too. Coding is the #1 sought after skill in employees. We’re proud to help kids understand how the internet works, how data is shared, and how to use technology in a safe, responsible and positive way.

Peace, love + code

Team Bright Little Labs ⚡

** we do too.*

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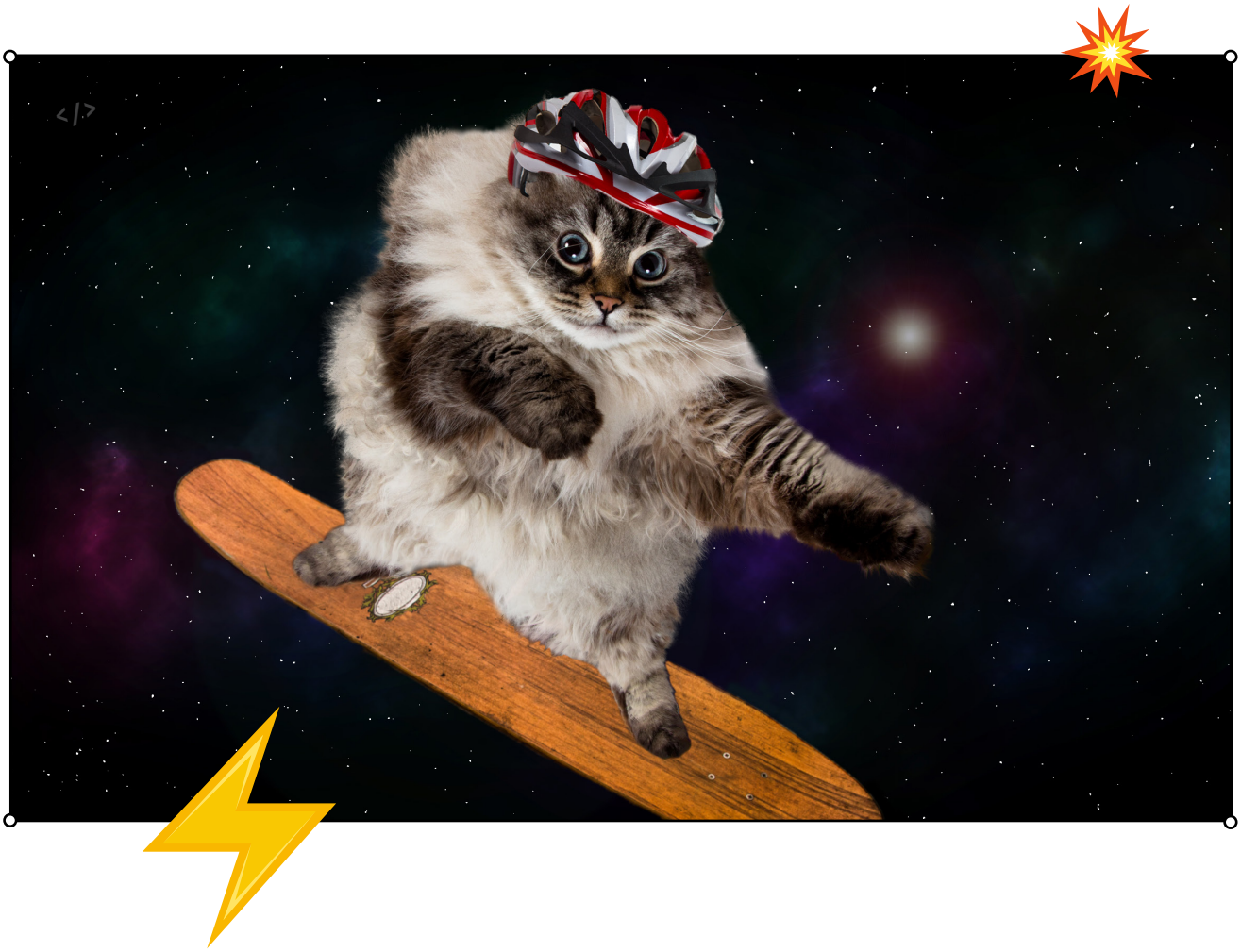
The Internet: The Basics!

