How to Prepare for Computer Science 2210 Exam

By: Engineer Fahad Ahmad Khan, MS Software Engineering, BE Telecom

Aim
The workshop will encompass the important bits and pieces of information that may help an O level student to study and prepare for the Computer Science 2210 (CS 2210) Exam in a smart way.

Objectives
After the completion of workshop, students will:

- Have strong understanding of course outline and contents of CS 2210
- Have clear idea about the questions they might encounter in CIE exam
- Be aware of must come questions from important topics
- Be able to solve the exam style questions from various topics
- Have an idea about Do’s and don’ts while attempting the exam
- Be able to manage the time for CS 2210 exam

Note: Students are advised to keep this handout with them while preparation of CIE exam.

Checklist
You should tick the topics in checklist during exam preparation in order to avoid missing anything.

Paper 1:
- Manual Input Devices
- Automatic Input Devices / Automatic Data Capture Devices
- Output Devices
- Data Storage
- Decimal, Binary & Hexadecimal Number System
- Logic Gates
- Operating System
- Types of Programming Languages & Translators
- The Von Neumann Model
- Fetch Execute Cycle
- Data Communication & Networking
- Data Security & Ethics

Paper 2:
- Introduction to Programming
- Pre-Release Programming Tasks with Practice Questions
- Pseudocode
- Program Flowchart
- Database
- Logo Language - Turtle Puzzle
For Computer Science 2210, each candidate is supposed to appear in two papers.

<table>
<thead>
<tr>
<th>Components</th>
<th>Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Paper 1: Theory</strong></td>
<td>60%</td>
</tr>
<tr>
<td>This written paper contains short-answer and structured questions. There is no choice of questions.</td>
<td></td>
</tr>
<tr>
<td>No calculators are permitted in this paper.</td>
<td></td>
</tr>
<tr>
<td>75 marks</td>
<td></td>
</tr>
<tr>
<td>Externally assessed.</td>
<td></td>
</tr>
<tr>
<td><strong>Paper 2: Problem-solving and Programming</strong></td>
<td>40%</td>
</tr>
<tr>
<td>This written paper contains short-answer and structured questions. There is no choice of questions. 20 of the marks for this paper are from questions set on the pre-release material.</td>
<td></td>
</tr>
<tr>
<td>No calculators are permitted in this paper.</td>
<td></td>
</tr>
<tr>
<td>50 marks</td>
<td></td>
</tr>
<tr>
<td>Externally assessed.</td>
<td></td>
</tr>
</tbody>
</table>

**Manual Input Devices**
- Keyboard
- Pointing Devices
- Scanner
- Digital Camera
- Microphone
- Musical Keyboard
- Remote Control

**Automatic Data Capture Devices**
- OCR and OMR readers
- MICR Reader
- Barcode Reader
- RFID tag reader
- Magnetic strip reader
- Smart card reader
- Biometric data capture devices

**Types of Sensors**
- Temperature Sensor
- Pressure Sensor
- Light Sensor
- Infrared Sensor
- Humidity Sensor
- Gas Sensor
Exam Style Questions

Question 1

Name a suitable sensor for each of the following applications. Choose a different sensor in each application.

(i) control of a central heating system

(ii) operation of automatic doors

(iii) detection of intruders

(iv) monitoring of a greenhouse environment

Question 2

The conditions in a fish tank are being controlled using sensors and a microprocessor. To keep the fish healthy, the temperature must be at 25°C and the oxygen content needs to be 20 ppm (parts per million). The tank contains a heater and an oxygen inlet controlled by a valve.
(a) Name the two sensors used in this application.

Sensor A

Sensor B

(b) Describe how the sensors and the microprocessor are used to maintain the correct conditions in the fish tank.

(c) What safeguards are needed to stop the fish tank temperature rising too high?
Question 3:

The following diagram shows six descriptions of automatic data capture methods and six terms. Draw lines to connect each description to the correct term.

1. Reading data directly from hard copy and converting into electronic/computer-readable form
   - Biometrics

2. Use of fingerprint scans, retina scans, face identification, etc. as a way of identifying a person uniquely
   - Data logging

3. Recognises spoken word patterns and compares them to patterns stored in memory
   - Optical character recognition (OCR)

4. Use of minute electronic devices (containing microchip and antenna) that can be read from distances up to 5 metres
   - Optical mark recognition (OMR)

5. Automatic data collection using sensors
   - Radio frequency identification (RFID)

6. System that reads pencil or pen marks on a piece of paper in pre-determined positions
   - Voice recognition
Output Devices
- Monitor
- Printers
- Plotters
- Cutters
- Speakers
- Projectors
- Buzzers
- Motors
- Switched outputs
- Lights
- Mechanical devices, e.g. a robot arm

**Question 1:** List down the names of three output devices that may be used at ATM machine along with their purpose.

Device 1:
Purpose:

Device 2:
Purpose:

Device 3:
Purpose:

Data Storage
A computer usually uses three types of storage.

