Government of **Western Australia**
School Curriculum and Standards Authority

ATAR course sample examination two

Question/Answer booklet

COMPUTER SCIENCE

Please place your student identification label in this box

WA student number: In figures

In words _____

Time allowed for this paper
Reading time before commencing work: ten minutes
Working time: three hours

Materials required/recommended for this paper
To be provided by the supervisor
This Question/Answer booklet
Source booklet

Number of additional answer booklets used (if applicable):

To be provided by the candidate
Standard items: pens (blue/black preferred), pencils (including coloured), sharpener, correction fluid/tape, eraser, ruler, highlighters

Special items: up to three calculators, which do not have the capacity to create or store programmes or text, are permitted in this ATAR course examination, Mathomat and/or Mathaid and/or any system flowchart template

Important note to candidates
No other items may be taken into the examination room. It is **your** responsibility to ensure that you do not have any unauthorised material. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.

Structure of this paper

Section	Number of questions available	Number of questions to be answered	Suggested working time (minutes)	Marks available	Percentage of examination
Section One Short answer	20	20	70	90	40
Section Two Extended answer	5	5	110	104	60
				Total	100

Instructions to candidates

1. The rules for the conduct of the Western Australian external examinations are detailed in the *Year 12 Information Handbook: Part II Examinations*. Sitting this examination implies that you agree to abide by these rules.

2. Write your answers in this Question/Answer booklet preferably using a blue/black pen. Do not use erasable or gel pens. Wherever appropriate, fully labelled diagrams, tables and examples should be used to illustrate and support your answers.

3. You must be careful to confine your answers to the specific questions asked and to follow any instructions that are specific to a particular question. Where no specific instructions are given, you should feel free to use a range of formats to express your knowledge and understandings.

4. Supplementary pages for planning/continuing your answers to questions are provided at the end of this Question/Answer booklet. If you use these pages to continue an answer, indicate at the original answer where the answer is continued, i.e. give the page number.

5. The Source booklet is not to be handed in with your Question/Answer booklet.

Section One: Short answer **40% (90 Marks)**

This section contains **20** questions. You must answer **all** questions. Write your answers in the spaces provided.

Supplementary pages for planning/continuing your answers to questions are provided at the end of this Question/Answer booklet. If you use these pages to continue an answer, indicate at the original answer where the answer is continued, i.e. give the page number.

Suggested working time: 70 minutes.

Question 1 **(4 marks)**

Penny has written a program that will convert values between different currencies. The program allows the user to enter an amount (*amt*), select the current currency (*current*) and select a new currency (*new*). The program contains a function *Calculate_Answer(amt, current, new)* that is called from the main module that returns the equivalent amount in the new currency. As part of this function, the program retrieves the current exchange rates from the Internet.

When Penny compiles and attempts to execute her program, it runs most of the way through, but stops before it outputs the correct answer.

(a) Identify a type of error that has occurred. (1 mark)

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(b) Justify your choice of error in part (a). (3 marks)

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See next page

Question 2 **(3 marks)**

List **three** ways that IPv6 offers improved network services over IPv4.

One: _____

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Two: _____

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Three: _____

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Question 3 **(3 marks)**

Explain the term 'version control' as it applies to computer programming, including reference to why it is useful in a large project.

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Question 4 **(1 mark)**

Identify **one** reason why the table below is not normalised.

PatientID	Name	Date-of-Birth	Height (cm)	Weight (kg)	Blood type
21AXC	Adam Lee	21/06/2000	170	60	A
53AGS	Kim Jones	25/09/2001	165	62	APos
21AXC	Adam Lee	21/06/2000	170	55	A

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See next page

Question 5   **(7 marks)**

Examine the following algorithm that accepts a number of sales amounts and calculates the total sales amount.

```
numSales = 0
totalSales = 0
INPUT(salesAmount)
WHILE salesAmount > 0
     numSales = numSales + 1
     totalSales = totalSales + salesAmount
     INPUT(salesAmount)
END WHILE
```

(a)   Complete the desk checking (trace table) for the algorithm using the following test data:
       25, 10, 5, 0.   (4 marks)

numSales	totalSales	salesAmount	salesAmount > 0

(b)   Rewrite the algorithm so that it uses a post-test loop.   (3 marks)

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Question 6 **(9 marks)**

Afua has written a special file sharing application that allows her to send files around her office using file transfer protocol (FTP) across a wired transmission control protocol/internet protocol (TCP/IP) connection. The application has been set up to use port 1200 within the confines of the office network.

