



basic education

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GRADE 12

INFORMATION TECHNOLOGY P2

NOVEMBER 2012

MARKS: 180

TIME: 3 hours

This question paper consists of 21 pages.

INSTRUCTIONS AND INFORMATION

1. This question paper consists of FIVE sections which are subdivided as follows:

SECTION A:	Multiple-choice questions	(10)
SECTION B:	Hardware and software	(50)
SECTION C:	Applications and implications	(25)
SECTION D:	Programming and software development	(48)
SECTION E:	Integrated scenario	(47)

2. Answer ALL the questions.
3. Read ALL the questions carefully.
4. The mark allocation generally gives an indication of the number of facts/reasons required.
5. Number the answers correctly according to the numbering system used in this question paper.
6. Write neatly and legibly.

SECTION A: MULTIPLE-CHOICE QUESTIONS

QUESTION 1

Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question number (1.1–1.10) in the ANSWER BOOK.

- 1.1 A software program that records what you type on the keyboard or the mouse clicks you make is called a ...
A worm.
B honeypot.
C keylogger.
D cookie. (1)
- 1.2 A ... is a shared library of instructions that can be used by different applications.
A GUI
B DLL
C RSS
D ADSL (1)
- 1.3 The process of data mining can be described as the ...
A deletion of large amounts of data from backup folders.
B analysis of large collections of data.
C formatting of old data files to take up less space.
D recovering of lost data on a disc. (1)
- 1.4 The switching technique where the best possible route is chosen to transfer data in a WAN is called ... switching.
A line
B packet
C circuit
D control (1)
- 1.5 ... is considered to be a low-level programming language.
A Java
B SQL
C An assembly language
D Delphi (1)
- 1.6 ... is non-volatile memory that can be used as secondary storage.
A SRAM
B DRAM
C Flash memory
D Cache memory (1)

1.7 Which operating system has been designed specifically to work on a cellphone?

- A Android
- B Solaris
- C Windows Vista
- D Linux

(1)

1.8 Software that translates each line of source code into machine code and executes it before moving to the next line of code is known as a/an...

- A assembler.
- B translator.
- C compiler.
- D interpreter.

(1)

1.9 The values below are saved into an array.

a	e	i	o	u
---	---	---	---	---

The index value of the element 'a' in the array is 0. The index value of the element 'u' in the array will be ...

- A 0.
- B 4.
- C 5.
- D 6.

(1)

1.10 The ... is a special register in the ALU that temporarily keeps the result of any calculation.

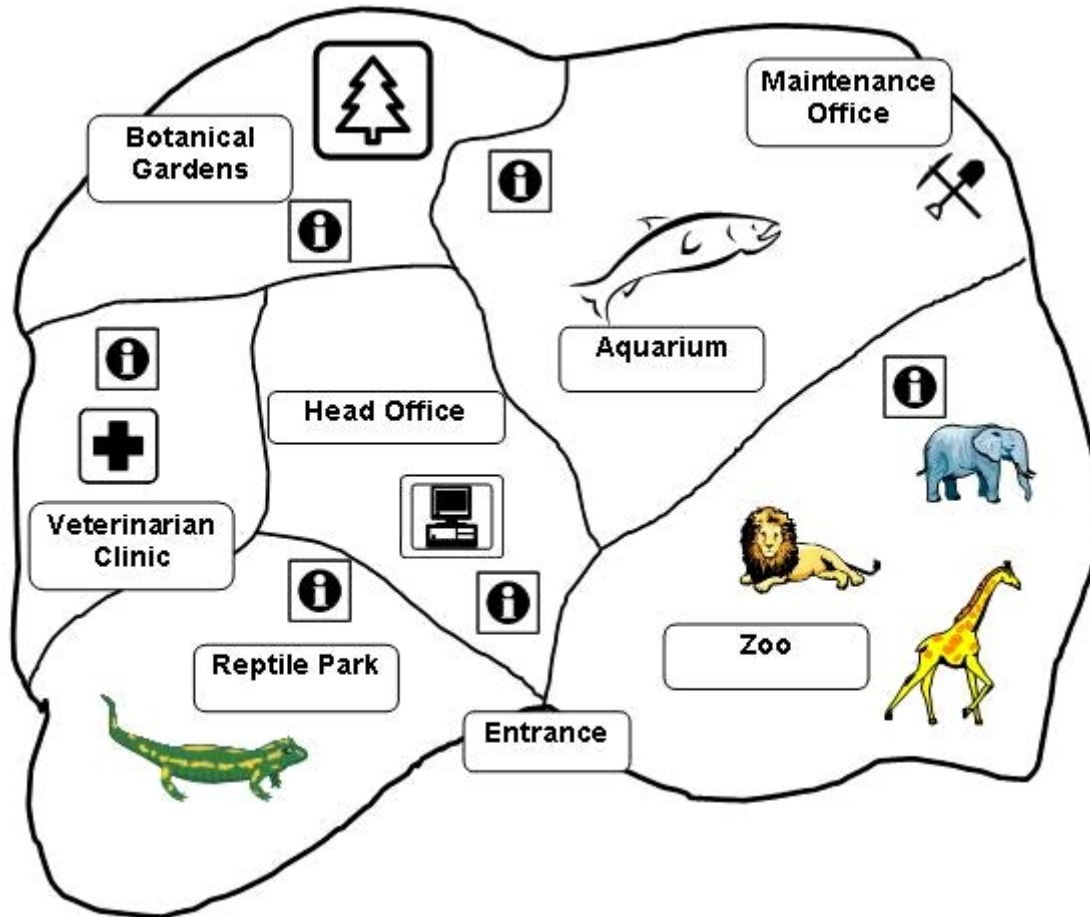
- A memory-data register
- B CMOS
- C program counter
- D accumulator

