



EXAMINERS' REPORT ON 2001 TERTIARY ENTRANCE EXAMINATION

SUBJECT: INFORMATION SYSTEMS

STATISTICS

Year	Number Who Sat	Non-Examination Candidates	Did Not Sit
2001	694	66	128
2000	679	53	109
1999	488	24	80

The Examiners' Report is written by the Chief Examiner (or another Examiner on their behalf) to comment on matters relating to the Tertiary Entrance Examination in their subject. The opinions and recommendations expressed in this report are those of the Chief Examiner and not necessarily representative of or endorsed by the Curriculum Council.

The Marking Guide provided at the end of this report was prepared for markers and may have been substantially amplified by discussions held in the pre-marking meeting. It is not intended as a set of model answers, and is not exhaustive as regards alternative answers. Some of the answers are less than perfect, but represent a standard of response that the examiners deemed sufficient to earn full marks. Teachers who use this guide should do so with its original purpose in mind.

SUMMARY/ABSTRACT

The 2001 Information Systems paper was well received and was considered to be a fair and reasonable paper. Feedback from the Syllabus Committee and anecdotal evidence from a number of teachers of the subject support this view. The length of the examination seemed to be appropriate and markers indicated that in general candidates completed the paper. The examination was similar in structure to that of the 2000 paper including the inclusion of the blue *Information sheet* with extracts from the extended answer questions, which was considered a valuable addition for candidates to use when answering the questions.

The general standards reflected by candidature were satisfactory and it was pleasing to note a great improvement in Part C results from the previous year, largely due to a better performance in the Languages component of the examination. As with the 2000 paper, the maximum possible marks were awarded for each question and question part throughout the entire paper, indicating that full marks were achievable by capable candidates even for the most difficult questions in the paper.

Due to an overall weakness of candidates in the Languages component of the syllabus revealed in examinations in previous years, a different approach was adopted for the Languages section of the 2001 examination. The Part C question was written in a more diagnostic style to determine whether candidates understood a selection of knowledge, tools and procedures used in the Languages and programming context. It is extremely pleasing to note the value of this style of question because the candidates performed very well in almost all sections of the Languages Part C question, a situation not seen in previous years. The implications of these results are discussed further in the *Points for Consideration by the Syllabus Committee* section of this report.

GENERAL COMMENTS

The examination consisted of fifteen multiple-choice questions (15%), thirteen short-answer questions (25%) and four extended answer questions (60%). Candidates were not given any choice in the extended answer section. The examiners attempted to ask questions that enabled candidates to demonstrate their knowledge in contexts considered to be reasonably familiar to candidates.

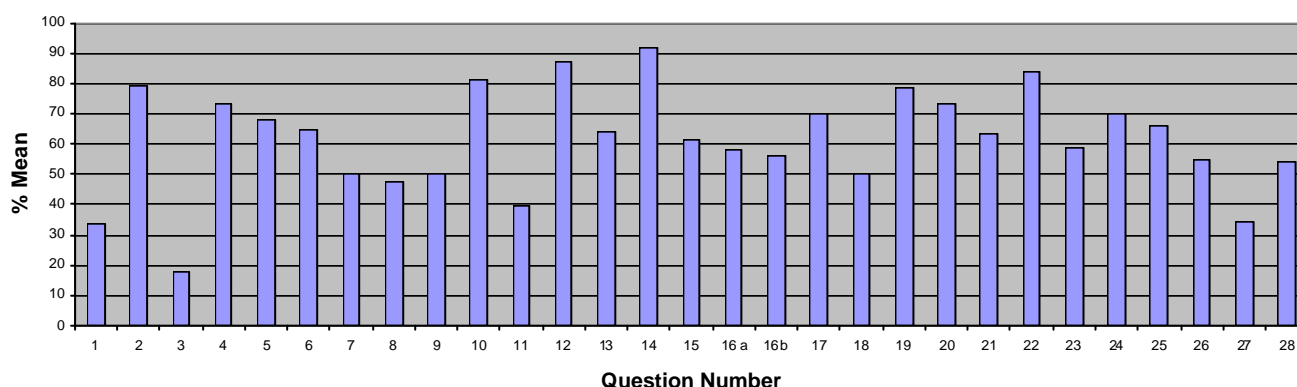
The balance of questions across the syllabus is indicated in the following table. The weighting was identical to the 2000 paper and falls within the requirements of the syllabus. The values in parentheses are the weightings specified in the syllabus.

2001 Information Systems Examination Breakdown						
PART	Languages	Architecture	Communications	Databases	Info Sys	Total
A	3	4	2	3	3	15
B	4	5	6	2	8	25
C	14	0	7	20	19	60
TOTAL	21	9	15	25	30	100
	(20-25)	(5 – 10)	(10 – 15)	(20 – 25)	(30 – 35)	

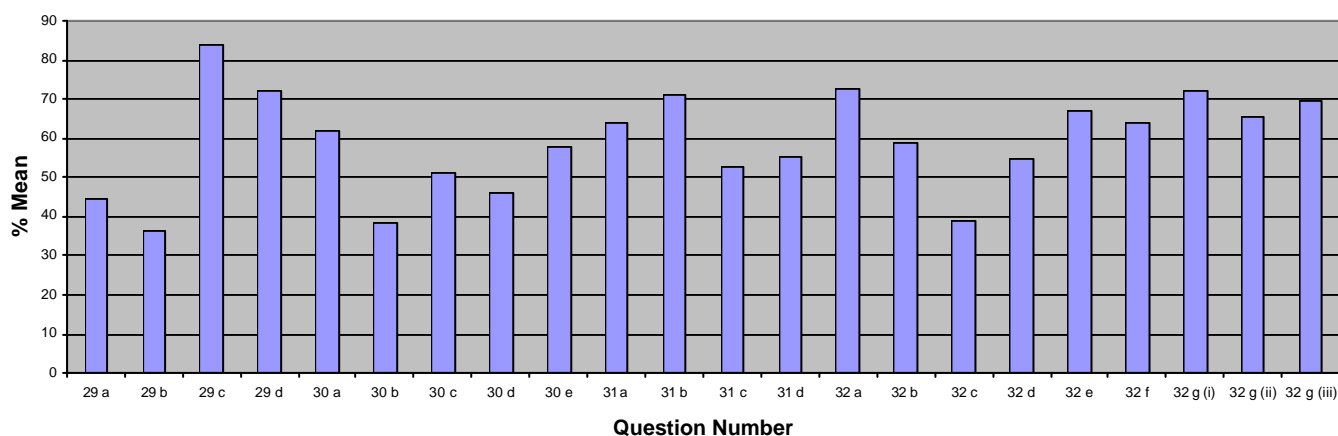
All values shown are percentages.

