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

WACE
Western Australian Certificate of Education

Western Australian Certificate of Education Examination, 2013

Question/Answer Booklet

COMPUTER SCIENCE

Stage 2

Please place your student identification label in this box

Student Number: In figures | | | | | | | | | |

In words _____

_____

Time allowed for this paper

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

Materials required/recommended for this paper

To be provided by the supervisor

This Question/Answer Booklet
Multiple-choice Answer Sheet

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: non-programmable calculators approved for use in the WACE examinations, 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 notes or other items of a non-personal nature in the examination room. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.

Ref: 13-028

Structure of this paper

Section	Number of questions available	Number of questions to be answered	Suggested working time (minutes)	Marks available	Percentage of exam
Section One: Multiple-choice	20	20	25	20	10
Section Two: Short answer	20	20	65	52	35
Section Three: Extended answer	4	4	90	70	55
				Total	100

Instructions to candidates

1. The rules for the conduct of Western Australian external examinations are detailed in the *Year 12 Information Handbook 2013*. Sitting this examination implies that you agree to abide by these rules.

2. Answer the questions according to the following instructions.

   Section One: Answer **all** questions on the separate Multiple-choice Answer Sheet provided. For each question, shade the box to indicate your answer. Use only a blue or black pen to shade the boxes. If you make a mistake, place a cross through that square, then shade your new answer. Do not erase or use correction fluid/tape. Marks will not be deducted for incorrect answers. No marks will be given if more than one answer is completed for any question.

   Sections Two and Three: Write your answers in this Question/Answer Booklet.

3. You must be careful to confine your responses to the specific questions asked and to follow any instructions that are specific to a particular question.

4. Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space if required to continue an answer.
   - Planning: If you use the spare pages for planning, indicate this clearly at the top of the page.
   - Continuing an answer: If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question that you are continuing to answer at the top of the page.

See next page

Section One: Multiple-choice **10% (20 Marks)**

This section contains **20** questions. Answer **all** questions on the separate Multiple-choice Answer Sheet provided. For each question, shade the box to indicate your answer. Use only a blue or black pen to shade the boxes. If you make a mistake, place a cross through that square, then shade your new answer. Do not erase or use correction fluid/tape. Marks will not be deducted for incorrect answers. No marks will be given if more than one answer is completed for any question.

Suggested working time: 25 minutes.

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1. The implementation of a Standard Operating Environment (SOE) is to ensure

   (a) computers run at the same temperature.
   (b) all computers switch off at night together.
   (c) multiple computers run with the same software image.
   (d) all computers have identical keyboards and mice.

2. The three buses that connect to a Central Processing Unit (CPU) are

   (a) data, control and address.
   (b) memory, control and address.
   (c) local, data and control.
   (d) local, data and address.

3. Software used to edit documents is an example of

   (a) system software.
   (b) application software.
   (c) anti-virus software.
   (d) maintenance software.

4. Which of the following is an example of biometric authentication?

   (a) password
   (b) username
   (c) encryption key
   (d) fingerprint

5. An atomic cell in a database table

   (a) has no data in it.
   (b) only has numbers.
   (c) has both numbers and text.
   (d) has only one piece of data.

See next page

6. In a relational database, a primary key is linked to a

(a) redundant key.
(b) foreign key.
(c) referential key.
(d) duplicate key.

7. A real number is

(a) a whole number greater than 0.
(b) a whole number less than 0.
(c) any number that cannot be a decimal.
(d) any number that can be a decimal.

8. Which of the following is an example of internal documentation?

(a) line comments
(b) trace tables
(c) user manuals
(d) installation instructions

9. When **1** is added to **F** in a hexadecimal numbering system, the resulting outcome is

(a) 16.
(b) 20.
(c) 10.
(d) 15.

10. Which of the following is a function of an operating system?

(a) manages the hardware resources
(b) connects the computer to the internet
(c) checks the hard drive for viruses
(d) translates commands from one motherboard to another

11. The binary number 10011101 requires what storage size?

(a) bit
(b) byte
(c) kilobyte
(d) megabyte

12. In order to find specific information in a database you need to use a

(a) form.
(b) report.
(c) query.
(d) record.

