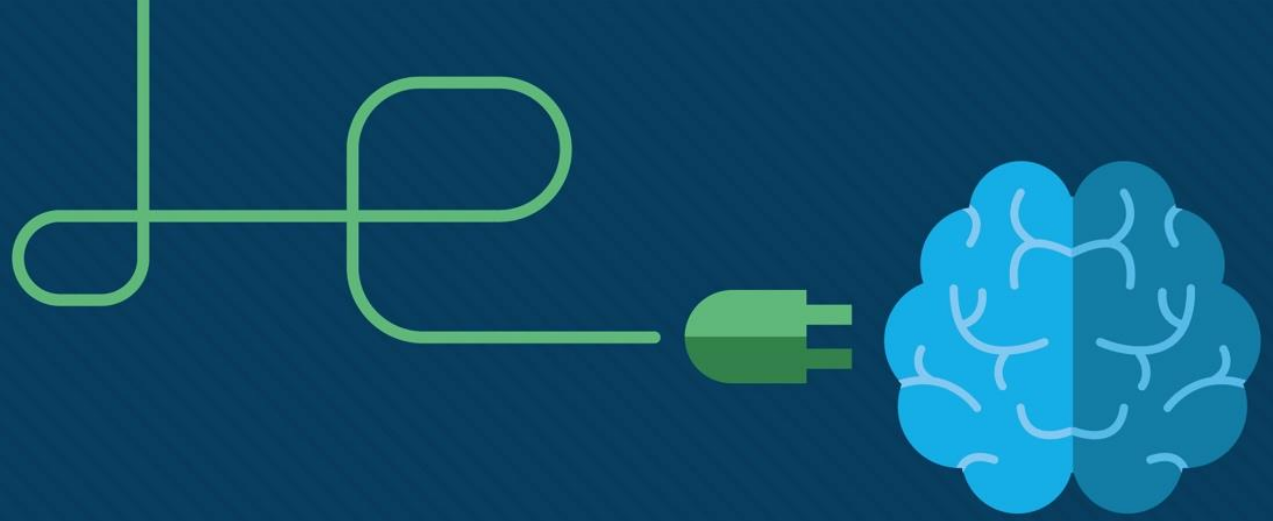

Cisco Networking Academy

Computing for Schools programme

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Computing for Schools

Support the development of Digital Skills

Cisco have teamed up with several Universities and a number of Master Teachers to build a educational programme to support the development of Computing and Digital Skills in all Key Stages

Key stage 1-4

The collection has been developed for Teachers of School children aged 5-16

UK National Curriculum

Based on the UK's National Curriculum for Computing. The collection initially covers an introduction to the Internet and the services it provides, with an emphasis on security awareness and personal safety

Cisco Networking Academy

Additional teaching resources to support the delivery, manage classes and run quizzes are available for free to schools by registering to become a Cisco Academy

