1. Data representation

Weeks 1–3

数据表示

They should be able to

1. Understand how and why computers use **binary** to represent all forms of data
2. (a) Understand the **denary**, **binary** and **hexadecimal** number systems (b) Convert between (i) positive denary and positive binary (ii) positive denary and positive hexadecimal (iii) positive hexadecimal and positive binary
3. Understand how and why hexadecimal is used as a beneficial method of data representation
4. (a) Add two positive 8-bit binary integers (b) Understand the concept of **overflow** and why it occurs in binary addition
5. Perform a **logical binary shift** on a positive 8-bit binary integer and understand the effect this has on the positive binary integer
6. Use the **two's complement** number system to represent positive and negative 8-bit binary integers
7. Understand how and why a computer represents text and the use of **character sets**, including American standard code for information interchange (**ASCII**) and **Unicode**
8. Understand how and why a computer represents sound, including the effects of the **sample rate** and **sample resolution**
9. Understand how and why a computer represents an image, including the effects of the **resolution** and **colour depth**
10. Understand how data storage is measured
11. Calculate the file size of an image file and a sound file, using information given
12. Understand the purpose of and need for **data compression**
13. Understand how files are compressed using **lossy** and **lossless compression** methods

Stage	Use	Your notes
Starter 10 min · retrieval practice	Topic quiz 01 (10 questions, answers on sheet 2) Starter quiz 1 — past-paper questions	
Teach the new content	Handout 01 Slide deck 01 Vocabulary list 01	
Practice guided then independent	Exercise sheets 1.1, 1.2, 1.3 Past-paper sheets 1.1, 1.2, 1.3	
Check before they leave	Unit test 1 (with mark scheme)	
Homework set from the Library	Any unused exercise sheet above Holiday homework pack	

2. Data transmission

Weeks 4–6

数据传输

They should be able to

1. (a) Understand that data is broken down into **packets** to be transmitted
2. (b) Describe the structure of a packet
3. (c) Describe the process of **packet switching**
4. (a) Describe how data is transmitted from one device to another using different methods of data transmission
5. (b) Explain the suitability of each method of data transmission, for a given scenario
6. Understand the **universal serial bus (USB)** interface and explain how it is used to transmit data
7. Understand the need to check for errors after data transmission and how these errors can occur
8. Describe the processes involved in each of the following error detection methods for detecting errors in data after transmission: **parity check** (odd and even), **checksum** and **echo check**
9. Describe how a **check digit** is used to detect errors in data entry and identify examples of when a check digit is used, including international standard book numbers (ISBN) and bar codes
10. Describe how an **automatic repeat query (ARQ)** can be used to establish that data is received without error
11. Understand the need for and purpose of **encryption** when transmitting data
12. Understand how data is encrypted using **symmetric** and **asymmetric encryption**

Stage	Use	Your notes
Starter 10 min · retrieval practice	Topic quiz 02 (10 questions, answers on sheet 2)	
Teach the new content	Handout 02 Slide deck 02 Vocabulary list 02	
Practice guided then independent	Exercise sheets 2.1, 2.2, 2.3 Past-paper sheets 2.1, 2.2, 2.3	
Check before they leave	Unit test 2 (with mark scheme)	
Homework set from the Library	Any unused exercise sheet above Holiday homework pack	

3. Hardware

Weeks 7–10

硬件

They should be able to

1. (a) Understand the role of the **central processing unit (CPU)** in a computer
2. (b) Understand what is meant by a **microprocessor**
3. (a) Understand the purpose of the components in a CPU, in a computer that has a **Von Neumann architecture**
4. (b) Describe the process of the **fetch–decode–execute (FDE) cycle**, including the role of each component in the process
5. Understand what is meant by a **core**, **cache** and **clock** in a CPU and explain how they can affect the performance of a CPU
6. Understand the purpose and use of an **instruction set** for a CPU
7. Describe the purpose and characteristics of an **embedded system** and identify devices in which they are commonly used
8. Understand what is meant by an **input device** and why it is required
9. Understand what is meant by an **output device** and why it is required
10. (a) Understand what is meant by a **sensor** and the purposes of sensors
11. (b) Identify the type of data captured by each sensor and understand when each sensor would be used, including selecting the most suitable sensor for a given context
12. Understand what is meant by **primary storage**
13. Understand what is meant by **secondary storage**
14. Describe the operation of **magnetic**, **optical** and **solid-state (flash memory)** storage and give examples of each
15. Describe what is meant by **virtual memory**, how it is created and used and why it is necessary
16. Understand what is meant by **cloud storage**
17. Explain the advantages and disadvantages of storing data on the cloud in comparison to storing it locally
18. Understand that a computer needs a **network interface card (NIC)** to access a network
19. Understand what is meant by, and the purpose of, a **media access control (MAC) address**, including its structure
20. (a) Understand what is meant by, and the purpose of, an **internet protocol (IP) address** (b) Understand that there are different types of IP address
21. Describe the role of a **router** in a network

