

2024 Sec 4 Computing Prelim Script Review

Proudly sponsored by



This is *not* a work of fiction. Answers photographed
are *not* the products of the author's imagination.
Any resemblance to answers of actual students,
living or dead, is purely intentional.

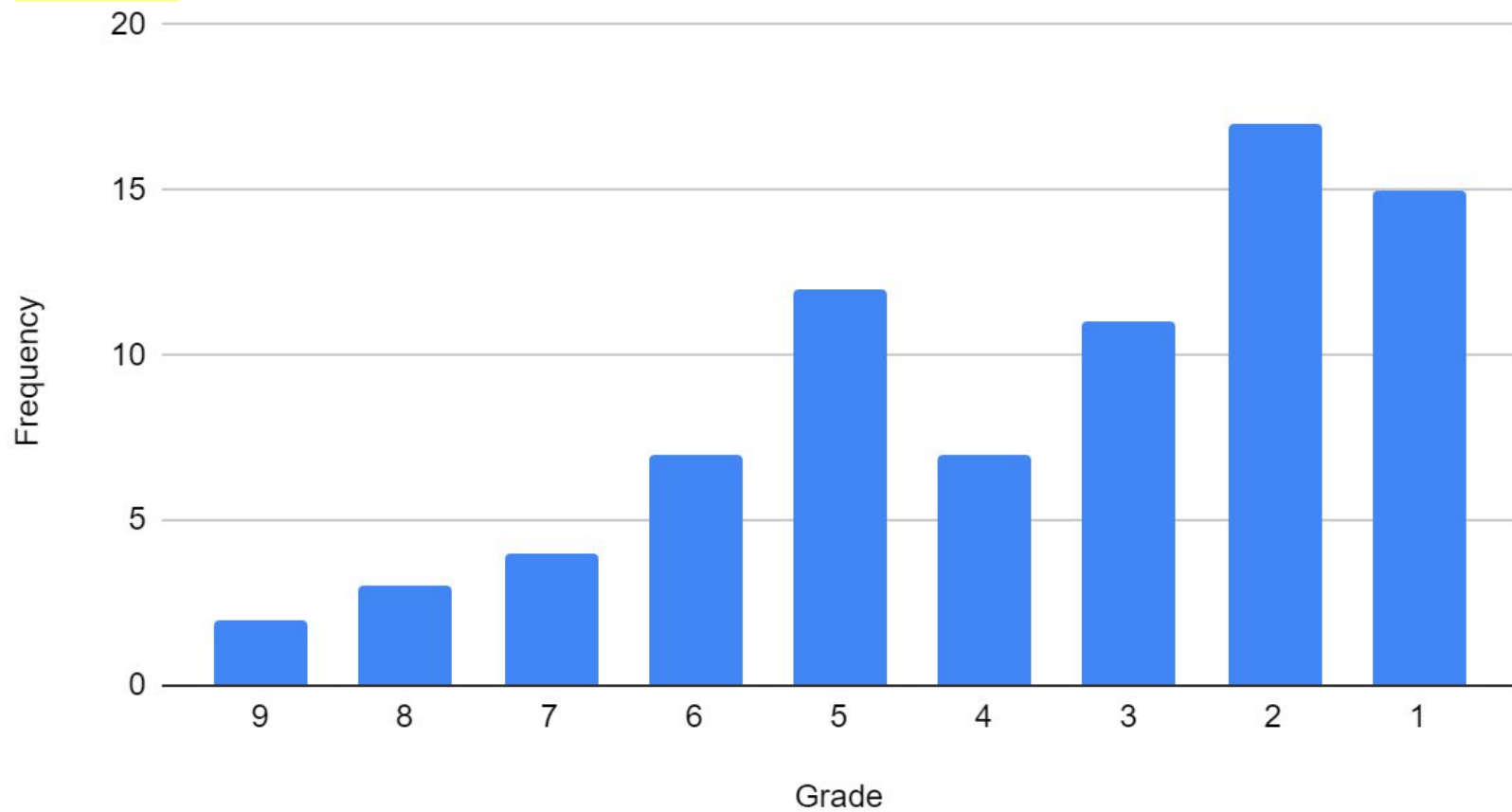
However, any resemblance to students'
handwriting is purely coincidental and not meant to
be a personal attack.

