basic education

Department:
Basic Education
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GRADE 12

INFORMATION TECHNOLOGY P2

FEBRUARY/MARCH 2014

MARKS: 180

TIME: 3 hours

This question paper consists of 21 pages.

INSTRUCTIONS AND INFORMATION

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

SECTION A:	Multiple-choice questions	(10)
SECTION B:	Hardware and software	(50)
SECTION C:	Applications and implications	(24)
SECTION D:	Programming and software development	(47)
SECTION E:	Integrated scenario	(49)

2. Answer ALL the questions.

3. Read ALL the questions carefully.

4. The mark allocation, in general, 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 malicious program that resides on your computer and propagates via network and Internet connections is known as …

A adware.
B a spider.
C a worm.
D a key logger. (1)

1.2 Which of the following refers to a type of file system?

A NTFS
B SMTP
C TCP/IP
D IRC (1)

1.3 In the following pseudocode of an IF-statement the incrementing of a counter is dependant on the value of B:

```
IF (B < 4) AND (B > 12)
     increase counter by 5
Else
     display message
```

The value of the counter will never be incremented because …

A the value of B is smaller than 4 and smaller than 12, for example 3.
B a negative value has been assigned to B.
C the value of B is greater than 12.
D both conditions will never be true at the same time. (1)

1.4 Which of the following is the domain part of the e-mail address user1@mybusiness.co.za?

A co.za
B user1
C mybusiness
D user1@mybusiness.co.za (1)

1.5 The difference between a *firewall* and a *proxy server* is that …

A a proxy server blocks unwanted traffic and a firewall manages Internet browsing.
B a firewall blocks unwanted traffic and a proxy server manages Internet browsing.
C a firewall manages incoming traffic and a proxy server manages outgoing traffic.
D a firewall manages outgoing traffic and a proxy server manages incoming traffic. (1)

1.6 Which loop structure would be best suited to find the information of a customer in the database of a big company with more than 100 000 records?

A Single loop
B Unconditional loop
C Conditional loop
D Infinite loop (1)

1.7 *Identity theft* is the …

A fraudulent action of stealing a user's green ID book while he/she is online.
B use of driver software to automatically allow access to private information on a network.
C copying of the username and password of a user on an online shopping site.
D fraudulent action of collecting sufficient personal information about an individual in order to assume his/her identity. (1)

1.8 Which of the following can be classified as system software?

A Notepad
B Adobe Reader 8
C Structured Query Language (SQL)
D Scandisk (1)

1.9 A *virtual machine* is …

A a new prototype for a computer.
B a theoretical computer such as the Turing machine.
C software emulating a computer.
D a computer running multiple operating systems. (1)

1.10 Which of the tasks numbered (i), (ii) and (iii) is/are the responsibility of a network administrator?

(i) Install network cables.
(ii) Set up user profiles for the network.
(iii) Analyse the network to ensure effective data transfer.

A Only (i)
B Only (ii)
C (i) and (ii)
D (ii) and (iii) (1)

TOTAL SECTION A: 10

SCENARIO

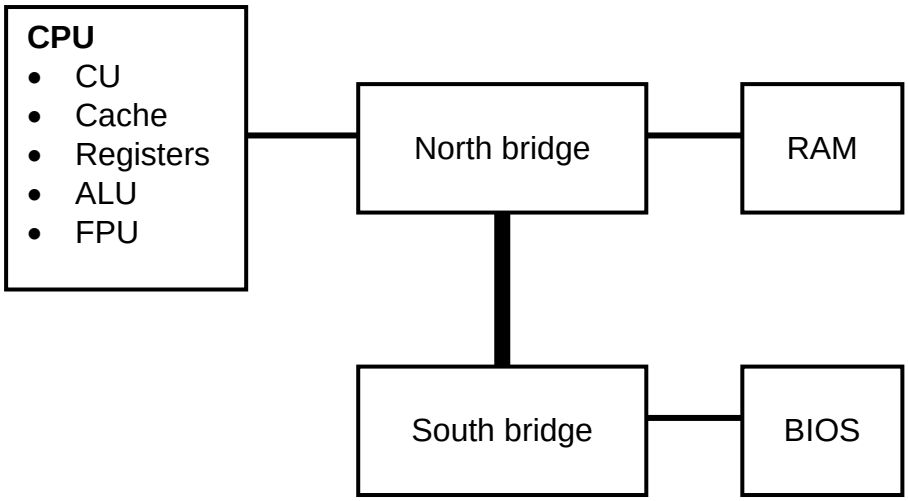
Schools will take part in a variety of athletics meetings arranged to take place in some of the major cities around the country as part of a national competition.