1. **Internal Storage/Primary Storage:** includes Read Only Memory (ROM), Random Access Memory (RAM) and DVD-RAM.
2. **Main Backing Storage/Secondary Storage:** includes Hard Disk Drive (HDD) and Solid State Drives (SSDs)
3. **Offline Storage/External Storage (Type of Backing Storage):** includes Digital Versatile Disk (DVDs), Compact Disks (CDs), Blu-ray, USB flash memory, Removable Disks

<table>
<thead>
<tr>
<th>Size</th>
<th>Equal to</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 bits</td>
<td>1 byte</td>
</tr>
<tr>
<td>1024 bytes</td>
<td>1 kilobyte</td>
</tr>
<tr>
<td>1024 kilobytes</td>
<td>1 megabyte</td>
</tr>
<tr>
<td>1024 megabytes</td>
<td>1 gigabyte</td>
</tr>
<tr>
<td>1024 gigabytes</td>
<td>1 terabyte</td>
</tr>
</tbody>
</table>
Exam Style Questions:

Question 1:

Four types of data storage media and four descriptions are shown in the table below.

Tick (✓) the appropriate boxes in the table to match each data storage medium to its most suitable description.

<table>
<thead>
<tr>
<th></th>
<th>CD-ROM</th>
<th>DVD-RAM</th>
<th>fixed hard disk</th>
<th>memory stick</th>
</tr>
</thead>
<tbody>
<tr>
<td>storage medium where data can only be read and not altered</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>portable medium which allows transfer of data between computers</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>memory where operating systems and applications software are usually stored</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>medium which allows recording and playback to occur at the same time</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

Question 2

Indicate which of the following statements are true or false:

(a) ROM stands for Read-Only Memory.
(b) Data can be saved in ROM.
(c) The internal memory of a computer can store software and data.
(d) Data that changes is normally held in ROM.
(e) Data on magnetic tape has to be read serially.
(f) An airline booking system would probably use hard disk drive as backing storage.
(g) A CD-ROM is an optical disk.

Question 3

A company produces animation effects using computers rather than producing them manually. Each image takes about 400 kilobytes of storage. 25 images per second are produced. How much memory would be needed to store a 30-minute animation?
Number System
- Decimal Number System
- Binary Number System
- Hexadecimal Number System

Exam Style Questions

Question 1
When a key is pressed on the keyboard, the computer stores the ASCII representation of the character typed into main memory.

The ASCII representation for A is 65 (denary), for B is 66 (denary), etc.

There are two letters stored in the following memory locations:

<table>
<thead>
<tr>
<th>Location 1</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location 2</td>
<td>C</td>
</tr>
</tbody>
</table>

(a) (i) Show the contents of Location 1 and Location 2 as binary.

Location 1 .............................................................................................................
Location 2 ............................................................................................................. [2]

(ii) Show the contents of Location 1 and Location 2 as hexadecimal.

Location 1 .............................................................................................................
Location 2 ............................................................................................................. [2]
(b) The following machine code instruction is stored in a location of main memory:

```
1 1 1 1 1 0 1 0 1 0 0 1 0 1 1 1
```

Convert this binary pattern into hexadecimal.

[4]

(c) Explain why a programmer would prefer to see the contents of the locations displayed as hexadecimal rather than binary, when debugging his program that reads the key presses.

[2]

**Question 2:** Decimal, Binary and Hexadecimal are key number systems used in daily life and computing.

(a) What is the highest decimal number that can be represented by 2 hexadecimal digits?

(b) How many bits are required to represent \((209)_{10}\) and \((0F9)_{16}\).

(c) What is the maximum binary number that can be represented by using 8 bits?

(d) How 1 in decimal can be represented in binary number by using 8 bits?

(e) What is the maximum denary number that can be represented by using an 8 bit binary number?
Bit pattern Exam Style Questions

Question 1

A digital alarm clock is controlled by a microprocessor. It uses the 24-hour clock system (i.e. 6 pm is 18:00).