(1)

TOTAL SECTION A: 10

SCENARIO

The Red Feather Nature Park consists of various smaller parks, including a reptile park, an aquarium, a zoo and a botanical garden as indicated in the diagram below.



Each smaller park has its own administration offices with computers that are linked to a server at the head office. The head office is situated near the main entrance to the Park. Most of the administrative work is done here.

In a new project to serve the community, learners from various schools volunteer to work at the Red Feather Nature Park during their holidays. Some of the learners will work with the animals, feeding them, cleaning the cages, et cetera. Some of the learners will receive a short training course as guides. Your expertise as an IT learner is needed in a group that is assigned to Mr Eagle, the Park's administration manager. Your group will help solve hardware-, software- and network-related problems.

Your group will also assist with new technology that will be implemented where cellphones can be used during guided tours. The official website of the Park (www.redpark.co.za) also needs some attention.

SECTION B: HARDWARE AND SOFTWARE

QUESTION 2

2.1 One of the computers in the reptile park's offices needs to be upgraded. This computer among other things is used to upload photographs of animals at the Red Feather Nature Park to the website.

2.1.1 Currently a 17" CRT screen is in use with a refresh rate of 70 Hz.

(a) Define the term *refresh rate*. (2)

(b) Give THREE reasons why it is recommended that the CRT screen should be replaced with an LCD screen. (3)

2.1.2 The hard disk contains mostly old photographs and is almost full.

(a) All of the photographs, except those taken by the lead photographer at the Park, must be deleted. Fortunately metadata was set up.

(i) What is *metadata*? (2)

(ii) Give ONE example of metadata that is applicable to this situation. (1)

(b) The new trend in hard drive storage devices is to increase the amount of data that can be stored in the same amount of space. Name ONE way in which this can be achieved. (1)

2.1.3 Mr Eagle has been advised to replace the RAM of the computer in order to enhance its performance.

(a) How will you ensure that the new RAM is compatible with the current motherboard? (1)

(b) Some of the learners in the group are of the opinion that, if there was enough virtual memory, there is no need to upgrade the RAM.

(i) Explain what *virtual memory* is. (2)

(ii) Explain why virtual memory will not be the solution to better performance. (1)

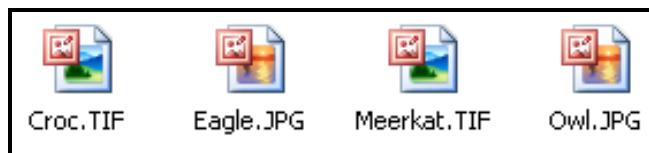
(c) The statement "*Upgrading RAM means more cache memory is available*" was made. Give THREE reasons why this statement is NOT true. (3)

2.1.4 Most of the peripheral devices required will be connected to the computer using USB ports. Standard drivers will be used.

