

ST PETER'S COLLEGE



SUBJECT: INFORMATION TECHNOLOGY

PAPER II

GRADE: 12

DATE 1 AUGUST 2024

MARKS: 150

EXAMINER: IT CLUSTER

TIME: 3 HOURS

MODERATOR: IT CLUSTER

FULL NAME: _____

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY:

- 1. This question paper consists of 27 pages. Please check that your question paper is complete.
- 2. Read the questions carefully and make sure that you answer all parts of all the questions.
- 3. **Answer ALL the questions on the question paper and hand this in at the end of the examination. Remember to write your name in the space provided.**
- 4. Show all working where applicable.
- 5. A non-programmable calculator may be used.
- 6. It is in your own interest to write legibly and to present your work neatly.
- 7. Three pages of lines are included at the end of the paper. If you run out of space for a question, use this page. Clearly indicate the number of your answer should you use this extra space.

Question	1	2	3	4	5	6	7	8	Total
Possible Marks	10	5	30	9	31	15	20	30	150
Actual Marks									

SECTION A SHORT QUESTIONS

QUESTION 1 DEFINITIONS

10 MARKS

Give the most appropriate term for each of the following expressions:

- 1.1 The process of converting typed or written text that was scanned into editable text, usually from the scanner (1)
- 1.2 A type of cable that uses light to transfer data. (1)
- 1.3 A signal sent to a computer's processor to momentarily interrupt its operations. (1)
- 1.4 The missing step in the machine cycle: Fetch, _____, Execute, Store. (1)
- 1.5 A wireless technology standard that transmits data over very short distances. (1)
- 1.6 A network topology that is a combination of one or more topologies. (1)
- 1.7 An attempt to obtain sensitive information from a user via email, under the guise of a trustworthy organization or entity. (1)
- 1.8 A design principle where computers are built with easily replaceable parts. (1)
- 1.9 An example of a low-level language. (1)
- 1.10 The component of the internal bus that transmits read and write signals to RAM. (1)

SECTION B

SYSTEM TECHNOLOGIES

QUESTION 2: THEORY

5 MARKS

For each of the terms in Column A below, you should select the **most correct** definition in Column C, matching the letter to the question number. You should merely write down the appropriate letter in Column B. An example is shown as Question 2.0, using “W” as the correct answer.

(5)

Column A		Column C	
2.0	2.0 Practical Examination	W	An examination where a student writes SQL and OOP code.
2.1	Multiprocessing	A.	Store most of their data remotely but use the processing power of a local device
2.2	Firmware	B.	Helps the CPU process mathematical operations using floating point arithmetic
2.3	Maths co-processor / FPU	C.	A step-by-step solution to a problem written in a logical order
2.4	Algorithm	D.	Code that the computer can understand and execute
2.5	Machine code	E.	Code that the developer can understand.
		F.	Permanent software programmed into a ROM chip
		G.	A form of browser attack where traffic is redirected to a fake website
		H.	Having multiple CPUs / cores on a single chip.
		I.	The automatic installation of hardware drivers when a new piece of hardware is inserted
		J.	When a computer appears to process multiple tasks at once by rapidly switching between them

Question Number:	2.0	2.1	2.2	2.3	2.4	2.5
Answer:	W					

SCENARIO

Consider the following scenario when answering the rest of the examination paper unless otherwise stated or the questions are of a general nature.

Sipho wants to earn extra money by playing games and streaming them online. He wants to play modern 3D games and stream them to his subscribers while he is playing. He does not have any other source of income and so he needs a good quality computer.

QUESTION 3

APPLICATION OF THEORY

30 MARKS

Sipho has bought the following computer which he will use to play 3D computer games.

Processor	AMD Ryzen 3.5GHz, 32MB Cache, 8x Core, 16x Threads
RAM	16GB DDR4 3600MHz SDRAM
Graphics	Onboard built-in Ryzen GPU
Secondary Storage	1TB NVME SSD Up to 3100MB/s
Ports	6 x USB Type-A 1 x USB Type-C 1 x HDMI 1 x RJ-45

3.1 Name and explain the function of three core components of a CPU.

Component	Function

(6)

3.2 Some modern processors can make use of hyperthreading.

3.2.1 Define hyperthreading.

(2)

3.2.2 How can you tell that this processor supports hyperthreading?

(2)

3.3 Sipho notices that this computer has a 32 MB processor cache.

3.3.1 How does processor cache help Sipho while playing games?

(2)

3.4 Sipho has heard about the term “Overclocking”.

3.4.1 What does it mean to overclock a component?

(2)

3.4.2 Explain by referring to the dangers of overclocking and the scenario, why Sipho should not overclock any components.