SECTION B: HARDWARE AND SOFTWARE

QUESTION 2

The organisers in each major city need to set up computer systems to be able to manage and process the vast amount of data that will be obtained from the registration of the athletes as well as the results for each event. Volunteers from the local communities and schools offered their assistance.

2.1 The following diagram, representing some of the components on a motherboard, was given to one of the volunteers who wanted to know more about how a computer operates:



Certain concepts indicated in the diagram need to be explained to the volunteer by answering the following questions:

2.1.1 The volunteer observes that the CPU contains registers. Briefly explain the function of registers. (2)

2.1.2 Explain why instructions loaded in cache memory are processed faster by the CPU than instructions stored in RAM. (2)

2.1.3 The basic process of how a CPU operates consists of four stages, namely fetch, decode, execute and store. Briefly describe what takes place during the DECODE stage. (2)

2.1.4 What is the physical connection between the CPU and the north bridge called? (1)

2.1.5 Different slots, such as AGP and PCI Express, are found on a motherboard.

(a) What is the purpose of the AGP slot? (1)

(b) To which bridge (north or south) is an AGP slot connected? (1)

(c) Someone told the volunteer that the PCI Express slots are on-board and not hot-pluggable.

(i) What does *on-board* mean? (1)

(ii) What does it mean when a device is NOT hot-pluggable? (1)

2.1.6 All computer systems contain RAM and ROM.

(a) State TWO major differences between *RAM* and *ROM*. (2)

(b) Explain the purpose of ROM. (1)

2.2 Large quantities of data related to all the athletes need to be saved on hard drives (HDD).

2.2.1 Which ONE disk controller, EIDE or SATA, will you recommend for connecting high-performance hard drives? (1)

2.2.2 Explain TWO aspects that influence the access time of an HDD. (2)

2.2.3 Disk caching will improve performance in terms of the storage and retrieval of data. Explain what *disk caching* is. (2)

2.2.4 Thrashing may occur when data is captured and processed.

(a) Explain what *thrashing* is. (2)

(b) What can be done to prevent thrashing from occurring? (1)

2.3 One of the organisers is an enthusiastic supporter of open-source software (OSS).

2.3.1 Tabulate the difference between *open-source software* and *freeware* in terms of any THREE of the following aspects:

- What is included in the package
- Means of distribution
- Support
- Availability of upgrades (3)

2.3.2 Explain the difference between the licensing of *freeware* and *shareware*. (2)

2.4 A cellphone company offered to supply smartphones to the organisers at the different centres.

2.4.1 Name ONE operating system developed exclusively for use on smartphones. (1)

2.4.2 Describe THREE responsibilities of the operating system of a computer system regarding the management of memory. (3)

2.4.3 Some of the organisers complained that some websites show less content when displayed on the smartphones, compared to displaying them on regular PCs.

Give a possible reason for the seemingly missing content. (2)

2.5 Data stored about the athletes must be protected against loss or damage. Although backups will be made regularly, data can still be lost due to unexpected power failures.

2.5.1 Suggest how the loss of data due to unexpected power failures can be prevented. (2)

2.5.2 Give TWO reasons, other than power failures, for the loss of or damage to data. For each reason, suggest a measure that can be adopted to prevent the loss or damage of data. (4)

2.5.3 Give TWO reasons why the local hard drive of a PC will not be suitable for backup purposes. (2)

2.6 The centres in each city that will host athletic events have a set of computers connected in a LAN, using a switch.

2.6.1 From the organisers' perspective, list THREE advantages of having a local network at each of the centres. (3)

2.6.2 What type of topology is most likely to be used with these networks? (1)

2.6.3 In the context of computing, explain the difference between a *router* and a *switch*. (2)

2.7 The organisers created a help desk to support the volunteers at the different centres. The following conversation took place between one of the volunteers and the help desk:

Help desk:	What antivirus program is installed on your computer?
Volunteer:	Firefox.
Help desk:	That is not an antivirus program.
Volunteer:	Oh, sorry ... Internet Explorer.