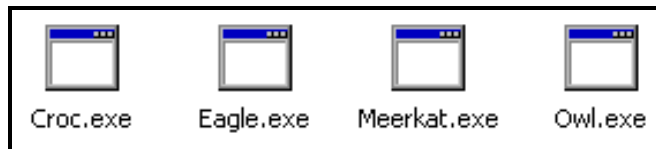
- (a) Write down the full term for the acronym *USB*. (1)
- (b) Name ONE port other than the USB port that can be used to connect a digital video camera to a computer. (1)
- (c) Define a *driver* in the context of computing. (2)
- (d) What is meant by the term *standard driver*? (1)
- (e) Name ONE device that makes use of a standard driver. (1)

2.2 Mr Eagle is experiencing problems when trying to open photographs saved on the hard drive. He noticed that the icons of these files have been replaced. This suggests that the hard disk might have been infected by a virus.

Previous icons:



Current icons:



- 2.2.1 What is a *computer virus*? (2)
- 2.2.2 State TWO ways of preventing a virus from being launched on a computer system. (2)
- 2.2.3 The virus could not be removed by any of the latest antivirus programs. Therefore the hard drive needs to be formatted.

Write down the TWO missing words to correctly complete the following statement. Write only the answer next to the question number (2.2.3(a–b)).

During the process of physical formatting (a) ... and (b) ... are created on the disk. (2)

- 2.2.4 Currently all the photographs, letters and other documents, such as financial reports and order forms, are saved in the root folder on the hard drive.
- Draw a simple diagram of a folder structure to illustrate an improved structure for organising the files on a hard drive. Make provision for at least TWO levels of subfolders. (2)
- 2.3 The Red Feather Nature Park has created new feeding stations in the lion cage. Staff members need to monitor whether the lions are visiting both the old and the new feeding stations using RFID tags.
- 2.3.1 Write down the full term for the acronym *RFID*. (1)
- 2.3.2 Describe how RFID tags could be used to facilitate the monitoring of the lions. (2)
- 2.4 The server at the main office has to be replaced.
- Give TWO reasons why a server is better suited to ensure high performance rather than a regular PC. (2)
- 2.5 The chipset is an integral part of the design of a computer.
- 2.5.1 Briefly describe the primary function of the chipset. (1)
- 2.5.2 The following devices must be connected to the chipset. For each device indicate whether it will be connected to either the north bridge or south bridge.
- (a) USB (1)
- (b) PCI Express (1)
- (c) Network card (1)
- 2.6 The performance of the CPU should be optimised to ensure a high-performance computer system.
- 2.6.1 One of the techniques used to improve the performance of a CPU is pipelining. Define *pipelining*. (2)
- 2.6.2 Explain the role cache memory plays in the performance of a CPU. (2)
- 2.6.3 CPUs are often over-clocked to increase performance. Overheating is the major problem that arises because of this practice.
- (a) What is meant by *over-clocking a CPU*? (1)
- (b) Name TWO ways in which overheating can be prevented. (2)

2.7 Mr Eagle found the following information on GPS tours on the Internet.

A GPS tour (using the Global Positioning System) is an audio tour or a multimedia tour that provides pre-recorded spoken commentary, normally through a mobile device.

GPS tours can be created by using a combination of software and hardware and can be downloaded from the Internet for cellphones.

- 2.7.1 What type of communication connection is used in GPS technology? (1)
- 2.7.2 Give TWO practical examples of how GPS technology can be used at the park other than conducting GPS tours. (2)
- 2.7.3 Name a possible file format for an audio file that can be downloaded from the Internet onto any type of cellphone. (1)

TOTAL SECTION B: 50

SECTION C: APPLICATIONS AND IMPLICATIONS

QUESTION 3: e-COMMUNICATION

Mr Eagle made the following statement: 'The Internet is an incredible communication tool, allowing new technology such as e-communication, e-banking and e-shopping.'

- 3.1 Many visitors requested that e-communication be in place as a standard facility at the park so that they can at least access their e-mails.
- 3.1.1 State TWO advantages of e-communication from the Park's point of view. (2)
- 3.1.2 State ONE disadvantage of having e-communication facilities at the Park from the visitors' point of view. (1)
- 3.2 The administration office requested that SSL should be implemented as an encryption protocol.
- 3.2.1 How will the Park's full website address (<http://www.redpark.co.za>) change once SSL is implemented? (1)
- 3.2.2 Briefly explain what *encryption* is. (2)
- 3.2.3 What is required to be able to decrypt an SSL-encrypted e-mail? (2)
- 3.2.4 Which ONE of the following activities will NOT need to make use of SSL encryption? Write only the answer (A–C) next to the question number (3.2.4). (1)
- A The online information centre of the zoo responding to a visitor requesting the toll-free telephone number of the centre
 - B A reply to the head of security indicating their new updated patrol routes
 - C A person replying to a request for donations with personal details regarding his donation
- 3.3 Give TWO practical and interesting examples of how podcasting can be used at the park. (2)
- 3.4 A new screensaver was downloaded from the Internet. Mr Eagle is concerned about the possible threat of a trojan.
- Explain what a *trojan* is. (2)
- [13]**

