



basic education

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REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

INFORMATION TECHNOLOGY P2

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MARKS: 180

TIME: 3 hours

This question paper consists of 19 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	(54)
SECTION C: Applications and implications	(20)
SECTION D: Programming and software development	(49)
SECTION E: Integrated scenario	(47)
2. Answer ALL the questions.
3. Read ALL the questions carefully.
4. Number the answers correctly according to the numbering system used in this question paper.
5. 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 ... is a set of rules used by browser software to send requests for web pages to web servers.
- A WLAN
 - B HTTP
 - C USB
 - D ISDN
- (1)
- 1.2 A user complains that his/her computer is very slow. From the list of possible causes given below, what is the most probable cause?
- A Lack of hard-disk space
 - B Waiting for the printer to be connected
 - C Booting from a non-system disk
 - D External drives were disabled
- (1)
- 1.3 Which technique allows the processor of a computer system to run at a speed faster than the motherboard normally supports?
- A Cache
 - B Clock multiplication
 - C Pipelining
 - D Hyperthreading
- (1)
- 1.4 A program that reorganises the files and unused space on a computer's hard disk so that the operating system can access the data more quickly is called a ...
- A disk driver.
 - B file manager.
 - C disk scanner.
 - D disk defragmenter.
- (1)
- 1.5 ... is an open-source multitasking operating system designed for smart phones.
- A Solaris
 - B Android
 - C Mac OS
 - D Windows Vista
- (1)

- 1.6 Which ONE of the following network standards uses short-range radio waves to transmit data?
- A IrDA
 - B WiMax
 - C Bluetooth
 - D TCP/IP
- (1)
- 1.7 The following guidelines are given to prevent a computer from being infected by viruses. Which ONE of the guidelines is FALSE?
- A Never start a computer with removable media already plugged into the ports.
 - B If the antivirus program indicates that an e-mail attachment is infected, open the attachment immediately.
 - C Set the macro security in programs to disable macros.
 - D Scan any new software, even shrink-wrapped software, before installing it on the computer.
- (1)
- 1.8 In object-oriented programming, which ONE of the following will be regarded as the most suitable object to create in a school athletics program?
- A RecordTime
 - B EventName
 - C Athlete
 - D EventDate
- (1)
- 1.9 The concept of hiding the details of an object is known as ...
- A abstraction.
 - B data-mining.
 - C modular programming.
 - D encapsulation.
- (1)
- 1.10 Which ONE of the following software items is used for developing web pages?
- A HTML
 - B SQL
 - C HTTP
 - D CSS
- (1)