The courses support learning in two ways

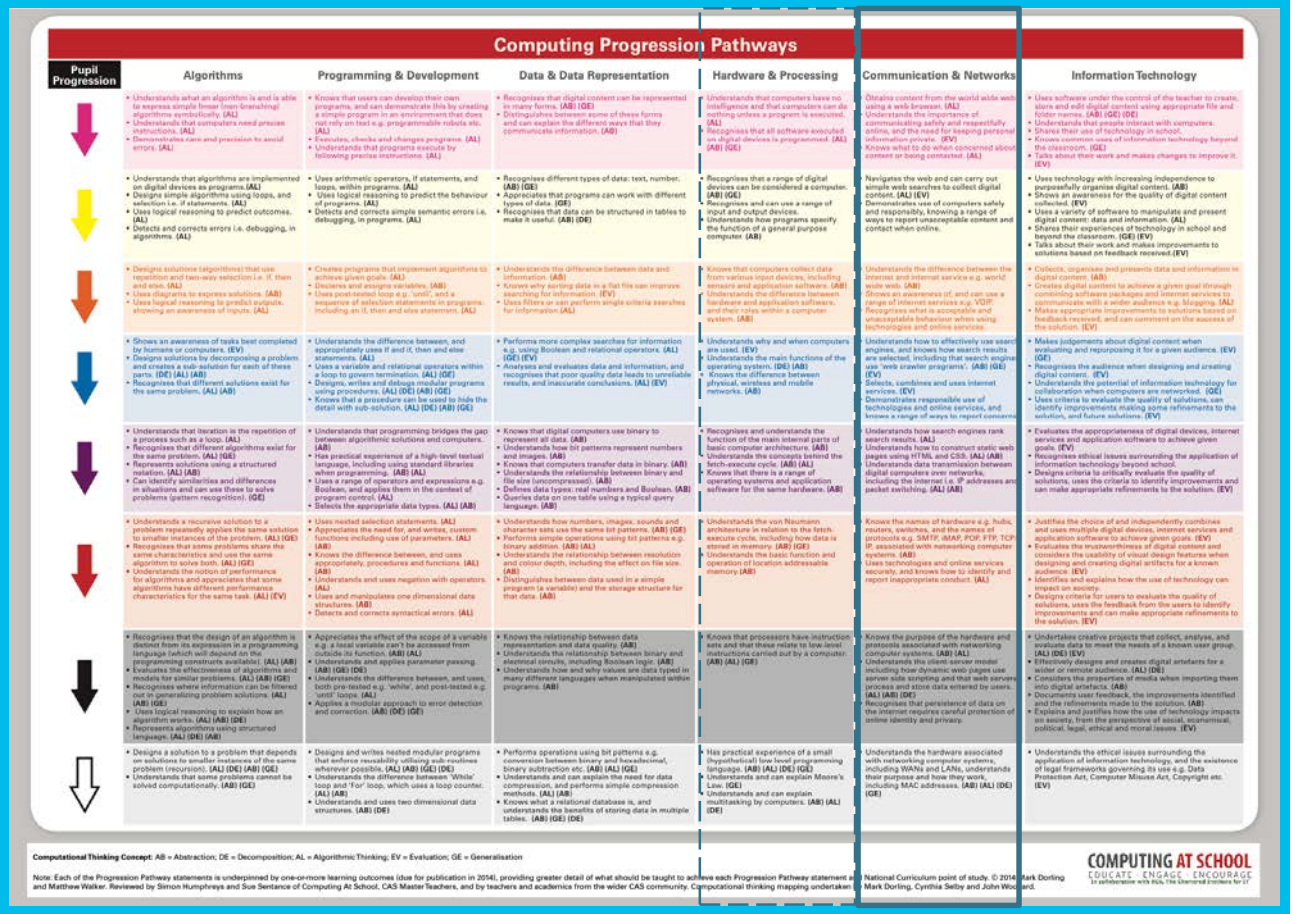
1.Providing **Teachers** with the tools to up-skill and prepare for delivering computing concepts to their Students

- Course materials support teaching programmes, content has been mapped into the required learning across the various key stages
- Numerous support activates which can be taught on a individual basis, group activity or class discussions
- Engaging updated course material

2. For **Students** the programme offers greater insight and skills that can be applied in the real-world

- E-safety is at the heart of the course
- Publicly available course material via Open Learn Create
    - Students also have the option to create their own account (using Gmail or school email if under 13 years old)
- As students progress through key stages, the programme further develops all the concepts and learning outcomes up to GCSE levels
- For further study students can use other freely available NetAcad courses, in areas like Cybersecurity and Linux