The Information Systems paper produced a satisfactory range of marks from 93% to 7% with a mean of 55.83% and a standard deviation of 17.80. Judging by the results, the paper seemed to be less difficult than last year's paper (mean of 51.25%). However, comments from markers also indicated that candidates appeared to be handling the more difficult questions better than previous years, indicating a more settled and consolidated approach to the 'new' subject of Information Systems, which may also have influenced these outcomes.

Performance on Sections A and B



Performance on Section C



COMMENTS ON SPECIFIC SECTIONS/QUESTIONS

The means (and correlation coefficients) for each section were:

Part	Mean	Correlation coefficient
A	60.57%	0.72
B	58.33%	0.89
C	53.39%	0.97

These statistics indicate that the questions were well graded in terms of difficulty across the sections of the paper. Overall the questions discriminated between better and less able candidates quite well, the exception being the well answered Part B Question 22 worth 1 mark, which had a low correlation with the total.

Candidates provided overall good responses on the Architecture, Communications, Databases, Information Systems and Languages topics throughout the paper. There were no identified areas of weakness in the Architecture topic, although it was suggested to the examiners that the short answer Question 21 in Part B on the subject of RISC and CISC was beyond the 'define' nature in the syllabus. However, the examiners stand by the question as the answer that was expected was merely in the definition of RISC and CISC computers and over 63% of candidates demonstrated their understanding by answering correctly.

The Communications questions Part C 29 (a) and 29 (b) were not answered as well as expected and candidates need to be reminded that it is not acceptable to provide specific brand names of software when answering questions. Generic terms must always be used.

The Database topic in general was handled quite well with the more capable candidates responding well to the challenging Part C Question 30 (b) and Part C Question 30 (d). It was interesting to note that some candidates were able to correctly represent the revised E-R diagram in Part C Question 30 (c) and yet were unable to describe what needed to be done in Question 30 (b) in terms of the database implementation. Possibly this was due to practice on paper the drawing of E-R diagrams and their remodelling of many-to-many relationships into one-to-many and many-to-one, without developing the understanding of the practical problem of implementing many-to-many relationships in a real database. On the other hand, Part C Question 30 (d) appeared to be hampered by hands-on practice where querying implemented databases was done using the "Query By Example" (QBE) style of query construction. The problem with QBE is that the extraction of data is somewhat transparent to the user and no real understanding of the data and tables is developed. This was revealed in the examination by a lack of understanding by many candidates as to which tables would be accessed for the extraction of the required data. Candidates were not expected to actually create a query, especially as it required the difficult concept of linked tables, rather they were required to recognise which tables hold the relevant data and conceptually in which order this data is extracted from the tables.

The main area of weakness in the Languages topic was the ability to trace an algorithm. This was evident in Part C Question 32 (c), where the examiners deliberately left the method of trace open to the candidate's individual choice. The purpose of the question was to determine whether candidates could trace an algorithm to follow the solution to a given problem and identify any breakdown in logic, rather than being concerned with the technicalities of a particular method of trace. The Part C Question 27 also involving a trace was compounded in difficulty for candidates because it required an understanding of the array data structure. The record and array data structures were both mentioned in last year's report as an area of weakness, and this was once again confirmed in Part A Question 3 on the 2001 examination.

Candidates performed very well in the Information Systems topic; however, markers observed once again that there is too much variation from candidates in the symbols used for data flow diagrams (similarly for entity-relationship diagrams in the Database topic). The examiners and markers consider it extremely beneficial to candidates if teachers refer to the additional documents *Suggested Standards for Information Systems Tools* and *Year 12 Information Systems (E238) Grade-Related Descriptors* in conjunction with the *Information Systems Syllabus* document. In combination, these three documents adequately guide candidates on subject content, scope and standards in preparation for the examination. Examiners and markers refer closely to these documents.

POINTS FOR CONSIDERATION BY THE SYLLABUS COMMITTEE

As mentioned in the abstract above, due to an overall weakness of candidates in the Languages component of the syllabus revealed in examinations in previous years, a different approach was adopted for the Languages section of the 2001 examination. The Part C question was written in a more diagnostic style to determine whether candidates understood a selection of knowledge, tools and procedures used in the Languages and programming context. This

year candidates performed very well in almost all sections of the Languages Part C question, a situation not seen in previous years. It should be reassuring to teachers that the candidates do appear to demonstrate the repertoire of knowledge and skills required in the Languages component of the syllabus. It is possible that in an examination context, the more integrated style of question used in previous years was not sufficient to determine the basic knowledge and skills of the candidates. Candidates found it difficult to produce an algorithm solution for unseen problems under examination conditions in previous years, and hence were unable to demonstrate the basic skills in the process. This should come as no surprise, as the whole process of software development is iterative and cyclic where multiple solutions are examined and refined over time. Whilst candidates may develop these basic skills, the difficulties which arise from being asked to produce solutions to problems in an examination context needs to be addressed. The process of determining whether candidates can develop suitable solutions to problems may benefit from a more holistic approach to assessment.

Last year it was recommended that the Syllabus Committee review expectations of what candidates can achieve in the Languages topic in the time allocated in the subject. As a result of candidate performance using the more diagnostic approach to Languages in the 2001 examination, this recommendation remains. However, there is an additional point for consideration i.e. the mismatch between the examination assessment approach and the process oriented knowledge and skills of candidates developed by candidates in the Languages component of the syllabus. It would be beneficial to candidates if alternative complementary assessment practices for the Languages topic could be developed in the future. These comments equally apply to the Databases topic. This is by no means a recommendation to abolish the written examination, as there are other topics that are perfectly suited to this form of assessment. The strong recommendation to the Syllabus Committee is that that the style of assessment needs to match the style of learning by which the candidates build their knowledge and skills associated with the Languages and Databases topics. Candidates would benefit from an assessment method that acknowledges the cyclic and iterative processes in the software development cycle, where in a learning context the theoretical concepts are refined as the practical understanding is being developed.

