STATUTORY COMPUTING AT KS4 ACROSS NOTTINGHAM ACADEMY

Introduction

The national curriculum for computing states that all pupils in KS4 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.

Specifically, 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.

This can be reduced to three strands to be developed in schools.

- Computer science
- Information Technology
- Digital Literacy

This document will demonstrate cross curricular examples of how these three strands are implemented across the academy.

1. Computational Thinking

Computational thinking involves problem-solving and critical thinking skills that are essential in computer science but can also be applied in various subjects. It includes breaking down complex problems into smaller, manageable parts and creating algorithms to solve them.

Maths: Computational skills in the form of problem-solving and structured reasoning is evident throughout the mathematics curriculum. The use of White Rose Maths in KS3 supports the development of this type of our thinking. In general, our mathematics scheme of learning starts with students gaining fluency and then as students develop their confidence they progress to the problem-solving and reasoning.

Science: Students apply computational thinking skills in science when using models to represent natural phenomena, such as the particle model of matter and molecular models to show chemical structures. Students need to recognise patterns in data from tables and graphs and describes the rends that they see. They use logical reasoning to explain trends in data that they gather experimentally or are presented with.

Technology: Exam preparation and theory components require students to recognise patterns in processes, material behaviour, and workflows. Logical reasoning is developed through tasks such as choosing manufacturing methods, materials, and interpreting technical drawings.

English: Students apply computational thinking when planning and structuring extended writing tasks, such as essays or creative writing. They break down tasks into manageable components (e.g., introduction, main points, conclusion) and use logical sequencing to build coherent arguments or narratives. We teach students to identify patterns in language, structure, and literary devices across

genres and time periods. Logical reasoning is developed through argument-building in analytical writing and through evaluating the effectiveness of rhetorical strategies in non-fiction texts.

History: students apply computational thinking when analysing historical sources critically, identifying bias, cause and consequence, and examples of change and continuity over time. They use structured reasoning to build coherent arguments, which are sequenced logically, and solve problems around historical interpretations. Logical reasoning is used in evaluating historical causes and consequences, comparing interpretations, identifying similarities and differences, and weighing evidence. Pattern recognition occurs when students identify trends such as social change or the recurring causes of conflicts across different periods.

Art & Photography: Students use computational thinking when developing and refining visual ideas. In particular, they follow structured processes when developing their digital art, developing their ideas, experimenting or photo manipulations, including step-by-step planning (decomposition) and refinement. They problem-solve during the creative process—for example, when resolving composition issues or adapting a technique to suit the desired outcome and planning for a final outcome. Digital design/development are part of their projects (e.g. using Adobe Photoshop, Illustrator, or online design tools like PhotoPea) require students to apply logical sequences, layering, and tool-based strategies. Animation or stop-motion tasks also reinforce pattern recognition and thinking. Typography design and layout planning often involve rule-based decisions and constraints that promote structured reasoning.

Religious Studies: Logical reasoning is embedded in argument evaluation: students assess strengths and weaknesses of different viewpoints, identify fallacies/ misconceptions, and recognise recurring moral patterns across religions (e.g. themes of forgiveness or justice).

Geography: We regularly need to analyse data in order to come to conclusions and predict next steps. An example is when we look at the track of hurricanes to determine what next steps should be taken.

MFL: Students apply structured reasoning when forming grammatically accurate sentences and manipulating verb conjugations in multiple tenses. They follow logical steps to build arguments in writing and speaking tasks.

Hospitality & Catering: Students identify patterns in food preparation methods, use logical sequencing in recipes and hygiene protocols, and analyse cause-and-effect relationships (e.g., food spoilage, customer complaints).

Sport: Students develop computational thinking when planning and evaluating warm-ups, injury prevention strategies (R180), or training programmes (R181). They must deconstruct complex tasks, analyse data, and make evidence-based decisions, mirroring structured reasoning and logic.

Performing Arts: In performing arts all components require students to conduct research and use this research to influence their own creative responses. They are required to rehearse and perform text as well as original work both of which require problem solving, critical thinking, sequencing and breaking down complex tasks. In music students have to perform and compose. In composition they have demonstrate computational thinking, problem solving and critical thinking. In preparation for performances students need to utilise computational thinking including sequencing, breaking down complex tasks, problem solving and critical thinking.