Coming into work on a Monday after a relaxing weekend, she wants to send a movie of her dog chasing birds in the park to one of her colleagues, Tāwhiri. Both their computers are connected to the network using a wired connection and have the following address details.

Computer	IP address	MAC address
Afua's	10.45.190.145	66:66:66:77:77:77
Tāwhiri's	10.45.190.156	22:22:22:33:33:33

Complete the table below that shows the address and the most likely protocol or communications standard that will be used at each layer of the Department of Defence (DoD) transmission control protocol/internet protocol (TCP/IP) model as the data is sent from Afua's computer to Tāwhiri's computer.

| Layer | Packet type | Address | | Protocol/ Standard |
		Source	Destination	
Application	Data	N/A	N/A	
Transport		1200		
Internet			10.45.190.156	
Network		66:66:66:77:77:77		Ethernet 802.3

Question 7 **(3 marks)**

Explain the term 'back door' as an external network threat.

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Question 8 **(2 marks)**

Describe the term 'IP spoofing'.

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Question 9 **(5 marks)**

Tadashi is writing a grid-based board game similar to chess and has decided to use a two-dimensional array to store the state of the game. In his game, the size of the board will vary based on the difficulty level selected by the player. Tadashi would like a module to set the initial state of his board by populating all the cells with a plus sign (+). For example, for a board that is 5 columns and 3 rows, the initial state will be:

$$+ + + + +$$
$$+ + + + +$$
$$+ + + + +$$

Complete the module *PopulateBoard* which takes in the number of rows and columns as parameters, and places a plus sign in each cell of the global array board.

MODULE PopulateBoard(rows, columns)

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_____

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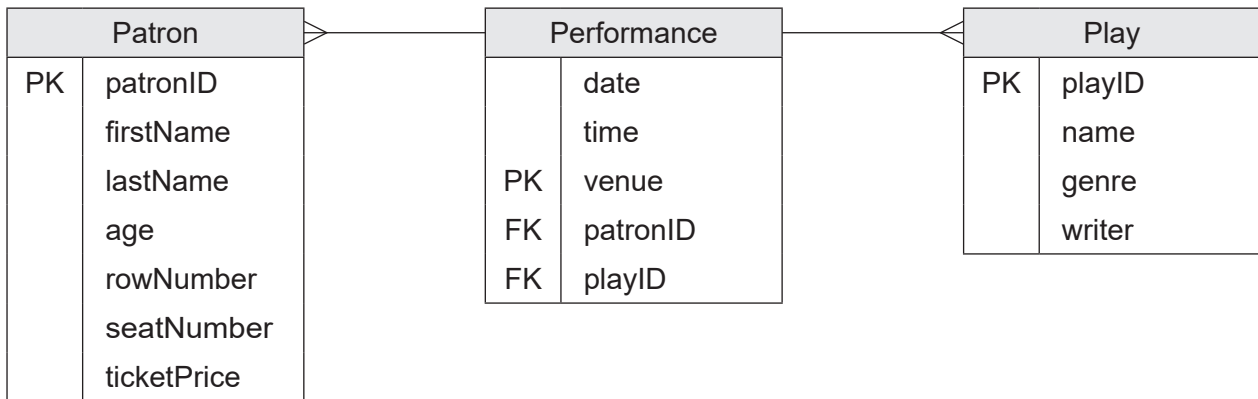
_____

END PopulateBoard

Question 10   **(3 marks)**

Examine the following entity relationship (ER) diagram that was designed to record who attends each performance of plays put on by the Joondalup City Theatre Company. Many patrons can attend many performances once and each play can be performed a number of times.

Patron	
PK	patronID
	firstName
	lastName
	age
	rowNumber
	seatNumber
	ticketPrice

Performance	
	date
	time
PK	venue
FK	patronID
FK	playID

Play	
PK	playID
	name
	genre
	writer

Outline **three** errors that exist within the ER diagram above.

One: _____

_____

Two: _____

_____

Three: _____

_____

Question 11   **(2 marks)**

Kade has developed a large software package with multiple modules. However, he is getting several logic errors. Identify **two** methods of error detection and correction that he could use to locate the errors.

One: _____

_____

Two: _____

_____

Question 12   **(6 marks)**

Elizabeth would like to send a private message via e-mail to her friend Michael.