The internet is more than just cat memes. It may seem like an abstract concept, but it's actually a system of physically connected cables and computers.



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Um, what exactly is the internet?

It's basically a network of cables.

The internet uses copper cables to enter your home, school or office. Just like water or gas pipes, these cables run under the ground and are connected to a local 'hub'. Your local hub is connected to other hubs using copper cables, or if you're lucky, fibre optic cables which are much faster. In every connected area (remember, only 51% of people in the world are connected to the internet), there are hubs running all the way to the sea.

From there, long fibre optic cables called submarine cables are laid on the seabed and connect one country to another. That's where the sharks come in. In 2015, they attacked and damaged underwater trans-Pacific cables that provided internet to much of Southeast Asia, affecting the internet in countries such as Vietnam. Other crazy stuff is happening out there in the sea. In 2007, pirates stole an 11km section of a submarine cable that connected Thailand, Vietnam, and Hong Kong, costing $2.7m dollars to repair. Wowsers.

Hang on, there are internet cables under the sea?

Yes, there are. They run underneath the sea to connect countries, and then under the ground, all the way to a hub near your house. The cables that lead to your home are sometimes called the 'last mile' and are usually what cause slow upload and download speeds. This is because the 'last mile' is the part of the internet that breaks the large 'trunk' of information into many 'branches' - so the concentration of information is broken up into many wires. Also, a lot of 'last mile' cables are made of copper, which conducts electricity slower than optical fibres, so information is sent at a slower rate.

What's the difference between the World Wide Web and the internet?

If you want to be really technical, then the World Wide Web is part of the internet devoted to storing websites. Anything you view in a web browser, like Chrome, Firefox, Safari or Edge is on the World Wide Web, but there are other things that use the internet that aren't necessarily on the web, like Skype calls.

Often when people refer to the World Wide Web, they are actually describing all the bits that make up the internet - a huge and sprawling global network of cables and devices that send and receive information between one another, like websites, email, Skype calls, and apps.

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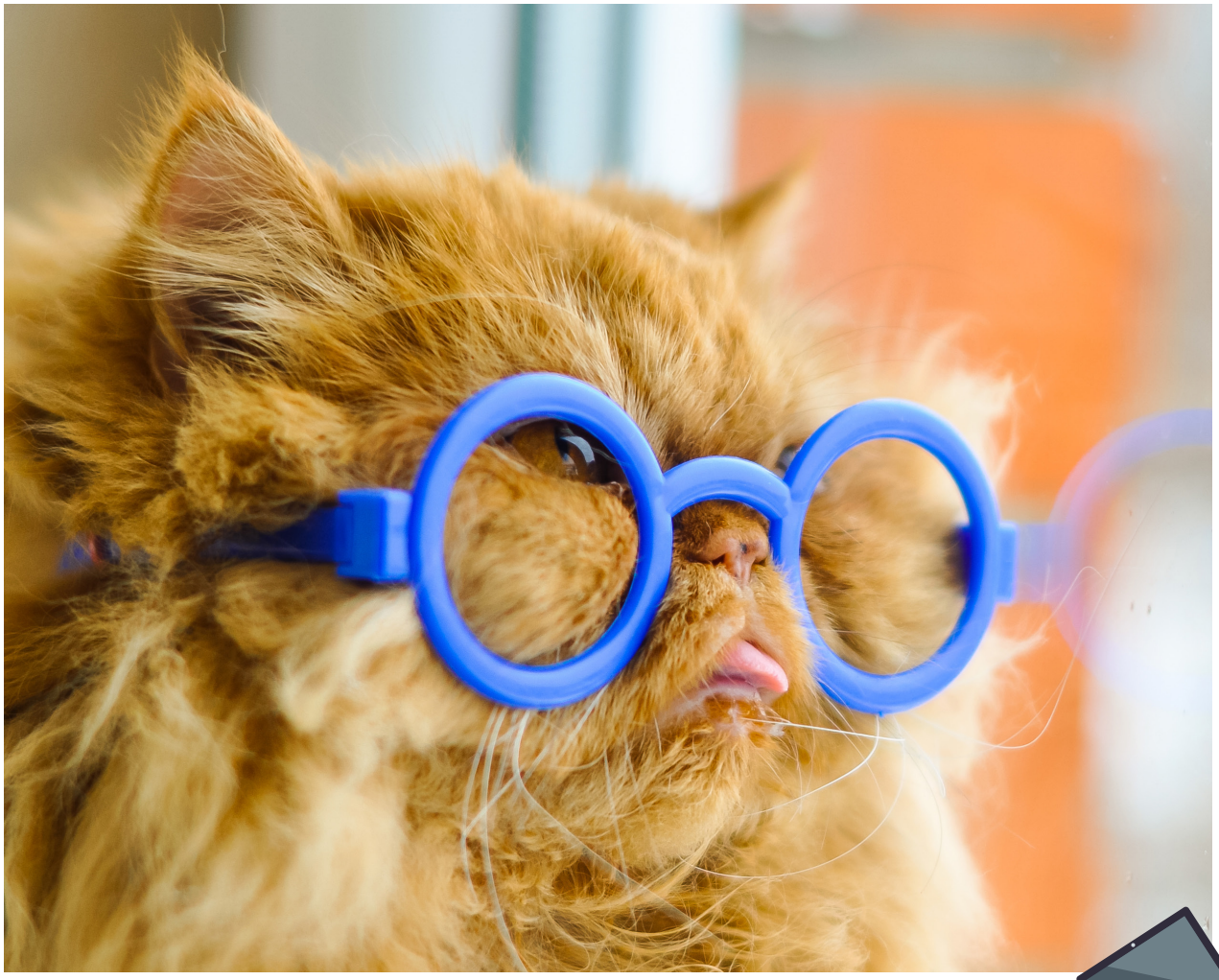
How are things connected to the internet?