The programme



Computing Progression Pathways

Pupil Progression	Algorithms	Programming & Development	Data & Data Representation	Hardware & Processing	Communication & Networks	Information Technology
	• Understands what an algorithm is and is able to express simple linear (non-branching) algorithms symbolically. (AL) • Understands that computers need precise instructions. (AL) • Demonstrates care and precision to avoid errors. (AL)	• Knows that users can develop their own programs, and can demonstrate this by creating a simple program in an environment that does not rely on text e.g. programmable robots etc. (AL) • Executes, checks and changes programs. (AL) • Understands that programs execute by following precise instructions. (AL)	• Recognises that digital content can be represented in many forms. (AB) (GE) • Distinguishes between some of these forms and can explain the different ways that they communicate information. (AB)	• Understands that computers have no intelligence and that computers can do nothing unless a program is executed. (AL) • Recognises that all software executed on digital devices is programmed. (AL) (AB) (GE)	• Obtains content from the world wide web using a web browser. (AL) • Understands the importance of communicating safely and respectfully online, and the need for keeping personal information private. (EV) • Knows what to do when concerned about content or being contacted. (AL)	• Uses software under the control of the teacher to create, store and edit digital content using appropriate file and folder names. (AB) (GE) (DE) • Understands that people interact with computers. • Shares their use of technology in school. • Knows common uses of information technology beyond the classroom. (GE) • Talks about their work and makes changes to improve it. (EV)
	• Understands that algorithms are implemented on digital devices as programs.(AL) • Designs simple algorithms using loops, and selection i.e. if statements. (AL) • Uses logical reasoning to predict outcomes. (AL) • Detects and corrects errors i.e. debugging, in algorithms. (AL)	• Uses arithmetic operators, if statements, and loops, within programs. (AL) • Uses logical reasoning to predict the behaviour of programs. (AL) • Detects and corrects simple semantic errors i.e. debugging, in programs. (AL)	• Recognises different types of data: text, number. (AB) (GE) • Appreciates that programs can work with different types of data. (GE) • Recognises that data can be structured in tables to make it useful. (AB) (DE)	• Recognises that a range of digital devices can be considered a computer. (AB) (GE) • Recognises and can use a range of input and output devices. • Understands how programs specify the function of a general purpose computer. (AB)	• Navigates the web and can carry out simple web searches to collect digital content. (AL) (EV) • Demonstrates use of computers safely and responsibly, knowing a range of ways to report unacceptable content and contact when online.	• Uses technology with increasing independence to purposefully organise digital content. (AB) • Shows an awareness for the quality of digital content collected. (EV) • Uses a variety of software to manipulate and present digital content: data and information. (AL) • Shares their experiences of technology in school and beyond the classroom. (GE) (EV) • Talks about their work and makes improvements to solutions based on feedback received.(EV)
	• Designs solutions (algorithms) that use repetition and two-way selection i.e. if, then and else. (AL) • Uses diagrams to express solutions. (AB) • Uses logical reasoning to predict outputs, showing an awareness of inputs. (AL)	• Creates programs that implement algorithms to achieve given goals. (AL) • Declares and assigns variables. (AB) • Uses post-tested loop e.g. 'until', and a sequence of selection statements in programs, including an if, then and else statement. (AL)	• Understands the difference between data and information. (AB) • Knows why sorting data in a flat file can improve searching for information. (EV) • Uses filters or can perform single criteria searches for information.(AL)	• Knows that computers collect data from various input devices, including sensors and application software. (AB) • Understands the difference between hardware and application software, and their roles within a computer system. (AB)	• Understands the difference between the internet and internet service e.g. world wide web. (AB) • Shows an awareness of, and can use a range of internet services e.g. VOIP. • Recognises what is acceptable and unacceptable behaviour when using technologies and online services.	• Collects, organises and presents data and information in digital content. (AB) • Creates digital content to achieve a given goal through combining software packages and internet services to communicate with a wider audience e.g. blogging. (AL) • Makes appropriate improvements to solutions based on feedback received, and can comment on the success of the solution. (EV)