(a)   Explain how the use of asymmetric encryption can be used to ensure that nobody else can read the message with the use of public/private keys.   (3 marks)

(b)   Explain why symmetric encryption is less secure than asymmetric encryption.   (3 marks)

See next page

Question 13   **(9 marks)**

Most game developers use object-oriented programming.

(a)   Using an example, describe the term 'encapsulation' as it applies to object-oriented
        programming.   (3 marks)

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(b)   Using an example, describe the term 'inheritance' as it applies to object-oriented
        programming.   (3 marks)

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(c)   Using an example, describe the term 'polymorphism' as it applies to object-oriented
        programming.   (3 marks)

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Question 14 **(5 marks)**

Kalina is developing a new online accounting package and has been advised that it would be a good idea to thoroughly test her software before it is released.

While writing her code, she has decided to use unit tests to ensure that her code performs correctly.

(a) Describe how the use of unit tests will ensure the code performs correctly. (2 marks)

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During development Kalina has tested her software using a small sample of customer data and is confident that her software will meet the functional requirements of her users.

(b) Explain whether this is sufficient testing to ensure that her software will operate as expected when deployed in the real world. (3 marks)

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Use the following diagram to answer Questions 15 to 17.

The following diagram shows two home networks that are connected to the same internet service provider (ISP). Both networks rely on the ISP for their domain name system (DNS) service.
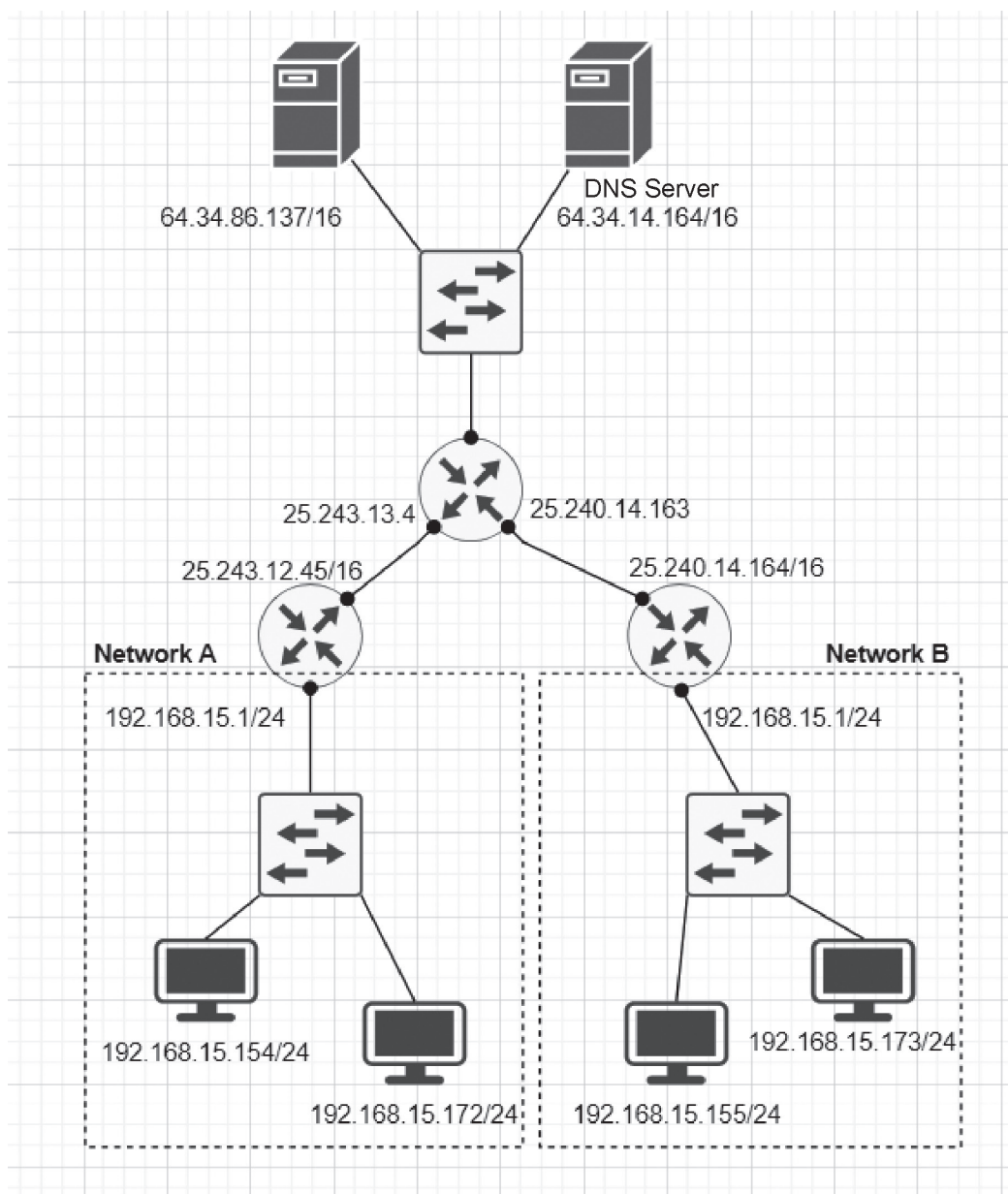
Question 15 (3 marks)