Cables again. The devices in our homes are connected to the internet through cables in the walls. You might have a desktop computer that's plugged straight into the physical internet cable in the wall of your home. Alternatively, you might have a router that is plugged into the wall.

What about WiFi? That's not physical.

OK, OK, you're right. WiFi is one of the exceptions. It connects your device (phone, laptop, smartboard, etc.) to the nearest router using radio signal. But your router is still connected to the rest of the network by a physical connection. Often, WiFi is less reliable than wired internet. It can struggle to travel through thick walls, which is why the further you are from your router, the less reliable your internet access can be.



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What about mobile phones?

CABLES!!! Most mobiles use something called 3G or 4G (and 5G is coming) to connect to mobile phone towers, before connecting to the internet through the same wires as you'll find in your walls. You won't find phone towers everywhere though - they are expensive to build. In some rural places where there aren't any phone towers, some mobile phones will actually connect to the internet through satellites in space.

What about Bluetooth speakers?

Devices that don't need any outside information to work are not usually connected to the internet. Wireless speakers and keyboards are usually connected to your computer using a local signal called Bluetooth. Your home or school printer might be connected to multiple computers that are all on the same local network. A local network is two or more devices that are connected to each other but not necessarily the rest of the world.

How does the internet work?

It's similar to the postal system.

Think about letters. They are sent using envelopes with addresses and return-to-sender information, and we put those letters in a postbox for collection. A local post office will receive the letter, check the recipient's address, and then decide on the best route for delivery. If your letter is going overseas, it might be sent to a sorting office at the destination country, and that local post office will figure out the best route for the letter to get to its final destination. The postal service's job is to send the information as quickly as possible. It could be sent by sea, truck, air or a mix, and there are lots of different roads a postal delivery van could take, depending on road traffic, time of day, etc.

OK, now think about the internet as a postal system for digital information, made up of cables and routers (local internet hubs).