Instructions

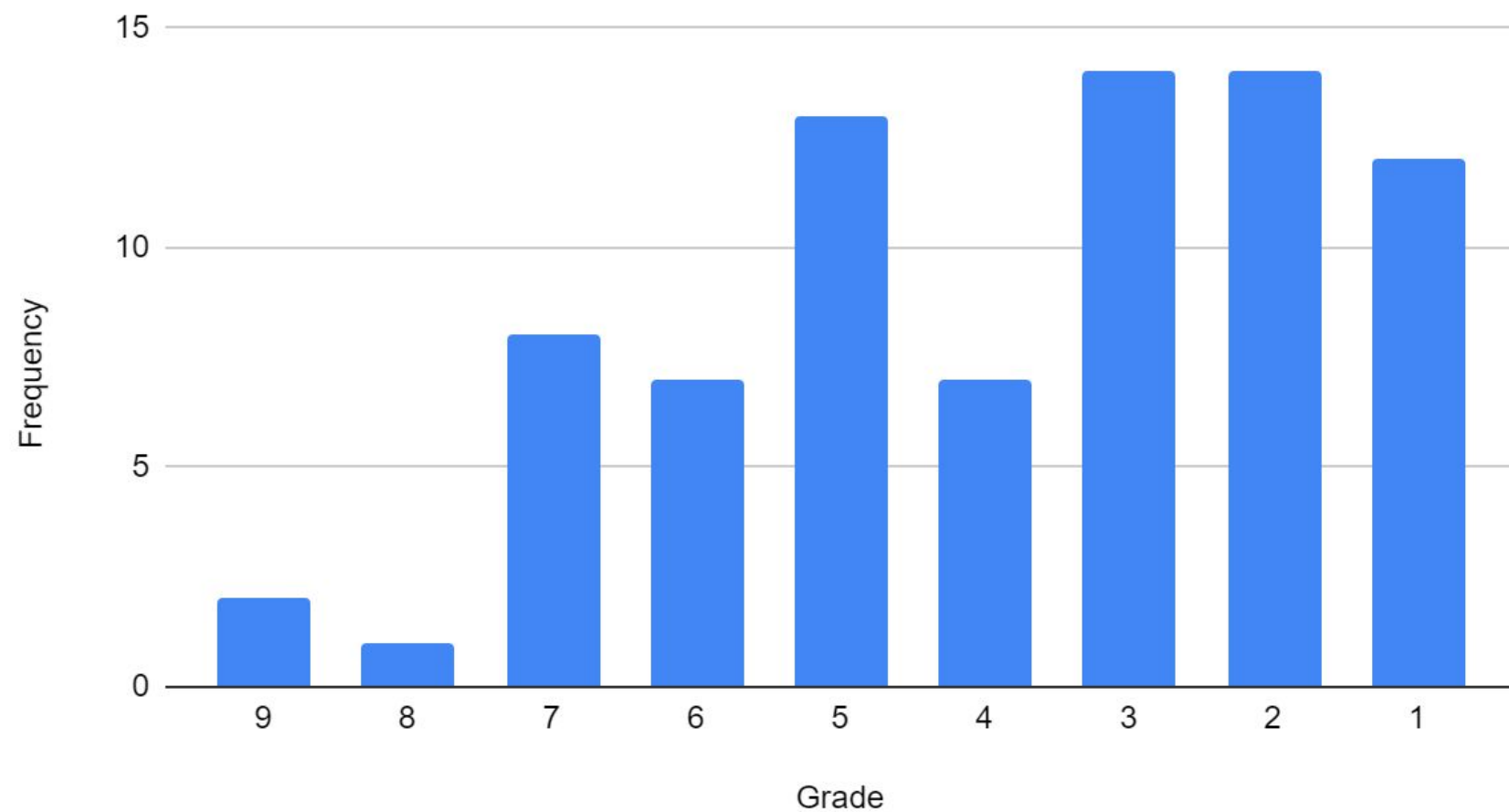
You are only allowed a green pen and
a calculator on the table.

All other things should be kept in your bag.