QUESTION 4: SOCIAL AND ETHICAL ISSUES

The Red Feather Nature Park has a code of ethics which enforces ethical behaviour within the organisation.

- 4.1 In terms of IT systems at the Park, describe TWO ways in which the electricity consumption could be reduced. (2)
- 4.2 The Park has a policy of replacing computers every five years.
- 4.2.1 State TWO responsible ways how the Park can dispose of their old computers. (2)
- 4.2.2 Do you think replacing computers every five years is a good policy? Give a reason for your answer. (2)
- 4.3 The administrator is concerned about sensitive financial data that has been saved on the hard disks of the computers they want to replace.
- State TWO measures that can be put in place to ensure that this data does not fall into the wrong hands. (2)
- 4.4 The human resources department is considering requesting access to the Facebook profiles of new employees in order to find out more about them.
- Do you think this is ethical? Justify your answer. (2)
- 4.5 The management at the Red Feather Nature Park is aware of the possibility of computer crime taking place in an e-communication environment.
- Explain the term *computer crime*. (2)


[12]

TOTAL SECTION C: 25

SECTION D: PROGRAMMING AND SOFTWARE DEVELOPMENT**QUESTION 5: ALGORITHMS AND PLANNING**

The development of the custom software required by the Park has been outsourced. As a member of the IT committee you are requested to assist the outsourced company with the planning and design of the required software.

- 5.1 A member of the panel has compiled a database called **PlantsDB** containing data of plants the Park needs to buy and nurseries supplying these plants. Various types of plants are required, such as trees, shrubs and creepers, et cetera. One of the tables in the database is the **tblNursery** table with the following layout:

tblNursery			
Key	Field Name	Data Type	Description
	CatalogueNumber	Text	Unique number
	BotanicalName	Text	Botanical name of the plant
	GeneralName	Text	Name of the plant
	PoisonousToAnimals	Number	Is the plant poisonous to animals?
	FertiliserType	Text	Type of fertiliser suitable for the plant
	FertiliserCost	Text	Cost of the fertiliser
	Nursery	Text	Name of the nursery supplying the plant
	NurseryPhoneNumber	Number	Contact number of the nursery supplying the plant
	NurseryContactPerson	Text	Name of the contact person at the nursery supplying the plant

- 5.1.1 Not much effort has been put into selecting suitable data types for the fields in the table. Suggest a *more suitable data type* for each of the following fields:

(a) **FertiliserCost** (1)

(b) **NurseryPhoneNumber** (1)

- 5.1.2 The preferred data type for the field **PoisonousToAnimals** is Boolean. Explain why the data type Number can be used as a suitable alternative. (1)

- 5.1.3 Only the letters K, M or U are allowed to be entered in the **FertiliserType** field. The entered data into this field needs to be validated.

(a) Write down the condition that must be used to apply validation to this field. (3)

(b) Give a suitable error message that should be displayed when invalid data is entered. (1)

- 5.2 Another table **tblTreeOrders** is used to store data on the orders placed for trees. The table has not been normalised.

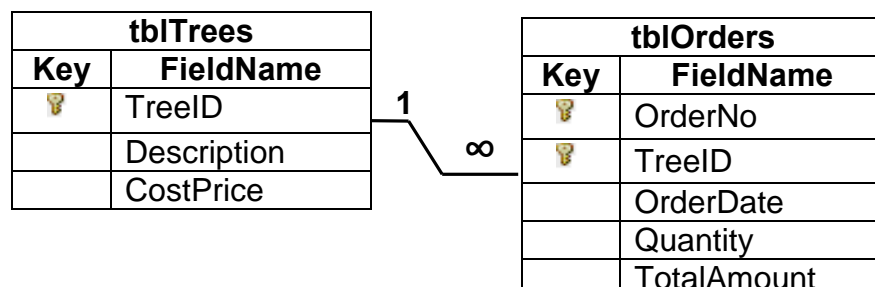
tblTreeOrders			
Key	Field Name	Data Type	Description
	OrderNo	Text	Number of the order
🔑	OrderDate	Date/Time	Date the order was placed
	Tree1	Text	Name of the tree
	Description1	Text	Description of the tree
	Quantity1	Number	Quantity of the trees that were ordered
	CostPrice1	Currency	Cost price of the tree
	Tree2	Text	Name of the tree
	Description2	Text	Description of the tree
	Quantity2	Number	Quantity of the trees that were ordered
	CostPrice2	Currency	Cost price of the tree
	TotalAmount	Currency	Total monetary value of this order