2.7.1 Neither Firefox nor Internet Explorer is an antivirus software application. Identify the category of software that both of these applications belong to. (1)

2.7.2 Apart from protecting a computer against viruses, state TWO other forms or useful protection that antivirus software normally offers. (2)

TOTAL SECTION B: 50

SECTION C: APPLICATIONS AND IMPLICATIONS

QUESTION 3: e-COMMUNICATION

The organisers requested that an online website portal be developed where athletes can view their results and maintain their personal details.

3.1 The website uses cookies.

3.1.1 What is a *cookie*? (2)

3.1.2 Explain how and why cookies can be misused. (2)

3.2 One of the organiser's computers is sending spam e-mails to all the athletes without his permission.

3.2.1 Explain what a *spam e-mail* is. (1)

3.2.2 What can be done to stop a computer from sending spam? (1)

3.2.3 Suggest TWO ways in which the receipt of spam can be limited. (2)

3.3 The organisers want to ensure that athletes' details are kept secure when they sign into their profiles on the website. This can be done by using encryption.

3.3.1 Define *encryption*. (2)

3.3.2 A digital certificate is needed in order to use SSL as an encryption protocol.

(a) What type of encryption does SSL use? (1)

(b) Define the concept *digital certificate*. (2)

(c) Name ONE company that issues digital certificates. (1)
[14]

QUESTION 4: SOCIAL AND ETHICAL ISSUES

An entrepreneur decided to use this opportunity to sell marketing material to promote the different athletics meetings.

4.1 The entrepreneur designed and manufactured T-shirts and sweaters which he advertised on his website.

4.1.1 What is the term used for conducting transactions, such as buying and selling products, on the Internet? (1)

4.1.2 Name TWO advantages of advertising and selling these products on the Internet instead of from a shop. (2)

4.1.3 DoS attacks could have a negative influence on his business. Explain what a *DoS attack* is and why it could influence his business negatively. (2)

4.2 The entrepreneur uses Google to find young athletes in South Africa to help promote his products. He obtains the following results:

4.2.1 Why will the search phrase used in this example produce different results when used in another search engine? (1)

4.2.2 Recommend a way that will improve the search results for the information he requires. (1)

4.3 The entrepreneur would like to make his business as environmentally friendly as possible.

4.3.1 In computing terms, describe TWO ways in which he can achieve making his business as environmentally friendly as possible. (2)

4.3.2 He recently bought the latest computer equipment for his business. What would you recommend the entrepreneur does with his outdated computer equipment? (1)

[10]

TOTAL SECTION C: 24

SECTION D: PROGRAMMING AND SOFTWARE DEVELOPMENT

QUESTION 5: ALGORITHMS AND PLANNING

The data on athletes is managed using custom software designed for the athletics meetings and is stored in a database. A separate GUI is developed for user access.

5.1 The **tblAthletes** table below is currently used to store athletes' details and event results.

Field Name	Data Type	Description
AthleteNumber	Number	Unique number assigned to each athlete
AthleteName	Text	Name of athlete
DateOfBirth	Text	Athlete's date of birth
Club	Text	The club the athlete is a member of
PhoneNumber	Number	Athlete's phone number
Event	Text	Event the athlete entered for
Result	Text	Numerical result for the event

5.1.1 Which field in this table is the most suitable primary key? (1)

5.1.2 Identify TWO fields in the table with poorly chosen data types and recommend more appropriate data types. Write down only the name of the field and the suggested data type. (2)

5.1.3 How will they ensure that the date of birth will always be entered in the format DD/MM/YYYY? (1)

5.1.4 What measure can be taken to ensure that the field containing the athlete's name will never be left blank? (1)

5.1.5 Athletes may take part in a maximum of six events.

(a) Explain why the current design of the database table is not suitable to capture the events in which the athletes would like to participate and the results. (2)