Stage	Use	Your notes
Starter 10 min · retrieval practice	Topic quiz 03 (10 questions, answers on sheet 2)	
Teach the new content	Handout 03 Slide deck 03 Vocabulary list 03	
Practice guided then independent	Exercise sheets 3.1, 3.2, 3.3, 3.4 Past-paper sheets 3.1, 3.2, 3.3, 3.4	
Check before they leave	Unit test 3 (with mark scheme)	
Homework set from the Library	Any unused exercise sheet above Holiday homework pack	

4. Software

Weeks 11–12

软件

They should be able to

1. Describe the difference between **system software** and **application software** and provide examples of each
2. Describe the role and basic functions of an **operating system**
3. Understand how hardware, firmware and an operating system are required to run applications software
4. Describe the role and operation of **interrupts**
5. Explain what is meant by a **high-level language** and a **low-level language**, including the advantages and disadvantages of each
6. Understand that **assembly language** is a form of low-level language that uses mnemonics, and that an **assembler** is needed to translate an assembly language program into **machine code**
7. Describe the operation of a **compiler** and an **interpreter**, including how high-level language is translated by each and how errors are reported
8. Explain the advantages and disadvantages of a compiler and an interpreter
9. Explain the role of an **IDE** in writing program code and the common functions IDEs provide

Stage	Use	Your notes
Starter 10 min · retrieval practice	Topic quiz 04 (10 questions, answers on sheet 2) Starter quiz 4 — past-paper questions	
Teach the new content	Handout 04 Slide deck 04 Vocabulary list 04	
Practice guided then independent	Exercise sheets 4.1, 4.2 Past-paper sheets 4.1, 4.2	
Check before they leave	Unit test 4 (with mark scheme)	
Homework set from the Library	Any unused exercise sheet above Holiday homework pack	

5. The internet and its uses

Weeks 13–15

互联网及其应用

They should be able to

1. Understand the difference between the **internet** and the **world wide web**
2. Understand what is meant by a **uniform resource locator (URL)**
3. Describe the purpose and operation of **hypertext transfer protocol (HTTP)** and **hypertext transfer protocol secure (HTTPS)**
4. Explain the purpose and functions of a **web browser**
5. Describe how web pages are located, retrieved and displayed on a device when a user enters a URL
6. Explain what is meant by **cookies** and how they are used, including **session cookies** and **persistent cookies**
7. Understand the concept of a **digital currency** and how digital currencies are used
8. Understand the process of **blockchain** and how it is used to track digital currency transactions
9. Describe the processes involved in, and the aim of carrying out, a range of **cyber security threats**
10. Explain how a range of solutions are used to help keep data safe from **security threats**

Stage	Use	Your notes
Starter 10 min · retrieval practice	Topic quiz 05 (10 questions, answers on sheet 2) Starter quiz 5 — past-paper questions	
Teach the new content	Handout 05 Slide deck 05 Vocabulary list 05	
Practice guided then independent	Exercise sheets 5.1, 5.2, 5.3 Past-paper sheets 5.1, 5.2, 5.3	
Check before they leave	Unit test 5 (with mark scheme)	
Homework set from the Library	Any unused exercise sheet above Holiday homework pack	

6. Automated and emerging technologies

Weeks 16–17

自动化与新兴技术

They should be able to

1. Describe how **sensors**, **microprocessors** and **actuators** can be used in collaboration to create **automated systems**
2. Describe the advantages and disadvantages of an automated system used for a given scenario
3. Understand what is meant by **robotics**
4. Describe the characteristics of a **robot**
5. Understand the roles that robots can perform and describe the advantages and disadvantages of their use
6. Understand what is meant by **artificial intelligence (AI)**
7. Describe the main characteristics of AI as the collection of data and the rules for using that data, the ability to reason, and it can include the ability to learn and adapt
8. Explain the basic operation and components of AI systems to simulate intelligent behaviour

Stage	Use	Your notes
Starter 10 min · retrieval practice	Topic quiz 06 (10 questions, answers on sheet 2)	
Teach the new content	Handout 06 Slide deck 06 Vocabulary list 06	
Practice guided then independent	Exercise sheets 6.1, 6.2, 6.3 Past-paper sheets 6.1, 6.2, 6.3	
Check before they leave	Unit test 6 (with mark scheme)	
Homework set from the Library	Any unused exercise sheet above Holiday homework pack	