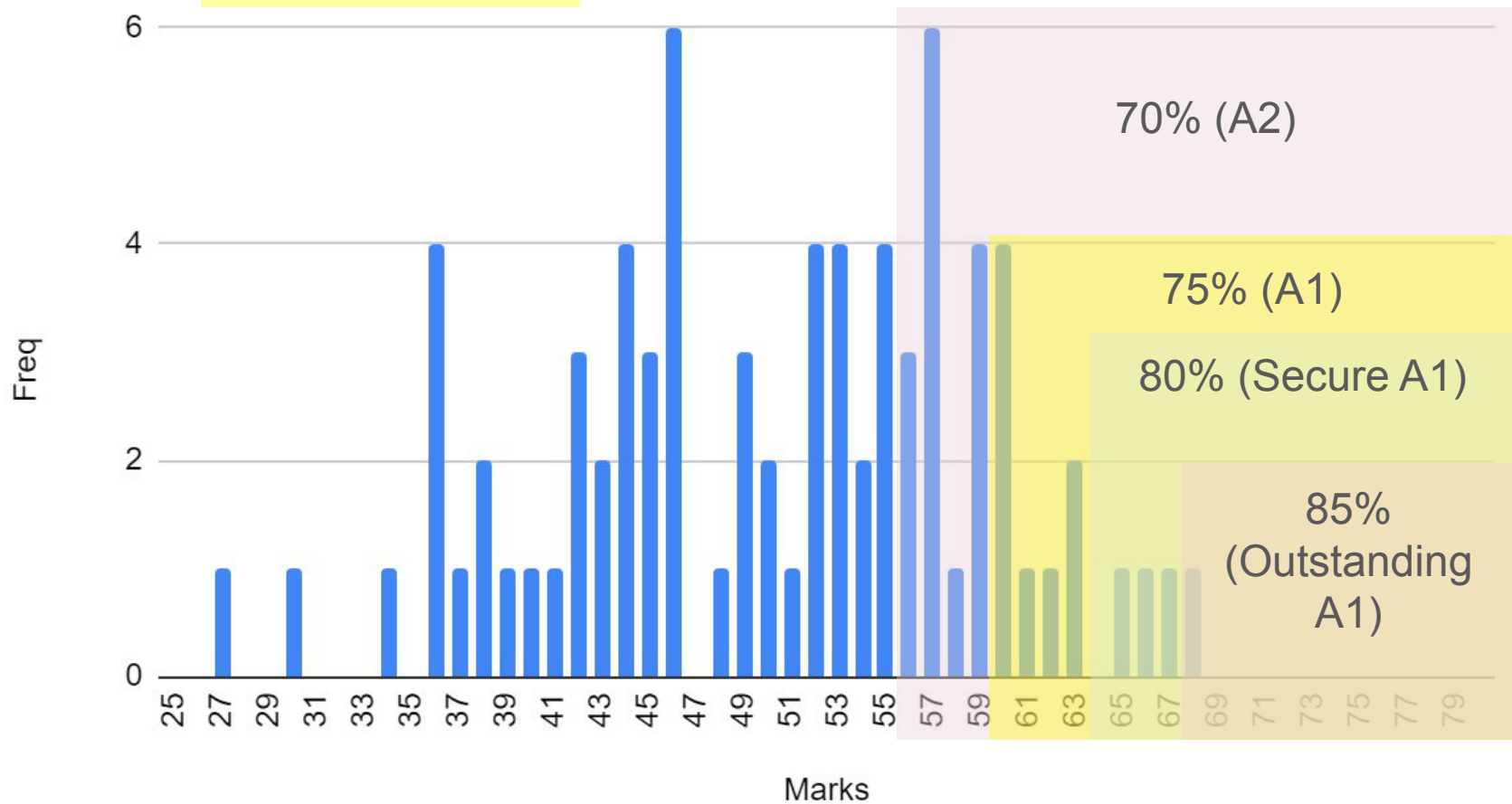
Overall vs Grade



Paper 1 vs Grade



Freq vs Marks (Paper 1)



Paper 1



**don't you want
your grades to
RISE?**

Examination Techniques

COMPUTING+

TABLE OF CONTENTS



01

READ

Read the question.



02

IDENTIFY

Identify the topic being tested in the question.



03

SELECT

Select the key words/phrases in the question.



04

EXPLAIN

Explain and elaborate your answers according to the mark allocation in question.

Question 1a

- (a) Explain how the components of multi-core processor can benefit Sigma Designs in running their 3D modelling and simulation software.

Ans:

A multi-core processor can handle more data and perform more instructions at the same time.

This will benefit Sigma Designs as 3D modelling uses lots of data to account for the extra dimension when compared to simpler 2-dimensional designs.

3D simulations also require many instructions/calculations to be performed simultaneously to render images and simulate physics smoothly.

Question 1b

- (b) Explain why data buses are not needed to copy data between two processor registers.

