NAME DATE STARTED TARGET END DATE

GCE AS LEVEL — COMPUTER SCIENCE UNIT 1 QUESTION PACK

2500U10-1 · 2015 spec Unit 1 Topic 5 · AS unit, first sat 2017, 100 marks, 2h paper

REVISE.wales

COMPUTER SCIENCE — UNIT 1 · Files, Data Structures & Databases

Topic 1.3 — Arrays, records, sequential / indexed-sequential / random files and relational databases

One- and two-dimensional arrays, fixed and variable length records, sequential and indexed-sequential file access, master / transaction file processing, entity relationships, database views and the role of DBMS features in storing and querying data.

2015 specification · current

Estimated time for entire question pack: ~2 h 9 min

Derived from the Unit 1 pace of ~1.2 min/mark, padded for written-prose answers (86 marks over 12 questions).

*You are advised to **not** attempt to complete all of this in one sitting.*

ABOUT THIS QUESTION PACK

This is a **comprehensive topic question pack**, not a single mock paper. It contains every question from the WJEC AS Unit 1 papers (Summer 2017 – Summer 2024, COVID gap) that maps onto Topic 1.3 of the 2015 specification.

Questions are ordered by source paper date.

INSTRUCTIONS

Use black ink or black ball-point pen. Show all working. A calculator is allowed where useful.

For Examiner's use only

Q	Source	Max	Mark
1	S17 Q8	6	
2	S18 Q6	5	
3	S19 Q7	11	
4	S19 Q13	11	
5	S22 Q5	6	
6	S22 Q6	7	

Q	Source	Max	Mark
7	S22 Q7	8	
8	S23 Q9	6	
9	S23 Q11	8	
10	S23 Q12	6	
11	S24 Q6	6	
12	S24 Q7	6	
Total		**86**	

Files, Data Structures & Databases — what the spec asks

WJEC GCE AS Computer Science (from 2015) · Unit 1: Fundamentals of Computer Science · Topic 1.3.

Arrays

- Fixed-size contiguous block; index 0 to n–1 (zero-based).
- 1D: list of values; 2D: grid (rows, columns) accessed by myArray[row][col].
- All elements have the same data type.
- Trade-off: fast indexed access vs cannot grow / shrink easily.

Records

- Heterogeneous: groups related fields of possibly different types.
- Fixed length: every record same byte size — simple addressing, wasted space if data varies.
- Variable length: uses delimiters or length-prefix — saves space, harder to index.
- Used to store one entity (e.g. one student, one product).

File organisation

- Sequential: records in order; read in sequence; insert means re-write or append.
- Indexed sequential: sorted file + index to seek directly to record group.
- Random / direct: hash key → address; O(1) lookup, no order.
- Choice depends on access pattern: bulk processing vs ad-hoc lookups.

Master & transaction files

- Master file: permanent store of records (e.g. all customers).
- Transaction file: temporary store of updates (e.g. today's sales) — sorted by key.
- Update process reads master + transaction sequentially → new master file.
- Common in payroll, banking, large batch-processing systems.

Relational databases

- Data stored in tables of rows (records) and columns (attributes).
- Primary key uniquely identifies each row; foreign keys link tables.
- Reduces redundancy (normalisation) and supports consistency.
- Manipulated with SQL (SELECT, INSERT, UPDATE, DELETE).

Database views & DBMS features

- Views: present a subset of data tailored to a user group.
- Concurrency control, transaction logs, integrity rules, backup & recovery.
- Access control restricts who can read / write each table or field.
- Stored procedures, triggers, query optimisation.

Crib sheet »

Files, Data Structures & Databases in one page

Quick-reference notes — revisit before each question.

Array vs list

Array: fixed size, fast indexed access, same type.
Linked list: dynamic size, sequential access, slower lookup, easier insertion.

Fixed vs variable records

Fixed: same byte size, easy random access, wastes space.
Variable: uses delimiter or length prefix, compact, harder to index.

File access types

Sequential: in order — bulk batch processing.
Indexed sequential: sorted + index — good for both bulk and lookups.
Direct / random: hash key → address — instant lookup, no order.

Master + transaction

Sort transaction file by key matching master.
Read both sequentially; output new master.
Used in payroll, banking, monthly cycles.

Primary & foreign keys

Primary key: unique row identifier in a table.
Foreign key: column in table B referencing primary key in table A — enforces referential integrity.

DBMS responsibilities

Concurrency, security, backup & recovery, integrity, query optimisation, transaction logging.
Views give tailored projections per user role.

Examiner only

8. At *Myles-Hill College*, students are able to study courses that are taught by teachers. A student can study any number of courses, and each course is taught by a single teacher, although a teacher may teach more than one course.

(a) Using an example from this scenario, explain what is meant by a foreign key in a database. [2]

(b) Describe the difference between flat file and relational database systems. [1]

(c) Construct an entity relationship diagram to illustrate the scenario described at *Myles-Hill College*. [3]

Examiner only

6. *PhoneRecycle* allows customers to trade in their handsets in return for vouchers that can be spent in other retail stores.

The total number of handsets traded-in with each member of staff is recorded each month as shown in the grid below:

Staff Code	Total number of handsets recycled each month					
	Jan	**Feb**	**Mar**	**Apr**	**May**	**…**
001	34	43	23	51	…	…
002	26	47	54	14	…	…
003	…	…	…	…	…	…
…	…	…	…	…	…	…

(a) State the full name of this type of data structure and state why this structure is the most appropriate for *PhoneRecycle*. [2]

(b) State the most suitable data type for this structure. [1]

(c) *PhoneRecycle* also stores customer details. State the most suitable data structure to store this information and justify your choice. [2]

Examiner only

7. *(a)* Draw a clearly labelled diagram that shows how a transaction file and master file are used during an update. [4]

(b) Describe the data used and the organisation of transaction files and a master file for an application of your choice. [4]

(c) Describe the most suitable mode of operation for your chosen application. [3]

Examiner only

13. Discuss the advantages of using database systems and their associated features to store data. [11]

END OF PAPER

Examiner only

5. Explain the difference between fixed and variable length records. [6]

Examiner only

6. (a) Describe the benefits of user groups having different views of database data. Describe how these views may be varied for each user group. [6]

(b) Describe the need for archiving files. [1]

Examiner only

7. The following user login details are stored in a two-dimensional string array called `loginDetails`.

	Username [0]	Password [1]	Full name [2]
[0]	MurahanA	152599	Alice Murahan
[1]	JonesT	p@ssword12134	Tim Jones
[2]	MurrayB	Fred1985	Benjamin Murray
[3]	AliZ	1234	Zaheer Ali
[4]	DaviesD	#12356!	Denzil Davies

Write an algorithm, using pseudo-code, which will allow a user to enter a username and password to login.

If the user has logged in successfully, then a suitable welcome message should be displayed followed by their full name.

Your algorithm should output a suitable error message if the password entered is incorrect or if the username is not found.

Your algorithm should be written using self-documenting identifiers. [8]

Examiner only

9. (a) The following data is stored in `myArray`.

`myArray`

1	2	5	6	8	11	14
(0)	(1)	(2)	(3)	(4)	(5)	(6)

Write down the order in which each number will be accessed when performing the following types of search for **14**.

You may not need to use all the boxes given.

(i) Linear search. [2]

1st	2nd	3rd	4th	5th	6th	7th

(ii) Binary search. [2]

1st	2nd	3rd	4th	5th	6th	7th

(b) Give **one** advantage and **one** disadvantage of a binary search over a linear search. [2]

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Examiner only

11. (a) Describe the term data structure and why data structures are used in computing. [2]

(b) Information about films is stored in a table.

FilmID	Title	Certificate	Genre
1	End in Justice	18	Horror
2	Inferno of Retaliation	12	Action
3	Mission Mercury	15	Sci-fi
4	Boy of an Angel	PG	Romcom
…	…	…	…

Describe each of the following using examples from the table:

(i) Field. [2]

(ii) Record. [2]

(iii) Primary key. [2]

Examiner only

12. Describe sequential files and how records are added to them. [6]

Examiner only

6. Describe the difference between fixed and variable length records. Give an example of data that could be contained in each. [6]

Examiner only

7. Explain the difference between sequential and indexed sequential file access. [6]

END OF QUESTION PACK

12 questions · 86 marks · ~2 h 9 min
Source: WJEC AS Computer Science Unit 1 (2500U10-1), Summer 2017–2024, COVID gap
Curated for WJEC Computer Science 2015 spec AS Unit 1 — Topic 5 (1.3)