Each digit in a typical display is represented by a 4-digit binary code.

For example:

```

0 8 3 5
```

is represented by:

```
0 0 0 0 1st digit (0)
1 0 0 0 2nd digit (8)
0 0 1 1 3rd digit (3)
0 1 0 1 4th digit (5)
```

(a) What time is shown on the clock display if the 4-digit binary codes are:

```
0 0 0 1
0 1 1 0
0 1 0 0
1 0 0 1
```

(b) What would be stored in the 4-digit binary codes if the clock display time was:

```
1 7 2 9
``"
(c) The clock alarm has been set at 08:00.

Describe the actions of the microprocessor which enable the alarm to sound at 08:00.

Question 2:

Letters from the Greek alphabet are to be transferred to a computer system. Each letter can be represented on an 8 by 8 grid. Each column has a value from 1 to 128.

The value of each row is stored in a table. The values in the column headings are used to work out the value for each row (e.g. in our example, row 8 has the value \(64 + 32 + 4 + 2 = 102\)).

Thus, in the example below, the letter (π) is stored as:

What values would be stored in the table for the Greek character (Σ)?
(b) Draw the character formed from the following value table:

<table>
<thead>
<tr>
<th>row</th>
<th>value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>146</td>
</tr>
<tr>
<td>2</td>
<td>146</td>
</tr>
<tr>
<td>3</td>
<td>84</td>
</tr>
<tr>
<td>4</td>
<td>84</td>
</tr>
<tr>
<td>5</td>
<td>56</td>
</tr>
<tr>
<td>6</td>
<td>16</td>
</tr>
<tr>
<td>7</td>
<td>16</td>
</tr>
<tr>
<td>8</td>
<td>16</td>
</tr>
</tbody>
</table>

Logic Gates

![MIL symbols for logic gates](image-url)
Exam Style Questions

Question 1:

(a) Draw the logic circuit for the logic statement:

\[ X = 1 \text{ if } (L \text{ is NOT 1 AND } F = 1) \text{ OR } (F \text{ is NOT 1 AND } A \text{ is 1}) \]

(b) Complete the truth table for the above system.

<table>
<thead>
<tr>
<th>L</th>
<th>F</th>
<th>A</th>
<th>Working space</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Question 2:

Write the logic statement to describe the following logic circuit:

![Logic Circuit Diagram]

Question 3:

A nuclear power station has a safety system based on three inputs to a logic circuit (network). A warning signal \( S = 1 \) is produced when certain conditions in the nuclear power station occur based on these three inputs.
A warning signal \((S = 1)\) will be produced when any of the following occurs:

either \((a)\) Temperature \(> 115^\circ C\) and Cooling water \(\leq 120 \text{ litres/hour}\)

or \((b)\) Temperature \(\leq 115^\circ C\) and Reactor pressure \(> 15\) bar or Cooling water \(\leq 120 \text{ litres/hour}\)

Draw a logic circuit (network) and truth table to show all the possible situations when the warning signal \((S)\) could be received.

**Operating System**

1. System Software
2. Application Software

Two types of system software:

1. Utility Software
2. Operating System

Tasks/Functions of an Operating System

1. Memory management
2. Scheduling
3. Manages System Security
4. Peripheral Management
5. Loading and running application software

Types of User Interface

1. Command Line Interface (CLI)
2. Graphical User Interface (GUI)
Peripheral Device Control (Peripheral Management)

1. Buffer
2. Polling
3. Interrupt
4. Handshaking
5. Checksum

Exam Style Questions

Question 1:

(ii) The same student also wrote: “to launch an application, a graphical user interface (GUI) requires typing the name of the application using a keyboard”.

Why is this statement incorrect?

.......................................................................................................................................................................................[1]

(b) A user interface is a function of a typical operating system.

Write down four other functions of a typical operating system.

1. ...................................................................................................................................................................................

...................................................................................................................................................................................

2. ...................................................................................................................................................................................

...................................................................................................................................................................................

3. ...................................................................................................................................................................................

...................................................................................................................................................................................

4. ...................................................................................................................................................................................

...................................................................................................................................................................................[4]
Question 4: Match the appropriate statements.

<table>
<thead>