(2)

3.5 Sipho’s computer comes with an onboard graphics card. He notices that his games are running slowly. He decides to upgrade to a dedicated graphics card to fix this. Do you agree that this will help? Justify your answer by referring to the scenario.

YES ☐ NO ☐ (1)

3.6 Sipho’s computer has 16GB DDR4 SDRAM.

3.6.1 What is the purpose of RAM?

(2)

3.6.2 Why is DDR RAM better than non-DDR RAM?

(1)

3.6.3 When Sipho is loading some modern games and streaming at the same time his system occasionally runs out of RAM. One solution is to buy more RAM, the alternative is for his system to make use of virtual memory. Explain how virtual memory works.

(2)

3.6.4 With reference to the scenario, give two reasons why Sipho might choose to use virtual memory instead of buying more RAM.

Reason 1:	
Reason 2:	

(2)

3.7 By referring to the scenario and the properties of an SSD compared to an HDD, give two reasons why Sipho needs an SSD.

(2)

3.8 Sipho's computer uses UEFI to manage the booting process instead of BIOS. Give two advantages of UEFI over BIOS.

Advantage 1:	
Advantage 2:	

(2)

3.9 Explain how Sipho can plug his mouse, keyboard, headset and web camera into the computer at the same time.

(1)

SECTION C INTERNET AND COMMUNICATION TECHNOLOGIES

QUESTION 4 THEORY 9 MARKS

Select the most correct answer from the options A-D. There is an answer grid at the bottom of this page for your answers. Write down the appropriate letter for your answer.

- 4.1 Gateways ...
- A) amplify and boost the signal strength within a local area network (LAN).
 - B) connect and translate data between different network protocols or architectures.
 - C) store and forward emails for a specific domain.
 - D) provide centralized authentication and authorisation services.
- 4.2) Which of the following is NOT a security threat?
- A) Phishing links.
 - B) Unauthorised access.
 - C) Denial of Service attack.
 - D) SSL Certificates
- 4.3 Virtual Private Networks (VPN)...
- A) enhance the speed of your internet connection by bypassing your (ISP).
 - B) allow secure and private communication over a public network by encrypting data.
 - C) increase the amount of data storage available on your device.
 - D) protect your device from malware and viruses by scanning all incoming data.
- 4.4 Which of the following best describes the primary purpose of remote access in a network?
- A) To allow users to connect to a computer from a different location.
 - B) To enable multiple users to edit a document simultaneously in real-time.
 - C) To provide a backup solution for data stored on local devices.
 - D) To enhance the quality of video calls by optimizing bandwidth usage.
- 4.5 Frames in data layer...
- A) compress data for efficient storage.
 - B) convert digital data into analog data.
 - C) encapsulate and transport packets of data between devices on a network.
 - D) authenticate users and grant access to network resources.

QUESTION NUMBER	4.1	4.2	4.3	4.4	4.5
ANSWER					

4.6 For each of the protocols shown in the table below, provide a brief explanation of what each is used for. There is an example to guide you in answering.

Protocol	Use
POP3	Downloading emails where the email is removed from the file server and only stored as a local copy on the email client.
HTTPS	
FTP	
SMTP	

(3)

4.7 Describe the difference between lossy and lossless compression by describing the data when it is decompressed.

(1)

QUESTION 5 APPLICATION OF NETWORKING TECHNOLOGIES 31 MARKS

Sipho wants to create a network to host a LAN party with friends and play online.

5.1 Network topologies.

5.1.1 Define a network topology.

(1)

5.1.2 Sipho has decided to use a star topology.

Describe TWO advantages of a star topology.

Advantage 1:	
Advantage 2:	

(2)

5.1.3 Most star topologies use UTP cabling. List ONE advantage and ONE disadvantage of UTP as a connection medium. Your answers may not be opposites of each other.