See next page

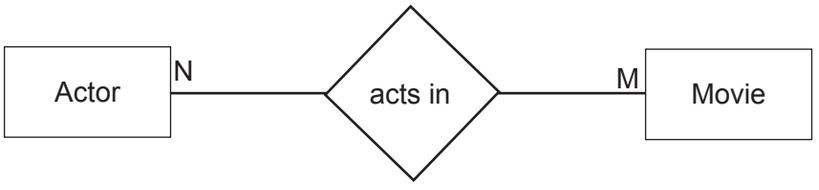
Use the following pseudocode for Question 13.

```
BEGIN
    days ← 0
    average ← 0
    totalrain ← 0
    INPUT (rainfall)
    REPEAT
        totalrain ← totalrain + rainfall
        days ← days + 1
        INPUT (rainfall)
    UNTIL days = 7
    average ← totalrain / days
END
```

13. The type of iteration (loop) being used in the above pseudocode is a

(a) for.
(b) test-last.
(c) test-first.
(d) case.

Use the following diagram for Questions 14 and 15.



14. The relationship in the Entity Relationship (ER) diagram above shows

(a) many actors can act in many movies.
(b) one actor can act in many movies.
(c) many actors can act in one movie.
(d) actors are restricted to which movies they can act in.

15. The symbol labelled Movie is

(a) a relationship.
(b) an attribute.
(c) an entity.
(d) a process.

See next page

16. A device that connects two LAN network segments using the same protocol is a

(a) switch.
(b) bridge.
(c) modem.
(d) firewall.

Use the following spreadsheet for Questions 17 and 18.

	A	B	C	D	E	
1		**Section 1**	**Section 2**	**Section 3**	**Total**	
2	**James**	10	19	44	73	
3	**Khang**	14	26	36	76	
4	**Sharyn**	8	12	26	46	
5	**Mohammed**	12	25	35	72	
6	**Peter**	6	12	24	42	
7						
8	**Average**	10	18.8	33	61.8	
9	**Number of students who scored > 65%**				?	
10	**Highest score on each test**	?	?	?		
11						

17. Which function would be **best** to calculate the number of students who scored more than 65%?

(a) sum
(b) count
(c) max
(d) countif

18. Which function would be **best** to find the highest score on each test?

(a) sum
(b) count
(c) max
(d) countif

19. An essential component of a Central Processing Unit (CPU) is the Program Counter. This is a register that stores

(a) the address of the last instruction executed.
(b) the results of the last instruction executed.
(c) the address of the next instruction that is to be executed.
(d) a copy of the instruction currently being executed.

See next page

20. Which of the following communication protocols is primarily used for the transmission of non-secure web pages across a network?

(a) SMTP
(b) HTTP
(c) HTTPS
(d) FTP

End of Section One

See next page

Section Two: Short answer **35% (52 Marks)**

This section has **20** questions. Answer **all** questions. Write your answers in the spaces provided.

Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space if required to continue an answer.

- Planning: If you use the spare pages for planning, indicate this clearly at the top of the page.
- Continuing an answer: If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question that you are continuing to answer at the top of the page.

Suggested working time: 65 minutes.

Question 21 **(2 marks)**

Complete the table below naming a piece of hardware that has been designed for the specific purpose. The first has been done for you.

Purpose	Hardware
Input	**microphone**
Process	
Output	

Question 22 **(1 mark)**

When using the Software Development Cycle (SDC), is testing carried out before or after evaluation?

Question 23 **(1 mark)**

WiFi can be used in homes or offices for short distance wireless networking. What term describes suburb or city wide wireless networking?

See next page

Question 24 **(2 marks)**

Define the following terms:

Data integrity: _____

_____

_____

Data redundancy: _____

_____

_____

Question 25 **(3 marks)**

In the table below, draw the symbols that would be used when creating Data Flow Diagrams (DFDs). The first has been done for you.

	Symbol
Entity	
Datastore	
Dataflow	
Process	

See next page

Question 26 **(3 marks)**

Complete the table below by writing each of the following terms next to the correct definition.

- Arithmetic Logic Unit (ALU)
- Control Unit (CU)
- Registers
- System Clock

The first has been done for you.

Term	Definition
System Clock	**controls the timing of the execution of instructions in the CPU**
	coordinates the components of the CPU during processing
	high speed memory locations used to temporarily store data during processing
	performs all the calculations during processing

Question 27 **(2 marks)**

Complete the table below by writing in the **most** appropriate communication protocol for each definition. The first has been done for you.

Protocol	Definition
SMTP	**manages email transfers across a network**
	transfer of files across a network
	secure transfer of data across a network

Question 28 **(1 mark)**

Your best friend sends you an email with an attachment. As you open the email your mouse starts to move on its own accord and clicks on random icons. What type of software that is normally used to protect your computer may be missing or not up to date?

