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TOTAL MARKS

NATIONAL SENIOR CERTIFICATE EXAMINATION
MAY 2025

INFORMATION TECHNOLOGY: PAPER II

EXAMINATION NUMBER

Time: 3 hours 150 marks

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This question paper consists of 28 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 examination number in the space provided.**
4. Show all workings 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. Two blank pages (pages 27 to 28) are included at the end of the question paper. Use these pages if you run out of space for a question. Clearly indicate the number of the question you are answering should you use this additional space.

FOR MARKER'S USE ONLY

Question	1	2	3	4	5	6	7	**Total**
Marks	**10**	**9**	**31**	**10**	**29**	**14**	**47**	**150**
Marked								
Moderated								
Re-Mark								

N12INTE-2-E

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SECTION A SHORT QUESTIONS

QUESTION 1 DEFINITIONS

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

1.1 A signal sent to the CPU (Central Processing Unit) by hardware components (like devices or peripherals) to request attention.

_____

(1)

1.2 A lightweight, minimalistic computer or terminal that relies heavily on a central server for data processing and storage.

_____

(1)

1.3 An address that is permanently assigned to network interfaces, e.g. 00:1A:2B:3C:4D:5E.

_____

(1)

1.4 The apparent execution by a computer of more than one program or task simultaneously.

_____

(1)

1.5 A data compression method that reduces the size of digital files by discarding some of the information.

_____

(1)

1.6 A decentralised digital ledger technology that records transactions securely and transparently across multiple computers in a network. Used with cryptocurrencies.

_____

(1)

1.7 A type of cyberattack on a targeted website or network, causing it to become slow or unavailable to legitimate users.

_____

(1)

1.8 A data storage configuration that mirrors data across multiple disks.

_____

(1)

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1.9 An error that occurs during the execution of a program when something unexpected happens that prevents the program from continuing its regular operation.

_____

(1)

1.10 A set of rules and guidelines created by an organisation or network provider to outline permitted and prohibited use of their technology infrastructure.

_____

(1)

10 marks

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SECTION B SYSTEM TECHNOLOGIES

QUESTION 2 THEORY

For each of the definitions in Column A below, select the **most appropriate term** in Column C by matching the letter to the question number. Only write down the appropriate letter in Column B.

Column A		Column B	Column C	
2.1	The delay before a data transfer begins following an instruction for its transfer.		A	Multi-processing
2.2	A small set of storage places inside the CPU.		B	Latency
2.3	The program a computer's microprocessor uses to start the computer system after it is powered on.		C	Creative commons
2.4	An external connector on the motherboard where any device can be connected.		D	Fetch
2.5	A programming language that uses human-understandable words/commands.		E	Multi-threading
2.6	A licence model that allows for the redistribution and adaptation of material while keeping attribution to the original creator.		F	Decode
2.7	An electronic pathway through which data can be transferred		G	BIOS
2.8	The use of more than one CPU to improve processing speed.		H	Bus
2.9	The first part of the CPU cycle.		I	POST
			J	Register
			K	Assembler
			L	High-level language
			M	SATA
			N	Freeware
			O	Port
			P	Hyper-threading

9 marks

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QUESTION 3 APPLICATION

Scenario

A farmer wants to introduce technology to improve efficiency on their farm. Both the farmer and their employees will use laptops in the farm office and the fields. Below are the specifications of the two laptops, Laptop A and Laptop B, they can purchase.

Specification	Laptop A	Laptop B
Processor	AMD Ryzen 3, 2.6GHz 1MB cache, 2 cores	Intel Core i5, 2.4GHZ 3MB Cache, 2 cores
RAM	8GB DDR4 SDRAM	8GB DDR4 SDRAM
Graphics	Onboard Radeon™ Graphics AMD Radeon RX Graphics 16GB	Onboard Intel HD Graphics
Secondary Storage	256GB SSD	500GB HDD

[Source: <https://silvinhahba.blogspot.com/2016/10/all-about-laptop.html> and <https://betanews.com/2014/11/19/acer-announces-travelmate-b115-laptop-affordable-and-portable/>]

3.1 Both laptops have 8GB of DDR4 *(Double data rate)* SDRAM *(Synchronous dynamic random-access memory)*.

3.1.1 What component on the motherboard is responsible for synchronising the data transfer to these chips?

_____

(1)

3.1.2 DDR brings further efficiency to RAM modules. How many times per clock cycle is data transferred when using DDR chips?