- 5.2.1 *Insert anomalies* is one of the problems that can occur when the table has not been normalised.

The following orders are placed separately but on the same day. In each case, give a reason why the insert anomaly will occur when the data has to be captured in the **tblTreeOrders** table.

- (a) In the morning the manager orders three different kinds of trees using order number AB230. (2)
- (b) In the afternoon another two trees need to be ordered using order number AB245. (2)

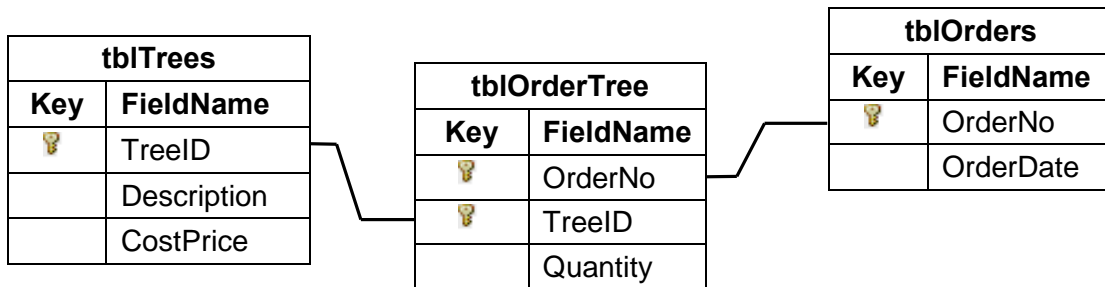
- 5.2.2 The following is a possible solution for normalising the **tblTreeOrders** table into 1NF. The **tblOrders** table makes use of a combined primary key to refer to records in the table.



- (a) What is a *combined primary key*? (2)

- (b) Give TWO reasons why the use of a combined primary key is required in this table. (2)
- (c) One of the aims of second normal form is to prevent partial dependencies. Define the term *partial dependency*. (1)

5.2.3 The following is an attempt to normalise the given **tblTreeOrders** table into 2NF.



- (a) Identify the type of relationship between the **tblOrders** table and the **tblOrderTree** table in the diagram. (1)
- (b) Give ONE example of a field that can act as the foreign key in the **tblOrderTree** table. (1)
- (c) The **TotalAmount** field does not appear in any of the 2NF tables. Will the user still be able to determine the total price of an order? Give a brief explanation to substantiate your answer. (2)

5.3 The cleaning staff gets paid per week at a rate of R100,00 per enclosure they clean. The software developer has compiled the following algorithm to calculate and display the payment of each cleaner. A program has been developed based on this algorithm.

Line	
1	Name ← input the name of the cleaner
2	Pay ← 0
3	Loop for each of the seven days
4	Total ← 0
5	Number ← Input the number of enclosures cleaned
6	Total ← Total + Number
7	Pay ← Number * 100
8	End loop
9	Display the name, number of enclosures cleaned and the payment the cleaner receives

5.3.1 Define an *algorithm*. (2)

5.3.2 In line 5 the user is required to enter a number which is saved into the integer variable **Number**.

(a) The user enters the number -3 (negative three) when prompted to enter the number of enclosures cleaned.

(i) What will the impact of this input be on the execution of the program based on this algorithm? (1)

(ii) Give a brief explanation to substantiate your answer to QUESTION 5.3.2(a) (i). (1)

(b) The user types in the phrase 'FIVE ENCLOSURES' when prompted to enter the number of enclosures cleaned. What type of error (Syntax/Runtime) will occur? (1)

5.3.3 When the program is executed and the user enters a valid number when prompted to enter the number of enclosures cleaned, the payments are calculated and displayed incorrectly. This is the result of TWO logical errors in the given algorithm.