See next page

Question 29 **(2 marks)**

POST is a program run by computers.

(a) What do the letters in the acronym POST stand for? (1 mark)

(b) Is POST run before or after the operating system is loaded? (1 mark)

Question 30 **(2 marks)**

Describe the difference between the following types of software licence.

Open source:

Shareware:

Question 31 **(1 mark)**

'Project management' often refers to terms such as planning, scheduling, budgeting and tracking. Define the term 'tracking'.

Question 32 **(1 mark)**

State **one** advantage of prototyping as a system development methodology.

See next page

Question 33 **(3 marks)**

Complete the table below which shows examples of programming language types that have evolved over the years. Match the language types with the language examples shown in the table. The first has been done for you.

Language types:

- machine
- assembler
- procedural
- non-procedural

Language example	Language type
SELECT * FROM DVD WHERE quantity < 5 ORDER BY title;	**non-procedural**

get (name)
if name = ‘ ’
print(‘nothing entered’)
else
print(name)
endif	

10001001 10101010 11001101	

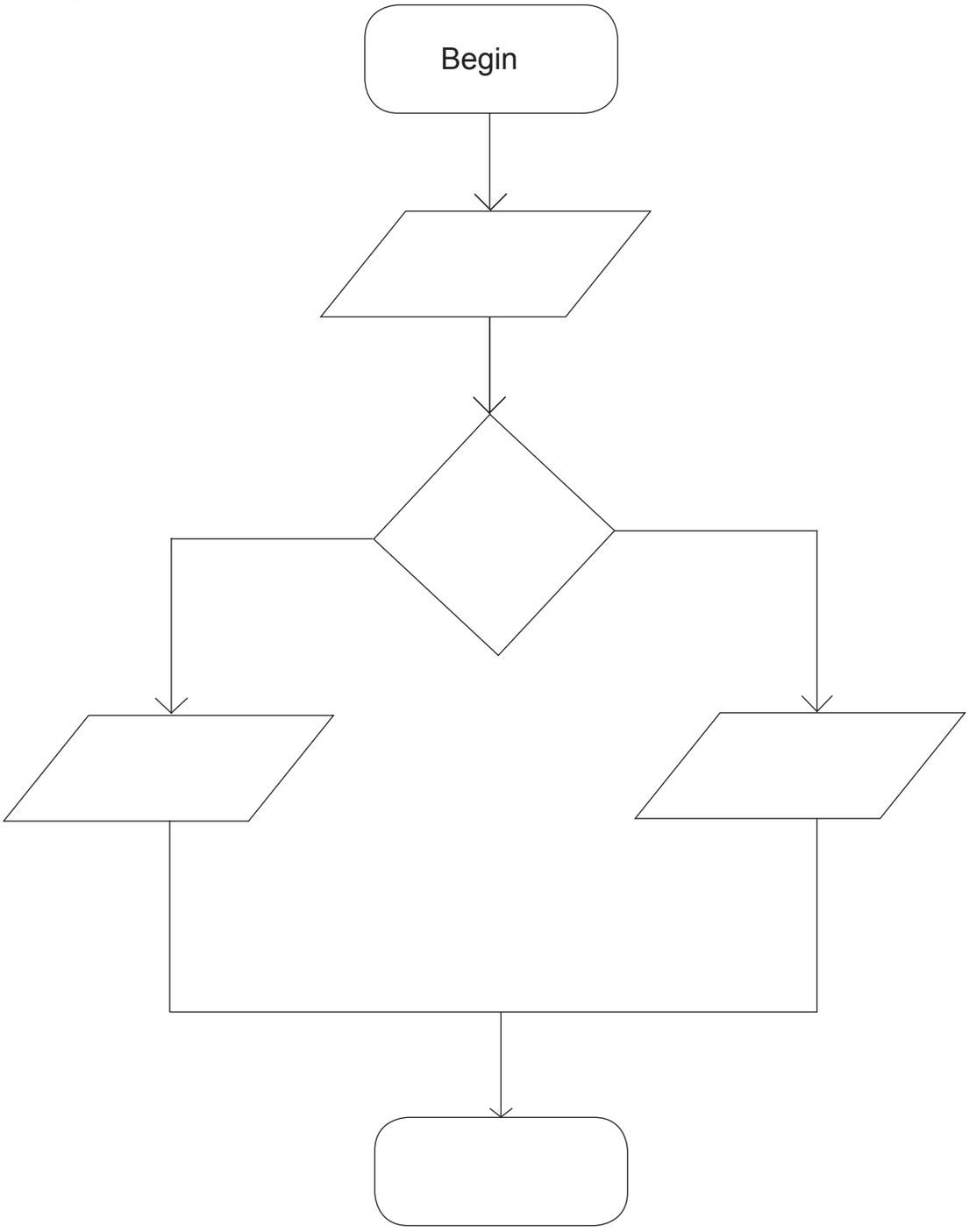
mov AL, 2h
mov CL, 3h
mov DL, 4h
mov ecx, -1	