Mario would like to connect a new device to Network A and has been told that the subnet mask is 255.255.255.0. Complete the following details for him to connect his device to the network.

IP address: _____

Gateway: _____

DNS server: _____

Question 16 (3 marks)

With reference to Network A and Network B in the diagram on page 14, explain the difference between a public and private IP address.

_____

_____

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Question 17 (2 marks)

Mario is trying to test his network performance. Describe the difference between 'ping' and 'traceroute' when evaluating network performance.

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Use the following information to answer Questions 18 and 19.

A local school is designing a database to store the results from their annual swimming carnival.
They have started normalising the data and currently have the following tables.

Event

Event Number	Distance	Style
1	50m	Freestyle
41	50m	Breaststroke
53	50m	Backstroke
60	50m	Butterfly
15	100m	Freestyle
31	200m	Freestyle
47	100m	Breaststroke

Competitor

Competitor Number	First Name	Last Name	Group	Colour
10065	Luke	Schneider	Kangaroo	Red
10098	Louis	Sampson	Koala	Green
20547	Travis	Fry	Wombat	Brown
10159	Jordan	Buckley	Dingo	Yellow
18664	Luke	Fry	Wombat	Brown
10258	Patrick	Nichols	Dingo	Yellow
20086	Dennis	Harper	Kangaroo	Red
19831	Robert	Sawyer	Dingo	Yellow

CompetitorEvent

EventNumber	Competitor Number	Place	Time
1	10065	1	00:37.5
1	10098	2	00:38.2
41	10098	1	00:46.5
41	10065	2	00:47.6
53	10065	5	00:42.3
53	10098	6	00:42.8
53	20547	7	00:46.4
53	10159	8	00:51.7
60	10065	1	00:34.9
60	20457	2	00:37.9
15	18664	2	00:58.7
15	10258	3	00:59.0
15	20086	4	00:59.1
15	19831	5	00:59.4
31	18664	7	02:34.9
31	10258	8	02:48.3
47	18664	1	00:40.4
47	20086	2	00:41.5

See next page

Question 18 **(9 marks)**

Using an example from the data on page 16, explain the following terms.

Referential integrity: _____

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Domain integrity: _____

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Entity integrity: _____

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Question 19 **(6 marks)**

Complete the table below by identifying and describing the level of normal form for each table.

Table	Normal form	Description
Competitor		
CompetitorEvent		

Question 20 **(5 marks)**

Complete the data dictionary below.

Element name	Data type	Size/ Format	Description	Constraint
StudentID		6	Unique identifier for each student	Required. Unique automatically created when record added
FirstName	Text	25	First name of student	
LastName	Text	25	Last name of student	Required
YearLevel	Integer		The year level	Required
Email	Text	255		Required
AccountBalance		6	The student's cash balance	Required

End of Section One

Section Two: Extended answer **60% (104 Marks)**

This section has **five** questions. Answer **all** questions. Write your answers in the spaces provided.

Supplementary pages for planning/continuing your answers to questions are provided at the end of this Question/Answer booklet. If you use these pages to continue an answer, indicate at the original answer where the answer is continued, i.e. give the page number.

Suggested working time: 110 minutes.

Refer to the Source booklet to answer Questions 21 to 24.

See next page

Question 21 **(14 marks)**

Refer to the information on page 2 of the Source booklet to answer the following question.

Rottnest Boat Charters would like to store this data in a more efficient manner. To help them with this, they have asked you to convert the data using the sample table on page 2 of the Source booklet, to third normal form (3NF).

Question 22   **(22 marks)**

Refer to the information on page 3 of the Source booklet to answer the following questions.

Using the sample data provided, identify what values would be returned by the following SQL queries.