Instead of a letter, your information is sent through your laptop (postbox) to a local internet hub (post office) and then routed to its final destination using a mix of copper and fibre optic cables (sea, truck, air). Unlike the postal service, all the information isn't sent at once, but is broken down into smaller bits of information called packets. Each packet has an IP address (the same as a postal address) which helps routers know where it needs to go. Packets travel from router to router and every time a packet reaches a router, it looks at the traffic in different parts of the internet and calculates the best route. These packets are sent in parallel,

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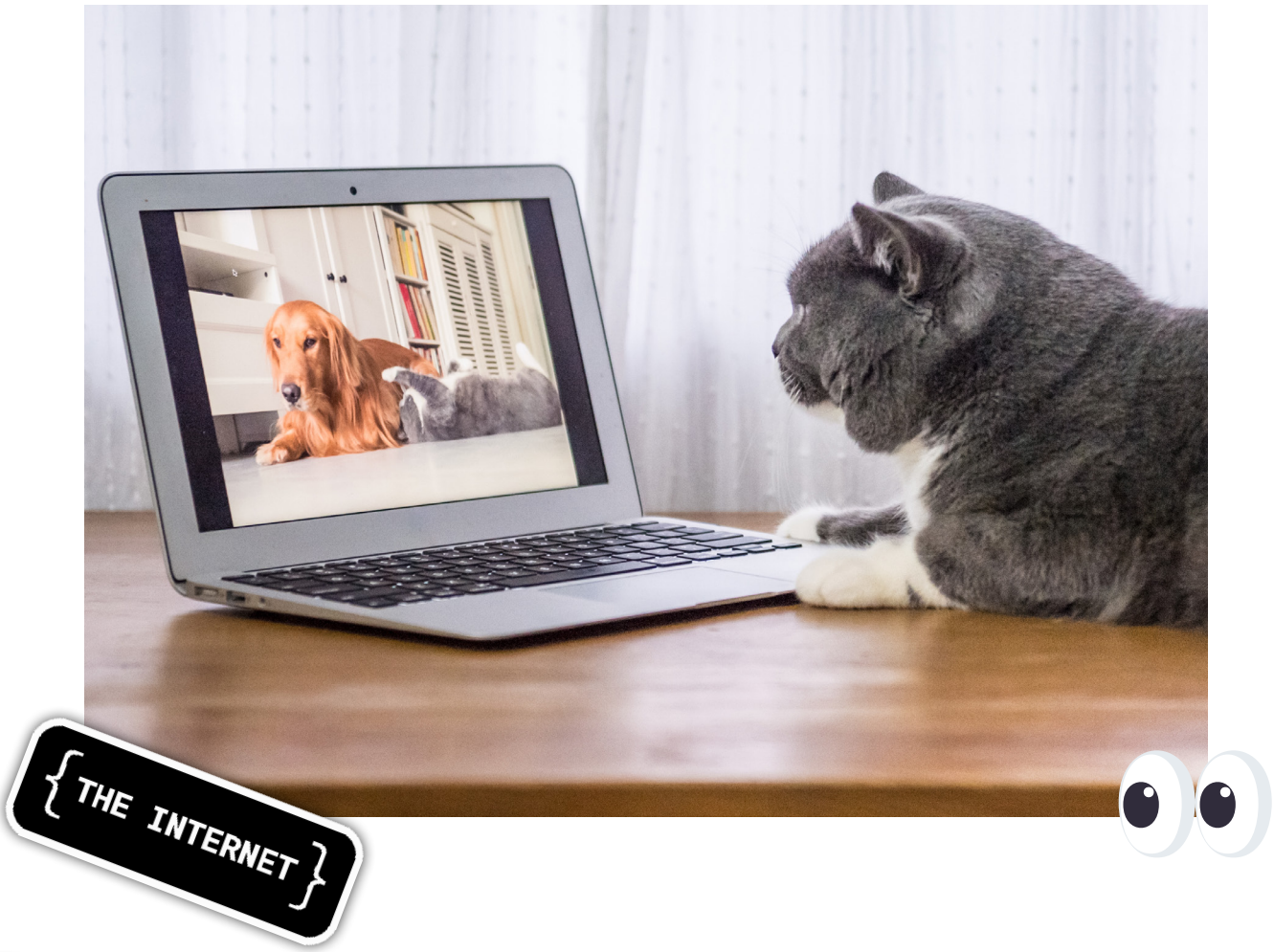
which means they travel at the same time, but sometimes along different routes. Each packet chooses the fastest route, which can differ millisecond to millisecond depending on the 'traffic' on the internet (how many other packets are trying to reach their destination). This is why it's so quick - because each individual packet can optimize their route before they reassemble at their destination.