(b) Describe the best way in which the design of the database can be changed so as to be able to capture all possible events/results for an athlete participating in more than one event. (3)

5.2 User and technical documentation was provided with the software that is used to manage athlete information.

5.2.1 Describe TWO features of good user documentation, apart from page layout and the format of the text. (2)

5.2.2 The technical documentation should include a printout of the programming code.

(a) Give TWO reasons why comments should be included in programming code. (2)

(b) Name TWO other topics, apart from the programming code, that should be included in the technical documentation. (2)

5.3 The programmers used defensive programming techniques and error handling in their programming code.

5.3.1 What is *defensive programming*? (1)

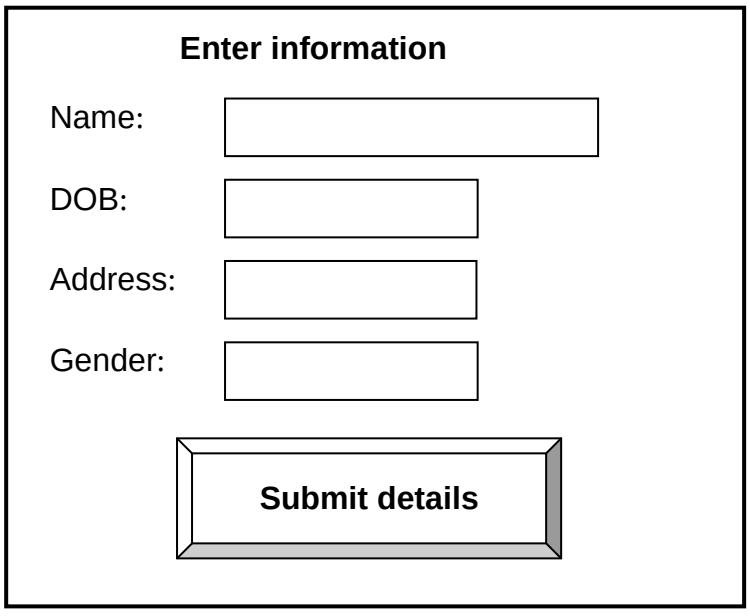
5.3.2 During a test of the software that was developed, the program stopped working with the following error message:

'execution halted – an overflow error occurred'

(a) Explain why overflow errors normally occur. (1)

(b) Suggest TWO ways in which programming code can be used to prevent a runtime error such as this one from occurring. (2)

5.4 The interface below is used to capture information of athletes. Study the diagram and answer the questions that follow.



5.4.1 The interface contains context-sensitive help. What is *context-sensitive help*? (1)

5.4.2 Critically comment on TWO aspects of the user-friendliness of the user interface in the diagram on the previous page, excluding the use of context-sensitive help. (2)

5.4.3 Describe TWO ways, excluding the use of context-sensitive help, in which the user interface can be improved to ensure that valid data will be entered. (2)

5.5 An algorithm needs to be developed as part of the management software that the programmers are busy developing.

5.5.1 Explain why it is important to develop an algorithm before a program is coded. (2)

5.5.2 The following algorithm has been designed to find and display the results of a specific athlete but it contains a few logical errors:

```
Line
1     Input the name of the athlete
2     found ← false
3     assign the index of first element in the array to the counter
4     Repeat while not found
5           If input name equals the name in the array at the
            position indicated by the counter
6                 found ← true
7                 Increase counter by one
8           found ← false
9     End repeat loop
10    If found
11          Display name and result
```

Use the test data that follows and the names 'John' and 'Dave' as input data to test the algorithm.

Use line numbers to identify and explain the logical errors encountered.

Test data:

Peter	Sam	John	Wayne	Garry
11.3	10.9	12.4	11.7	10.5

(6)

5.5.3 After the software has been developed with no logical errors, users complain that names they enter cannot be found, although the names appear in the array.

(a) What could be the reason why a name in the array cannot be located? (1)

(b) Briefly explain why defensive programming will not be able to prevent this problem from occurring. (1)

5.6 The programmer who created the application software used object-orientated programming (OOP) principles. Study the class diagram below and answer the questions that follow.