(a) Explain, in general, what a *logical error* is. (2)

(b) Explain how to correct EACH of the TWO logical errors in the given algorithm. In your answer make use of the line numbers to refer to the statements in the algorithm. (2 x 2) (4)

5.4 A text file called **Clinic.txt** is used to keep track of the animals admitted to the clinic and their caretakers. Below is an example of data in the text file. The number of lines the file contains is unknown.

```
NAME,TYPE,DATE_ADMITTED,CARETAKER
Rose,Impala,2012/04/23,John
Shambo,Lioness,2012/05/01,Koos
Joe,Kudu,2012/05/06,John
Nugget,Impala,2012/05/15,John
Shambo,Lioness,2012/05/27,Thabo
Peach,Impala,2012/06/20,Mary
Suzi,Kudu,2012/06/22,John
```

The following incomplete algorithm was developed as part of the administration system:

Line	
1	Read the first line of text from the file.
2	Initialise a WHILE-loop to read data from the text file.
3	Read one line of text from the text file.
4	Extract the name of the animal, animal type, date of admission and name of the caretaker from the line read from the file.
5	IF ...
6	Display the name of the animal.
7	End loop

5.4.1 Give ONE reason why a WHILE loop is a more suitable control structure than a FOR loop in the given algorithm. (1)

5.4.2 Line 5 of the given algorithm may be completed in a number of different ways.

Analyse the aims and IF statements below and write down ONLY the correct missing logical operator (NOT/AND/OR) to complete each of the IF statements in order to accomplish the set aim in each case.

(a) Aim: List the dates when Shambo, the lioness, was admitted to the clinic.

IF (animal name is Shambo) ... (animal type is a lioness) (1)

(b) Aim: List the dates when all the impala and kudu were admitted to the clinic.

IF (animal type is impala) ... (animal type is kudu) (1)

5.4.3 Write down the name(s) of the animal(s) that will be displayed when line 5 of the given algorithm is replaced with the following IF statement:

IF NOT (admitted during the month of May) OR (animal type is impala) AND (John is the caretaker) ... (3)

5.5 The software developer who created the administration system for the veterinary clinic made use of object-orientated programming (OOP) principles.

The following class diagram (on the next page) is to be used to store information on a sick animal. Study the class diagram and answer the questions that follow.

ANIMAL	
<ul style="list-style-type: none"> - ID - Name - Diagnosis - Medication - Hospitalised 	Private attributes
<ul style="list-style-type: none"> + Constructor() + Constructor(ID) + getAnimalID():string + getAnimalName():string + setDiagnose(Diagnosis) + setMedicationUsed(Medicine) + toString():string 	Public methods

5.5.1 Two constructor methods are listed in the class diagram above.

- (a) What is the purpose of a constructor in object-orientated programming? (1)
- (b) How will the program know which constructor to run because both constructors have the same name? (1)
- (c) What is the term used for having more than one method called by the same name? (1)

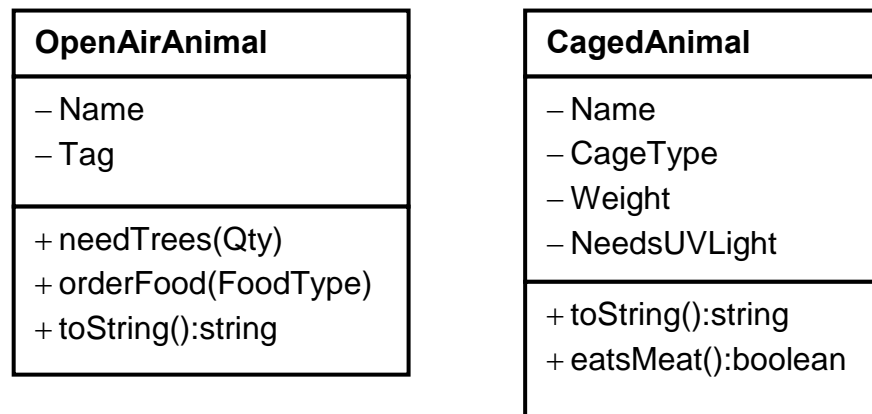
5.5.2 The software developer needs a method that returns whether the animal is hospitalised or not.

- (a) Classify this method as either a set (mutator) or a get (accessor) method. (1)
- (b) Write a statement to be added to the given class diagram that will refer to this method. Use a suitable name for the method in your answer. (2)

5.5.3 Two new classes to describe specific types of animals housed at the clinic were created, such as the following:

- **CagedAnimal** class: animals requiring a closed cage, for example birds and reptiles
- **OpenAirAnimal** class: animals that can be housed in an enclosure in the open air, for example lions and impala

Study the two class diagrams below and answer the questions that follow.