<tr>
<th>A memory area shared by hardware devices or program processes that operate at different speeds or with different sets of priorities.</th>
<th>Interrupt</th>
</tr>
</thead>
<tbody>
<tr>
<td>A technique that continually interrogates a peripheral device to see if it has data to transfer.</td>
<td>Handshaking</td>
</tr>
<tr>
<td>A signal from a device attached to a computer or from a program within the computer that causes the operating system to stop doing the current processing.</td>
<td>Buffer</td>
</tr>
<tr>
<td>The process by which two devices initiate communications and one device sends a message to another device indicating that it wants to establish a communications channel.</td>
<td>Checksum</td>
</tr>
<tr>
<td>An error detection technique which is used to count the number of bits in a transmission unit that is included with the unit.</td>
<td>Polling</td>
</tr>
</tbody>
</table>

Types of Programming Languages
- Low Level Programming Language
- High level Programming Language

Types of Programming Language Translators
- Assembler
- Compiler
- Interpreter

Exam Style Question

Look at these two pieces of code:

A:

CLC
LDX #0
loop: LDA A,X
ADC B,X
STA C,X
INX
CPX #16
BNE loop

B:

FOR Loop = 1 TO 4
INPUT Number1, Number2
Sum = Number1 + Number2
PRINT Sum
NEXT

(a) Which of these pieces of code is written in a high-level language?
(b) Give one benefit of writing code in a high-level language.

(c) Give one benefit of writing code in a low-level language.

(d) High-level languages can be compiled or interpreted.

Give two differences between a compiler and an interpreter.

1

2

The Von Neumann Model
Fetch Decode Execute Cycle

Types of Registers

1. Instruction Register (IR)
2. Memory Data Register (MDR)
3. Memory Address Register (MAR)
4. Program Counter (PC)
5. Accumulator
Computer Network & Data Communication

- Serial & Parallel Transmission
- Error Detection Methods (Checksum, Parity bit method, CRC)
- Error Correction Methods (ARQ, FEC)
- Types of Network (LAN, WLAN & WAN)
- Role of Client & Server in a Network
- Communication Equipment for Internet (LAN Card, Switch, Router, Modem)
- Role of Web Browser & Web Server
- MAC vs IP Address
- HTTP vs HTML
- File Formats (Sound, Images, Video, Text)
- Compression (Lossy vs Lossless Compression)
- Internet Risks (Virus, Spyware, Trojan, Malware, Adware, Phising, Pharming, DoS, Hacking)
- Protection Against Internet Risks
- Encryption (Symmetric vs Asymmetric Encryption)
- Dial-up vs Broadband Connection

Exam Style Questions

Question 1:

(a) Which of the following activities should always be regarded as security risks to computer systems?
Indicate by ticking (√) the Yes or No column.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>chat rooms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>cookies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pharming</td>
<td></td>
<td></td>
</tr>
<tr>
<td>virus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VoIP</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Question 2:

A company uses an intranet which can also communicate with the outside world through the Internet.

(a) The system uses modems.

What is the purpose of a modem?
(b) Part of the company’s security strategy is to use a firewall.

Describe two features of a firewall.

1. .................................................................

2. .................................................................

(c) Connecting to the Internet can cause potential problems.

State two of these problems.

1. .................................................................

2. .................................................................

Question 3: A satellite earth station for a TV Channel is sending a 1,215 bytes long message to the Medium Orbit Satellite (MEO). Calculate the checksum value for this message with appropriate steps.
Question 4:

Bytes of data transferred using a serial cable are checked for errors at the receiving end using an even parity check.

Can these bytes of data pass the even parity check?

(a) 01010101

(b) 11001000

(c) How can any errors be corrected?

Question 5: Define the following terms.

IP Address:
MAC Address:
NIC:

Question 6: Differentiate between IPv4 and IPv6.

Question 7: What are the possible unique combinations for the following?

IPv4:
IPv6:
MAC:
**Question 08:** Match the appropriate ones.

<table>
<thead>
<tr>
<th>When the receiver detects an error in a packet, it automatically requests the transmitter to resend the packet.</th>
<th>WLAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>A method of obtaining error control in data transmission in which the source (transmitter) sends redundant data and the destination (receiver) recognizes only the portion of the data that contains no apparent errors.</td>
<td>Encryption</td>
</tr>
<tr>
<td>A software which allows you to visit websites and do activities within them like login, view multimedia, link from one site to another, visit one page from another, print, send and receive email, among many other activities.</td>
<td>Wide Area Network (WAN)</td>
</tr>
<tr>
<td>Special, powerful computers that provide ‘services’ to the client computers on the network.</td>
<td>Automatic Repeat Request (ARQ)</td>
</tr>
<tr>