Robyn Rumble
January 2002

2001 Examining Panel

Chief Examiner: Mrs Robyn Rumble
Deputy: Ms Tanya McGill
Third Member: Mr Craig Valli

Chief Marker: Mrs Robyn Rumble

TEE

Information Systems

Suggested Marking Guide

2001

This document may only be considered as a working document amplified by discussion held by markers, and is not a set of model answers.

PART A Multiple Choice Items (15 marks)

Attempt all questions in this part. Each question is worth 1 mark. Each question has only one correct response. For each question select the response that is correct. Signify your answer by circling the label (a, b, c or d) of the correct response. If you change your answer, completely erase your original answer. Questions where two or more responses are selected will score no marks.

1. Which of the following would not be considered a feature of writing programs using modules and parameters?

- (a) Modules may be reused in other programs.
- (b) Different modules may be substituted to perform the same task.
- (c) Programs may be run using different sets of data.
- (d) **Programs are more accurate using modules and parameters.**

2.

A ← 8
B ← -8
FOR COUNT 1 ← 4 DO
A ← A - 2
B ← B + 2
ENDFOR
OUTPUT A, B

Which of the following correctly shows the output of this algorithm?

- (a) 8, -8
- (b) -8, 8
- (c) **0, 0**
- (d) 4, 4

3. Consider the following statements about data structures. Decide whether each statement is true or false. Then select the appropriate response.

First Statement: *Records may have data stored in arrays.*
Second Statement: *Arrays may have data stored in records.*

- (a) **Both statements are true.**
- (b) The first is true but the second is false.
- (c) The first is false but the second is true.
- (d) Both statements are false.

4. The rows of a table in a database are called
- (a) attributes.
 - (b) tuples.**
 - (c) indexes.
 - (d) relationships.
5. A technical description of the data which is to be stored in a database is called
- (a) a physical database design.
 - (b) a data dictionary.**
 - (c) an E-R diagram.
 - (d) a logical database design.

6. Consider the student enrolment data in the fields in the following table extract:

First name	Surname	Birth date	Address	Sub1	Sub2	Sub3
Susan	Freeman	17/9/92	4 Barton Rd, Redback 9455	Science	History	Japanese
Kate	Smith	23/4/91	36 Spring St, Clayfield 9123	Maths	English	Science
Billy	Smith	23/4/91	36 Spring St, Clayfield 9123	Economics	Music	Geography

Which of the following would **not** be considered an improvement to the design of this student enrolment database?

- (a) Putting address data into separate *Street*, *Suburb* and *Postcode* fields so mailouts can be sorted by postcode.
 - (b) Adding an extra field to the table, such as *IDNum*, which will uniquely identify each student.
 - (c) Putting all the fields containing subject data into a separate linked table.
 - (d) Removing the Birth date field to avoid the occurrence of redundant data, such as students with the same birthdays.**
7. Carriers and service providers both have a role to play in information and communications technology. Which statement **best** describes their roles?
- (a) Carriers own communications media and lease the means of communication to service providers and sometimes other carriers.**
 - (b) Service providers own communications media and lease the means of communication to carriers and sometimes other service providers.
 - (c) Carriers may lease the means of communication from service providers and other carriers.
 - (d) Service providers may lease the means of communication from carriers and other service providers.
8. One of the roles of systems analysts is to
- (a) design mainframe computers.
 - (b) design customised information systems.**
 - (c) analyse operating systems.
 - (d) set up computer hardware for a company to use.

9. The information systems life cycle stage in which problems are fixed or changes are made is called the
- (a) **maintenance stage.**
 - (b) design stage.
 - (c) implementation stage.
 - (d) replacement stage.
10. Which of the following is **not** a network topology?
- (a) Star
 - (b) **Switched**
 - (c) Token Ring
 - (d) Bus
11. You have purchased a computer with the following description: 128 Mb RAM, 500 MHz CPU, 10 Gb HDD and 100 Mb NIC. The “100 Mb NIC” is an example of
- (a) data terminal equipment.
 - (b) data transmission standards.
 - (c) **data communications equipment.**
 - (d) network integrated connectors.
12. A tape drive, CD Writer (CDRW) and removable hard disk are all examples of
- (a) secondary storage devices typically used for application access.
 - (b) primary storage devices typically used for backup.
 - (c) **secondary storage devices typically used for backup.**
 - (d) primary storage devices typically used for application access.
13. Software instructions that would perform primary hardware tests and checks when a computer is starting up would be typically stored as
- (a) **firmware on the mainboard/motherboard.**
 - (b) software on the hard disk.
 - (c) firmware on the hard disk.
 - (d) software in the operating system.
14. The part of a central processing unit (CPU) that performs logic operations is called the
- (a) logic unit.
 - (b) control unit.
 - (c) register.
 - (d) **arithmetic logic unit.**
15. Data can be found in a number of places before, during and after processing on a computer. Which of the following devices would be least involved when data is currently being processed?
- (a) RAM
 - (b) Bus
 - (c) Register
 - (d) **Hard disk**

PART B Short Answers (25 marks)

Answer all questions. Write your response in the spaces provided in this Question/Answer booklet.

16. Explain the meaning of each of the following terms.

(a) data integrity (1 mark)

How well the data represented within the database compares to the original data from the source documents.

(b) data redundancy (1 mark)

Unnecessary duplication of data within a database

17. What is a prototype? Provide **one** reason why it would be developed.

(2 marks)

Mock up (rough working model) of system with all (most) of the functionality but no whistles and bells. Developed so users can have input during the development and changes made as the development is in process.

18. State **one** activity that might occur in each of the following systems development life cycle stages. (e.g. Analysis – interview system users)

(3 marks)

Design:

Logical model used to plan (design) new system

Early general design and later detailed design of new system

Development:

All programs written and databases created

Screens, programs and reports tested with test data

Implementation:

Ordering and installing equipment

Data conversion

Training end users

Active language required in answers.