	• Shows an awareness of tasks best completed by humans or computers. (EV) • Designs solutions by decomposing a problem and creates a sub-solution for each of these parts. (DE) (AL) (AB) • Recognises that different solutions exist for the same problem. (AL) (AB)	• Understands the difference between, and appropriately uses if and if, then and else statements. (AL) • Uses a variable and relational operators within a loop to govern termination. (AL) (GE) • Designs, writes and debugs modular programs using procedures. (AL) (DE) (AB) (GE) • Knows that a procedure can be used to hide the detail with sub-solution. (AL) (DE) (AB) (GE)	• Performs more complex searches for information e.g. using Boolean and relational operators. (AL) (GE) (EV) • Analyses and evaluates data and information, and recognises that poor quality data leads to unreliable results, and inaccurate conclusions. (AL) (EV)	• Understands why and when computers are used. (EV) • Understands the main functions of the operating system. (DE) (AB) • Knows the difference between physical, wireless and mobile networks. (AB)	• Understands how to effectively use search engines, and knows how search results are selected, including that search engines use 'web crawler programs'. (AB) (GE) (EV) • Selects, combines and uses internet services. (EV) • Demonstrates responsible use of technologies and online services, and knows a range of ways to report concerns	• Makes judgements about digital content when evaluating and repurposing it for a given audience. (EV) (GE) • Recognises the audience when designing and creating digital content. (EV) • Understands the potential of information technology for collaboration when computers are networked. (GE) • Uses criteria to evaluate the quality of solutions, can identify improvements making some refinements to the solution, and future solutions. (EV)
	• Understands that iteration is the repetition of a process such as a loop. (AL) • Recognises that different algorithms exist for the same problem. (AL) (GE) • Represents solutions using a structured notation. (AL) (AB) • Can identify similarities and differences in situations and can use these to solve problems (pattern recognition). (GE)	• Understands that programming bridges the gap between algorithmic solutions and computers. (AB) • Has practical experience of a high-level textual language, including using standard libraries when programming. (AB) (AL) • Uses a range of operators and expressions e.g. Boolean, and applies them in the context of program control. (AL) • Selects the appropriate data types. (AL) (AB)	• Knows that digital computers use binary to represent all data. (AB) • Understands how bit patterns represent numbers and images. (AB) • Knows that computers transfer data in binary. (AB) • Understands the relationship between binary and file size (uncompressed). (AB) • Defines data types: real numbers and Boolean. (AB) • Queries data on one table using a typical query language. (AB)	• Recognises and understands the function of the main internal parts of basic computer architecture. (AB) • Understands the concepts behind the fetch-execute cycle. (AB) (AL) • Knows that there is a range of operating systems and application software for the same hardware. (AB)	• Understands how search engines rank search results. (AL) • Understands how to construct static web pages using HTML and CSS. (AL) (AB) • Understands data transmission between digital computers over networks, including the internet i.e. IP addresses and packet switching. (AL) (AB)	• Evaluates the appropriateness of digital devices, internet services and application software to achieve given goals. (EV) • Recognises ethical issues surrounding the application of information technology beyond school. • Designs criteria to critically evaluate the quality of solutions, uses the criteria to identify improvements and can make appropriate refinements to the solution. (EV)
	• Understands a recursive solution to a problem repeatedly applies the same solution to smaller instances of the problem. (AL) (GE) • Recognises that some problems share the same characteristics and use the same algorithm to solve both. (AL) (GE) • Understands the notion of performance for algorithms and appreciates that some algorithms have different performance characteristics for the same task. (AL) (EV)	• Uses nested selection statements. (AL) • Appreciates the need for, and writes, custom functions including use of parameters. (AL) (AB) • Knows the difference between, and uses appropriately, procedures and functions. (AL) (AB) • Understands and uses negation with operators. (AL) • Uses and manipulates one dimensional data structures. (AB) • Detects and corrects syntactical errors. (AL)	• Understands how numbers, images, sounds and character sets use the same bit patterns. (AB) (GE) • Performs simple operations using bit patterns e.g. binary addition. (AB) (AL) • Understands the relationship between resolution and colour depth, including the effect on