<td>A network that extends over a large area. It is often created by joining several LANs together</td>
<td>Servers</td>
</tr>
<tr>
<td>A LAN that uses radio signals to connect computers instead of cables.</td>
<td>Forward Error Correction (FEC)</td>
</tr>
<tr>
<td>A secure protocol developed for sending information securely over the Internet.</td>
<td>Web Browser</td>
</tr>
<tr>
<td>A method of scrambling data in such a way that only the people who have the ‘secret key’ to unlock the message can read it</td>
<td>Secure Socket Layer (SSL)</td>
</tr>
</tbody>
</table>
Question 09:

(a) Draw a line to match each description to the appropriate technical term.

<table>
<thead>
<tr>
<th>Description</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>authoring language used to create documents to be viewed on the World Wide Web</td>
<td>Browser</td>
</tr>
<tr>
<td>computer that responds to requests to provide information and services over the Internet</td>
<td>HTML</td>
</tr>
<tr>
<td>defines how messages are transmitted and formatted over the Internet</td>
<td>MAC address</td>
</tr>
<tr>
<td>numerical ID for each device on the Internet</td>
<td>Internet Server</td>
</tr>
<tr>
<td>software that enables users to access/view documents and other resources on the Internet</td>
<td>IP address</td>
</tr>
<tr>
<td>unique ID for a network interface card</td>
<td>http</td>
</tr>
</tbody>
</table>
Question 10:

The diagram below shows a number of descriptions and terms used in computer security. By drawing arrows, connect the correct description to the computer security term.

- Program installed on a PC to gather data about the user. It monitors every key press and relays the data back to the home base. [Cookies]
- Junk (unsolicited) electronic mail advertising products and services sent to a general mailing list. [Phishing]
- Sending an email that claims to be from a legitimate company; the recipient is then directed to a bogus website where their personal details will be collected. [Pharming]
- Malicious code installed on a PC or on a server. This code directs users to a fraudulent website without their knowledge. [Spyware]
- Act of locating and possibly exploiting a wireless network by touring an area. This requires a laptop with relevant software and an antenna. [Spam]
- Information that a website stores about a user on the user’s hard disk; this enables the website to remember details about the user when they next visit the website. [War-driving]
**Question 11:**

In a simple symmetric encryption system, each letter of the alphabet is substituted with another.

The plain text message:

*The quick brown fox jumps over the lazy dog.*

becomes the cypher text message:

*Zag towns jumpy dmh coip mngu zag bfke qmx.*

(a) (i) Decode this cypher text message.

*Agbbm Pmubq*

------------------------------------------------------------------------------------------------------------------------

------------------------------------------------------------------------------------------------------------------------

2

(ii) Convert these words to cypher text.

*Computer Science*

------------------------------------------------------------------------------------------------------------------------

------------------------------------------------------------------------------------------------------------------------

2

(b) Both the person who sends the message and the person who receives it need to know what the substitution key is, and they need to keep this secret. A copy of the substitution key has been sent using SSL transmission.

Explain why this keeps the copy of the key secret during transmission.

------------------------------------------------------------------------------------------------------------------------

------------------------------------------------------------------------------------------------------------------------

------------------------------------------------------------------------------------------------------------------------

------------------------------------------------------------------------------------------------------------------------

2
Question 12:

A company advertises its Internet broadband speeds as follows:

- download speed of 128 megabits per second
- upload speed of 16 megabits per second \((8 \text{ bits} = 1 \text{ byte})\)

(a) Explain what is meant by the two terms download speed and upload speed.

  - download speed
  - upload speed

(b) Give two advantages of using broadband rather than dial-up.

  1.

  2.

(c) Give two different scenarios when a fast broadband connection is essential.

  1.

  2.

(d) How many 4-megabyte files could be downloaded per second using this company’s broadband?

...
Data Security

- Key Threats to Data Security
- Steps to Secure Data
- Data Verification (Double Entry, Proof Reading Data)
- Data Validation (Length Check, Format Check, Presence Check, Range Check, Spell Check, Check Digit)
- Computer Ethics (Copyright & Plagiarism)
- Types of Software Licensing (Free Software, Freeware, Shareware)
- Data Protection Act and Its Principals
- Types of Personal Data

Exam Style Questions

Question 1

A company selling CDs uses a unique 6-digit identification number for each CD title. The rightmost digit (position 1) is a check digit.

For example,