Ans:

The data bus transports data from the memory to be processed on the CPU and data that has already been processed from the CPU to the memory. Processor registers are physically located inside the processor and therefore the data is transferred within the processor without using the data bus.

Note: Students need to mention what data bus does and why the two processor registers does not need it.

Question 1c

Note: Students need to compare, A1 vs. A2 and B1 vs. B2, Do not state A1 and B does not have A1.

- (c) Compare magnetic and optical storage media in terms of capacity and durability. Recommend the most suitable storage medium for Sigma Designs to store and access their large volumes of data quickly and securely.

Ans:

Magnetic Storage vs. Optical Storage:

- Magnetic Storage's capacity is higher (up to terabytes) vs. Optical Storage's moderate capacity (up to gigabytes)
- Magnetic Storage is easily damaged and will eventually break over time whereas Optical Storage is vulnerable to scratches and fingerprints

Magnetic Storage Suitability: Good for large data volumes, but not ideal for speed and durability concerns. Optical Storage is not ideal for large, frequently accessed data.

Question 2a

Daksh has just moved into a new house and wants to set up a network that includes his laptop, desktop, smartphone, smart TV, and a wireless printer. He wants to be able to print from any device and have fast, reliable internet access throughout the house.

- (a) Identify two necessary network hardware components Daksh would need and explain the function of each component.

Ans: Any 2 of the following

Modem: The modem is responsible for modulation and demodulation. The modem is needed to connect to the internet provided by the Internet Service Provider.

Router: A router forwards packets between separate networks and distributes the internet connection to all devices within the network, both wired and wireless.

Wireless Access Point (WAP): A wireless access point (WAP) is network hardware that provides a connection between wireless devices up to 100 metres away and can connect to wired networks. Allows Daksh's wireless devices (laptop, smartphone, smart TV, wireless printer) to connect to the network.

Ethernet Cables: Connect devices that require a wired connection, such as the desktop and potentially the router to the modem.

Question 2b

(b) What is a Service Set Identifier?

Ans:

A service set identifier (SSID) is a string of up to 32 bytes that identifies a wireless access point (WAP), and all the devices connected to it.

Note: Many students quoted 32 bits instead of 32 bytes... 32 bytes = 256 bits... huge difference. Need to pay attention to details.

Question 3

Describe: Give a factual account of the distinctive features of an item. Give more information on the “what” and “how”.

Describe one positive and one negative social or economic impact of using the passport-free, biometric ABCS lanes instead of counters manned by immigration officers who manually check travellers' passports.

Ans: **Positive:** *Any of the following*

Economic:

- There is **Cost Reduction** as ABCS can reduce operational costs such as manpower costs by replacing human labour with the ABCS machines.
- There is **Increased Productivity** as automation and advanced technologies such as the ABCS often lead to higher productivity and efficiency, as machines can work longer hours/ reduces the possibilities of human errors from fatigue.

Social:

- There is **Higher Quality of Life** as the ABCS lanes will reduce the need for immigration officers from the menial task of checking travellers' passports potentially reducing their workload and need for night shifts.
- There is **Greater Convenience** as travellers can now clear the immigration checkpoints faster with more lanes without needing to scan their passports.

Question 3

Describe one positive and one negative social or economic impact of using the passport-free, biometric ABCS lanes instead of counters manned by immigration officers who manually check travellers' passports.

Ans: **Negative:** *Any of the following*

Economic:

- There is an increase in **Capital Investments Costs**. The initial investments in the ABCS can be high and there are recurring costs to maintain the ABCS lane machinery and equipment.

Social:

- There is a need for **Up-skilling/Re-skilling**. Immigration officers need to acquire new skills to manage the ABCS. Older officers may find it more difficult to cope with changes and new roles.

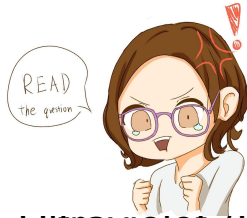
Question 4

The table below contains statements about software licenses.

Tick one or more boxes in each row to indicate if the statement is true for free and open-source (FOSS) software, freeware and shareware.

Statement	FOSS software	Freeware	Shareware
May be legal to copy and distribute	✓	✓	✓
Considered a limited version of proprietary software		✓	
Source code is kept secret		✓	✓
May be legally modified	✓		
Copyrighted	✓	✓	✓

Question 5a



Kaden has obtained the Ultraviolet (UV) Index readings from the school field. The readings have been taken hourly for a week, with the first reading at 7am and the last reading at 7pm, and recorded in **a text file**. The UV Index values are whole numbers ranging from 0 to 10 inclusive.