file size. (AB) • Distinguishes between data used in a simple program (a variable) and the storage structure for that data. (AB)	• Understands the von Neumann architecture in relation to the fetch-execute cycle, including how data is stored in memory. (AB) (GE) • Understands the basic function and operation of location addressable memory. (AB)	• Knows the names of hardware e.g. hubs, routers, switches, and the names of protocols e.g. SMTP, IMAP, POP, FTP, TCP/IP, associated with networking computer systems. (AB) • Uses technologies and online services securely, and knows how to identify and report inappropriate conduct. (AL)	• Justifies the choice of and independently combines and uses multiple digital devices, internet services and application software to achieve given goals. (EV) • Evaluates the trustworthiness of digital content and considers the usability of visual design features when designing and creating digital artifacts for a known audience. (EV) • Identifies and explains how the use of technology can impact on society. • Designs criteria for users to evaluate the quality of solutions, uses the feedback from the users to identify improvements and can make appropriate refinements to the solution. (EV)
	• Recognises that the design of an algorithm is distinct from its expression in a programming language (which will depend on the programming constructs available). (AL) (AB) • Evaluates the effectiveness of algorithms and models for similar problems. (AL) (AB) (GE) • Recognises where information can be filtered out in generalizing problem solutions. (AL) (AB) (GE) • Uses logical reasoning to explain how an algorithm works. (AL) (AB) (DE) • Represents algorithms using structured language. (AL) (DE) (AB)	• Appreciates the effect of the scope of a variable e.g. a local variable can't be accessed from outside its function. (AB) (AL) • Understands and applies parameter passing. (AB) (GE) (DE) • Understands the difference between, and uses, both pre-tested e.g. 'while', and post-tested e.g. 'until' loops. (AL) • Applies a modular approach to error detection and correction. (AB) (DE) (GE)	• Knows the relationship between data representation and data quality. (AB) • Understands the relationship between binary and electrical circuits, including Boolean logic. (AB) • Understands how and why values are data typed in many different languages when manipulated within programs. (AB)	• Knows that processors have instruction sets and that these relate to low level instructions carried out by a computer. (AB) (AL) (GE)	• Knows the purpose of the hardware and protocols associated with networking computer systems. (AB) (AL) • Understands the client-server model including how dynamic web pages use server side scripting and that web servers process and store data entered by users. (AL) (AB) (DE) • Recognises that persistence of data on the internet requires careful protection of online identity and privacy.	• Undertakes creative projects that collect, analyse, and evaluate data to meet the needs of a known user group. (AL) (DE) (EV) • Effectively designs and creates digital artefacts for a wider or remote audience. (AL) (DE) • Considers the properties of media when importing them into digital artefacts. (AB) • Documents user feedback, the improvements identified and the refinements made to the solution. (AB) • Explains and justifies how the use of technology impacts on society, from the perspective of social, economical, political, legal, ethical and moral issues. (EV)
	• Designs a solution to a problem that depends on solutions to smaller instances of the same problem (recursion). (AL) (DE) (AB) (GE) • Understands that some problems cannot be solved computationally. (AB) (GE)	• Designs and writes nested modular programs that enhance reusability utilising sub-routines wherever possible. (AL) (AB) (GE) (DE) • Understands the difference between 'While' loop and 'For' loop, which uses a loop counter. (AL) (AB) • Understands and uses two dimensional data structures. (AB) (DE)	• Performs operations using bit patterns e.g. conversion between binary and hexadecimal, binary subtraction etc. (AB) (AL) (GE) • Understands and can explain the need for data compression, and performs simple compression methods. (AL) (AB) • Knows what a relational database is, and understands the benefits of storing data in multiple tables. (AB) (GE) (DE)	• Has practical experience of a small (hypothetical) low level programming language. (AB) (AL) (DE) (GE) • Understands and can explain Moore's Law. (GE) • Understands and can explain multitasking by computers. (AB) (AL) (DE)	• Understands the hardware associated with networking computer systems, including WANs and LANs, understands their purpose and how they work, including MAC addresses. (AB) (AL) (DE) (GE)	• Understands the ethical issues surrounding the application of information technology, and the existence of legal frameworks governing its use e.g. Data Protection Act, Computer Misuse Act, Copyright etc. (EV)