(a)   (i)   SELECT Boat.name, Boat.capacity
           FROM Boat, Operator
           WHERE Boat.operatorID = Operator.operatorID
           AND Operator.name = "Sunny Dive Charters"   (1 mark)

    (ii)   William has attempted to run the following SQL query that is supposed to return the names and locations of all the dive sites but did not get the expected results. Identify and outline the problem with his query.

           SELECT Site.name, Site.maxDepth, Site.waterType, Location.name, Location.state, Location.country
           FROM Site, Location
           WHERE Site.locationID = Location.locationID   (2 marks)

Using the sample data on page 3 of the Source booklet from William's database create the following SQL queries.

(b)   Create an SQL query that lists the name and waterType of all the dive sites that are less than 15 metres deep.   (3 marks)

Question 22 (continued)

(c)   For each dive that William has completed, find the date, average and maximum depths of the dive and name of the site. Create an SQL query that sorts the dives based on the maximum depth for each dive in descending order (deepest dive first).   (4 marks)

(d)   Create an SQL query that will find the number of dives that William has completed in Australia where he went deeper than 20 metres.   (6 marks)

(e)   Find the total number of divers that each dive operator can take out on a boat dive at the same time. Create an SQL query that lists the name of each diver operator using the alias 'Dive Operator' and the total number of divers using the alias 'Total Dives'.   (6 marks)

Question 23 **(21 marks)**

Refer to the information on page 4 of the Source booklet, to answer the following question.

(a)   Complete the partial pseudocode below as one function.   (10 marks)

```
def main():
        itemsToHire = [ ]
```

_____

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```
        costOfGear = {
                        "mask", 2.00;
                        "wetsuit", 5.00;
                        "BCD", 5.00;
                        "fins", 2.00;
                        "tank", 5.00
                        }
        totalCost = 0
```

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```
        discountRate = 0
        memberLevel = input("Enter your membership level (Gold/Silver/Bronze): ")
```

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```
        discount = 
```
_____

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```
        print(finalCost)

    main()
```

See next page

(b)   Explain how a modular approach could be used to improve the structure of the code in
        part (a) on page 24.   (3 marks)

(c)   (i)   Using a dictionary, create a Python function to calculate totalCost and returns
                itemsToHire to the main module.   (4 marks)

                def calculateTotalCost(itemsToHire)

        (ii)   Create a Python function to calculate the discount based on the appropriate
                member level.   (4 marks)

                def getDiscountRate(memberLevel)

See next page

Question 24 **(38 marks)**

Refer to the information on page 5 of the Source booklet, to answer the following question.

(a)   Using appropriate Cisco conventions, draw a network diagram to show the logical layout of the dive centre network. You should clearly indicate the different subnets of the network and the components within each subnet. **(17 marks)**

Rottnest Dive Centre has hired a security consultant to evaluate the potential threats to their new network.

(b)   For each of the following network threats, explain the threat and its relevance to the Rottnest Dive Centre's network drawn on page 27.   (9 marks)

Social engineering (phishing): _____

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Man-in-the-middle: _____

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Cross-site scripting: _____

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Question 24 (continued)

(c) For each of the following security solutions, explain how the solution could be used to protect the Rottnest Dive Centre network. (9 marks)

Anti-malware: _____

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Access control lists: _____

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Physical security: _____

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See next page

The security consultant has told Rottnest Dive Centre that he knows some hackers that could help to improve the security of the network. When the owner hears the word hacker, he immediately thinks of criminals breaking into a network to steal customer data.

(d)   Explain the role of ethical hacking in improving network security.   (3 marks)

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Question 25 **(9 marks)**

William is a keen programmer as well as a diver and has decided to develop some software to help him record his dives.

He has decided to use the following pseudocode class structure to store information about his dives in an array.

```
CLASS Dive
        dive_num: int
        date: string
        site: string
        depth: float
        rating: int

dives = Dive[ ]
```

For the purpose of this question, assume that the array *dives* has been populated with the data for 800 individual dives, with at most one dive entered per day. Initially, the dives have been entered in order based on the date of the dive.

William would like to find the deepest dive that he has completed.

(a)   Write an algorithm that will allow William to find the deepest dive in the dives array. If there are two dives of the same depth, then your algorithm should return the first dive in the array of that depth. (6 marks)

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William would like to perform a search for a specific dive based on the date of the dive. He has heard about two types of searches – a linear search and a binary search.

(b)   Justify which search algorithm would be the most appropriate to use in this situation.

(3 marks)

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End of questions

Supplementary page

Question number: _____

Supplementary page

Question number: _____

Supplementary page

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