_____

(1)

3.2 The chosen laptops must have enough space to store photographs of the farm and growing crops. The farm manager will take photographs using their smartphone. Each photograph can be up to 2MB, and they will take up to 20 photographs each day.

3.2.1 Name one file format used to store digital photographs.

_____

(1)

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3.2.2 Both laptops have relatively small storage devices. Using the grid below, suggest TWO alternative storage devices that could be used to store the photographs other than an internal storage device and how these connect to the laptop. Your choices should make use of different connections.

Storage device		**Connection to laptop**
Device 1		
Device 2		

(4)

3.2.3 A friend of the farmer has suggested that laptops use virtual memory, which will assist in finding sufficient storage for photographs.

(a) Is this TRUE or FALSE? Tick the appropriate box below.

TRUE	FALSE

(1)

(b) Justify your answer with ONE reason. Your answer must also explain the function of virtual memory.

Justification:

_____

_____

_____

(2)

Function of virtual memory:

_____

_____

_____

(2)

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3.3 The specifications of Laptop B refer to 3MB of cache. Cache memory can either be part of the CPU or be located on the motherboard.

3.3.1 Give ONE advantage of cache memory being part of the CPU.

_____

_____

(1)

3.3.2 What type of RAM chips are used for cache memory located on the motherboard?

_____

(1)

3.3.3 List ONE advantage and ONE disadvantage of the type of chips in 3.3.2 compared to regular DRAM chips.

Advantage	
Disadvantage	

(2)

3.3.4 There are various other types of caches that are used on computers. Name TWO other cache types.

Cache type 1	
Cache type 2	

(2)

3.4 According to their specifications, Laptop B has an integrated (onboard) graphics card, while Laptop A has both an integrated and dedicated graphics card.

3.4.1 By using the grid below, distinguish between an integrated graphics card and a dedicated graphics card. Tick the appropriate blocks below.

Type of card	Part of the CPU	Uses system resources	Has its own RAM	Separate GPU
Integrated				
Dedicated				

(4)

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3.4.2 Do you recommend that the farm's chosen laptop have a dedicated or integrated graphics card? Show your answer by ticking the box below and justify your answer with TWO reasons.

Integrated	Dedicated

Reason 1	
Reason 2	

(3)

3.5 Components of a laptop or PC can be overclocked. There are two ways in which overclocking may be implemented – per component or whole system.

3.5.1 Briefly explain how each of these techniques is accomplished.

Per component: _____

_____

_____

(2)

Whole system: _____

_____

_____

(2)

3.5.2 Overclocking carries some risks. List ONE risk of overclocking and ONE technique to avoid this risk.

Risk	
How to avoid	

(2)

31 marks

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SECTION C INTERNET AND COMMUNICATION TECHNOLOGIES

QUESTION 4 THEORY

To answer the questions below, select the **most appropriate answer** from options A to D. An answer grid at the bottom of each page is provided for your answers. You must only write down the appropriate letter for your answer.

4.1 Which of the following is an example of a correct IPv6 address?

A 192.168.1.1
B 00:1A:2B:3C:4D:5E
C 256.256.256.256
D 2001:0000:130F:0000:0000:09C0:876A:130B

4.2 Which protocol transfers web pages from a server to a client?

A HTTP
B FTP
C SSL
D DNS

4.3 Which of the following is not a use of VOIP?

A Sending a voice note to a friend using WhatsApp.
B Conference calling for a business meeting using Microsoft Teams.
C Calling customer care using your mobile phone's SIM card.
D Using Zoom to phone your family in another country.