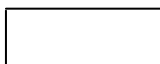
19. For each term below, **draw** the symbol and **describe** its purpose in the preparation of a data flow diagram. (3 marks)

External entity (source, sink):



Shows where data comes from into the system, or where data goes to from the system.

Data store (file):



Shows where data is stored after processing in the system, and from where it is accessed.

Process:



Shows the processing of data in the system.

20. Describe the role of cache as applied to computer hardware devices. (1 mark)

*A device where frequently and/or recently used instructions and/or data are stored
or
Designed to make the processing faster...*

21. Under certain circumstances a RISC based processor with the same processor speed and bus width can operate faster than a CISC based processor. Provide a reason for this. (1 mark)

RISC has a reduced instruction set

22. Give **two** examples of preventative maintenance that the average user can perform to keep their computer functioning correctly. (1 mark)

*Virus scanning
Clean from dust etc
Backups
Verification of backup
Defragging hard drive
etc*

23. Referring to the *memory, control unit, arithmetic logic unit* and *registers*, describe the fetch-execute cycle for a central processing unit. (2 marks)

Instructions and data fetched from memory by control unit
Instructions and data temporarily stored in registers
Instructions decoded by control unit
Data processed by arithmetic logic unit

24. Explain the difference between an attenuated and a noisy signal? (2 marks)

attenuation - fading of a signal over distance or the carrying capacity of a medium is inadequate or resistance in wires
noisy signal – loss of clarity in the signal due to electromagnetic interference or moisture or extreme temperatures etc

25. Each of the following is needed when connecting to the Internet to browse the World Wide Web. What is the meaning of these terms. (3 marks)

IP Address:

Used to uniquely identifies the computer on the Internet

Connection Protocol:

Used to negotiate (handshake) data transfer between data terminal equipment or
Set of rules and methods (agreed standards) for communications

Browser:

Used as an interface to access/view web pages and files via the Internet

26. Provide a general form of a boolean search string that could be used in a search engine to find information about the Australian Branch of the Speedy Motor Company. (1 mark)

australian AND speedy

or

au AND speedy

or

australia AND speedy

or

.au AND speedy

27. The procedure below manipulates an array of values that have previously been read into the array. Show the predicted output using the three given values that have been read into the array called *NumArray*:

5, -6, 0

```
PROCEDURE SUM_AND_OUTPUT_VALUES (NumberOfValues, NumArray)
```

```
    PosTotal ← 0
```

```
    NegTotal ← 0
```

```
    X ← 1
```

```
    WHILE X <= NumberOfValues DO
```

```
        IF NumArray[X] > 0 THEN
```

```
            PosTotal ← PosTotal + NumArray[X]
```

```
        ELSEIF NumArray[X] < 0 THEN
```

```
            NegTotal ← NegTotal + NumArray[X]
```

```
        ENDIF
```

```
        OUTPUT X, NumArray[X], PosTotal, NegTotal
```

```
        X ← X + 1
```

```
    ENDWHILE
```

```
ENDPROCEDURE
```

(3 marks)

1	5	5	0
2	-6	5	-6
3	0	5	-6

28. State **one** difference between an interpreter and a compiler.

(1 mark)

Interpreter converts program instructions to machine code during run time whereas compiler converts all program instructions to machine code before run time

END OF PART B

PART C Extended Answers (60 marks)

There are four questions in Part C. Answer all of them. Write your answers in this Question/Answer Booklet using the spaces indicated. Label your answers clearly.

29. (7 marks)

Vital Video

Vital Video is a successful video hiring business that has recently expanded its operation. It has acquired two new shops in suburbs that are next to the suburb of the existing shop. The owner of the new video chain wishes to centralise all of the administration functions and most importantly its membership database system. Each shop currently has one stand alone computer that runs the membership database. The membership database will be merged and stored on a computer that is located at the original video shop. The data will be accessed and available at all three video shops at any time.

Vital Video's owner wants fast, reliable electronic communication. You have been contacted for advice on communications issues in relation to connecting the two new video shops to the original video shop.

- (a) Suggest **two** suitable methods of connectivity that may be used to provide data communications between the three video shops. (2 marks)

ISDN
Modem
(Acceptable but not expected – radio, fibre, ADSL, Frame relay)

- (b) As well as the communications link between the video shops, a server and other physical hardware will also be required for the membership database system. Suggest **one** type of software that would be necessary to allow the interconnection between the video shops? (1 mark)

Client server software or
Communications software or
File transfer software etc

- (c) An Internet Service Provider (ISP) has suggested an option whereby the video shops can transmit their data between the shops via the Internet. Explain to Vital Video's owner **one** advantage and **one** disadvantage for communicating their data via the Internet. (2 marks)

Advantages:
Common standard TCP/IP
Cheap alternative to dedicated lines
Ease of Access
Ease of expansion

Disadvantages:
Lack of reliability
Lack of security
Speed not guaranteed (bandwidth)

- (d) The Internet Service Provider's option is very appealing to the owner because members will be able to make advanced bookings for video hires via the Vital Video web site. However, the owner is very concerned about the security of all the confidential data on the server. Specify **four** methods or tools that may be used to protect this data.

(2 marks)

Encryption

Firewall

Passwords

Levels of access

Strong authentication for login

Backups

Virus software

30. (20 marks)

Ned's News – a newsagent

Your local newsagent, *Ned's News*, orders and delivers magazines requested by its customers from its suppliers. The employees at Ned's News currently store all the order and delivery details on cards filed in a box. However, they have become aware that it would be better to store them in an electronic database on their computer.

Below is an example showing one card that is currently filed at *Ned's News*.

