Computing programmes of study: key stages 3 and 4

National curriculum in England

Purpose of study

A high-quality computing education equips pupils to use computational thinking and creativity to understand and change the world. Computing has deep links with mathematics, science, and design and technology, and provides insights into both natural and artificial systems. The core of computing is computer science, in which pupils are taught the principles of information and computation, how digital systems work, and how to put this knowledge to use through programming. Building on this knowledge and understanding, pupils are equipped to use information technology to create programs, systems and a range of content. Computing also ensures that pupils become digitally literate – able to use, and express themselves and develop their ideas through, information and communication technology – at a level suitable for the future workplace and as active participants in a digital world.

Aims

The national curriculum for computing aims to ensure that all pupils:

 can understand and apply the fundamental principles and concepts of computer science, including abstraction, logic, algorithms and data representation

 can analyse problems in computational terms, and have repeated practical experience of writing computer programs in order to solve such problems

 can evaluate and apply information technology, including new or unfamiliar technologies, analytically to solve problems

 are responsible, competent, confident and creative users of information and communication technology.

Attainment targets

By the end of each key stage, pupils are expected to know, apply and understand the matters, skills and processes specified in the relevant programme of study.
Schools are not required by law to teach the example content in [square brackets].

Subject content

Key stage 3

Pupils should be taught to:

☒ design, use and evaluate computational abstractions that model the state and behaviour of real-world problems and physical systems

☒ understand several key algorithms that reflect computational thinking [for example, ones for sorting and searching]; use logical reasoning to compare the utility of alternative algorithms for the same problem

☒ use two or more programming languages, at least one of which is textual, to solve a variety of computational problems; make appropriate use of data structures [for example, lists, tables or arrays]; design and develop modular programs that use procedures or functions

☒ understand simple Boolean logic [for example, AND, OR and NOT] and some of its uses in circuits and programming; understand how numbers can be represented in binary, and be able to carry out simple operations on binary numbers [for example, binary addition, and conversion between binary and decimal]

☒ understand the hardware and software components that make up computer systems, and how they communicate with one another and with other systems

☒ understand how instructions are stored and executed within a computer system; understand how data of various types (including text, sounds and pictures) can be represented and manipulated digitally, in the form of binary digits

☒ undertake creative projects that involve selecting, using, and combining multiple applications, preferably across a range of devices, to achieve challenging goals, including collecting and analysing data and meeting the needs of known users

☒ create, re-use, revise and re-purpose digital artefacts for a given audience, with attention to trustworthiness, design and usability

☒ understand a range of ways to use technology safely, respectfully, responsibly and securely, including protecting their online identity and privacy; recognise inappropriate content, contact and conduct and know how to report concerns.

Key stage 4

All pupils must have the opportunity to study aspects of information technology and computer science at sufficient depth to allow them to progress to higher levels of study or to a professional career.

All pupils should be taught to:

☒ develop their capability, creativity and knowledge in computer science, digital media

and information technology

☒ develop and apply their analytic, problem-solving, design, and computational thinking skills

☒ understand how changes in technology affect safety, including new ways to protect their online privacy and identity, and how to identify and report a range of concerns.