7. Algorithm design and problem-solving

Weeks 18–22

算法设计与问题求解

They should be able to

1. Understand the **program development life cycle**, limited to: **analysis**, **design**, **coding** and **testing**
2. (a) Understand that every computer system is made up of sub-systems, which are made up of further sub-systems
   (b) Understand how a problem can be **decomposed** into its component parts
3. (c) Use different methods to design and construct a solution to a problem
4. Explain the purpose of a given algorithm
5. Understand **standard methods of solution**
6. (a) Understand the need for **validation checks** to be made on input data and the different types of validation check
7. (b) Understand the need for **verification checks** to be made on input data and the different types of verification check
8. Suggest and apply suitable **test data**
9. Complete a **trace table** to document a **dry-run** of an algorithm
10. Identify errors in given algorithms and suggest ways of correcting these errors
11. Write and amend **algorithms** for given problems or scenarios, using: pseudocode, program code and flowcharts

Stage	Use	Your notes
Starter 10 min · retrieval practice	Topic quiz 07 (10 questions, answers on sheet 2)	
Teach the new content	Handout 07 Slide deck 07 Vocabulary list 07	
Practice guided then independent	*nothing in the Library for this stage yet*	
Check before they leave	Unit test 7 (with mark scheme)	
Homework set from the Library	Holiday homework pack	

8. Programming

Weeks 23–26

程序设计

They should be able to

1. Declare and use **variables** and **constants**
2. Understand and use basic **data types**
3. Understand and use **input** and **output**
4. (a) Understand and use the concept of **sequence**
5. (b) Understand and use the concept of **selection**
6. (c) Understand and use the concept of **iteration**
7. (d) Understand and use the concepts of **totalling** and **counting**
8. (e) Understand and use the concept of **string handling**
9. (f) Understand and use **arithmetic**, **relational** and **logical operators**
10. Understand and use **nested statements**
11. (a) Understand what is meant by **procedures**, **functions** and **parameters** (b) Define and use procedures and functions, with or without parameters (c) Understand and use local and global variables
12. Understand and use **library routines**
13. Understand how to create a **maintainable program**
14. Declare and use **one-dimensional (1D)** and **two-dimensional (2D) arrays**
15. Understand the use of arrays
16. Write values into, and read values from, an array using iteration
17. Understand the purpose of storing data in a **file** to be used by a program
18. Open, close and use a file for reading and writing

Stage	Use	Your notes
Starter 10 min · retrieval practice	Topic quiz 08 (10 questions, answers on sheet 2) Starter quiz 8 — past-paper questions	
Teach the new content	Handout 08 Slide deck 08 Vocabulary list 08	
Practice guided then independent	Exercise sheets 8.1, 8.2, 8.3 Past-paper sheets 8.1, 8.2, 8.3	
Check before they leave	Unit test 8 (with mark scheme)	
Homework set from the Library	Any unused exercise sheet above Holiday homework pack	

9. Databases

Weeks 27–28

数据库

They should be able to

1. Define a **single-table database** from given data storage requirements
2. Suggest suitable basic **data types**
3. Understand the purpose of a **primary key** and identify a suitable primary key for a given database table
4. Read, understand and complete **structured query language (SQL)** scripts to query data stored in a single database table

Stage	Use	Your notes
Starter 10 min · retrieval practice	Topic quiz 09 (10 questions, answers on sheet 2)	
Teach the new content	Handout 09 Slide deck 09 Vocabulary list 09	
Practice guided then independent	*nothing in the Library for this stage yet*	
Check before they leave	Unit test 9 (with mark scheme)	
Homework set from the Library	Holiday homework pack	

10. Boolean logic

Weeks 29–30

布尔逻辑

They should be able to

1. Identify and use the standard symbols for **logic gates**
2. Define and understand the functions of **logic gates**
3. (a) Use logic gates to create given **logic circuits** from a: (i) problem statement (ii) logic expression (iii) truth table (b) Complete a **truth table** from a: (i) problem statement (ii) logic expression (iii) logic circuit
4. (c) Write a logic expression from a: (i) problem statement (ii) logic circuit (iii) truth table

Stage	Use	Your notes
Starter 10 min · retrieval practice	Topic quiz 10 (10 questions, answers on sheet 2)	
Teach the new content	Handout 10 Slide deck 10 Vocabulary list 10	
Practice guided then independent	*nothing in the Library for this stage yet*	
Check before they leave	Unit test 10 (with mark scheme)	
Homework set from the Library	Holiday homework pack	