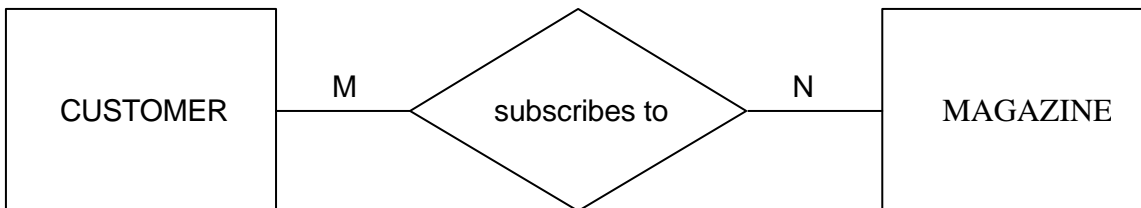
Customer name: <u>Margaret Jones</u>	Start issue: <u>Issue 2, 2001</u>
Magazine: <u>TV News</u>	End issue: <u>Issue 1, 2002</u>
ISSN*: <u>0113-1243</u>	Monthly cost: <u>\$18.00</u>
Address: <u>15 Dixon Rd</u> <u>Waterford WA 6890</u>	Publisher: <u>Western Print</u>

* ISSN (International Standard Serial Number) is a code used to identify journals and magazines.

- (a) Explain **two** advantages of storing the data for magazine orders and deliveries in a relational database. (2 marks)

Customer can order more than one magazine without redundant address data
Changes in price etc need to be made in only one place etc
Easier to update records
Reduces unnecessary duplication
Normalised to reduce redundancy
Faster access to data
Saving space

- (b)



The entity-relationship diagram above shows the initial basic model for the database.

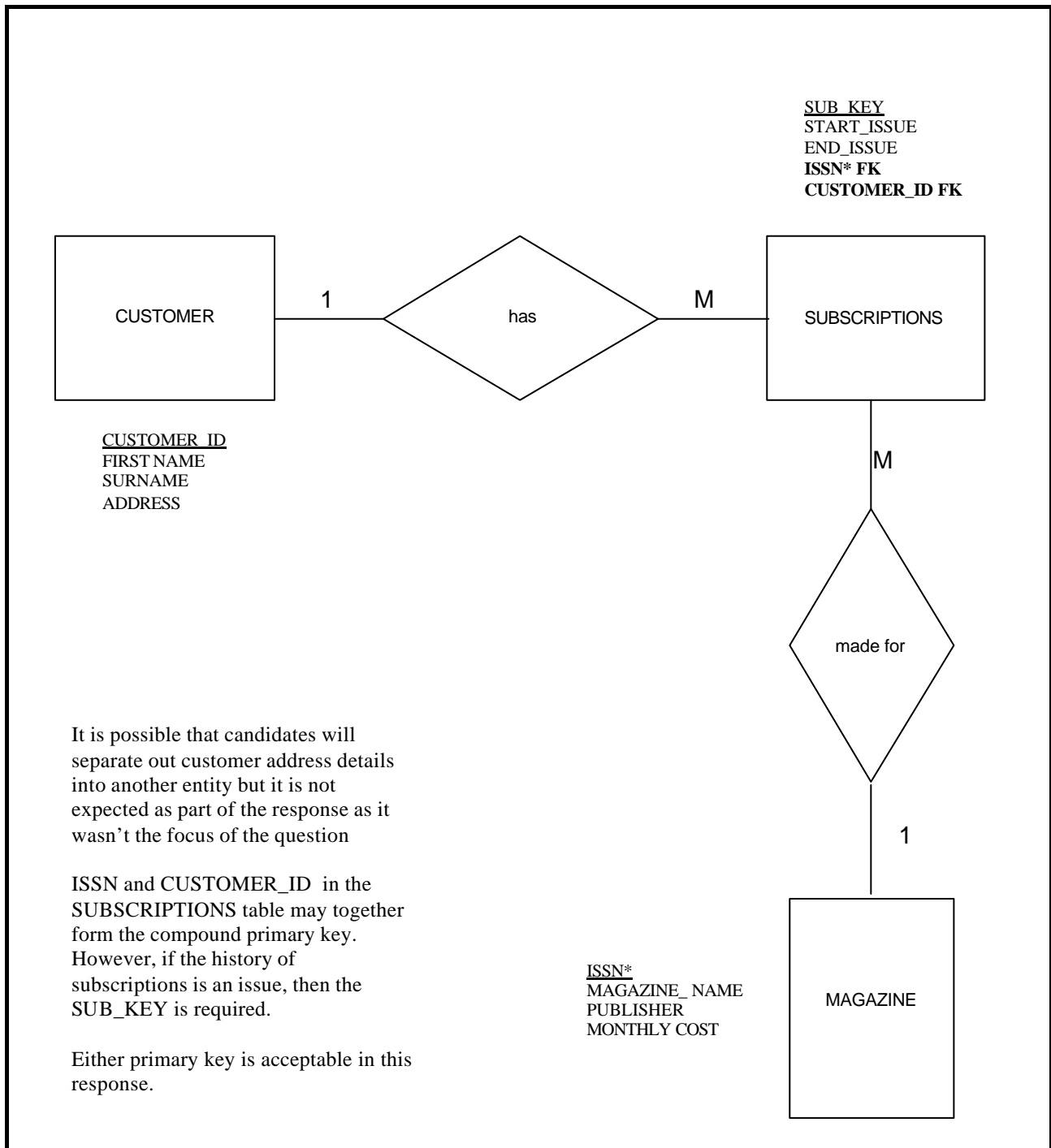
In order to implement this model, changes must be made to handle the many-to-many relationship between *CUSTOMER* and *MAGAZINE*. **Describe** what needs to be done.

(4 marks)

Create another entity
Establish key of new entity
Change relationship from *M : M* to *1 : M* and *M : 1*
Linking and foreign key

- (c) **Draw** a revised entity-relationship (E-R) diagram that models the design that can be implemented in the database. On your diagram, be sure to do the following:
- (i) **Name** all entities, attributes and relationships (note: you may create any new attributes you think might be needed)
 - (ii) **Underline** the primary key for each entity
 - (iii) **Indicate** all foreign keys with the code FK

(7 marks)



- (d) *Western Print* recently contacted *Ned's News* to obtain the names and addresses of all customers who subscribe to any of their publications. *Western Print* wishes to write to the customers directly and inform them of some new magazines to be released soon. An employee at *Ned's News* has been asked to obtain the required information from the database. Explain exactly how the database tables would be accessed to get the required information.

(3 marks)

*Find all magazines on Western Print in the MAGAZINE table
Find customer ID on that selection in the SUBSCRIPTIONS table
Go to CUSTOMER table to get names and addresses*

- (e) The database you have designed stores the amount each magazine costs per month because billing is done on a monthly basis. However, not all customers pay their accounts in full on time. Two possible modifications that could be made to the database design to record overdue amounts include adding an extra field to the CUSTOMER entity or creating a new PAYMENTS entity. You have been asked to make a recommendation.

