

## Programming Skills – Unit 2

Skills	Grade						
	2	3	4	5	6	7	8
Variables	I can print a value in a program	I can use input statements to get a value from the user	I understand how to store the results when I change the value of a variable	I can describe the different data types and use appropriate input statements	I use meaningful identifiers for variables so it is easy to see what each one is for	I can use casting to change the data type of variables when needed	I can identify situations where constants should be used and declare them
Operations	I can use simple arithmetic operations (+, -)	I can concatenate (join) strings together	I can use a range of arithmetic operations (*, /)	I can select individual letters or substrings from a longer string	I can use DIV (//) and MOD (%) to solve more complex mathematical problems	I can use less common arithmetic operators for rounding, square roots	I consistently and confidently use a wide range of operations to solve a variety of problems
Selection (IF statements)	I can predict what will happen in a program that uses an IF statement	I can create a simple IF statement in a program	I can use IF, ELIF and ELSE to select multiple possible outcomes	I understand and consistently use IF and ELIF statements to improve efficiency	I can use logical operators (AND/OR) to build more complex if statements	I can use nested IF statements confidently	I consistently and confidently use selection statements to solve a variety of problems
Iteration (Loops)	I can predict what will happen in a program that uses a simple loop	I can create a simple count controlled (FOR) loop in a program	I can create a simple condition controlled (WHILE) loop, given some guidance	I can use the counter in a FOR loop as a variable	I can use logical operators (AND/OR) to build more complex loop structures	I can use nested loops confidently	I consistently and confidently use condition controlled loops to solve a variety of problems
List Handling	I can find an item in a list myself, e.g. names[2]	I can create a list in a program	I can print out each item from a list and find its size	I can write a program to check if an item is in a list and find its index	I can use a FOR loop to step through each item in a list	I can store data in a 2D list and return information from it	I consistently and confidently use lists to solve a variety of problems

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Skills	Grade						
	2	3	4	5	6	7	8
Subroutines	I can follow a simple program that uses subroutines	I can create a subroutine and call it from the main method	I can create a program that uses several subroutines to complete different tasks	I can pass values to a subroutine.	I can return values from a subroutine. I can explain the difference between a procedure and a function	I can explain the difference between a parameter and an argument	I consistently and confidently use subroutines to solve a variety of problems
File Handling		I can open a file, print its contents and close it	I can print each line of a file separately	I can write text to a file. I know when to use write mode or append mode	I can use the split function to turn a line from a CSV file into a list	I can write to a CSV file, using write mode or append mode as appropriate	I can use file handling techniques to solve complex problems including data storage and retrieval
Robust Programming	I can add comments to my code	I can debug simple syntax errors	I can debug simple logic errors	I can create simple validation loops to ensure the user only enters sensible values	I test my programs with valid, invalid and extreme data in order to test to destruction	I can use exception handling techniques to deal with a variety of potential problems	I can anticipate problems and create authentication procedures that check usernames and passwords
Translators & IDEs	I can name the three types of translator	I can explain the purpose of a translator	I can describe the difference between high level languages and assembly language	I can describe some of the features of an IDE	I can describe the difference between a compiler and an interpreter	I can write assembly language programs to complete simple tasks	I can discuss the advantages and disadvantages of using a compiler or an interpreter

## Algorithm Skills – Unit 2

Skills	Grade						
	2	3	4	5	6	7	8
Describing Algorithms	I can follow a simple flow chart	I can follow a flow chart that includes decisions	I can create a flow chart, using the appropriate symbols	I can create a simple pseudocode representation of a flowchart	I can create a flowchart that includes one or more subroutines	I can create a top level design for a complex programming problem	I consistently and confidently use a range of suitable planning tools
Computational Thinking	I can break a task into a series of individual steps	I can decompose large problems into a series of smaller tasks	I can plan a top level solution to a problem	Given a problem to solve, I can identify the key features to include and exclude (abstraction)	I can plan a top level solution to a problem and also plan each of the decomposed tasks	I can explain, in detail, how abstraction and decomposition are used in problem solving	I consistently and confidently apply computational thinking skills to solve complex problems
Standard Algorithms	I can manually find an item in a list	I can manually sort a list into order by different properties	I can describe and program the steps involved in a linear search	I can describe and program the steps involved in a binary search	I can describe and program the steps involved in a bubble sort	I can describe and program the steps involved in an insertion sort	I can describe and program the steps involved in a merge sort
SQL	I can read an SQL statement and identify what results will be come back when it is run		I can write simple SQL statements to return data from a database table		I can write complex SQL statements that include wildcards to search for a range of different information in a database		I consistently and confidently use SQL statements to interrogate data