Kaden writes a program to analyse the readings to find out the number of days that the average UV Index reading is more than 7.

(a) Specify one input to the program and state one requirement for the input to be valid.

Ans:

Input: A text file with all the UV Index readings.

Requirement: The text file must not be empty.

OR

The values in the text file must all be integer values ranging from 0 to 10 inclusive.

OR

The text file must have 91 (13×7) individual values.

Question 5b

Kaden writes a program to **analyse the readings to find out the number of days that the average UV Index reading is more than 7**.

- (b) The problem can be decomposed into smaller and more manageable parts before Kaden writes the program.

Cambridge:

- Stronger responses considered the whole problem and identified individual parts that would need to be actioned and then combined to produce the whole response.
 - E.g. Calculate the average UV index for each day by adding all the UV index values for each day and dividing it by the number of readings for the day.
- The weaker responses copied text directly from the problem description.
 - E.g. Find out the number of days that the average UV Index reading is more than 7
- Do not give the whole problem (goal is to decompose the problem).

Question 5b

Tip: If you are copying from the question, you are doing it wrong. Try interpreting the question like you would do when considering how each part of the question should be coded.

Kaden writes a program to **analyse the readings to find out the number of days that the average UV Index reading is more than 7**.

- (b) The problem can be decomposed into smaller and more manageable parts before Kaden writes the program.

Ans: Any 2 of the following

- **Read in/Input** the values from the text file.
- **Calculating** the average UV index of each day/ Adding all the UV index values for each day and dividing it by 13/number of readings for the day
- **Checking** if the average UV index of each day is more than 7
- Using a counting variable to **count** the number of days where the UV index of each day is more than 7

Question 5c

Note: Memory cards are solid-state drives. They are very sturdy and not vulnerable to shocks, drops or scratches.

- (c) Kaden saves the data onto a memory card. He also uploads the data to a cloud storage service and shares it with his project groupmates.

Describe two kinds of human actions that may threaten the integrity or availability of the data. For each way, describe one measure Kaden can take to prevent it. Each measure must be different.

Ans: Any 2 of the following

Human Action: Storage devices may be accidentally damaged by water or extreme temperature.

Preventive Measure: *Any of the following; the first point may not be repeated*

- Make regular backups of data.
- Use adequate protection when storing storage devices, such as keeping it in a waterproof bag away from extreme heat.

Human Action: Not ejecting the memory card properly before physical removal

Preventive Measure: *Any of the following; the first point may not be repeated*

- Make regular backups of data.
- Ensure to eject the memory card from the computer and check for confirmation before removing the card physically.

Question 5c (continued)

Ans: Any 2 of the following

Human Action: Overwriting of data due to multiple users working on the same file in the cloud.

Preventive Measure: *Any of the following; the first point may not be repeated*

- Make regular backups of data.
- Set up proper rules for the editing of the data, such as only one editor at a time.

Human Action: Some malicious software may purposely damage and corrupt data as a way of attacking the computer that the memory card is inserted into.

Preventive Measure: *Any of the following; the first point may not be repeated*

- Make regular backups of data.
- Avoid opening email/chat attachments or files from unknown sources.
- Install and configure a firewall to prevent them from spreading through the network.
- Install anti-virus and anti-spyware software, as well as perform regular scans and updates.

Human Action: The file may be accidentally overwritten or deleted/ the memory card may be misplaced.

Preventive Measure: *Any of the following; the first point may not be repeated*

- Make regular backups of data.

Question 6ai

(a) (i) Convert the first byte of the IPv4 address to hexadecimal.

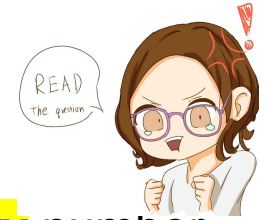
Ans: $B3_{16}$

MUST be accompanied by
either working

Denary	Quotient	Remainder
179	11	$3_{10} = 3_{16}$
11	0	$11_{10} = B_{16}$

16^1	16^0
$11_{10} = B_{16}$	3

Question 6a ii



(a) (ii) Convert the second byte of the IPv4 address to a **1-byte binary** number.