Child Development: Problem-solving: When designing safe environments (e.g., changing areas), students identify hazards, assess risks, and propose solutions—mirroring the decomposition and evaluation steps in computational thinking (RO58)

- **Structured reasoning**: In tasks like comparing nutritional options or evaluating equipment, students follow logical steps to justify decisions, similar to algorithmic thinking (R058)
- **Planning and evaluation**: In play activity planning and meal preparation, students follow structured processes, evaluate outcomes, and iterate—key aspects of computational thinking.

2. Information Technology

Information technology refers to the use of technology tools, software, and hardware to access, manage, and manipulate information. It involves practical IT skills and understanding how technology works.

Art & Photography: Graphic design, digital illustration, web-based portfolios, digital photography, and 3D product design all mirror professional workflows. Students may simulate client-based briefs (e.g. logo design or promotional posters), learning to use IT as industry professionals do in advertising, marketing, and media production. We embed discussions about copyright, plagiarism, and appropriate image sourcing into all digital work. Students learn how to use Creative Commons and royalty-free assets, cite image sources properly, and consider the ethical use of digital tools in representation and editing.

Science: Information technology is used by scientists in drug development to see how chemicals interact.

Technology: Students are explicitly taught how to use 2D CAD software to draw accurate engineering designs, and how to format and present written work in a clear, professional manner using Word. These skills align with real-world industry expectations.

Maths: Graphing tools on calculators and computers to draw quadratic graphs in business to maximise profits. Imaging systems use transformations – rotations and translations and coordinates to reconstruct body scans. Gaming and animation use geometry, trigonometry and vectors to create characters and environments.

Geography: We use GIS for mapping, USGS for earthquakes, worldometre for up-to-date estimates on a range of factors from population count to energy used today.

Religious Studies: Pupils explore how digital platforms shape religious identity and interfaith dialogue (e.g. digital worship, online activism, digital evangelism, or the ethics of AI and automation from a religious perspective).

Design and Technology: In this subject, students can learn to use computer-aided design (CAD) software to create digital models and prototypes.

Music: In music students use MuseScore, and DAW's such as Ableton Live Intro to compose their original pieces.

English: Students may engage in tasks ranging from creating digital presentations, researching using online databases, and submitting assignments via digital platforms such as Teams. These mirror real-world communication and research practices in journalism, publishing, and marketing

Languages: By using online collaborative tools, digital flashcards, and structured grammar websites, students gain experience navigating platforms and managing information relevant to modern language learning. This takes place during home learning.

History: utilising primary and secondary content relating to British history), and presentation software (e.g. PowerPoint, Google Slides). They may also engage with timeline creation tools (e.g. myvisme.co) and digital mapping software (e.g., Google Earth) for contextual understanding.

Hospitality & Catering: Students explore the use of booking and ordering systems, allergen tracking software, and digital menu planning—mirroring practices used in the hospitality industry. Use of Canva reflects the kind of digital marketing and branding that is widely used in food businesses.

Child Development:

- **Word processing and presentation tools** (e.g., Word, PowerPoint) for coursework and evaluations.
- **Online research tools** for sourcing dietary guidelines, equipment specifications, and child development theories.
- **Multimedia tools** (videos, simulations) to support SEND learners and enhance engagement.
- **Assistive technology** (e.g., PECS apps, observation tracking tools) for SEND adaptations.

3. Digital Literacy

Digital literacy involves the ability to find, evaluate, and use digital information effectively and responsibly. It encompasses skills related to internet safety, media literacy, and understanding digital tools.

Art & Photography: Digital Art & Design leads directly to careers in graphic design, digital illustration, animation, game design, UI/UX design, fashion design, and marketing. Students are introduced to how technology drives the creative industries and are shown examples of professional creative workflows.

Science: We use digital pH monitors when we carry out neutralisation reactions. We use data loggers in the acceleration practical. Students are taught why digital measuring devices are more accurate than analogue devices and can also be more precise. We explain to students how to find reliable sources of information online and explain that a lot of the science presented on TikTok is inaccurate. We talk about peer reviewed scientific research and recommend YouTube channels, TikTokers and websites that are sound in their scientific content. When we teach the development of the periodic table and the development of the model of the atom, we teach the importance of peer reviewing research to ensure it is not biased.