## Data Representation – Paper 1

	Grade						
Skills	2	3	4	5	6	7	8
Representation of Numbers	I can arrange the binary units (KB/MB/etc.) in order	I can convert a 4-bit binary number into denary and back again	I can convert an 8-bit binary number into denary and back again	I can convert between binary, denary and hexadecimal numbers	I can solve problems involving binary addition and binary shifts	I can explain how check digits are used to validate data	I consistently and confidently work with numbers in a range of bases and with a high degree of accuracy
Representation of Data	I can convert between a binary number and its letter equivalent	I can describe what is meant by a character set	I can describe how simple images can be stored using binary numbers	I can explain how sounds can be stored using binary numbers	I can explain the difference between ASCII, Extended ASCII and Unicode	I can describe the difference between data and metadata and I can give examples of metadata	I consistently and confidently work with numbers in a range of bases and with a high degree of accuracy
Compression	I can say whether a large file is good or bad in different situations	I can explain why it is useful to reduce the size of a file	I can describe how the number of pixels in an image will affect its file size and quality	I can describe how the colour depth of an image will affect its file size and quality	I can describe how the sample rate, sample size and bit rate of a digital sound will affect its file size and quality	I can explain the main differences between lossy and lossless compression	I can justify the choice to use uncompressed, lossless or lossy files in different scenarios

## Hardware & Software – Paper 1

	Grade						
Skills	2	3	4	5	6	7	8
Architecture	I can state what CPU stands for	I can explain the purpose of the CPU	I can describe the effects of changing the clock speed, cache size and number of cores	I can state the names of the main registers in the processor	I can explain what is meant by, and give examples of, embedded systems	I can explain most of the steps in the fetch-decode execute cycle	I can describe all of the steps in the FDE cycle, including the role of different registers
Memory & Storage	I can state what RAM stands for	I can state the purposes of RAM and ROM	I can explain what is meant by secondary storage and name different types of storage device	I can explain what is meant by cache memory, RAM and virtual memory	I can describe different storage technologies in terms of capacity, speed, durability, portability, reliability, cost	I can describe the function and discuss the advantages of using cache memory, RAM and virtual memory	I can justify decisions in terms of storage technologies for a range of different scenarios
System Software	I can say whether different software is applications or system software	I can name at least 4 different features of an operating system	I can explain what is meant by systems software, application software and utilities	I can identify and describe the purpose of several different types of utility software	I can explain the causes of fragmentation and the process of defragmentation	I can describe, in detail, all 5 roles of an operating system	I can discuss and justify different choices of backup strategy in different scenarios
Consequences of Computing	I can name at least 3 of the 5 main laws that relate to computing	I can identify which actions are linked to which law	I can identify a small range of ethical, legal, cultural, environmental or privacy issues for a given scenario	I can describe the stakeholders who are affected by technology for a given scenario	I can provide an argument that shows some understanding of the impact of technology on people	I can provide a balanced argument using deep technical knowledge to explain the impact on different people	I consistently and confidently produce thorough and balanced responses to challenging scenarios

## Networks – Paper 1

Skills	Grade						
	2	3	4	5	6	7	8
Networks	I can state the definition of a LAN and a WAN	I can compare a standalone computer with a networked computer	I can state factors that affect the performance of networks	I can identify and state the purpose of a variety of networking hardware	I can draw, label and discuss the advantages of different topologies	I can describe the differences in function of peer-peer and client-server networks	I can confidently and consistently answer a wide range of questions about building networks
The Internet	I can describe the Internet as a worldwide network of computers	I can explain the difference between the Internet and the WWW	I can explain what is meant by cloud storage	I can describe how network hosting is required for sharing websites	I can describe the advantages and disadvantages of storing data in the cloud	I can describe the purpose and the steps involved in DNS lookup	I can describe how virtual networks function and discuss why they are used
Protocols	I can explain the difference between wired and wireless networks	I can explain what is meant by an IP address	I can explain how and why data is split into packets	I can describe the differences between IP and MAC addressing	I can explain how and why wireless transmissions use encryption and different frequencies	I can name and identify the purpose for a wide range of network protocols	I can describe the purpose and function of layers in networking
System Security	I can explain why a weak password is a security risk	I can suggest minimum requirements for a strong password	I can identify a number of attacks including malware, phishing, social engineering and brute force	I can identify preventative measures including anti-malware, firewalls and user access levels	I can describe a range of attacks including DoS, data interception, SQL injection and poor network policy	I can describe protective measures including pen testing, network forensics, policies and encryption	I can discuss the likelihood, impact and appropriate protective measures for a range of scenarios