Advantage	
Disadvantage	

(2)

5.2 A switch is used to connect the devices on the network. Sipho has bought a switch that is advertised as 10/100/1000.

5.2.1 Give the difference between a bridge and a switch.

(2)

5.2.2 The numbers 10/100/1000 refer to the speed at which data can be transmitted through the Ethernet ports.

Give the unit commonly used to measure fast network speeds.

--

(1)

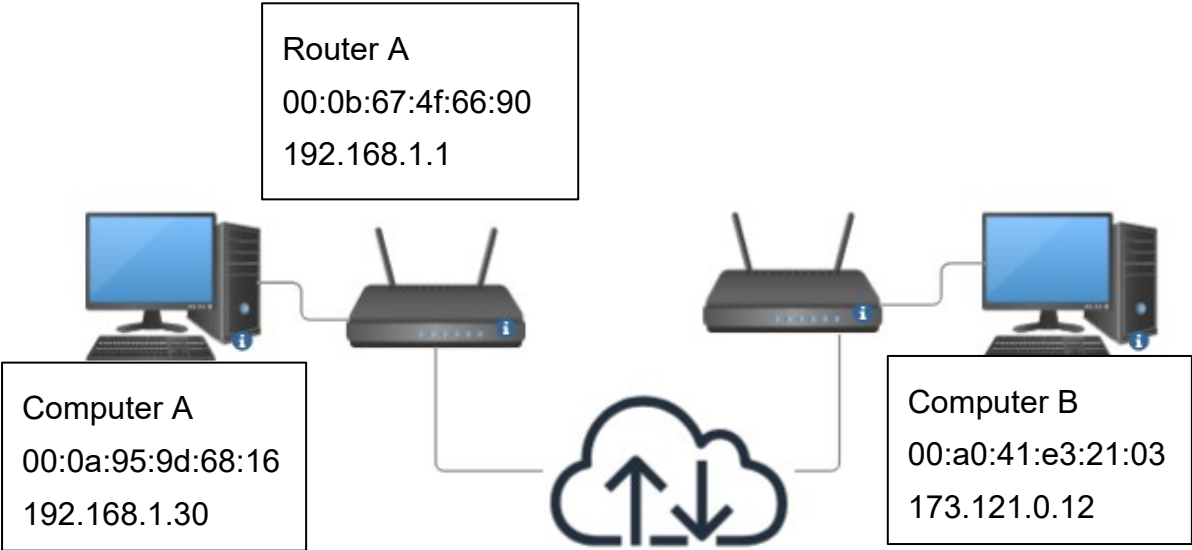
5.2.3 The switch can store up to 5000 entries of MAC Addresses.

Explain why a switch stores MAC Addresses. Refer to frames in your answer

(2)

5.3 A router transmits packets instead of frames.

5.3.1 The diagram below shows two computers connected to the Internet by routers. Complete the table underneath the diagram showing the addresses as one packet of data is sent FROM Computer A TO Computer B as it LEAVES LAPTOP A.



Destination MAC	Source MAC	Destination IP	Source IP

(4)

5.3.2 In addition to connecting to a network and retransmitting signals list ONE other function of a router.

Function 1:	

(1)

5.4 Clients

5.4.1 Define a thin client and a fat client

Thin client:	
Fat client:	

(2)

5.4.2 Give one reason why Sipho's friends should not use thin clients for the LAN party.

(1)

5.5 One of the games Sipho downloads does so by using a peer-to-peer network.

List TWO advantages of peer-to-peer file sharing.

Advantage 1	
Advantage 2	

(2)

5.6 Deep web and dark web

5.6.1 Define the deep web and the dark web.

Deep web	
Dark web	

(2)

5.6.2 Sipho advertises a website, www.siphogames.com for his gaming subscribers. Subscribers need to use a username and password to access the website.

Give TWO reasons why this is an example of the deep web and not the dark web.

Reason 1:	
Reason 2:	

(2)

5.7 Sipho has an excellent firewall on his machine. Explain why he is not completely protected from viruses. In your answer refer to the function of a firewall and how viruses are transmitted.