Technology: Students must communicate their designs and processes clearly using digital tools. Annotated diagrams, formatted reports, and technical justifications form part of the NEA submission and must be digitally produced and professionally presented.

Religious Studies: Discussions on cyber-ethics, freedom of speech, digital surveillance, and online religious extremism are woven into ethics modules. Pupils reflect on responsible digital behaviour through a moral lens.

MFL: We help students to use online translation tools responsibly and support appropriate digital engagement during lessons. In Year 9 there is a topic on online life which includes some mentions of the advantages & disadvantages of social media.

English: Through non-fiction reading and discussion, we explore themes such as online identity, cyberbullying, and digital footprints. We also reinforce the importance of respectful online communication and responsible use of digital content. We teach students to evaluate the reliability and bias of online sources, particularly in persuasive writing and spoken language units. For example, researching contextual information on Literature texts, or researching relevant information and data to support Speaking and Listening presentations for Language. Media texts are analysed for purpose, audience, and manipulation techniques.

Humanities: students can learn to critically assess online sources for bias and credibility when conducting research on historical events or current affairs.

Physical Education: Digital literacy can be applied by using fitness tracking apps to monitor personal health and exercise routines while understanding privacy and data security considerations.

PSHE: Students can study the ethical implications of digital technology, including discussions on cyberbullying, online privacy, and responsible online behaviour.

Art: Students can analyse digital media, such as online videos or advertising, to understand how messages are constructed and delivered.

History: Students are taught to evaluate the credibility of sources, and this applies to historical sources as well as online sources of information. They are taught how to recognise misinformation, through discussions about bias and propaganda, which extend to digital media, reinforcing responsible and ethical use (e.g. the use of AI, either as a creator or a spectator).

Hospitality & Catering: Students regularly conduct online research to compare recipes, investigate nutritional guidelines, and explore food legislation. They are taught to critically evaluate the credibility of websites and identify bias or inaccuracy in sources. Additionally, students use ICT to research suitable dishes for their controlled assessment and scale recipes up or down based on portion size, budget, or brief requirements – requiring them to apply both digital and analytical skills to make informed choices.

Child Development:

- Safeguarding and privacy: When discussing child safety and observation, students learn about confidentiality, ethical data handling, and appropriate use of images or information—key aspects of digital citizenship.
- Online research: Students are guided to use reputable sources, reinforcing safe and ethical online behaviour.
- SEND adaptations: Use of assistive technologies includes guidance on responsible and respectful use.

Performing Arts:

- How to use Ai appropriately in an educational context.
- How to acknowledge sources and avoid plagiarism.
- Copyright and the use of sampling/clips.
- How to use images/recordings of themselves safely.

4. Careers

Science: Computing is used widely in science. Electron microscopes, used to view the living world in great detail, use computers. The Human Genome Project used computers to map the whole genome so we know where every gene is and can diagnose genetic disorders more easily.

Maths: Gaming and animation, business optimising profits, medical profession imagery and scanning technology, research for governmental policies.

History: Historians use databases, digital archives, GIS mapping, and data visualization software. Skills in managing digital information and critical analysis are relevant to careers in research, education, archiving, and heritage management (as demonstrated in our recent visit into school by Derwent Valley Mills World Heritage Site).

English: English supports careers in digital journalism, content creation, publishing, marketing, and communications. Students learn to write for digital platforms, evaluate online content, and use IT tools for communication and collaboration.

Geography: Data analysis, volcanologist, environment agency, urban planning, agricultural work.

Religious Studies: Students explore careers in journalism, law, politics, consultancy, social media management, education, and public service where evaluating digital content and ethical implications of technology is vital.

MFL: Modern language careers increasingly demand digital proficiency—translators use CAT tools, language teachers use digital platforms, and linguists access real-time media for interpretation and research. Technology plays a central role in all careers involving Spanish.

Hospitality & Catering: Students explore the use of digital systems in catering, from menu costing spreadsheets to online bookings, allergen management, and marketing through digital media (e.g. Canva, social media platforms). This prepares them for digital expectations in modern hospitality roles.

Technology:

Engineering careers frequently require digital competency. This includes:

- CNC programming
- Robotics and automation
- Stress analysis software.
- Digital simulations
- Design and manufacturing software tools