ATHLETE	
- Name **- Address** **- DateOfBirth** **+ Gender** **+ Club**	Attributes
+ Constructor() **+ Constructor(Name, Address, DateOfBirth)** **- getName():string** **- getAddress():string** **+ setAddress(Address)** **+ IsValidDateOfBirth(DateOfBirth):boolean** **+ toString():string**	Methods

5.6.1 Identify a suitable data structure that can be used to store a collection of athlete objects. (1)

5.6.2 Explain why the class shown in the diagram violates the principle of data encapsulation. (1)

5.6.3 **Address** is a parameter in the constructor of the class. Why is it necessary to also have a **setAddress(Address)** method? (1)

5.6.4 Two constructors are included in the class diagram. This is known as overloading.

(a) Explain why it is advisable to have these two constructors from the point of view of application development. (2)

(b) Can methods, other than constructors, also be overloaded? (1)

5.6.5 The following method call was made:

```
IsValidDateOfBirth(day,month,year)
```

Explain why an error message will be displayed when this method call is executed. (2)

5.7 The following data structures can be used to store and manipulate data in a program:

- A two-dimensional array
- An array of type string
- A string
- An array of objects

In each of the following cases, decide which ONE of the above will be the **best** to use:

5.7.1 A list of names of the 15 cities where some of the athletics meetings will take place (1)

5.7.2 All the details of each of the 15 organisers of the athletics meetings, including their names and contact details (1)

5.7.3 The title of an athletics meeting (1)

5.7.4 Booking of seats at one of the athletics meetings (1)

TOTAL SECTION D: 47

SECTION E: INTEGRATED SCENARIO

QUESTION 6

Six client computers and one server computer to be networked were installed at the head office. An administrative office has been set up in each city where athletics meetings will take place to collate and send results to the head office.

6.1 The organisers have been offered either an ADSL or a 3G Internet connection to connect the various administrative offices to the head office in order to create a VPN.

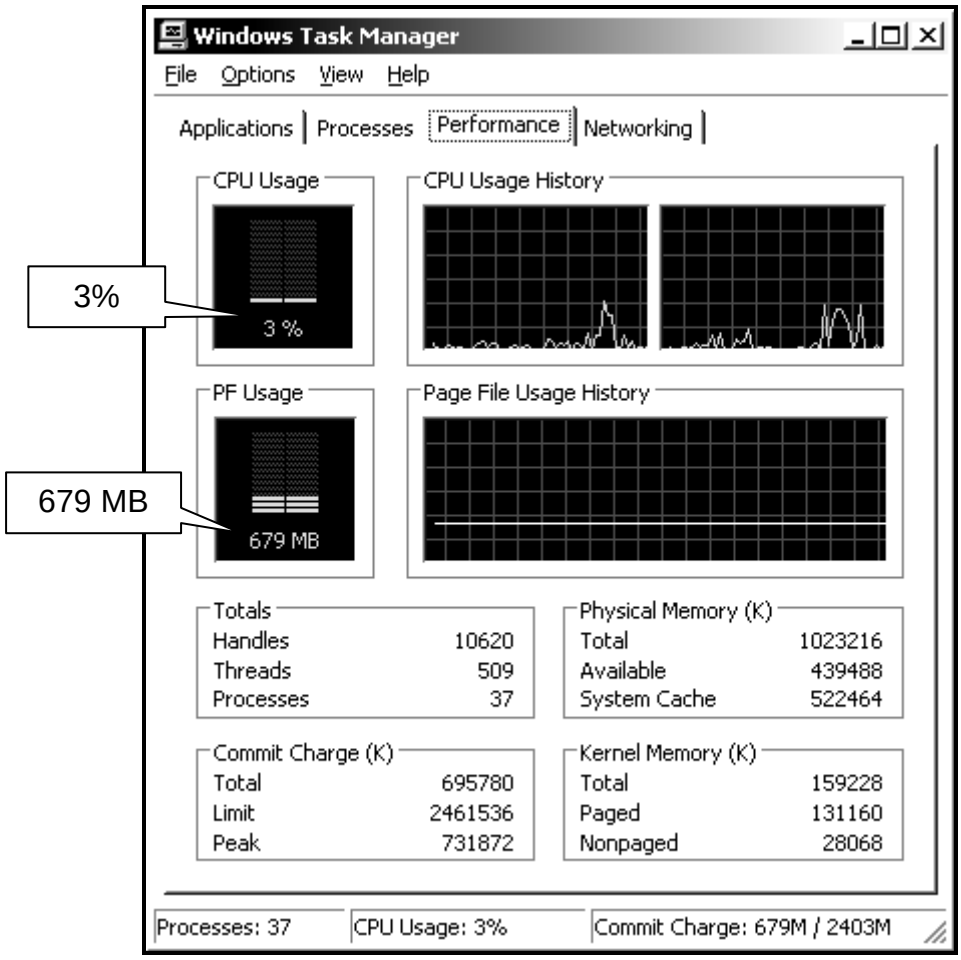
6.1.1 Expand the acronym *3G*. (1)