4.4 Which type of network covers a small geographical area, such as an office building?

A WAN (Wide Area Network)
B PAN (Personal Area Network)
C LAN (Local Area Network)
D MAN (Metropolitan Area Network)

4.5 Which protocol is used for sending emails?

A WebDav
B SMTP
C HTTP
D FTP

4.6 Which service translates domain names into IP addresses?

A DNS
B UDP
C ARP
D TCP

Question	4.1	4.2	4.3	4.4	4.5	4.6
Answer						

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4.7 Which technology was developed specifically to allow wireless devices to exchange data over short distances?

A Ethernet
B Wi-Fi
C Bluetooth
D LTE (Long-Term Evolution)

4.8 Which of the following refers to web pages with static content?

A Web 1.0
B Web 2.0
C Web 3.0
D None of the above

4.9 Which protocol is used for secure communication over the Internet?

A HTTP
B FTP
C HTTPS
D Telnet

4.10 What is the purpose of a firewall in network security?

A To enhance network speed.
B To prevent unauthorised access.
C To manage email traffic.
D To improve Wi-Fi signal strength.

Question	**4.7**	**4.8**	**4.9**	**4.10**
Answer				

10 marks

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QUESTION 5 APPLICATION

Several areas on the farm will be connected to a network, including an office with four laptops, the farmhouse with three laptops and one PC, and a packing area with two PCs. The office has a server and a shared networked printer. The farmhouse is 1 km from the office, and the packing area is 95 m away from the office.

5.1 There are several other devices on a network other than laptops or PCs.

5.1.1 What is the function of a switch on a local area network (LAN)?

_____

_____

_____

(1)

5.1.2 List THREE devices, other than a laptop or PC, that are likely to be connected to the switch on the farm network.

Device 1	
Device 2	
Device 3	

(3)

5.1.3 TRUE or FALSE: A switch holds a list of the IP addresses of devices on the network. Justify your answer with ONE reason.

TRUE	FALSE

Justification: _____

_____

_____

(2)

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5.2 What topology do you suggest should be used for the farm network? Tick the appropriate box below and justify your answer with ONE reason using facts related to the scenario.

Ring	Star	Hybrid

Justification: _____

_____

_____

(2)

5.3 The laptops used in the office all need to connect to the LAN wirelessly.

5.3.1 What ONE device will need to be added to the network in order to allow the laptops to connect wirelessly?

_____

_____

(1)

5.3.2 How will the device you gave in your answer to 5.3.1 above connect to the network?

_____

_____

(1)

5.3.3 The data transmitted between the laptops and the network needs to be encrypted. It has been recommended that TKIP (Temporal Key Integrity Protocol) be used.

TKIP uses a relatively small (48-bit) number for encryption. Despite this small size, give ONE reason why TKIP offers reasonable security.

_____

_____

(2)

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5.4 Consider the portion of the LAN that is linked to the farmhouse.

5.4.1 What bounded medium is needed to connect the farmhouse to the office?

_____

(1)

5.4.2 Give ONE reason why this medium will have to be used. Support your answer with facts from the scenario.

_____

_____

(2)

5.4.3 Give TWO disadvantages of this medium.

Disadvantage 1	
Disadvantage 2	

(2)

5.5 Currently, the farm uses a 5G link for Internet connectivity. The equipment to connect to the mobile network is located in the office.

5.5.1 Give ONE advantage and ONE disadvantage of 5G compared to previous versions of this technology (3G/4G).

Advantage	
Disadvantage	

(2)

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5.5.2 The farmer is considering a different Internet connection. A neighbouring farmer is using a new ISP that connects via the satellite. To help them decide, they visit their neighbour and test the speed of their link. The results are shown in the following two images. Figure A is the farmer's current connection (5G), and Figure B is his neighbour's.

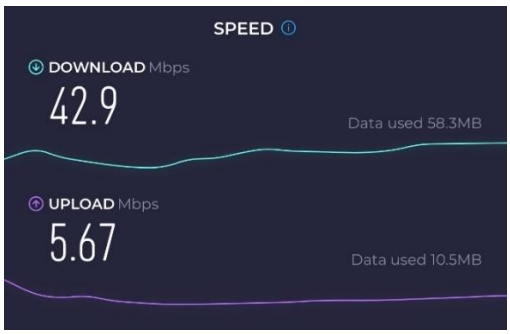


Figure A



Figure B

(a) Both connections have similar download speeds but different upload speeds. Complete the grid below to describe each connection.