```
6 5 4 3 2 1  \rightarrow  digit position
3 0 6 1 4 9  \rightarrow  identification number
                         \rightarrow  check digit
```

The validity of the number and check digit is calculated as follows:

- multiply each digit by its digit position
- add up the results of the multiplications
- divide the answer by 11
- if the remainder is 0, the identification number and check digit are valid.

(a) Show whether the following identification numbers are valid or not. You must show how you arrived at your answer.

Identification number 1: 4 2 1 9 2 3

working: ........................................................................................................

........................................................................................................

........................................................................................................

........................................................................................................
valid or not valid?

Identification number 2: 8 2 0 1 5 6

working: .................................................................

.................................................................

.................................................................

valid or not valid? .................................................................

(b) Find the check digit for this identification number.

5 0 2 4 1 ___

working: .................................................................

.................................................................

.................................................................

check digit: .................................................................

(c) Describe, with examples, two different types of data entry errors that a check digit would detect.

1 .................................................................

.................................................................

2 .................................................................

.................................................................
Question 2:

(a) Name three features of a typical data protection act.

1

2

3

(b) Data being held is often referred to as Personal or Sensitive Personal data.

Give two examples of each type of data.

Personal Data

1

2

Sensitive Personal Data

1

2
Question 3:

A hospital holds records of its patients in a database. Four of the fields are:

- date of visit (dd/mm/yyyy)
- patient's height (m)
- 8-digit patient ID
- contact telephone number

The presence check is one possible type of validation check on the data. For each field, give another validation check that can be performed. Give an example of data which would fail your named validation check.

A different validation check needs to be given for each field.

<table>
<thead>
<tr>
<th>field name</th>
<th>name of validation check</th>
<th>example of data which would fail the validation check</th>
</tr>
</thead>
<tbody>
<tr>
<td>date of visit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>patient's height</td>
<td></td>
<td></td>
</tr>
<tr>
<td>patient ID</td>
<td></td>
<td></td>
</tr>
<tr>
<td>contact telephone number</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Question 4: Fill in the blanks with appropriate words.

1. _____________ is a software that gives its users the freedom to share, study and modify it.
2. _____________ any software that is distributed for use at a price of zero but may not be "free software".
3. _____________ is a software that is distributed free on a trial basis with the understanding that the user may need or want to pay for it later.
4. _____________ is the practice of taking someone else's work or ideas and passing them off as one's own.
5. A _____________ attack is an attempt to make a machine or network resource unavailable to its intended users.
6. _____________ is the protection of someone’s already published work and prevention of this work from being used without prior permission.
Pre-Release Programming Tasks - 2015

Task 1
A school keeps records of the weights of each pupil. The weight, in kilograms, of each pupil is recorded on
the first day of term. Input and store the weights and names recorded for a class of 30 pupils. You must
store the weights in a one-dimensional array and the names in another one-dimensional array. All the
weights must be validated on entry and any invalid weights are rejected. You must decide your own
validation rules. You may assume that the pupils’ names are unique. Output the names and weights of
the pupils in the class.

Task 2
The weight, in kilograms, of each pupil is recorded again on the last day of term. Calculate and store the
difference in weight for each pupil.

Task 3
For those pupils who have a difference in weight of more than 2.5 kilograms, output with a suitable
message, the pupil’s name, the difference in weight and whether this is a rise or a fall.

Exam Style Questions