See next page

Question 34 **(5 marks)**

Complete the flowchart below for the following pseudocode. The first symbol has been done for you.

```
BEGIN
        INPUT (Score)
        IF Score >= 50 THEN
                PRINT ('You passed!')
        ELSE
                PRINT ('You need to try again')
        END IF
END
```



See next page

Question 35 **(3 marks)**

Place the following names next to the appropriate terms in the table below.

- tuple
- attribute
- byte

The first has been done for you.

table	**entity**
field	
character	
record	

Question 36 **(3 marks)**

Without proper security the Windy West Car Hire network may be susceptible to the following types of malware. Match the malware types listed below with their correct definition.

- Virus
- Trojan
- Spyware
- Keylogger

The last has been done for you.

	a program that tracks user activity
	a self-replicating program
	a program that disguises itself
Keylogger	**a program that has the ability to record and log every keystroke made on the keyboard**

See next page

Use the following pseudocode to answer Question 37.

```
BEGIN
    total ← 0
    counter ← 0
    average ← 0
    mark ← 0
    INPUT (mark)
    DO WHILE mark <> 999
        total ← total + mark
        IF mark >= 0
            counter ← counter  + 1
            average ← total / counter
            PRINT (average)
            PRINT ('you have made' + counter + 'entries')
        ELSE
            PRINT ('no valid marks were entered')
        ENDIF
        INPUT (mark)
    END WHILE
END
```

Question 37 **(3 marks)**

(a) Identify **two** variables used in this pseudocode. (2 marks)

(b) What input value of mark will cause this program to finish? (1 mark)

Question 38 **(1 mark)**

A software developer will provide both internal and external documents to assist software users. State **one** example of external documentation.

See next page

Question 39 **(4 marks)**

Network administrators use acronyms, such as RAM, which are not always understood. State what the following acronyms stand for. The first has been done for you.

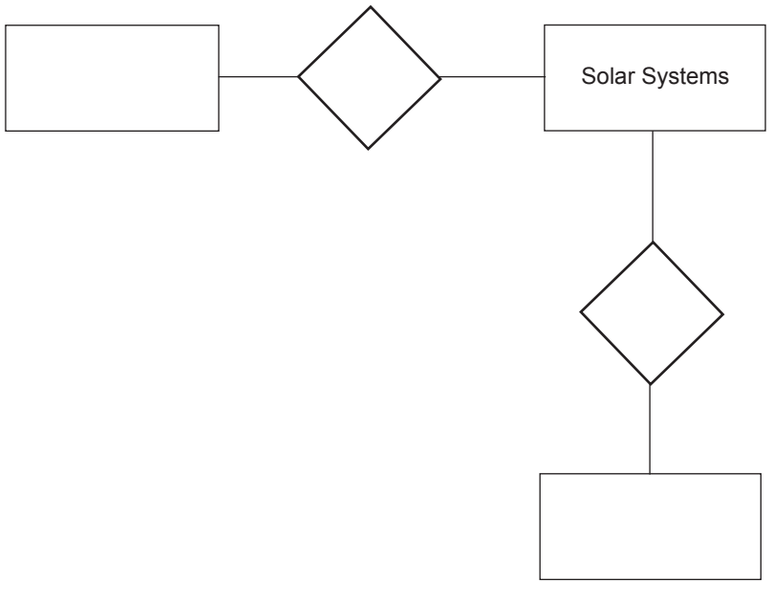
RAM	**Random Access Memory**
UTP	
ROM	
SSD	
NIC	

Question 40 **(9 marks)**

Consider the statement below.

A galaxy consists of many solar systems. A solar system can have many planets.