Ans: $0110\ 0101_2$

MUST be accompanied by
either working

Denary	Quotient	Remainder
101	50	1
50	25	0
25	12	1
12	6	0
6	3	0
3	1	1
1	0	1

2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
0	1	1	0	0	1	0	1

Question 6b

(b) State one common use of the hexadecimal number system.

Ans:

Internet Protocol version 6 (IPv6) addresses.

OR

Media Access Control (MAC) addresses.

OR

Red-Green-Blue (RGB) colour codes.

OR

Extended American Standard Code for Information Interchange (ASCII) codes.

Note: Where possible, spell out the abbreviations.

Question 6c

Note: Be as detailed as possible... Since you are given an example, use it to illustrate every stage.

- (c) **Describe** how the hexadecimal number **2FA** is converted to denary. Give the denary value in your answer.

Ans:

Convert each alphabetical letter to its numerical value, with A = 10, B = 11 and so on, until F = 15.

From the last digit, assign each digit to a power of 16, starting with power 0.

Digit	2	F = 15	A = 10
Power of 16	16^2	16^1	16^0

Multiply each digit's numerical value with its corresponding power of 16 and add the resulting values up. $2 \times 16^2 + 15 \times 16^1 + 10 \times 16^0 = 762_{10}$

Question 7a, b

	A	B	C	D	E	F	G	H	I	J	K
1	No.	Item	Sales	Cost Price	Selling Price	GST Payable	Profit per piece	Total Profit		Prevailing GST	9%
2	1	Chocolate Chip Cookie	73	\$0.50	\$1.00	\$0.08	\$0.42	\$30.47			
3	2	Oatmeal Cookie	44	\$0.60	\$1.00	\$0.08	\$0.32	\$13.97			
4	3	Peanut Butter Cookie	81	\$0.45	\$1.00	\$0.08	\$0.47	\$37.86			
5	4	Pandan Cake	20	\$15.00	\$20.00	\$1.65	\$3.35	\$66.97			
6	5	Unicorn Cake	34	\$25.00	\$40.00	\$3.30	\$11.70	\$397.71			
7	6	Kueh Lapis	19	\$27.00	\$45.00	\$3.72	\$14.28	\$271.40			
8	7	Strawberry Shortcake	0	\$20.00	\$35.00	\$2.89	\$12.11	\$0.00			
9											
10							Total profit from all sales	\$818.38			
11							Target total profit	\$1,500.00			

- (a) Cell H10 displays the total profit from the sales from items 1 to 7, rounded to 2 decimal places. Describe the formula that will be used in H10.

Ans: The SUM() function will be used to add up the values in cells H2:H8.

The ROUND() function will be applied to the result of SUM() to round it to 2 decimal places.

- (b) Identify the **type of cell referencing** that allows the value in K1 to be used in each formula from F2 to F8, without re-entering the cell reference each time.

Ans: Absolute cell reference

Question 7c

	A	B	C	D	E	F	G	H	I	J	K
1	No.	Item	Sales	Cost Price	Selling Price	GST Payable	Profit per piece	Total Profit		Prevailing GST	9%
2	1	Chocolate Chip Cookie	73	\$0.50	\$1.00	\$0.08	\$0.42	\$30.47			
3	2	Oatmeal Cookie	44	\$0.60	\$1.00	\$0.08	\$0.32	\$13.97			
4	3	Peanut Butter Cookie	81	\$0.45	\$1.00	\$0.08	\$0.47	\$37.86			
5	4	Pandan Cake	20	\$15.00	\$20.00	\$1.65	\$3.35	\$66.97			
6	5	Unicorn Cake	34	\$25.00	\$40.00	\$3.30	\$11.70	\$397.71			
7	6	Kueh Lapis	19	\$27.00	\$45.00	\$3.72	\$14.28	\$271.40			
8	7	Strawberry Shortcake	0	\$20.00	\$35.00	\$2.89	\$12.11	\$0.00			
9											
10							Total profit from all sales	\$818.38			
11							Target total profit	\$1,500.00			

- (c) The baker has a target of a total profit of \$1500 from all sales, as shown in cell H11. Leaving all other values the same, describe how she can use the Goal Seek tool to adjust the Total Profit required from the sale of Strawberry Shortcakes in order to meet her target total profit.

Ans:

She can adjust the value in H8 so that H10 reaches 1500.

Question 8a

```
01 green = int(input())
02 other = int(input())
03 student = input()
04 if student == true:
05     total = 1.5 * (green + other)
06 else:
07     total = 1.8 * (green + other)
08 if green + other > 3 and green > 1:
09     total = 0.8 * total
10 if green + other > 3:
11     total = 0.9 * total
12 print total
```

(a) Identify the line numbers of two **logic errors** and give the corrected lines.