Question 1: Declare the arrays to store the student names, weight on first day and last day with
appropriate data type.

Question 2: Write down the programming code/pseudocode or program flowchart to store the names
of students and weight in Kgs at first day and finally output the name and weight in kgs and average
weight. Do not include validation checks for weight.

Question 3: Write down the programming code/pseudocode or program flowchart to store the names
of students and weight in Kgs at first day and finally output the name and weight in kgs. Include
appropriate validation checks/rules.

Question 4: Write down programming code/pseudocode or program flowchart output the names and
weight of student in grams recorded at first day of term.

Question 5: Write down the programming code/pseudocode or program flowchart to store the weight
of students in Kgs at last day of term. Do not include validation checks for weight.

Question 6: Write down the programming code/pseudocode or program flowchart to store the weight
of students in Kgs at last day of term. Include appropriate validation checks for weight.

Question 7: Explain how you will select the student with maximum weight recorded at first day. You
may include pseudocode or programming statements to help illustrate your explanation.

Question 8: Explain how you will select the student with maximum weight recorded at last day. You may
include pseudocode or programming statements to help illustrate your explanation.

Question 9: Explain how you will select the student with minimum weight recorded at first day. You may
include pseudocode or programming statements to help illustrate your explanation.
**Question 10:** Explain how you will select the student with minimum weight recorded at last day. You may include pseudocode or programming statements to help illustrate your explanation.

**Question 11:** Write programming code/pseudocode or program flowchart to calculate the difference in between the weight of students recorded at first day and last day. Also show the number of students having a rise in their weight, decline in weight and no change in weight.

**Question 12:** List down suitable data sets along with examples that you may use and test on your code.

---

**Pseudocode**

Pseudocode is a false code which consists of plain English statements, mathematical notations and keywords that are commonly found in high level languages.

<table>
<thead>
<tr>
<th>Arithmetic Operator</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>Addition</td>
</tr>
<tr>
<td>-</td>
<td>Subtraction</td>
</tr>
<tr>
<td>*</td>
<td>Multiplication</td>
</tr>
<tr>
<td>/</td>
<td>Division</td>
</tr>
<tr>
<td>^</td>
<td>Show power of a number</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Comparison Operator</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>=</td>
<td>Equal to</td>
</tr>
<tr>
<td>&lt;&gt;</td>
<td>Not equal to</td>
</tr>
<tr>
<td>&lt;</td>
<td>Less Than</td>
</tr>
<tr>
<td>&gt;</td>
<td>Greater Than</td>
</tr>
<tr>
<td>&lt;=</td>
<td>Less Than or Equal to</td>
</tr>
<tr>
<td>&gt;=</td>
<td>Greater Than or Equal To</td>
</tr>
</tbody>
</table>

**Assignment Operator:**

It is denoted by either of the following:

- \( \leftarrow \)
- \( = \)
- \( := \)

**Input in Pseudocode (INPUT, READ, ENTER)**

**Output in Pseudocode (OUTPUT, WRITE, PRINT)**

**Variable**

**Totalling & Counting**

**FOR...TO...NEXT**
WHILE...DO...ENDWHILE
REPEAT...UNTIL
IF...THEN...ELSE...ENDIF
CASE...OF...OTHERWISE...ENDCASE

Exam Style Questions

Question 1:
(a) Write an algorithm, using pseudocode or a flowchart, which
\begin{itemize}
  \item inputs a set of positive numbers (which end with -1)
  \item outputs the average (mean) value of the input numbers
  \item outputs the value of the largest (highest) number input
\end{itemize}
(b) Write an algorithm, using pseudocode or a flowchart, which
\begin{itemize}
  \item inputs a whole number (which is > 0)
  \item calculates the number of digits in the number
  \item outputs the number of digits and the original number
\end{itemize}
(E.g. 147 would give an output of 3, 147)

Question 2:

A school is doing a check on the heights and weights of all its students. The school has 1000 students.

Write an algorithm, using pseudocode or a flowchart, which
\begin{itemize}
  \item inputs the height and weight of all 1000 students
  \item outputs the average (mean) height and weight
  \item includes any necessary error traps for the input of height and weight
\end{itemize}

Program Flowchart

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Name</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Start/end</td>
<td>An oval represents a start or end point.</td>
</tr>
<tr>
<td></td>
<td>Arrows</td>
<td>A line is a connector that shows relationships between the representative shapes.</td>
</tr>
<tr>
<td></td>
<td>Input/Output</td>
<td>A parallelogram represents input or output.</td>
</tr>
<tr>
<td></td>
<td>Process</td>
<td>A rectangle represents a process.</td>