Connection type	**A or B**
Synchronous	
Asynchronous	

(2)

(b) Is a faster upload speed necessary for normal business or home use? Justify your answer with ONE reason.

YES	NO

Justification: _____

_____

_____

(2)

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(c) If the farmer decides to use cloud storage for all the farm data, do you believe having a connection with a faster upload speed would be an advantage? Justify your answer with ONE reason.

YES	NO

Justification: _____

_____

_____

(2)

5.6 Devices on a network can either have fixed IP addresses or changeable IP addresses.

5.6.1 What is the name given to an IP address that does not change?

_____

(1)

5.6.2 What protocol is used to allocate changeable IP addresses to devices on a network?

_____

(1)

5.6.3 Give an example of ONE device on the farm network that should have a fixed IP address and explain why this device needs it.

Device: _____

Explanation: _____

_____

_____

(2)

29 marks

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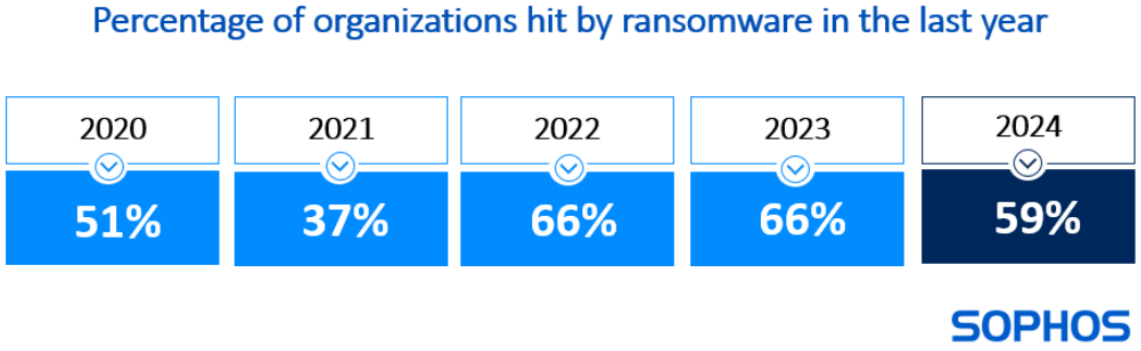
SECTION D SOCIAL IMPLICATIONS

QUESTION 6

'*The State of Ransomware 2024*' by Sophos News. Read the following article carefully and answer the questions that follow.

Attack rates have dropped, but recovery costs have increased

59% of organizations were hit by ransomware last year, a small but welcome drop from the 66% reported in both the previous two years. While any reduction is encouraging, with more than half of organizations experiencing an attack, this is no time to lower your guard.



While the attack rate has dropped over the last year, overall recovery costs (excluding any ransom payment) have soared to $2.73M, a 50% from the $1.82M reported in 2023.

[Source: Sophos News. (2024, April 30). The State of Ransomware 2024. Retrieved from Sophos News <https://news.sophos.com/en-us/2024/04/30/the-state-of-ransomware-2024>]

6.1 What is meant by the phrase 'ransomware'? Include TWO facts in your answer.

(2)

6.2 Give ONE reason why you believe the percentage of attacks dropped between 2023 and 2024.

(1)

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6.3 The report suggests that recovery costs, excluding ransom payments, have increased. Give ONE example of how a business will incur costs other than a ransom payment during such an attack.

_____

_____

(1)

6.4 Cryptocurrencies are often used in payments for cybercrimes.

6.4.1 Give ONE example of a cryptocurrency.

_____

(1)

6.4.2 List TWO characteristics of cryptocurrencies.

Characteristic 1	
Characteristic 2	

(2)

6.4.3 Give ONE reason why cryptocurrencies are often requested as payment for cybercrimes.

_____

_____

(1)

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6.5 The farm manager wishes to avoid any potential ransomware attacks on his network. State THREE tips to avoid such attacks.