Discuss these modifications and justify your recommendation.

(2 marks)

Second option – have a history of payments

Various points of discussion acceptable, but valid justification required

31. (19 marks)

Greenfield City Crime Monitoring System

The Greenfield City is serious about reducing crime and is attempting to manage its crime database in a way to help improve the rate of solving crime. The diagram on the following page models the Greenfield City Crime Monitoring System.

When a member of the community reports a crime, they are required to provide name and contact address and phone number. Each community member who reports a crime is provided a crime ID number for later reference.

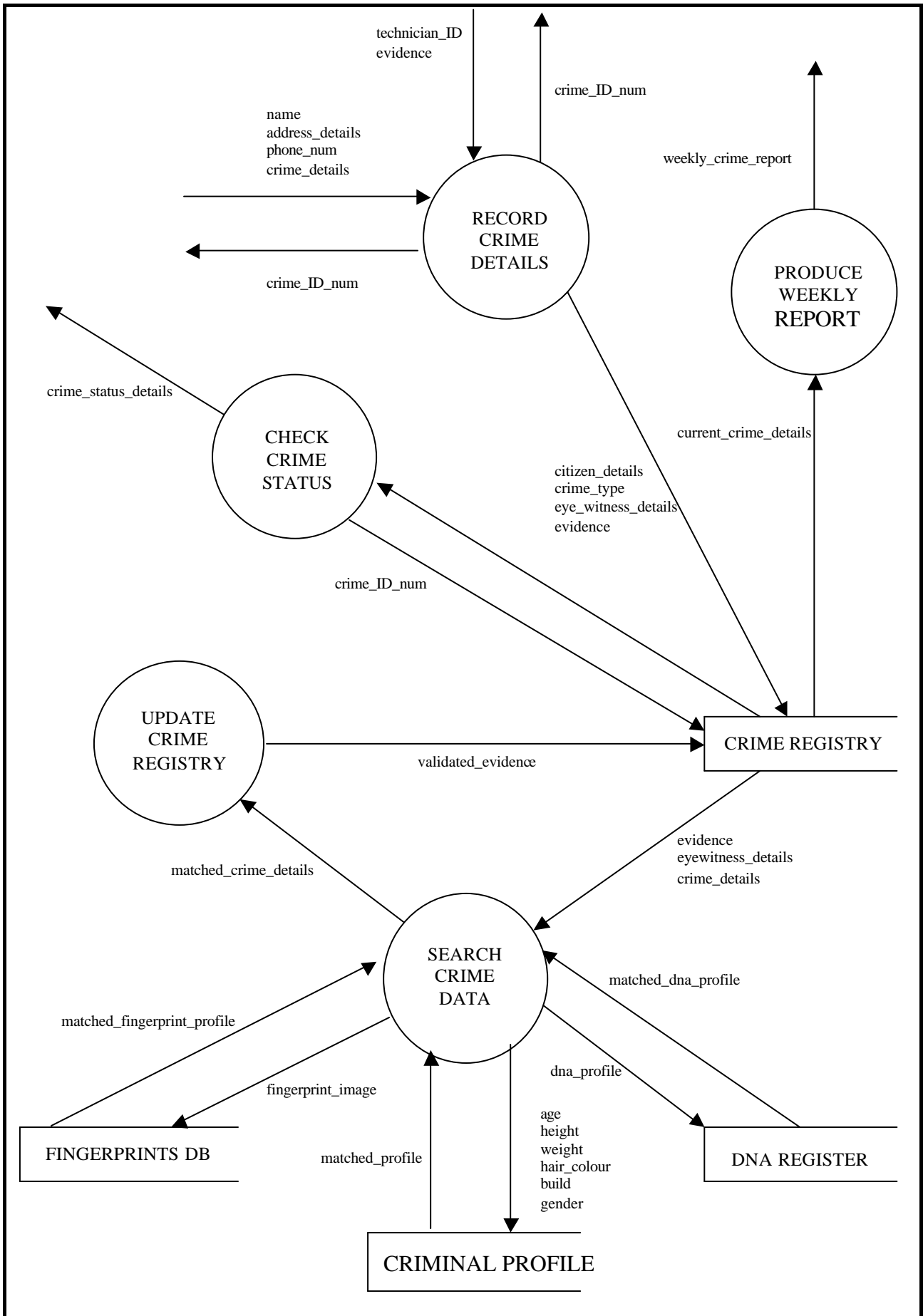
Alternatively, when crime technicians present details of a crime they provide their technician ID number and give details of the evidence they have collected. They too are supplied with a crime ID number for later reference.

When crime technicians and members of the community wish to check the progress of a particular crime, they are required to provide the crime ID number first, before the crime registry can be accessed.

All the reported crime details and evidence are held in the crime registry, which is regularly updated. Searches are made in the criminal profiles, fingerprints and DNA register databases and are matched with the recorded crime details and evidence found at crime scenes.

Each week the Greenfield City Police Commissioner receives a report summarising the progress being made with solving crimes.

Greenfield City wished to upgrade its Crime Monitoring System and contracted an information technology specialist to help them. The data flow diagram that follows shows how the crime data moves through the **current** Greenfield City Crime Monitoring System.



- (a) The Greenfield City Crime Monitoring System (GCCMS) is an information system. Using examples from the data flow diagram, define the terms and clearly explain the relationship between *data*, *information* and *information systems*.

(5 marks)

Many possibilities:

Data is the raw facts eg name and address, evidence

Information is processed data that is meaningful eg weekly crime report

Information systems process raw data and produce meaningful information

- (b) The data flow diagram models the Greenfield Crime Monitoring System. Suggest **two** methods that may have been used by the information technology specialist to obtain information before modelling the system.