</tr>
<tr>
<td></td>
<td>Decision</td>
<td>A diamond indicates a decision.</td>
</tr>
</tbody>
</table>
Exam Style Questions

Question 1:

The flowchart inputs the size of a number of car engines; a value of -1 stops the input.
This information is output: average engine size and number of engines with size > 1.5

START

Engine ← 0
Count ← 0
Number ← 0

INPUT Size

is Size = -1 ?
Yes Average ← Engine/Number

is Size > 1.5 ?
Yes Count ← Count + 1

No Number ← Number + 1

Engine ← Engine + Size

OUTPUT Average, Count

STOP
Complete the trace table for the input data.
1.8, 2.0, 1.0, 1.3, 1.0, 2.5, 2.0, 1.3, 1.8, 1.3, -1

<table>
<thead>
<tr>
<th>Engine</th>
<th>Count</th>
<th>Number</th>
<th>Size</th>
<th>Average</th>
<th>OUTPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Question 2:

A heating system is being controlled by sensors and a computer. The temperature must be kept between 15°C and 25°C. If 30°C is exceeded a warning message is generated and the system shuts down.

A flowchart of the process is shown below. Some of the items are missing.

Complete the flowchart, using item number only, from the list of items given.

**List of Items**

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Item Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>convert data to digital using ADC</td>
</tr>
<tr>
<td>2</td>
<td>are data digital?</td>
</tr>
<tr>
<td>3</td>
<td>is temperature &lt; 15°C?</td>
</tr>
<tr>
<td>4</td>
<td>is temperature &gt; 25°C?</td>
</tr>
<tr>
<td>5</td>
<td>is temperature &gt; 30°C?</td>
</tr>
<tr>
<td>6</td>
<td>output warning message</td>
</tr>
<tr>
<td>7</td>
<td>send signal to turn OFF the heater</td>
</tr>
<tr>
<td>8</td>
<td>send signal to turn the heater ON</td>
</tr>
<tr>
<td>9</td>
<td>send signal to shut down the heater</td>
</tr>
</tbody>
</table>
Database

- Field vs Record
- Primary Key vs Foreign Key
- Data Types in Database
  1. Alphanumeric or Text
  2. Number
  3. Date/Time
  4. Currency
  5. Auto number
  6. Logical, Boolean, Yes/No

Exam Style Question
A survey of motorways was carried out and a database was produced. A section of the database is shown below.

<table>
<thead>
<tr>
<th>Motorway ID</th>
<th>Length (km)</th>
<th>Cars per day</th>
<th>Toll charge per km ($)</th>
<th>Number of lanes</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1</td>
<td>100</td>
<td>50000</td>
<td>0.60</td>
<td>2</td>
</tr>
<tr>
<td>M2</td>
<td>210</td>
<td>75000</td>
<td>0.40</td>
<td>3</td>
</tr>
<tr>
<td>M3</td>
<td>180</td>
<td>60000</td>
<td>0.50</td>
<td>4</td>
</tr>
<tr>
<td>M4</td>
<td>40</td>
<td>20000</td>
<td>0.30</td>
<td>3</td>
</tr>
<tr>
<td>M5</td>
<td>25</td>
<td>15000</td>
<td>0.10</td>
<td>2</td>
</tr>
<tr>
<td>M6</td>
<td>100</td>
<td>40000</td>
<td>0.70</td>
<td>4</td>
</tr>
<tr>
<td>M7</td>
<td>30</td>
<td>10000</td>
<td>0.40</td>
<td>2</td>
</tr>
<tr>
<td>M8</td>
<td>150</td>
<td>60000</td>
<td>0.60</td>
<td>4</td>
</tr>
</tbody>
</table>

(a) How many fields and how many records are shown?
  (i) number of fields
  (ii) number of records

(b) Using Motorway ID only, what would be output if the following search condition was used?

(Length (km) > 100) AND (Number of lanes > 3)
You can start programming the movement of turtle by using the following web link:

http://turtleacademy.com/learn.php

A very simple language consisting of very few commands.

- **Forward n** where *n* is distance turtle will cover in **forward direction**. So for example, **Forward 10** means turtle will move 10 units distance in forward direction.

- **Backward n** where *n* is distance turtle will cover in **backward direction**. So for example, **Backward 10** means turtle will move 10 units distance in backward direction.

- **Right n** where *n* is angle at which turtle will **turn in right hand direction**. So for example, **Right 90** means the turtle will turn 90 degrees in right hand direction.

  Important to remember **Right 90 = Left 270**

- **Left n** where *n* is angle at which turtle will **turn in left hand direction**. So for example, **Left 90** means the turtle will turn 90 degrees in left hand direction.

  Important to remember **Left 90 = Right 270**

- **Penup** when some movement or turn is to be performed without tracing it.

- **Pendown** when some movement or turn is to be performed by tracing it.

- **Repeat n** It is a programming code used to repeat one same line of code or multiple same lines of code for *n* times. Where *n* is the number of times we want to repeat for example 3 or 4 or 8 etc.

  **Endrepeat** It tells the end of a **Repeat n** statement. It must be used after each **Repeat n** statement.
Exam Style Questions

Question 1:

Write down the Logo Language instructions for drawing the following shape.
Question 2: Write down the Logo Language instructions for drawing the following shape.

Pendown
Left 45
Forward 28
Right 45
Forward 20
Right 135
Forward 28
Left 90
Forward 28
Right 135
Forward 20
Right 45
Forward 28
Penup