(a) Complete the Entity Relationship (ER) diagram below, showing all entities, relationships and cardinalities. (5 marks)



(b) Identify **two** possible primary keys. (2 marks)

(c) Identify **two** possible foreign keys. (2 marks)

End of Section Two
See next page

Section Three: Extended answer **55% (70 Marks)**

This section has **four (4)** questions. Answer **all** questions. Write your answers in the spaces provided.

Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space if required to continue an answer.

- Planning: If you use the spare pages for planning, indicate this clearly at the top of the page.
- Continuing an answer: If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question that you are continuing to answer at the top of the page.

Suggested working time: 90 minutes.

Question 41 **(17 marks)**

Windy West Car Hire is a small business whose owners want to improve its efficiency and they have contacted you to analyse how their system operates.

(a) The Windy West Car Hire owners have been told they need to use a System Development Life Cycle (SDLC) to create their new system. You have been given the six stages but they have been scrambled. Place them in order by using the numbers 1–6. Two have been done for you. (4 marks)

Design	**3**
Evaluation and maintenance	
Preliminary analysis	
Implementation	**5**
Analysis	
Development	

Question 41 (continued)

The following narrative describes how vehicles are hired out in the current system:

- When a customer wishes to hire a vehicle, they go online to the business's website and search the vehicle datastore for availability of the type of car they want to hire.
- The customer makes a note of the car ID and then contacts the office.
- The receptionist requests their name, home address, drivers licence number and credit card details.
- The customer states the car ID and the length of time they wish to hire it for.
- The receptionist enters the customer's personal details into the customer datastore that returns a customer ID.
- The customer ID and car ID are entered into the hiring datastore.
- On the basis of the car type and the length of hire, the receptionist calculates the cost of the hire and uses the credit card details to make an electronic transaction for the full hire amount via their EFTPOS machine to the bank.
- The bank receipt number is then entered into the hiring datastore.

(b) List **two** entities referred to in this narrative. (2 marks)

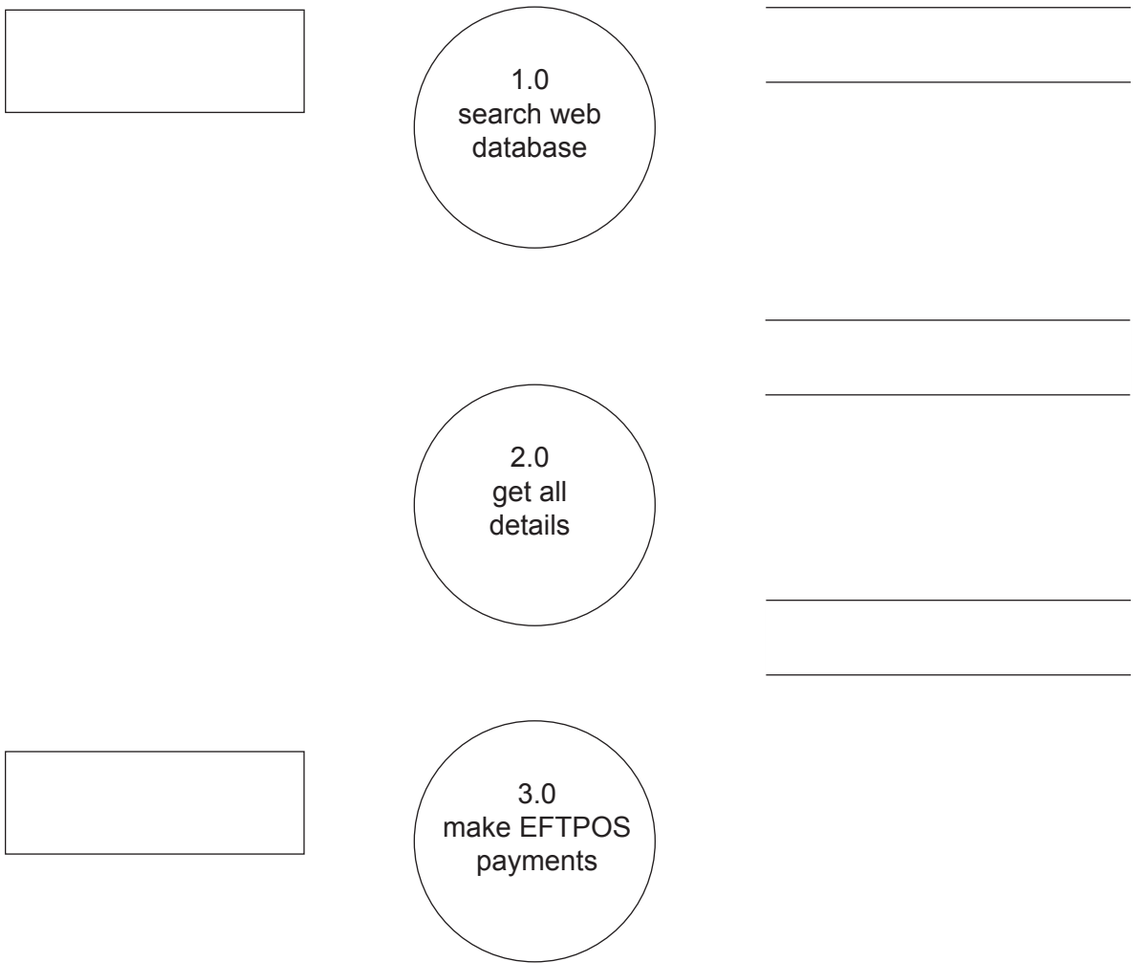
(c) List **two** datastores referred to in this narrative. (2 marks)