(2 marks)

Interviews

Work shadowing

Questionnaires

Document gathering

Using the system

etc

Solving crime with communication

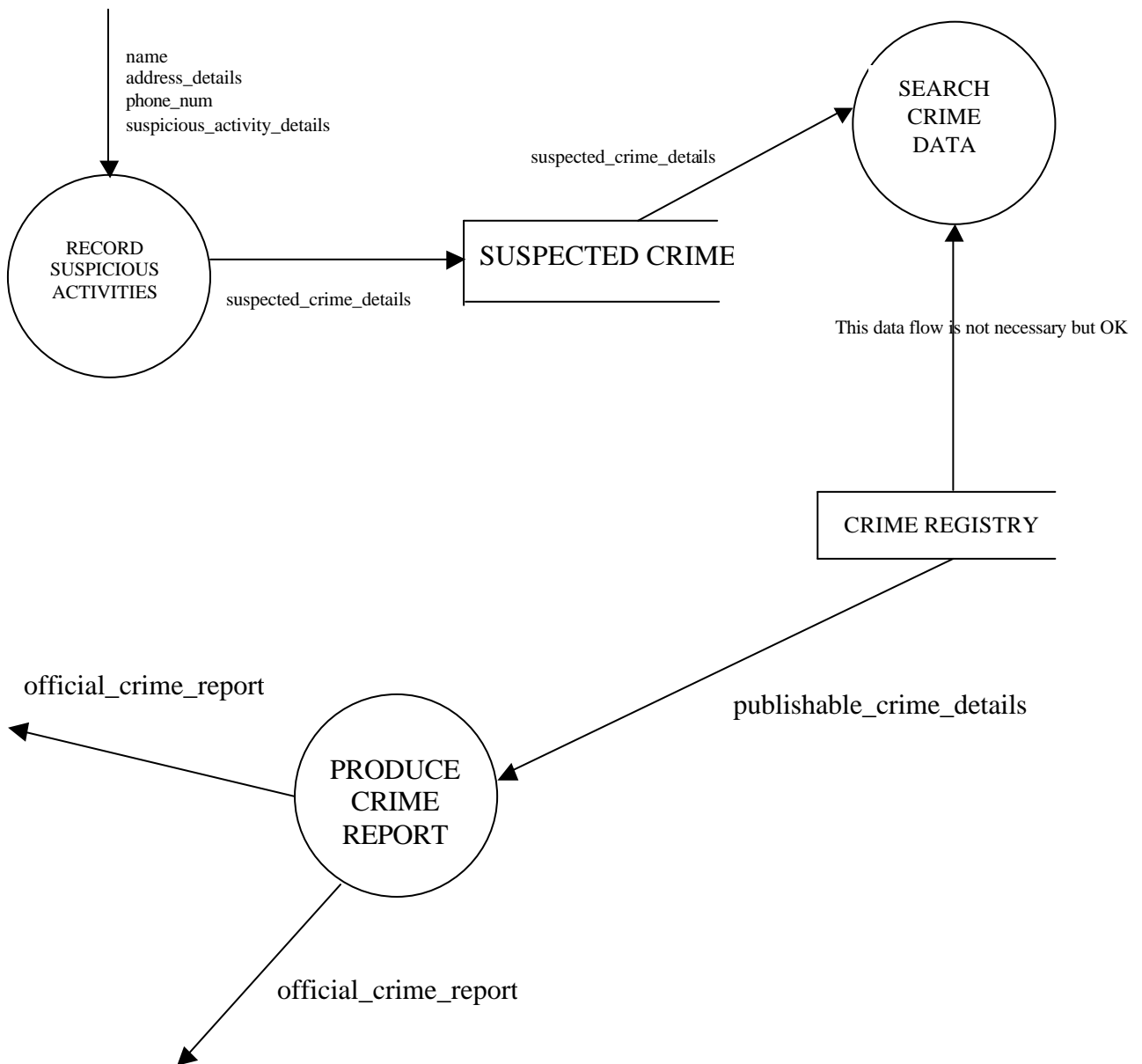
One of the best ways of solving crime is to improve communications with the general public. A group of volunteers named *Community Alert* will cooperate with the Greenfield City Police and communicate suspicious activities noticed in their local streets.

The Greenfield City police will regularly send publishable crime details to *Community Alert* and the local newspaper *Greenfield Gazette*. Greenfield City must extend their Crime Monitoring System so that it can communicate with *Community Alert* and the *Greenfield Gazette*.

- (c) Draw the extensions to the data flow diagram in the space below to include suspicious activity reporting and notification of publishable crime details. Part of the diagram has been provided for you to add any new processes, data stores and data flows.