Tip 1	
Tip 2	
Tip 3	

(3)

6.6 Explain how SSL (Secure Sockets Layer) helps improve cybersecurity.

_____

_____

(1)

6.7 The farmer is looking at ways in which he could use drones on his farm to assist with efficiency.

List TWO tasks that drones could be used to assist with other than time- or labour-consuming tasks.

Task 1	
Task 2	

(2)

14 marks

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SECTION E DATA AND INFORMATION MANAGEMENT AND SOLUTION DEVELOPMENT

QUESTION 7

7.1 Programs written to object-oriented programming (OOP) principles make use of a number of methods to work with objects.

7.1.1 What are the functions of accessor and mutator methods?

Accessor method: _____

_____

(2)

Mutator method: _____

_____

(1)

7.1.2 Use the following grid to distinguish between the characteristics of accessor and mutator methods. Tick the appropriate blocks to indicate your answers.

Characteristic	Accessor method	Mutator method
Returns a single value		
Are void methods		

(2)

7.2 OOP also makes use of the concept of encapsulation. What is meant by encapsulation?

_____

_____

_____

(2)

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7.3 Several farmers have worked together to create software to help them manage the costs of their crops. Each farm can grow TWO different crops. The details of two classes that have been coded are shown below.

Crop class

This class will be used to instantiate **Crop** objects. The class will have the following fields and methods:

Fields:
- **name**: string *(the name of the crop being grown, e.g. beans, tomatoes)*
- **seedCost**: real *(the cost of one packet of seeds for the crop)*
- **packsBought**: integer *(the number of seed packs bought)*

These fields should not be accessible from outside the **Crop** class.

- **growingCost**: integer – a class constant with the value of 2850 *(a fixed cost for growing any crop)*

This field should be accessible to any class created in the same project as the **Crop** class.

Methods:
- A default **constructor** method, which assigns default values to all fields.
- A parameterised **constructor** method, which accepts the following parameters, namely **inN** (string), **inSc** (real), and **inPb**(integer)
- An accessor method for the **seedCost** and **packsBought** fields
- A ***totalCost()*** – a typed method that calculates and returns the cost of growing a crop, which is determined by multiplying **seedCost** by **packsBought** and adding the **growingCost**.
- A ***toString()*** method – to concatenate all the fields of a **Crop** object into a single string.

These methods should be accessible to any class created in the same project as the **Crop** class.

Farm class

This class will be used to instantiate **Farm** objects, one object for each farm. A **Farm** object will have the following fields:

Fields:
- **farmName**: string *(the name of one farm)*
- **area**: integer *(the area of a farm in square metres)*
- **dam**: boolean *(if the farm has a dam or not)*
- **cropOne**: Crop *(the first crop being grown on the farm)*
- **cropTwo**: Crop *(the second crop being grown on the farm)*

These fields should not be accessible from outside the **Farm** class.

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Methods:

- A parameterised **constructor** method, which accepts the following parameters, namely **inFn** (string), **inA** (integer), **inD** (boolean), **inC1** (Crop), **inC2** (Crop).
- An accessor method for the **farmName** field.
- A mutator method for the **dam** field that accepts a parameter **chD** (boolean)
- A method with the name ***farmCost()*** that returns the total cost of growing the two crops on one farm.
- A ***toString()*** method that returns all the fields of the **Farm** class as one string.

Complete the following class diagrams for the **Crop** and **Farm** classes.

Crop
Fields:
Methods:

Farm
Fields:
Methods:

(11)

7.4 Both the **Crop** and **Farm** classes have a ***toString()*** method. Is this an example of method overriding? Justify your answer clearly with ONE reason.

YES	NO

Justification: _____

_____

_____

(2)

7.5 Give the name of a method from either class that is an example of method overloading. Justify your answer with ONE reason.

Method name: _____

Justification: _____

_____

_____

(3)

7.6 OOP programs with multiple object definition classes often have a relationship between these classes, either by inheritance or composition.