(d) List **two** processes referred to in this narrative. (2 marks)

(e) List **two** data flows referred to in this narrative. (2 marks)

See next page

(f) Windy West Car Hire has been presented with the following partially completed Level 0 Data Flow Diagram (DFD). Fill in the missing entities and datastore names. (5 marks)



Question 42 **(11 marks)**

The data below is part of the hiring datastore that is kept on a spreadsheet by Windy West Car Hire. The following notes describe the process.

When the vehicle is hired, the hirer's first name, the car type, the number of days for which it is initially hired and the number of kilometres on the odometer at the start of the hire are entered into the spreadsheet.

- a VLookup function uses the car type to return a value for hire cost per day, which is used to calculate the total cost for basic car hire.

When the car is returned the following actions occurs:

- the final kilometre reading is entered into the spreadsheet
- the total kilometres travelled is calculated
- a VLookup function returns the car type cost per day
- a formula is used to calculate the total hire cost.

Worked examples have been provided:

	A	B	C	D	E	F	G	H	I	J	K
1	**Hirer**	**Car type**	**Days hired**	**Car type hire cost per day ($)**	**Total cost for basic car hire ($)**	**Start kilometres**	**Final kilometres**	**Total kilometres travelled**	**Car type cost per kilometre**	**Total kilometre cost ($)**	**Total hire cost ($)**
2	Harold	sedan	3	35.00	105.00	12900	13201	301	1.00	301.00	406.00
3	Ahmed	wagon	1	40.00	40.00	21909	22309	400	1.25	500.00	540.00
4	Greg	people mover	4	65.00	260.00	15191	15775	584	2.25	1314.00	1574.00
5	Khang	ute	2	37.50	75.00	8321	8707	386	3.25	1254.50	1329.50
6	Ben	wagon	2	40.00	80.00	2235	2572	337	1.25	421.25	501.25
7	Jill	sedan	1	35.00	35.00	25009	25336	327	1.00	327.00	362.00
8											
9											
10		**Per Day Cost**									
11		**Car type**	**Car hire cost per day ($)**								
12		sedan	35.00								
13		wagon	40.00								
14		people mover	65.00								
15		ute	37.50								
16											
17											

See next page

The following formulas need to be supplied.

(Do not attempt to calculate any answers, as only the formulas are required.)

(a) Write the formula for Cell H2 that calculates the total kilometres travelled. (1 mark)

(b) Write the formula for Cell E2 that calculates the total cost for basic car hire. (1 mark)

(c) Write the VLookUp function to enter the car type cost per day value into Cell D2. (3 marks)

=VLookUp (

(d) Write the formula for Cell H8 that counts the number of cars hired where the total kilometres travelled exceeded 300. (3 marks)

Windy West Car Hire wants to convert its spreadsheet into a database. Part of the change requires that all data types match between the two systems.

(e) Explain the term data type. (1 mark)

(f) What data type is being used in Cell A2? (1 mark)

(g) What data type is being used in Cell F2? (1 mark)

See next page

Question 43 **(24 marks)**

In order to reward its loyal customers, Windy West Car Hire has decided to provide a yearly refund based on the number of kilometres used by each hirer.

The refund will be calculated based on the following sliding scale.