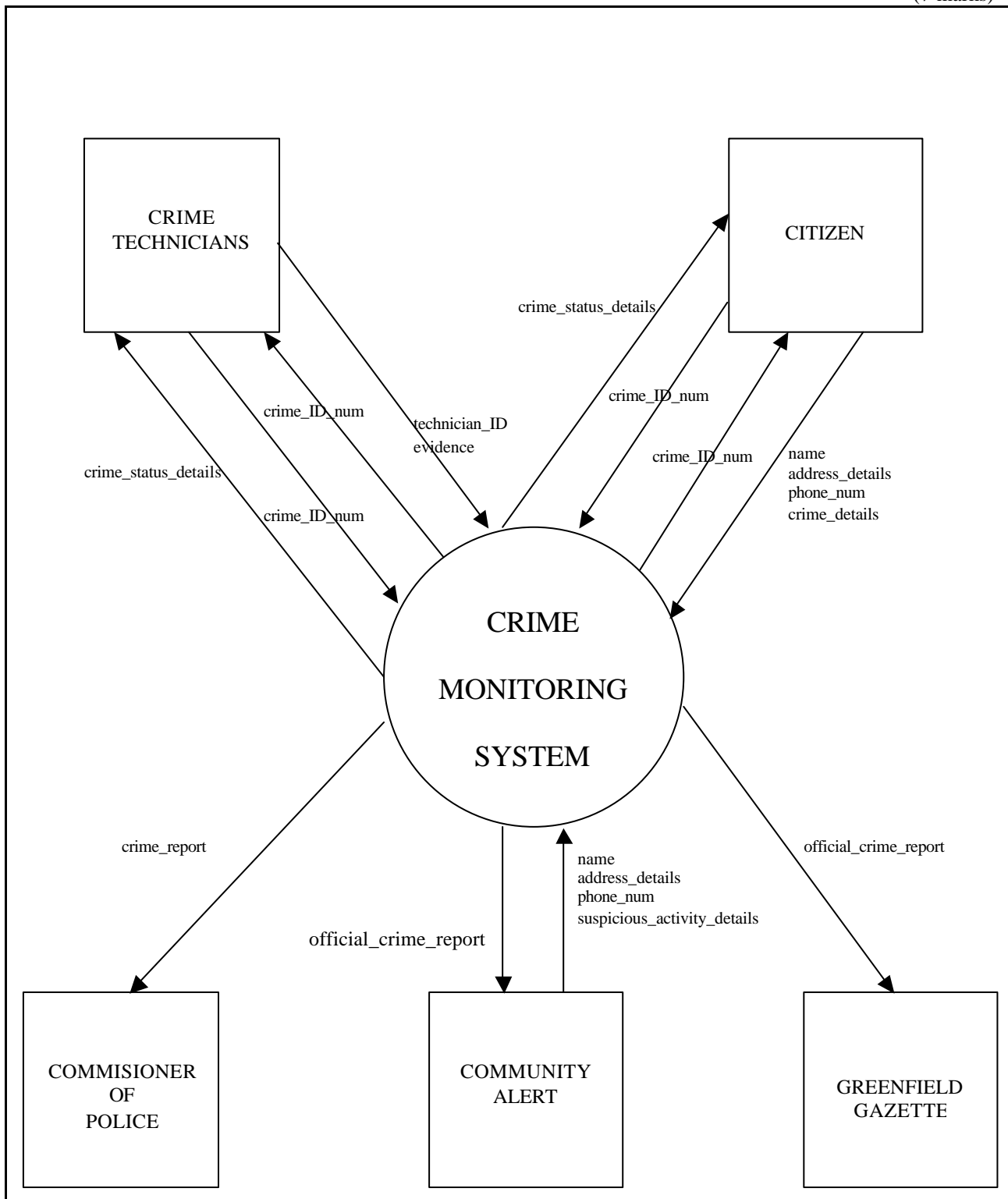
You do not have to show any of the details that are already recorded in the original data flow diagram.

(5 marks)



- (d) Prior to constructing the data flow diagram, the information technology specialist first drew a context diagram to show the overview of the system. Draw the context diagram for the Greenfield City Crime Monitoring System. Be certain to also include the relevant details from the extensions from part (c).

(7 marks)



32. (14 marks)

Sparkling Waters Swimming Carnival

Sparkling Waters is a coastal country school where four teams compete annually in the 50 event Sparkling Waters Swimming Carnival. Being inhabitants of a tropical climate, the school swimming teams are called Banana, Mango, Pineapple, and Paw-paw. For each swimming race, points are awarded to the team achieving first, second, third and fourth places, as shown in the table below. The points are tallied up and the team with the highest number at the end of the carnival wins the Coconut Cup.

Placing	Points
1 st place	10
2 nd place	8
3 rd place	6
4 th place	4

A computer program needs to be written to record the results of the Sparkling Waters Swimming Carnival. You have been asked to help create the program and your problem solving has commenced in earnest. The module that you designed for calculating progressive totals is shown in pseudocode below.

```
MODULE CalculateTotals      (MangoPoints, PinePoints, PawPoints, Banana, Mango, Pine, Paw)

    Banana ← Banana + BananaPoints

    Mango ← Mango + MangoPoints

    Pine ← Pine + PinePoints

    Paw ← Paw + PinePoints

END CalculateTotals
```

The draft mainline for the program that you designed is shown in pseudocode below:

```
Set team totals to 0
FOR NumberOfEvents = 1 to 50 DO
    EnterSwimmingResults

    CalculateTotals

        IF Event Number is a multiple of 10

            OutputTotals
        ENDIF

    ENDFOR
OutputChampionTeam
```

An appropriate data type for **MangoPoints** would be *Integer*. Explain why.

(1 mark)

Need to store only whole number

(a) Explain whether it would be appropriate to use the same data type for **Mango**?

(1 mark)

Yes it is appropriate because the points total will always be a whole number (maximum of 500 points)

(b) At the beginning of the Sparkling Waters Swimming Carnival the total points for the four teams are:

Banana 0
 Mango 0
 Pineapple 0
 Paw-paw 0

Show how your module above calculates the points, **as it is currently written**, by completing a trace of the results for the following events:

(2 marks)

Event number	Placing	Team
1	1 st	Banana
	2 nd	Mango
	3 rd	Pineapple
	4 th	Paw-paw
2	1 st	Mango
	2 nd	Paw-paw
	3 rd	Banana
	4 th	Pineapple

Event no	MangoPoints	PinePoints	PawPoints	Banana	Mango	Pine	Paw-paw
				0	0	0	0
1	8	6	4	0	8	6	6
2	10	4	8	0	18	10	10

(c) Provide **two** reasons why the progressive totals for the teams will not be correct when using this module.

(2 marks)

Banana points has been omitted as a parameter

Pineapple points have been added to the Paw-paw total instead of Paw-paw points

- (d) Rewrite the *CalculateTotals* module in pseudocode to provide the correct results.

(2 marks)

MODULE CalculateTotals (*BananaPoints*, MangoPoints, PinePoints, PawPoints, Banana,
Mango, Pine, Paw)

Banana ← Banana + BananaPoints

Mango ← Mango + MangoPoints

Pine ← Pine + PinePoints

Paw ← Paw + *PawPoints*

END CalculateTotals

- (e) The mainline and module have both been written in *pseudocode*. Explain the purpose of pseudocode.

(1 mark)

Pseudocode is the solution algorithm written in English like statements, the purpose of which is to show all the logical steps in solving the problem.

- (f) (i) Nassi-Shneidermann diagrams may be used as an alternative to pseudocode. Rewrite the mainline using a Nassi-Shneidermann diagram. (3 marks)

Must show correct N-S standard constructs for FOR, IF and SEQUENCE

- (ii) Name **two** programming constructs. (1 mark)

Two of the following:

Sequence

Selection (IF)

Iteration (FOR)

- (iii) Clearly indicate, on your Nassi-Shneidermann diagram, examples of these two constructs.

Two of the constructs on the N-S diagram must be clearly indicate