Computational Thinking Concept: AB = Abstraction; DE = Decomposition; AL = Algorithmic Thinking; EV = Evaluation; GE = Generalisation

Note: Each of the Progression Pathway statements is underpinned by one-or-more learning outcomes (due for publication in 2014), providing greater detail of what should be taught to achieve each Progression Pathway statement a National Curriculum point of study. © 2014 Mark Dorling and Matthew Walker. Reviewed by Simon Humphreys and Sue Sentance of Computing At School, CAS Master Teachers, and by teachers and academics from the wider CAS community. Computational thinking mapping undertaken Mark Dorling, Cynthia Selby and John Wo rd.

COMPUTING AT SCHOOL
EDUCATE · ENGAGE · ENCOURAGE
In collaboration with BCS, The Chartered Institute for IT

The first version of the course covers the Communication & Networking strand taken from the Computing At School (CAS) Progression Pathways

It comprises 8 courses (one per each colour of the progression pathways) and covers all of the learning outcomes (24) which have been mapped to the various key stages

Additional content is expected to cover the Hardware and Processing strand

Content – courses 1-4

1 hr	2 hrs	2 hrs	2 hrs
The World Wide Web and Internet safety	Navigating and searching the web	The Internet and the web	Using and understanding Internet services
This is an introduction to the broad technology behind the World Wide Web (WWW) alongside helping students become familiar with Internet Safety and 'good' internet behaviour in their terms	An introduction to the operation of the WWW, and how to improve your web searches to find the exact information you require. It explains terms such as URLs and hyperlinks and will help you search more effectively. It has examples of how easy it is to be tricked by someone online.	This course is for anyone who wants to know more about the Internet, what it can do and how we connect to it. It introduces terms such as LAN, WAN, WiFi, 3/4G. It also gets you to think about how you should behave online.	This course is for anyone who wants to know more of the details about how the Internet works and how search engines 'choose' what they show us. It introduces terms such as email, file transfer, clients and peers. It also gives advice about what to do and what organisations to go to if you have concerns about e-safety.

Content – courses 4-8

2 hr	2 hrs	2 hrs	2 hrs
Introduction to Data networks and IP addresses	Identify network hardware and protocols	The purpose of network hardware and protocols	The operation of LAN and WAN hardware and protocols
This course is for anyone who wants to know more about how data finds its way through the Internet. It introduces IP address and knowledge of binary numbers. It introduces terms such as IP, DNS, DHCP and looks at how a typical home network (SOHO) connects to the Internet	The course is for anyone who wants to know more devices that make up the Internet and how they work together to provide a global communications network. It introduces the concept of a layered model and explains the role of a switch, router, WAPs, modems. It also gives examples of the clever ways bad people will try and use the Internet and what you can do to be safe online.	The course is for anyone who wants to know in detail about how the TCP/IP layered model works, which devices work at which layer and how one IP address can be shared by a single house for many devices. It also looks at some hard hitting stories about the dangers of posting online.	The course is for anyone who wants to know in detail about the variety of ways devices are connected across the Internet and how we can connect to it. It looks at the 'language' (protocols) used between devices to explain how they communicate and cooperate to provide connectivity

Course layout

Course content

- Updated and maintained high quality curricula
- Based on the UK National curriculum for Computing
- Covers the Networking and Communication strand taken from CAS's Progressions Pathways

Useful content

- PowerPoint
- Web links
- Videos
- Packet Tracer demo
- Free and unlimited use of Packet Tracer, a network configuration and IoT simulation tool (available to NetAcad sign ups)

Activities

- Downloadable documents
- Web based activities
- Can be taught on a individual basis, as a group activity or as a class discussion

Quiz and Extras

- Assessment – normally 10 multiply choice questions
- Extra material for further study

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Packer Tracer

A network and IoT simulation and visualization tool which is freely available to all Networking Academy's

Both teachers and students will have free access to Cisco powerful network simulation program Packet Tracer.

Here students can experiment with network behaviour and ask 'what if' questions.

It supplements physical equipment in the classroom by allowing students to create a network with an almost unlimited number of devices, encouraging practice, discovery and troubleshooting.

CISCO