Just like parcels in the post, packets can get lost or delayed if they're stuck in a traffic jam. Sometimes, one of them will take a much longer route than the other packets. That might make the internet seem really slow. When you reload a website, you are actually asking for the packet to be sent again. The internet can also be slow if your home WiFi is acting up, or if there are too many people in one area trying to access big files all at the same time.

Packets are sent through copper cables in regional networks under most towns and cities, before arriving at an internet hub where they can be transferred across the largest, fastest cables (also known as the internet backbone). In the UK, nearly all information goes through an internet hub in London, whilst in the USA, most information travels through New York City. The internet hub then sends the data across the ocean using the fibre optic cables under the sea, before reaching a new hub and being sent to its regional destination.



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Is the internet safe?

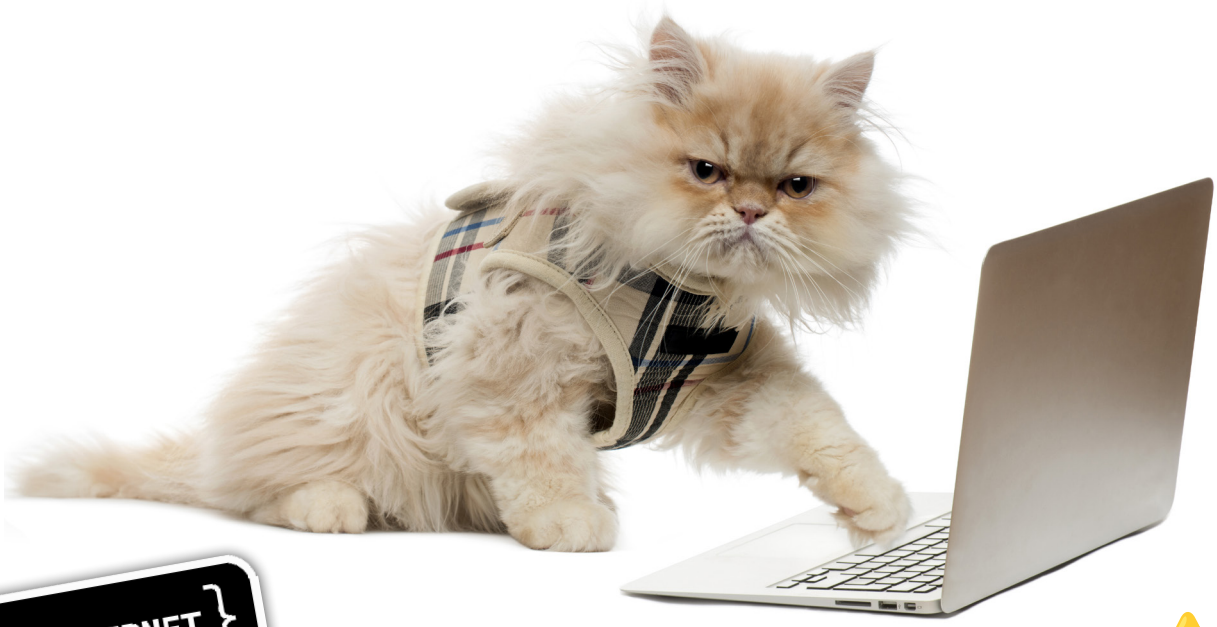
Think about it like this. There are over 4 billion people online. And just like in real life, not everyone is cool. We all know to be wary of strangers, but online it can be even more difficult to tell if the person you are chatting to is really who they say they are. Be careful of strangers both on and offline, especially if they come bearing gifts. Something tempting, like a free game, could actually take over your computer with a virus, or malware that spies on you and collects information about every website you visit or every word you type.

Staying safe online isn't just about privacy. It's about positive interactions as well. The NSPCC's Talking to Your Child About Staying Safe Online or Kidscape have great advice on cyber-bullying.

Can all emails be trusted?

No way. Be careful of financial fraud and phishing, which is when someone pretends to be a person or company you know and trust, and then they try to manipulate you into giving away personal info - so they can pretend to be you.

Don't open an attachment from someone you don't know, and be careful about emails from people you do know too - they could contain a virus. For example, the infamous "I love you" virus was delivered by an email with the subject "I love you." People were SO excited to open it they didn't pause to think. Once opened, the virus sent a new "I love you" email to everyone in the recipient's address book, allowing it to spread very quickly.