(2)

5.8 Sipho decides to store some of his data in the cloud
5.8.1. Give TWO advantages of using cloud storage.

Advantage 1	
Advantage 2	

(2)

5.8.2 Give an example of some data that Sipho might want to store on the cloud, related to streaming / subscribers.

(1)

5.9 Sipho has a router that allows for wired and wireless connections. Give ONE advantage and ONE disadvantage of using **only** wireless connections for his LAN party. Your answers may not be the opposite of each other.

Advantage	
Disadvantage	

(2)

SECTION D CURRENT AND FUTURE TRENDS

QUESTION 6 SOCIAL IMPLICATIONS 15 MARKS

Read the following text about the use of ChatGPT in education. This text was written by ChatGPT using the prompt: "Write 200 words about the use of ChatGPT in online gaming at a Grade 8 reading level."

ChatGPT can make online gaming much more fun and engaging. In multiplayer games, ChatGPT can be used as a smart character that talks to players, gives them quests, and makes the game's story more interesting. These characters can respond in real-time, making the game world feel more alive and interactive.

ChatGPT can also help players by giving hints, tips, and strategies. If a player is stuck on a hard level, ChatGPT can provide advice to help them move forward, reducing frustration and keeping the game enjoyable.

For game developers, ChatGPT can help create content like dialogue, story ideas, and quests. This can make the development process faster and more creative, leading to better and more exciting games.

Additionally, ChatGPT can improve player communities by moderating chat rooms and keeping them friendly and safe. It can spot and deal with bad behavior, making the gaming environment more enjoyable for everyone.

[Source: <https://chatgpt.com>]

6.1 ChatGPT is often described as a generative artificial intelligence. Define artificial intelligence.

(1)

6.2 Give TWO reasons why you believe ChatGPT has become such a successful product. The reason may be in any context, not only gaming.

Reason 1:	
Reason 2:	

(2)

6.3 Sipho is deciding which game he is going to play and stream to his audience. Explain ONE advantage and ONE disadvantage of choosing a game that uses ChatGPT to create characters and stories.

Advantage:	
Disadvantage:	

(2)

6.4 ChatGPT uses substantially more processing power and storage than any other current technology. Name and explain TWO reasons why this is a problem in the context of green computing.

Reason 1:	
Reason 2:	

(4)

- 6.5 ChatGPT was trained on millions of pieces of writing and pictures from all over the Internet. Some people believe that using ChatGPT to generate stories and pictures is unethical because people did not give permission for their data to be used.
- 6.5.1 Do you agree with the above statement?
- YES

NO
- (1)

6.5.2 Justify your answer.

(1)

- 6.6 While Sipho is online various companies will be gathering data about him. List TWO ways in which this data can be used to help Sipho and list TWO ways in which it can be harmful to Sipho.

Benefit 1:	
Benefit 2:	

Harm 1:	
Harm 2	

(4)

SECTION E DATA AND INFORMATION MANAGEMENT AND SOLUTION DEVELOPMENT

QUESTION 7 DATA REPRESENTATION 20 MARKS

Sipho is starting to attract subscribers to his streaming channels and needs a way to store information about subscribers, donations and any rewards that his subscribers earn.

7.1 Sipho decides to validate all the data that he collects before he stores it.

7.1.1 Sipho is validating the email address of a subscriber. Name and explain any TWO methods of validation he could use for an email address.

Method 1:	NAME:
	EXPLANATION:
Method 2:	NAME:
	EXPLANATION:

(4)

7.1.2 Sipho decides that because he has validated the information it is guaranteed to be correct. Do you agree with the statement?

YES ☐ NO ☐

(1)

7.1.3 Justify your answer to 7.1.2 with reference to validation and correctness.

(2)

7.2 Sipho decides to store the number of subscribers he has in a variable. Although it is unlikely, Sipho wants to ensure that if all 8 billion people in the world subscribed to his channels that the variable would be able to store the number.

7.2.1 Name the term used when a number is too large to fit into a variable.

--

(1)

7.2.2 A signed integer uses 32 bits to store a value and its sign. By means of a calculation show whether an integer is suitable to store a value of 8 billion (8 000 000 000).