Ans:

Error: Line 8

Corrected line: if green + other > 3 and green **>=** 1:

Error: Line 10

Corrected line: **elif** green + other > 3:

Note: You are asked to write Python code...
Be sure to follow the Python syntax!

Question 8b

```
01 green = int(input())
02 other = int(input())
03 student = input()
04 if student == true:
05     total = 1.5 * (green + other)
06 else:
07     total = 1.8 * (green + other)
08 if green + other > 3 and green > 1:
09     total = 0.8 * total
10 if green + other > 3:
11     total = 0.9 * total
12 print total
```

(b) Identify the line numbers of two **syntax errors** and give the corrected lines.

Ans:

Error: Line 4

Corrected line: if student == "true":

Error: Line 12

Corrected line: print (total)

Note: While the expected input on line 3 is vague, it is definitely a string. This is the only way to fix the issue in just one line.

Students who typecasted the input on line 3 and corrected line 4 to True, got 1 mark in total.

Question 8c

```
01 green = int(input())
02 other = int(input())
03 student = input()
04 if student == true:
05     total = 1.5 * (green + other)
06 else:
07     total = 1.8 * (green + other)
08 if green + other > 3 and green > 1:
09     total = 0.8 * total
10 if green + other > 3:
11     total = 0.9 * total
12 print total
```

(c) Name the data type of the variable `total`.

Ans: Floating point/ float data type.

Note: If possible, give the full form "floating point".

Question 8di

- (d) (i) Name one data validation technique that can be used for the variable green and describe what it should check for in this context.

Ans: *Any of the following*

Format check.

Check if the variable is composed entirely of digits.

OR

Range check.

Check if the variable is more than or equal to 0.

OR

Presence check.

Check if the variable is not left blank.

Question 8dii

- (d) (ii) Write program code to implement the validation check you described in part (i). The code should repeatedly ask for input until it is valid.

Ans: *Any of the following, corresponding to answer in (i)*

Format check	Range check	Presence check
<pre>valid = False while valid == False: green = int(input()) if green.isdigit() == True: valid = True</pre>	<pre>valid = False while valid == False: green = int(input()) if green >= 0: valid = True</pre>	<pre>valid = False while valid == False: green = int(input()) if green != "": valid = True</pre>

Question 8e

- (e) (i) The program code does not have any constants. Suggest one way to modify the program code such that it uses constants in an appropriate way.

Ans:

The price of each pen for students and non-students can be stored as constant values.

OR

The discounts offered can be stored as constant values.

- (ii) Explain one advantage of assigning fixed values in a program as constants.

Ans:

It gives meaning to the value through the name of the constant.

OR

It makes the value easier to change in the future, especially if it appears more than one time in the code.

Question 9a

Ans:

Main program			<u>func()</u>		
a	b	Output	x	y	Value returned
133820					
	245				
			133820	245	
			245	133820	
			50	245	
			45	50	
			5	45	
			0	5	
					5
		5			

Question 9b, c

(b) Identify the purpose of the algorithm.

Ans: The purpose of the algorithm is to find the greatest common divisor/ highest common factor of a and b .

(c) The function $\text{func}(x, y)$ is known as a recursive function. Explain how $\text{func}(x, y)$ processes its arguments to produce the final return value.

Ans: The function repeatedly calls itself on the values y modulo x and x and returns y only when x is 0.

Question 9d

- (d) (i) Name the stage of developing a program where program developers may draw a flowchart.

Ans: Design solutions.

- (ii) Describe one other task besides drawing a flowchart that program developers may perform at this stage.

Ans: *Any of the following*

- Manually solving different simplified examples of the problem/ generalising the steps needed to produce the required output
- Trying different ways to break down the problem into smaller parts
- Comparing the problem (or its smaller parts) to other problems that have been solved before and identifying which algorithms can be used
- Estimating the amount of effort needed to write the code/ the time needed to complete the algorithm
- Consider the options available before any code is written.
- Choose an algorithm based on the resources available such as manpower and time.

Question 10a

(a) Complete the truth table for the following Boolean expression.
 $X = A \text{ OR NOT } B \text{ AND } C \text{ NOR } B$

Ans:

Note: Label each column clearly!

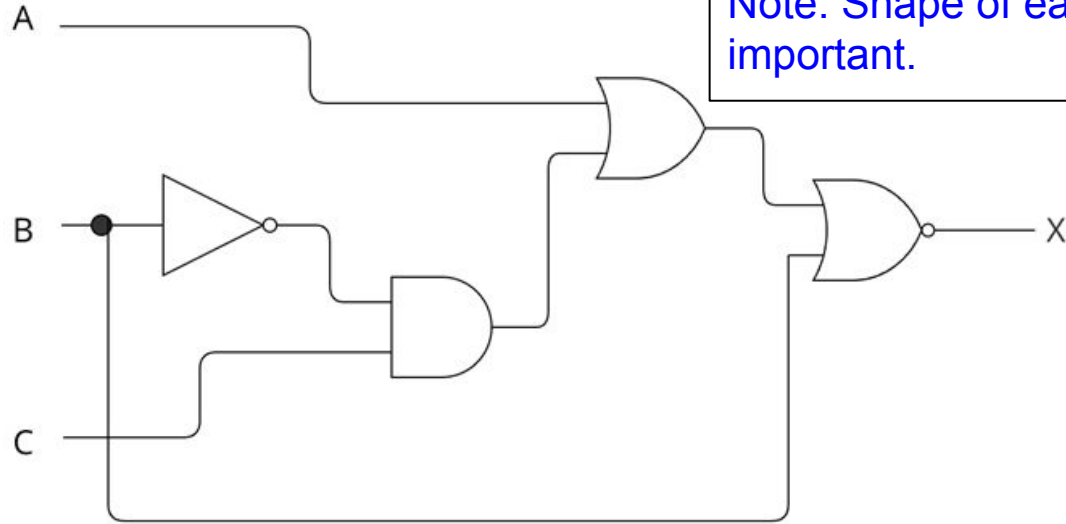
Order of operations:
NOT
AND
OR

A	B	C	Working Space			X
			$\overline{B}$	$\overline{B} \cdot C$	$A + \overline{B} \cdot C$	
0	0	0	1	0	0	1
0	0	1	1	1	1	0
0	1	0	0	0	0	0
0	1	1	0	0	0	0
1	0	0	1	0	1	0
1	0	1	1	1	1	0
1	1	0	0	0	1	0
1	1	1	0	0	1	0

Question 10b

(b) Draw the logic circuit for the expression in part (a). Do not simplify the expression.

Ans:



Note: Shape of each logic gate is important.

Note: Error carry forward given, for a max of 3 out of 4 marks.

Question 10c

- (c) Using the truth table from part (a), simplify the Boolean expression such that it only uses two distinct types of logic gates.

Ans: $X = \overline{A + B + C}$

Note: Answers accepted based on students' part (a) answer.

Question 11

Parity check is an error-checking technique which uses a parity bit to detect errors. The parity bit is an additional bit which is either appended or prepended to a string of binary data for transmission.

Write program code to:

- take input of the type of parity check system to be used (either Odd or Even)
- take input of a string of bits
- determine and output whether the string is valid or invalid according to the parity system
- repeatedly take input of strings of bits and output their validity until the user indicates that the algorithm should stop.

Ans:

Question 11

Ans: *Any 6 of the following*

- a) Input of parity check system and string
- b) Loop for each character of the string
- c) Check if each character is "1" and add to counting variable if it is
- d) Calculating the number of "1"s modulo 2
- e) Output of "valid" or "invalid" correctly, depending on parity and modulo value
- f) Ask if user wants to continue checking more strings...
- g) ... and loop back to input based on reply

Note: 1 mark penalty for syntax error (eg. missing ":", indentation error, capitalised "For"/"If")

Question 11

Ans:

```
system = input("What parity system do you want to use? Enter \"O\" for  
odd and \"E\" for even: ")  
cont = "Y"  
while cont != "N": #g; make sure you look the input of bits but not  
parity  
    string = input("Enter a string of bits: ") #a  
    num_ones = 0  
    for char in string: #b  
        if char == "1":  
            num_ones += 1 #c  
    if (system == "O" and num_ones % 2 == 1) or (system == "E" and  
num_ones % 2 == 0): #d  
        print(f"The string of bits {string} is valid.")  
    else:  
        print(f"The string of bits {string} is not valid.") #e  
    cont = input("Do you wish to continue checking? Press \"N\" to quit,  
any other key to continue: ") #f
```

*This programme has been
brought to you by*

