# Appendix 2: Comparison of National 4 and National 5

This table shows the relationship between the mandatory National 4 and National 5 knowledge and understanding. This table may be useful for:

- designing and planning learning activities for multi-level National 4/National 5 classes
- ensuring seamless progression between levels
- identifying important prior learning for learners at National 5

Teachers should also refer to the Outcomes and Assessment Standards for each level when planning delivery.

**NB:** Where similar topics are covered at both levels, the Outcomes, Assessment Standards and Evidence Requirements distinguish the level of treatment.

| **Software Design and Development** | | |
|---|---|---|
| **Topic** | **National 4** | **National 5** |
| **Computational constructs** | Exemplification and implementation of the following constructs:<br><br>♦ expressions to assign values to variables<br>♦ expressions to return values using arithmetic operations (+, -, *, /, ^)<br>♦ execution of lines of code in sequence demonstrating input — process — output<br>♦ use of selection constructs including simple conditional statements<br>♦ iteration and repetition using fixed and conditional loops | Exemplification and implementation of the following constructs:<br><br>♦ expressions to assign values to variables<br>♦ expressions to return values using arithmetic operations (+, -, *, /, ^, mod)<br>♦ expressions to concatenate strings and arrays using the & operator<br>♦ use of selection constructs including simple and complex conditional statements and logical operators<br>♦ iteration and repetition using fixed and conditional loops<br>♦ pre-defined functions (with parameters) |
| **Data types and structures** | string<br>numeric (integer) variables<br>graphical objects | string, character<br>numeric (integer and real) variables<br>Boolean variables<br>1-D arrays |
| **Testing and documenting solutions** | ♦ normal, extreme and exceptional test data<br>♦ readability of code | ♦ normal, extreme and exceptional test data<br>♦ syntax, execution and logic |

| | | |
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| | (internal commentary, meaningful variable names) | errors<br>♦ readability of code (internal commentary, meaningful identifiers, indentation) |
| **Algorithm specification** | | Exemplification and implementation of algorithms, including:<br>♦ input validation |
| **Design notations (also applies in information system design and development)** | ♦ graphical to illustrate selection and iteration<br>♦ other contemporary design notations | ♦ pseudocode to exemplify programming constructs<br>♦ other contemporary design notations |
| **Low-level operations and computer architecture** | Use of binary to represent and store:<br>♦ positive integers<br>♦ characters<br>♦ instructions (machine code)<br><br>Units of storage (bit, byte, Kb, Mb, Gb, Tb, Pb) | Translation of high-level program code to binary (machine code): interpreters and compilers.<br><br>Use of binary to represent and store:<br>♦ integers and real numbers<br>♦ characters<br>♦ instructions (machine code)<br>♦ graphics (bit-mapped and vector)<br><br>Basic computer architecture: processor (registers, ALU, control unit), memory, buses (data and address), interfaces |

| **Information System Design and Development** | | |
|---|---|---|
| *The following mandatory generic topics and vocabulary may be applicable to a range of information systems types and contexts (including databases, websites, games, mobile applications, kiosk systems).* | | |
| **Topic** | **National 4** | **National 5** |
| **Structures and links (databases)** | ♦ database structure: field, record, file<br>♦ field types (text, number, date, time, graphic, calculated)<br>♦ database operations (search, sort) | ♦ database structure: flat file, linked tables, primary keys and foreign keys<br>♦ field types (text, number, date, time, graphic, object, calculated, link, Boolean)<br>♦ validation (including presence check, restricted choice, field length and range)<br>♦ database operations search, sort (on multiple fields)<br>♦ good design to avoid data duplication and modification errors (insert, delete, update) |

| | | |
|---|---|---|
| **Structures and links (web-based)** | ♦ website, page, URL<br>♦ hyperlink | ♦ website, page, URL<br>♦ hyperlink (internal, external), relative and absolute addressing<br>♦ navigation<br>♦ web browsers and search engines<br>♦ good design to aid navigation, usability and accessibility |
| **User interface (also applies in software design and development)** | | User requirements (visual layout, navigation, selection, consistency, interactivity, readability) |
| **Media types** | Sound, graphics, video, text | Standard file formats:<br>♦ text: txt, rtf<br>♦ audio: wav, mp3<br>♦ graphics: jpeg, bmp, gif, png<br>♦ video: mp4, avi<br>♦ pdf<br><br>Factors affecting file size and quality, including resolution, colour depth, sampling rate. Calculation of file size for colour bitmap.<br><br>Need for compression |
| **Coding** | | Exemplification and implementation of coding to create and modify information systems, including use of:<br>♦ scripting languages (including JavaScript)<br>♦ mark-up languages (including HTML) |
| **Testing** | | ♦ Links and navigation<br>♦ Matches user interface design |
| **Purpose, features, functionality, users** | Simple descriptions of main features and functionality | ♦ Description of purpose<br>♦ Users: expert, novice, age-range |
| **Technical implementation (hardware requirements)** | ♦ input and output devices<br>♦ processor clock speed (Hz)<br>♦ memory (RAM, ROM) | ♦ input and output devices<br>♦ processor type and speed (Hz)<br>♦ memory (RAM, ROM)<br>♦ device type (including supercomputer, desktop, portable devices (including laptop, tablet, smartphone) |
| **Technical** | ♦ operating system | ♦ operating systems |

| | | |
|---|---|---|
| **implementation (software requirements)** | platform required | ♦ web browsers<br>♦ specific applications and/or utilities |
| **Technical implementation (storage)** | Storage devices:<br>♦ built-in, external, portable<br>♦ magnetic, optical<br>♦ capacity, speed<br>♦ rewritable, read-only | ♦ local, web/cloud<br>♦ capacity (in appropriate units)<br>♦ rewritable, read-only<br>♦ interface type<br>♦ data transfer speed<br>♦ storage devices:<br>– built-in, external, portable<br>– magnetic, optical<br>– solid state |
| **Technical implementation (networking/ connectivity)** | ♦ stand-alone or networked<br>♦ LAN/internet<br>♦ wired/wireless | ♦ peer-to-peer, client/server<br>♦ wired, optical, wireless |
| **Security risks** | ♦ viruses, worms, Trojans<br>♦ hacking | ♦ spyware, phishing, keylogging<br>♦ online fraud, identity theft,<br>♦ DOS (Denial of Service) attacks |
| **Security precautions** | | ♦ anti-virus software<br>♦ passwords/encryption<br>♦ biometrics<br>♦ security protocols and firewalls<br>♦ use of security suites |
| **Legal implications** | | ♦ Basic descriptions and implications of:<br>♦ Computer Misuse Act<br>♦ Data Protection Act<br>♦ Copyright, Designs and Patents Act (plagiarism)<br>♦ Health and Safety regulations<br>♦ Communication Acts |
| **Environmental impact** | | ♦ Energy use<br>♦ Disposal of IT equipment<br>♦ Carbon footprint |

A similar table in the Higher Computing Science *Course Support Notes* shows the relationship between the mandatory National 5 and Higher knowledge and understanding.