TOTAL SECTION A: 10

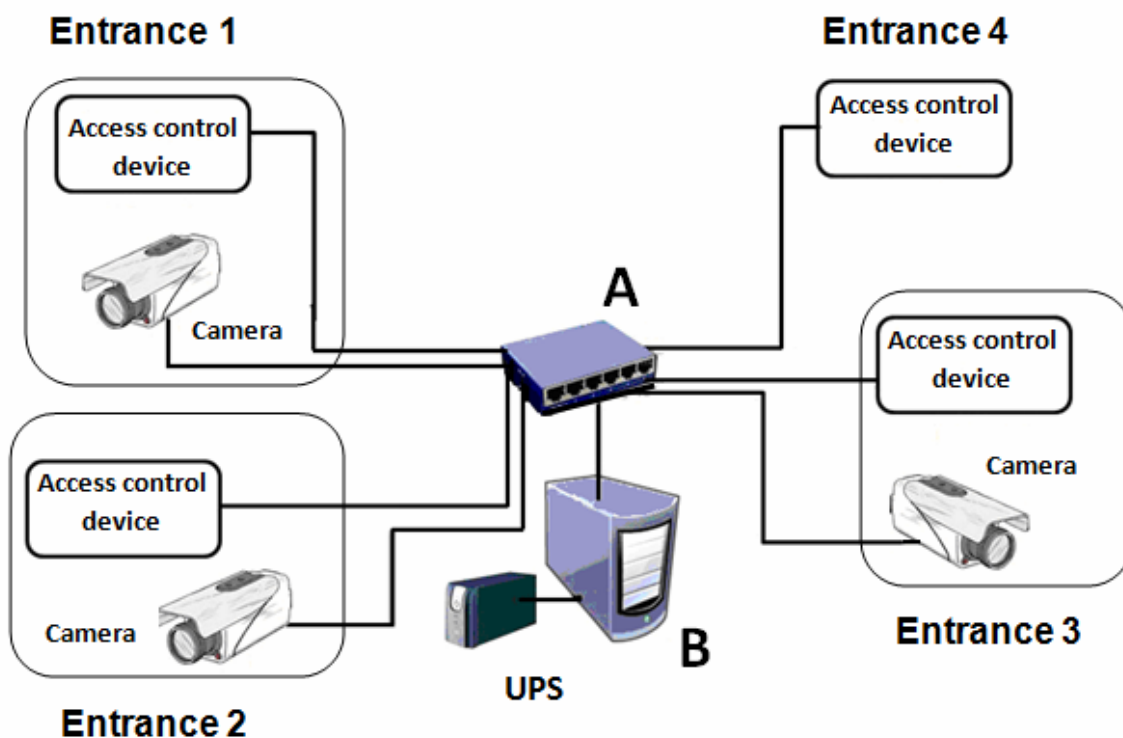
SCENARIO

A school has four separate entrances that learners can use to gain access to the school grounds. The school management has decided to install various security devices at these entrances which will seamlessly integrate with the existing local area network. The security company has given the school the choice of implementing one of the following access control technologies:

- An RFID tag for each learner
- A fingerprint scanner at each entrance
- Bar-coded ID cards that include the learner's name and photograph

The school management also wishes to install surveillance cameras around the school and store all of the surveillance video in a digital format. All surveillance video's from the cameras will be stored on the school's server. On the last day of each month the data for the entire month will be sent to a specialised company for analysis.

A diagram of the proposed network layout, including the new security devices, is shown below.



SECTION B: HARDWARE AND SOFTWARE**QUESTION 2**

- 2.1 The security company suggests that a UPS should be connected to the server (device B). Briefly describe what a UPS does. (2)
- 2.2 Access to the security data on the network should be strictly controlled.
- 2.2.1 Name TWO software-related measures that can be taken to prevent unauthorised users at the school from accessing the data files. (2)
- 2.2.2 Name ONE non-software-related measure that can be used to prevent unauthorised users at the school from accessing the data files. (1)
- 2.2.3 Authorised users should be aware of social engineering as a possible security threat. In the context of computers, briefly explain what *social engineering* is. Give an example as part of your explanation. (2)
- 2.3 The server that is going to store the security data needs to be a high-performance machine. Someone recommends that the server should have at least an AGP for video editing, a 64-bit motherboard and two physical CPUs.
- 2.3.1 Explain what an *AGP* is. (2)
- 2.3.2 Explain why a 64-bit motherboard will perform better than a 32-bit motherboard. (2)
- 2.3.3 Write down the term used to refer to a processing technique that makes use of more than one physical processor. (1)
- 2.3.4 Differentiate between a computer using *two physical CPUs* and a computer using *multicore technology*. (2)
- 2.3.5 Explain how the front-side bus on a motherboard with two CPUs would differ from that of a motherboard that supports only one CPU. (2)
- 2.3.6 Virtual memory is often used in a computer system.
- (a) What is *virtual memory*? (2)
- (b) Which software implements and manages virtual memory in a computer system? (1)
- (c) How can you avoid using virtual memory? (1)

- 2.4 Learners should only be allowed to enter the school grounds if they are currently registered learners.
- 2.4.1 Name TWO hardware items the school would need to purchase in order to make use of bar-coded ID cards as an access control mechanism. (2)
- 2.4.2 Describe how it is possible for RFID tags to identify unauthorised access to the school grounds. (2)
- 2.4.3 Which ONE of the following access control technology options provided by the security company will be the most secure?
- An RFID tag for each learner
 - A fingerprint scanner at each entrance
 - Bar-coded ID cards that include the learner's name and photograph
- Give a reason for your answer. (2)
- 2.4.4 Data on learners will need to be captured and stored for security purposes. Explain, by referring to TWO hardware items in the diagram on page 5, why computers to store the data will not be required at the entrances. (2)
- 2.5 The security company suggests that the school purchase cameras that plug directly into the network via UTP cabling.
- 2.5.1 The IT administrator at the school says that the cameras will not need IP addresses as they are not actual computers.
- (a) What is an *IP address*? (1)
- (b) Give an example of an IP address. (1)
- (c) Do you agree with the IT administrator? Give a reason for your answer. (2)
- 2.5.2 Write down ONE possible file extension that the video files generated by the cameras are likely to have. (1)
- 2.5.3 The surveillance system is likely to generate a large number of files every day. It is important that the files be organised in an efficient manner.
- (a) Suggest a convention for naming the files which would help identify them. (1)
- (b) Recommend a folder structure (at least three levels) which would allow the school to easily find any surveillance footage they may require. (2)

- 2.5.4 The school server that will store the surveillance footage has a 2-terabyte hard drive. The size of one day of video data from all the cameras is approximately 50 gigabytes.
- (a) How many days' worth of data would the hard drive be able to store before running out of storage space if it was only used for storing videos? (2)
 - (b) Suggest TWO strategies that can be used to extend the capacity of the hard drive once it is full. These strategies must still allow the school to record more surveillance data without losing any of the old data and without physically adding an extra hard drive to the server. (2)
- 2.5.5 Backing up the surveillance data regularly is important.
- (a) How often, do you think, should this data be backed up? