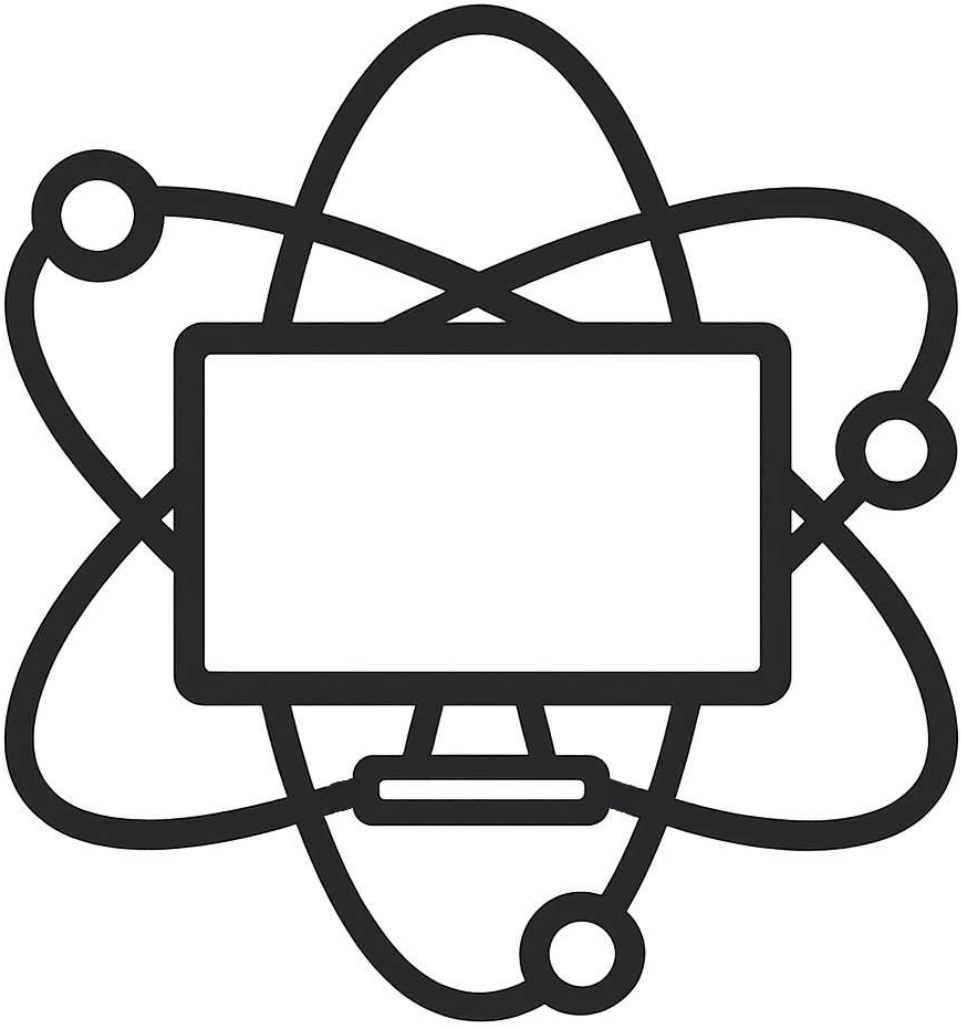
0478 IGCSE Computer Science
Summary Sheet
Assessment Test Prep



Prepared by:
The ReviseRoom Educator Team

Chapter 1 – Data Representation

Binary

- Base 2 system
- Only 0s are 1s
- All data needs to be converted to binary so that the computer can use it
- Process data in logic gates and store data in registers

Hexadecimal

- Base 16 system
- Sixteen values used to represent all values, 0-9 A-F
- Hexadecimal is shorter so it takes less space
- Easy to
    - Read and write
    - Debug
- Used in
    - MAC address
    - IPV6
    - HTML color codes
    - Assembly language error codes

Denary

- Base 10 system
- Easy to read

Overflow Error

- When a number larger than a register can store is generated overflow error occurs
- E.g. A value greater than 255 in a 8 bit register
- Computers have predefined limits that it can store. Overflow is when a value outside this limit is generated

Logical Shifts

- Moving the bits to the left or right in a register
- Left or Right most ones are lost and places are filled with 0s
- Most or Least significant bits are lost
- Each left shift means multiply by 2
- Each right shift means divide by 2

Converting text to binary

- Uses character set (A defined list of characters recognized by a computer's software and hardware)
    - Unicode
    - ASCII
- ASCII represents up to 7 bits
    - All of the lower and upper case English characters, punctuation marks and control actions (backspace, enter, tab, etc) can be represented.
- Extended ASCII represents up to 8 bits
    - Allows special characters such as © ě and accents in languages such as French or Spanish to be represented.
- Disadvantages of ASCII
    - Can only represent up to 128 characters
    - Cannot represent characters from non-western languages
- Unicode uses 16 bits or 32 bits
    - Can represent characters from all the languages around the world
    - Take up more storage space

Converting images to binary

- An image is made up of pixels
- Each pixel is converted to binary depending on its color
- Each color has its own binary value
- Metadata is stored alongside images. It is extra but includes dimensions, file type, date created, resolution, and color depth.
    - Without meta data, the image data would not be correctly displayed.
- Resolution is the size or number of pixels in image
    - The greater the number of pixels within the given area, the greater the resolution
- Color depth is number of bits used to represent each color
    - The greater the color depth, the greater the number of colors that can be represented
- True color is a 24-bit color depth representation of an image, each pixel's color is defined by 8 bits each for red, green, and blue (RGB).
- File size is proportional to resolution and color depth

Converting Sound to Binary

- Sound sampling means measuring the amplitude of the sound at regular time intervals
- Each sound wave (analogue data) is converted to binary (digital data) then processed by computer (With the usage of ADC)
- Sample rate is number of samples taken per second
- Sample resolution is number of bits per sample
- The higher the number of bit per sample, the greater the quality of sound and the larger the file size
- Loudness and pitch depends on sample resolution

File compression

- Done to save space and reduce data transmission time
- Advantages
    - Less storage required
    - Less bandwidth required
    - Less time taken for transfer
    - Quicker to upload and download
- Disadvantages
    - Can affect the quality of file
    - Compressing / Decompressing takes up time
    - Need to be done with compatible software or file may get corrupt

Lossy compression

- Finds unnecessary and redundant data in file then remove them
- Data is lost permanently thus original file cannot be restored after decompression
- Usually used for images and sound
- For images it removes colors humans can't see, reduce the color depth and the number of pixels (resolution)
- For sound, it removes sounds that humans can't hear or small differences in volume and frequency, reduces sample resolution and sample rate

  (Note from Educator: These are what I write every time these kind of questions are asked)
- How to compress sound files
    - A compression algorithm is used. Use perceptual music shaping which removes sounds that human ear can't hear properly. The sample rate and resolution is reduced. If two sounds play at the same time, the softer one unheard by the ear is removed. Unnecessary data is removed permanently and the original file is lost.
- How to compress video files
    - A compression algorithm is used. Use perceptual music shaping which removes sounds that human ear can't hear properly. The color depth and resolution is reduced. Unnecessary data is removed permanently and the original file is lost. (Could also add in more from the sound question above since video files are just moving images with sound)

Lossless compression

- Uses compression algorithms to reduce size without permanently removing any data
- Used for files where any loss of data is unacceptable
- Usually used for text files and executable files
- A common algorithm is RLE
    - RLE is used to reduced the size of repeating string of items
    - The repeating string is called a run and is represented by two bytes
        - First byte represents the number of times the information is repeated
        - Second byte represents the information itself
    - RLE is effective when there's a long run of repeated units, not effective if else
    - RLE uses a flag to counter strings that has a mix of repeated sequence and single, non-repeated values E.G. "abababa cccccc dedede"
        - The flag is placed before the first byte

Chapter 9 – Data Base

Database

- Definition: information stored in a structured/organized way so it can easily be accessed, searched or updated.
    - Advantages
        - Data can be found quickly
        - Data can be filtered to retrieve only the needed data
        - Data can be shared using the internet or external drive
        - A backup can be easily made
- Database store data in a table and the table is made up of record (rows) and field (columns)
- A record is a collection of data about one item in the database
- A field is one piece of data about one item in a database

Data types

- Text (alphanumeric)
    - Any characters or symbols
- Integer (number)
    - Whole numbers
- Real (number)
    - Number with decimal places
- Date/Time
    - Dates and Times… (What did you expect)
- Boolean
    - Yes / No or True / False
- Currency
    - Financial data

Primary Key

- A primary key is a unique identifier, it is needed to identify one record (row) from another within a database
- Fields marked as a primary key will not allow you to enter duplicates
- E.G. Passport number, NRC, Credit card number

Queries

- A method of searching the database
- Uses SQL
- Multiple criteria searches are possible and results can be sorted in ascending or descending order

SQL Scripts

SQL Query Statement	Description
`SELECT`	Fetches specified fields (columns) from a table; queries always begin with **`SELECT`**.
`FROM`	Identifies the table to use.
`WHERE`	Includes only records (rows) in a query that match a given condition.
`ORDER BY`	Sorts the results from a query by a given column either alphabetically or numerically.
`SUM`	Returns the sum of all the values in a field (column). Used with **`SELECT`**.
`COUNT`	Counts the number of records (rows) where the field (column) matches a specified condition. Used with **`SELECT`**.

- SELECT and FROM are mandatory, all other commands are optional
- SELECT Statement
    - To specify the individual fields to be shown
        - SELECT field1, field2, field3
- FROM Statement
    - To specify the table to be used
        - FROM Tablename

- WHERE Statement
    - To specify the condition to apply

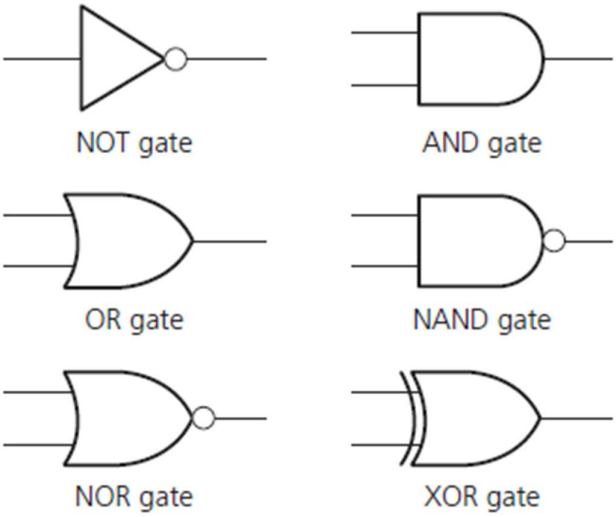
Operator	Description
=	equal to
>	greater than
<	less than
>=	greater than or equal to
<=	less than equal to
<>	not equal to
BETWEEN	between a range of two values
LIKE	search for a pattern
IN	specify multiple values
AND	specify multiple conditions that must all be true
OR	specify multiple conditions where one or more conditions must be true
NOT	specify a condition that must be false

- ORDER BY Statement
    - To sort the data in ascending or descending order starting with the first field
        - ORDER BY field1, field2, field3 DESC

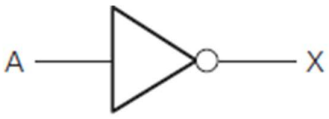
- SUM Statement
    - To specify the field for calculation
    - The field need to be integer or real
        - SUM(field1) FROM tablename
- COUNT Statement
    - To specify the field to count if given criteria
        - SELECT COUNT(field1) FROM tablename WHERE field2 > num
            - (In the case above, field 2 is the criteria field)

Chapter 10 – Logic gates and Logic Circuits

Logic gate symbols



NOT gate



Input	Output
0	1
1	0

- The output, X, is 1 if the input, A, is 0

AND gate

A	B	Output
0	0	0
1	0	0
0	1	0
1	1	1

- The output, X, is 1 if both inputs, A and B, are 1

OR gate

A	B	Output
0	0	0
1	0	1
0	1	1
1	1	1

- The output, X, is 1 if either input, A or B, are 1

XOR gate

A	B	Output
0	0	0
1	0	1
0	1	1
1	1	0

- The output, X, is 1 if the input, A and B are not the same

NAND gate

A	B	Output
0	0	1
1	0	1
0	1	1
1	1	0

- The output, X, is 1 if both input, A and B are not 1 at the same time

NOR gate

A	B	Output
0	0	1
1	0	0
0	1	0
1	1	0

- The output, X, is 1 if both input, A or B is not 1

Logic statements

- In logic statements, you are not given the 0s and 1s. You are given ON and OFF instead.
- ON = 1 and OFF = 0
- E.G.
    - X = 1 if (A =OFF OR B=ON) AND (A=ON NOR B=OFF)
    - X = (A =0 OR B=1) AND (A=1 NOR B=0)
    - X = (A =NOT 1 OR B=1) AND (A=1 NOR B=NOT 1)
    - X = (NOT A OR B) AND (A NOR NOT B)

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