Refund type	Kilometres travelled	Refund rate
A	less than 500 km	$0
B	500 km – 1000 km	$0.025 per kilometre
C	greater than 1000 km	$25.00 + $0.05 per kilometre over 1000 km

The program is to:

- input the hirer's name
- use an iteration (loop) to enter the number of kilometres travelled during each hire period
- accept a negative number to indicate no more entries needed
- calculate the total kilometres travelled
- calculate the refund based on the refund rate in the table above
- print out the hirer's name, the total kilometres travelled and the total refund earned in dollars.

See next page

(a) A partial algorithm has been supplied for you below. Complete the algorithm by filling in the blank boxes. (8 marks)

```
/* define constants */
refund_rate_A = 0
refund_rate_B = 0.025
refund_rate_C = 0.05

/* initialise variables */
kms_for_trip ← 0
total_kms ← 0
refund ← 0
name ← ' '

/* calculate discounts */

INPUT [(                                                    )]

INPUT (kms_for_trip)

WHILE kms_for_trip [                                        ]

        total_kms ← [                    ] + [              ]

        INPUT [(                                            )]
END WHILE

IF total_kms < 500 THEN

        refund ← [                                          ]

ELSE IF [                                                   ] THEN

        refund ← total_kms * refund_rate_B
ELSE
        refund ← [                                          ]
END IF
 /* print out results */

PRINT ('Hirer's Name: ', name)
PRINT ('Total kilometers driven: ', total_kms)
PRINT ('Refund amount: $', refund)
```

(b) What is a constant? (1 mark)

See next page

Question 43 (continued)

(c) What is a variable? (1 mark)

(d) Why is it a good programming practice to initialise variables at the start of a program? (1 mark)

(e) Give **one** reason why the programmer would use a constant to store the refund rate used in the calculations? (1 mark)

(f) Describe what happens when the line of code refund ← 0 runs. (1 mark)

(g) What type of algorithm error can a trace table test for? (1 mark)

See next page

(h) The company also wants to determine the average distance that each customer drives a car when they hire a vehicle. The following algorithm has been designed to calculate this average by reading through a list of distances.

```
 1    NumHires ← 0
 2    TotalDistance ← 0
 3    AverageDistance ← 0
 4    INPUT (Distance)
 5    WHILE Distance > 0
 6        NumHires ← NumHires + 1
 7        TotalDistance ← TotalDistance + Distance
 8        INPUT (Distance)
 9    END WHILE
10    AverageDistance ← TotalDistance / NumHires
```

Complete the trace table below to test the logic of the algorithm using the following values: 200, 300, 100, -5. The trace table has been started for you. (8 marks)

Line	NumHires	Distance	TotalDistance	AverageDistance	Distance > 0
1	0				
2			0		
3				0	
4		200			
5					TRUE
6	1				
7			200		
8		300			
5					TRUE
6	2				

(i) The Windy West Car Hire company has asked the programmer to create a user interface. Identify **two** features of a good user interface. (2 marks)