6.1.2 State TWO possible problems that could occur when using a 3G connection. (2)

6.1.3 ADSL is an asymmetric service. Briefly explain what *asymmetric service* means. (1)

6.1.4 Explain what a *VPN* is. (2)

6.2 The organisers looked at the performance of one the computers in the newly installed network using the Windows Task Manager.



6.2.1 There is a reference to 'system cache' in the diagram on the previous page. What is the size of the cache memory of this computer in MB? (1)

6.2.2 The organisers are concerned about the high number of threads. Explain what a *thread* is in computing terms. (2)

6.2.3 A computer system can use several different processing techniques. Explain the following processing techniques:

(a) Multitasking (3)

(b) Multiprocessing (2)

6.2.4 Why is it possible for this computer to do multiprocessing? (1)

6.2.5 The screenshot of the task manager was taken during normal operation of the computer. Why does this computer not necessarily need a faster CPU? (1)

6.3 Not all the athletes can afford a personal trainer. The organisers decided on using an expert system using artificial intelligence that can be of help to train these young athletes.

6.3.1 Explain the term *artificial intelligence*. (1)

6.3.2 What does an expert system consist of? (2)

6.4 Each athlete competing in the half-marathon event will receive an RFID tag.

6.4.1 Briefly explain how an RFID tag functions. (2)

6.4.2 State TWO advantages of using RFID tags from the event manager's perspective. (2)

6.4.3 Marshals on duty at strategic points along the road agreed to use their smartphones as a means of communicating with fellow marshals along the road during the event.

(a) Explain why Wi-Fi will NOT be a suitable connection type. (1)

(b) Suggest TWO ways in which the marshals can communicate using their smartphones with minimal or no additional costs. (2)

6.5 One of the organisers stumbled upon information on a social media website indicating that a specific athlete used a banned substance.

6.5.1 Give an example of a social media website that could have been used to publish this information about the athlete. (1)

6.5.2 Is the organiser allowed to act upon this information? Motivate your answer. (2)

6.5.3 It was established that the profile does not belong to the athlete implicated. What kind of computer crime was committed against the athlete in this case? (1)

6.6 The organisers are hosting a website with information about the different athletics meetings. It has been suggested that the website should contain hyperlinks.

6.6.1 Explain the advantage of using hyperlinks. (1)

6.6.2 Name TWO other features of a well-designed website. (2)

6.6.3 Websites are normally accessed using a web browser and a URL. Explain what a *URL* is and give an example of a URL as part of your answer. (2)

6.7 Fingerprint readers are used to let authorised organisers enter the administration office.

6.7.1 What is technology such as a fingerprint reader called? (1)

6.7.2 Name TWO other examples of this type of technology that could also be used. (2)

6.8 The network at the head office uses the client-server model.

6.8.1 Name ONE other type of network model. (1)

6.8.2 State TWO advantages of the client-server model. (2)

6.9 The Ethernet network communication standard is used at the head office.

6.9.1 Ethernet uses packet-switching. Briefly explain the concept of *packet-switching*. (3)

6.9.2 Ethernet uses a protocol to transmit and receive data.

(a) What is a *protocol*? (2)

(b) Name the protocol used by Ethernet. (1)

6.9.3 Which topology is used where Ethernet is implemented? (1)

6.9.4 What is the name of the organisation that evaluates and approves network standards? (1)

TOTAL SECTION E: 49
GRAND TOTAL: 180