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What about the info we share online?

That's risky too. When we upload things to the internet, like a selfie on social media, that file passes through many other computers before reaching its destination. These files can very quickly be copied, shared, and saved all around the world. The rule of thumb for kids (and adults): always think about what your message or picture reveals, and whether you would be comfortable if your message or picture was seen by a stranger.

Our digital footprint follows us forever, keeping a record of all the things we say or do. Universities and future employers often research applicants online, so it's never too early to be thinking about what our digital footprint says about us. It's even more important to avoid sharing personal information like your name, address, or birthday, in case the file ends up in the wrong hands. Sometimes personal information is accidentally included in a photo (like a school uniform or a road sign in the background of a photo) which can put people at risk of their identity or location being discovered.

Why are passwords important? What makes a strong password?

Passwords keep strangers from being able to sneak into your accounts. The best way of keeping people out of your accounts is to use a different password for each one, so if anyone does crack your password, they won't get access to all your accounts. Instead of trying to remember complicated passwords with random letters and characters, you could try to use a sentence that is easy to remember, such as "I l0ve strong passwords!"

How does encryption work?

As well as being a really cool word, encryption is the idea of sending information as a code, where only the intended receiver has the key to decoding it. You can start by introducing simple codes such as A=1 and Z=26.

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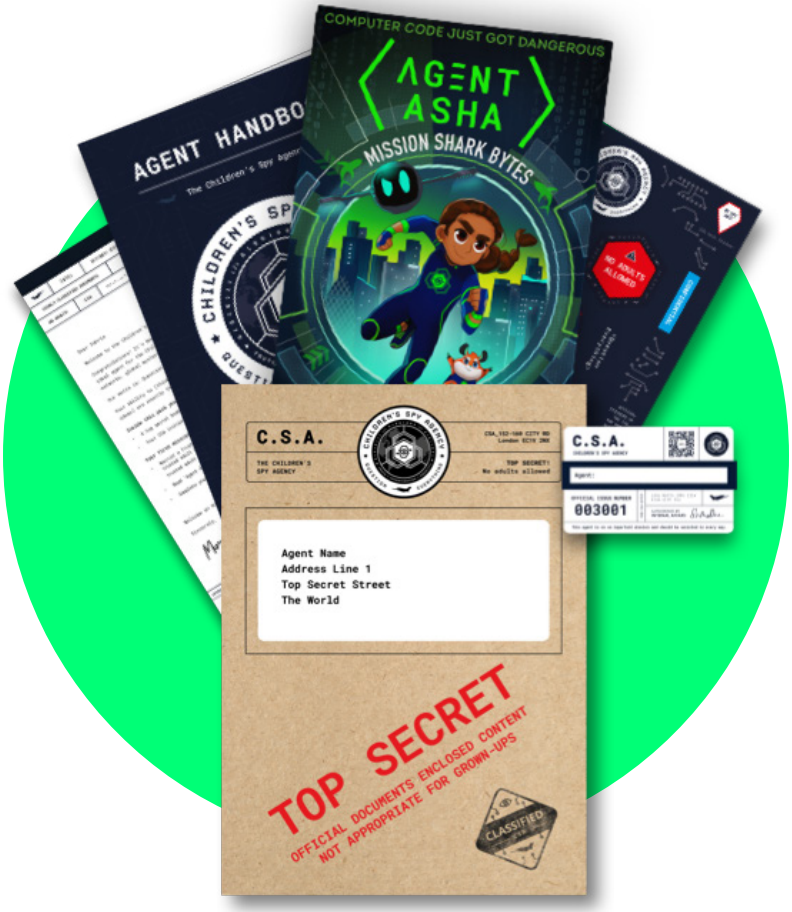
Learn digital literacy with the Agent Asha Gift Pack

A personalised gift to inspire the next generation of coders, creators and critical thinkers.

Agent Asha teaches kids how to go undercover *(internet safety)*, design gadgets *(computer programming)*, avoid data-hungry baddies *(digital literacy)*, analyse intelligence *(fake news)* and more.



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