Calculation:	
Conclusion (YES/NO):	

(3)

7.3 Note the data Sipho has collected about two of his subscribers:

Subscriber A		Subscriber B	
Name	Samuel	Name	Tawana
Subscriber	FALSE	TotalDonations	R 500
Nickname	Sam	Subscriber	TRUE
NumPets	2	SubDate	10/06/2024
		Nickname	

Note: Nickname has deliberately been left blank for Subscriber B.

7.3.1 Complete the JSON file below to store all the information for Subscriber A.

{

(4)

7.3.2 Sipho tries the following SQL statement to insert the data for Subscriber A into a table called tblSubs.

```
INSERT FROM tblSubs (Name, Subscriber, Nickname, NumPets)
VALUES ("Samuel", false, 2)
```

Rewrite the statement and correct TWO mistakes in the SQL code.

(2)

7.3.3 Should Sipho use a JSON file or an SQL database to store the details of ALL subscribers? Justify your answer by referring to the fields of Subscriber A and Subscriber B and the properties of your chosen structure in your answer.

JSON ☐ SQL ☐

(3)

QUESTION 8 SOFTWARE DEVELOPMENT30 MARKS

8.1 Sipho hires a programmer to create a program to manage the details of games that he has streamed for his audience. The **Game** class has the following fields:

- **name** – contains the name of the game as text.
- **lastStreamed** – contains the date that Sipho last streamed the game.
- **finished** – contains a Boolean value where TRUE means that Sipho has finished the game and FALSE means that Sipho has not finished the game.

All the above fields should be accessible only from inside of the class.

- **STREAMERID** – contains the static, constant text “Sipho762” which remains the same for all instances of the Game class.

The above field should be accessible from both inside and outside of the class.

The **Game** class has the following methods:

- **parameterised constructor method** which accepts parameters for the **name**, **lastStreamed** and **finished** fields.
- an **accessor/getter** method for the **name** field
- a **mutator/setter** method for the **finished** field which accepts a suitable parameter
- a **toString** method

Complete the class diagram for the **Game** class below showing all fields, methods, parameters, return types and access modifiers.

Game
Fields:
Methods:

(10)

8.2 An array of names called **incorrectNames** is shown below:

angel	claire	dimitri	mpho	nkosi	patience	reimo	shrivesh	wouter	andre
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8.2.1 Give one reason why the array above is NOT suitable for the binary search algorithm.

(1)

8.2.2 The array is reduced to the following 7 elements and called **nArr**.

angel	claire	dimitri	nkosi	patience	reimo	shrivesh
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A variable **target** has the value "claire"
A variable **size** has the value 6

The following algorithm uses the data in **nArr** and the variables above.

```
1      lower ← 0
2      upper ← size – 1
3      found ← false
4      while (lower <= upper && found = false)
5          mid ← (lower + upper) / 2
6          if (target > nArr[mid])
7              lower ← mid + 1
8          else if (target < nArr[mid])
9              upper ← mid – 1
10         else
11             found ← true
12     end if
13 end while
14 print mid
```

Complete the following trace table to show the algorithm's actions. You MUST include the line numbers as a reference to the line of code in the algorithm. There are more lines on the grid than are necessary for a correct answer. The first line has been completed as an example for you.

Trace table on next page

8.2.4 What does the output mean in the context of the algorithm?

(1)

8.3 Sipho wants to reward his loyal subscribers and encourage new fans to subscribe. He will apply the following conditions:

- A person is currently subscribed – let this equal S
- A person has followed Sipho for at least two years – let this equal T
- A person averages 50 comments a year – let this equal C

Sipho will reward any current subscriber who has followed him for at least two years. He will also reward anyone who is NOT a current subscriber, has NOT followed Sipho for at least two years and averages 50 comments a year.

This condition can be written as the following Boolean expression:

$$F(S,T,C) = S.T + S'.T'.C$$

Complete the following truth table to represent the condition.

S	T	C	S'	T'	S.T	S'.T'.C	RESULT
0	0	0					
0	0	1					
0	1	0					
0	1	1					
1	0	0					
1	0	1					
1	1	0					
1	1	1					

(6)

GRAND TOTAL: 150 MARKS

ADDITION SPACE.

Please indicate clearly the question number or question numbers of the you continue here:

[illegible]