The following algorithm was designed as part of the clinic's administration system:

Line	
1	Define object <u>OpenAir</u> as OpenAirAnimal class type
2	Define object <u>Caged</u> as CagedAnimal class type
3	IF (OpenAirAnimal.Name) = (CagedAnimal.Name)
4	Display message: 'Animals have the same name'
5	IF OpenAir.NeedTrees(toString)
6	Display message: 'Animal needs trees in cage'

- (a) What is the purpose of the toString() method? (1)
- (b) Explain why the IF statement in line 3 is an invalid statement. (2)
- (c) Explain why the IF statement in line 5 is an invalid statement. (2)

TOTAL SECTION D: 48

SECTION E: INTEGRATED SCENARIO

QUESTION 6

The Red Feather Nature Park makes use of ICTs for marketing purposes.

- 6.1 The Park recently launched its website and still has a lot to learn regarding the design and maintenance of websites.
- 6.1.1 Why is it important for the Park to have a website? (2)
- 6.1.2 Describe THREE requirements of a well-designed website. (3)
- 6.1.3 The administration manager has heard that hackers could gain access and interfere with the Park's website.
- (a) Give ONE possible indication/reason that may make one conclude that a website has been hacked. (1)
- (b) State TWO ways of preventing the hacking of a website. (2)
- (c) Give TWO reasons why hackers usually try to gain access to websites. (2)
- 6.1.4 A website is *search-engine friendly* when it is displayed high up in search results for relevant keywords.
- (a) Why is it important for the Park to have a search-engine-friendly website? (1)
- (b) Google makes use of spider programs in this regard. What is a *spider program*? (2)
- 6.1.5 Navigation is an important part of a website's functionality.
- Name TWO aspects regarding a website's design that will promote good website navigation. (2)
- 6.1.6 The webmaster uses FTP to update the Park's website.
- (a) Define the concept *FTP*. (2)
- (b) Explain the difference between *HTTP* and *FTP*. (2)
- (c) State another way in which the webmaster could update the website. (1)

- 6.1.7 A server is used to host the park's website. The server makes use of RAID technology to protect the website's data.
- (a) RAID Level 0 will not protect the website's data. Explain why this is the case. (2)
 - (b) Motivate why RAID Level 1 will protect the website's data by briefly explaining how RAID Level 1 works. (3)
 - (c) Name TWO operating systems that could be used on the server. (2)
 - (d) Explain how web caching improves the speed of accessing a website. (2)
- 6.2 All the buildings in the Park are connected via an Ethernet network making use of the TCP/IP protocol.
- 6.2.1 Define the term *communication protocol*. (2)
- 6.2.2 Define the term *network topology*. (1)
- 6.2.3 Name the topology that is used in an Ethernet network. (1)
- 6.2.4 The Park is more than five kilometres wide.
- Give TWO reasons why UTP cables are NOT the preferred choice for cabling the network. (2)
- 6.2.5 The botanical garden and the maintenance offices are outer buildings which make use of a VPN to connect to the administration office.
- (a) Briefly explain what a VPN is. (2)
 - (b) State ONE disadvantage of using a VPN. (1)
- 6.3 The administration manager has been informed that RSS feeds are a good way to distribute the latest news about the park.
- 6.3.1 Many people prefer RSS feeds instead of visiting a website for news. Give TWO possible reasons why. (2)
- 6.3.2 Name TWO other ways in which newsworthy events at the Park could be distributed online. (2)

6.4 The Park sends out a monthly e-mail newsletter to all its subscribers.

- 6.4.1 Describe TWO ways in which the author of the e-mail could prevent the e-mail being flagged as spam by the recipients' e-mail software. (2)
- 6.4.2 An unsubscribe option is included at the bottom of every newsletter. Why is it important that this option is included? (1)
- 6.4.3 The e-mail newsletter has over 5 000 subscribers. A newspaper article has been scanned to be attached and sent out with the e-mail newsletter. The scanner gives the option to create the document in a PDF or TIFF file format.
- (a) Which file format (PDF or TIFF) would you recommend? (1)
- (b) Give ONE reason for your answer. (1)

TOTAL SECTION E: 47
GRAND TOTAL: 180