7.6.1 What is the relationship between the **Crop** and **Farm** classes?

_____

(1)

7.6.2 What characteristic supports your answer to 7.6.1?

_____

_____

(2)

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7.7 When choosing a farm to buy, it is desirable that it has certain characteristics that will help in growing crops.

Let:

D = Farm has a dam
P = Can pump water from a neighbouring dam
S = Good quality soil for growing

The following boolean function can express a suitable farm:

F(D, P, S) = D.S + P.S

7.7.1 Complete the following truth table to represent the condition:

F(D, P, S) = D.S + P.S

D	P	S	D.S	P.S	D.S + P.S	RESULT True/False
0	**0**	**0**				
0	**0**	**1**				
0	**1**	**0**				
0	**1**	**1**				
1	**0**	**0**				
1	**0**	**1**				
1	**1**	**0**				
1	**1**	**1**				

(3)

7.7.2 Write out the function that represents the combination of all valid outcomes from the truth table using the correct notation.

F(D, P, S) = _____

(2)

7.8 The OOP project has been expanded to include an array class that will store an array of Farm objects. Sample data in the array is shown below.

Array element		**fArr[0]**	**fArr[1]**	**fArr[2]**
Farm Name		Happy Farm	Moonshine Farm	Green Glades
Area		2000	5000	10000
Dam		True	False	True
CropOne	name seedCost packetsBought	Onions 29,00 1000	Tomatoes 21,99 2000	Beans 29,00 10000
CropTwo	name seedCost packetsBought	Lettuce 19,50 5000	Cabbage 12,00 20000	Chilli 9,50 2000

An algorithm has been developed to determine which farm will cost the most to operate with the two crops being grown. When coded, the algorithm's output is not as expected. You are required to trace the algorithm to find the error.

The following calculations have been done to assist you and can be used directly in your trace table. (This INCLUDES the fixed growingCost value.)

Farm Name	Happy Farm	Moonshine Farm	Green Glades
Crop one cost	31 850,00 (Onions)	46 830,00 (Tomatoes)	292 850,00 (Beans)
Crop two cost	100 350,00 (Lettuce)	362 850,00 (Cabbage)	21 850,00 (Chilli)

Assume that any methods used in the algorithm that are not shown in the class diagram have been coded.

```
  public method findMostExpensive() : string
  begin
1     farmName ← ""
2     farmCost ← 0.00  //the total cost for a farm
3     biggestCost ← 0.00 //the most expensive farm
4     crop1Cost ← 0.00
5     crop2Cost ← 0.00
6     for i ← 0 to size - 1, inc by 1
      begin
7           crop1Cost ← fArr[i].getCropOne().totalCost()
8           crop2Cost ← fArr[i].getCropTwo().totalCost()
9           farmCost ← crop1Cost + crop2Cost
10          if (farmCost > biggestCost)
            begin
11                farmName ← fArr[i].getName()
12                farmCost ← biggestCost
            end if
      end for
13 return farmName
```

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7.8.1 Complete the trace table BELOW page using the data supplied on the previous page.

Line	farmName	farmCost	biggestCost	i	crop1Cost	crop2Cost	farmCost > biggestCost?

7.8.2 The output from the algorithm is incorrect. Identify the line in the algorithm that is responsible for the output being incorrect.

_____

(1)

7.8.3 Explain the error in this line and write out how the line should be corrected.

_____

_____

_____

(3)

7.8.4 The calculations in lines 7–9 could be more efficiently coded by using other available methods. Rewrite these three lines as ONE line to achieve the same value for the variable `farmCost`. NB: Do not write Java/Delphi code; write this in ALGORITHM form. (Based on scenario in Question 7.3)

_____

(2)

47 marks

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ADDITIONAL SPACE (ALL QUESTIONS)

REMEMBER TO CLEARLY INDICATE AT THE QUESTION THAT YOU HAVE USED THE ADDITIONAL SPACE TO ENSURE THAT ALL ANSWERS ARE MARKED.

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