One: _____

_____

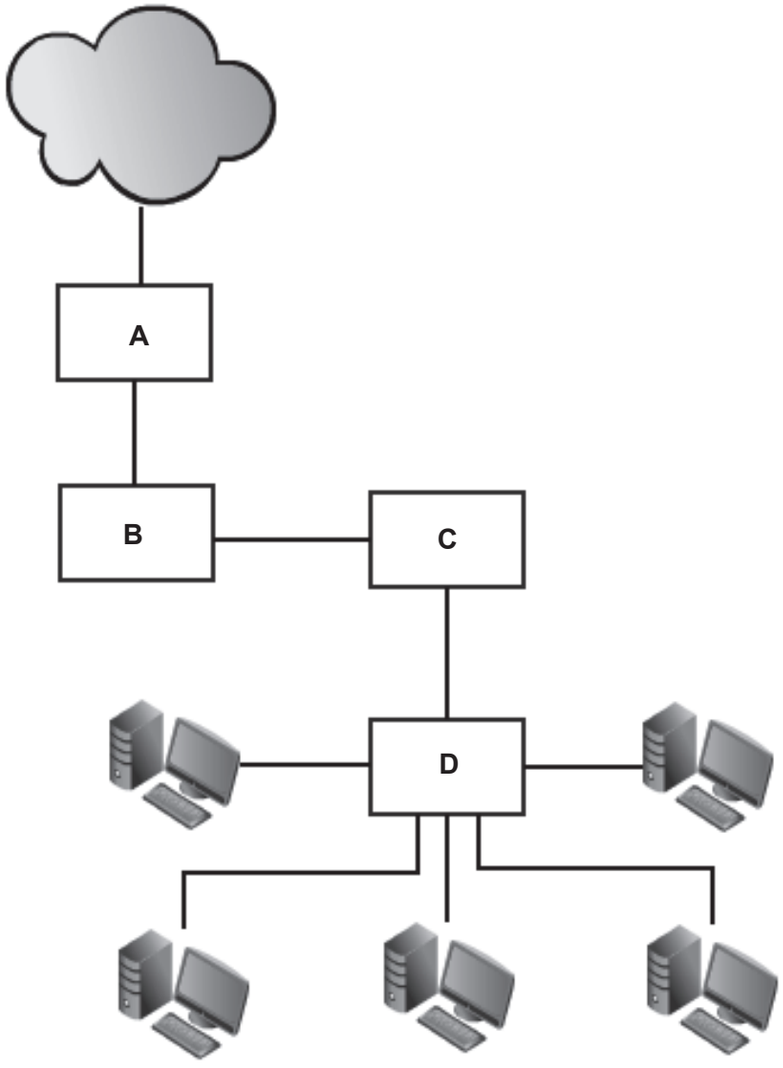
Two: _____

_____

See next page

Question 44 **(18 marks)**

The following diagram shows the layout for the planned Windy West Car Hire office network.



See next page

(a) Complete the table below, matching the items to the device shown in the network diagram on page 26. (3 marks)

- router
- firewall
- modem
- switch

The last one has been done for you.

	Device
A	
B	
C	
D	**switch**

(b) State the function of each of these devices. The last one has been done for you. (3 marks)

Device	State the function of the device
router	
firewall	
modem	
switch	**joins computers together to form a LAN**

(c) Is the Windy West Car Hire network diagram a LAN or a WAN? (1 mark)

See next page

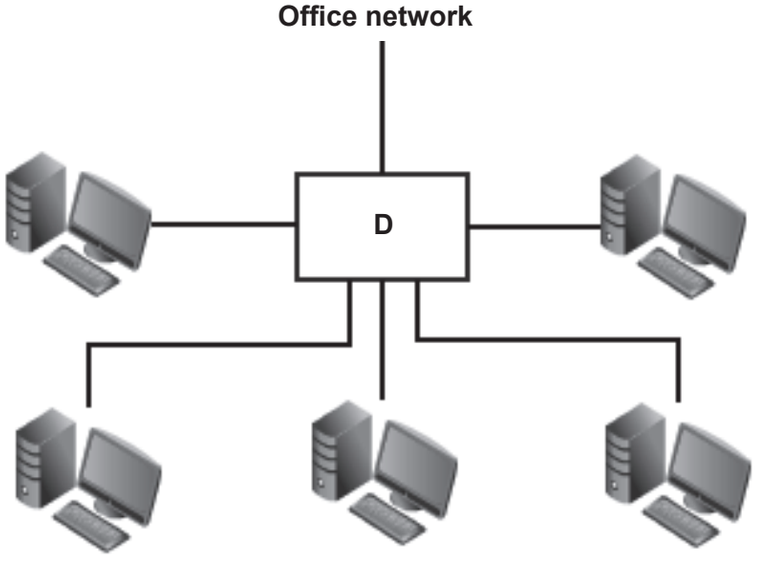
Question 44 (continued)

(d) Windy West Car Hire currently uses cables for its network. Describe **one** advantage Unshielded Twisted Pair (UTP) has over wireless. (1 mark)

(e) The Windy West Car Hire network diagram shows the following cloud symbol.

What does this symbol represent? (1 mark)

Windy West Car Hire has decided to convert its office computing and communications equipment to wireless. This involves the switch and the office computers as shown below. The rest of the system will remain connected via cable.



(f) In the space provided, redraw the office network as a wireless networked system.

(6 marks)

See next page

Question 44 (continued)

(g) Windy West Car Hire currently runs a Peer-to-Peer network. What is a Peer-to-Peer network? (1 mark)

(h) Windy West Car Hire is considering adding a server that will convert its Peer-to-Peer network into a Client Server Network. Give **one** benefit of using a Client Server network. (1 mark)

(i) Windy West Car Hire is concerned about the security of customer data that will be sent across the internet. Identify **one** method of securing this data while it is being transported over the internet. (1 mark)

End of questions

Question number: _____

Question number: _____

Question number: _____

Additional working space

Additional working space

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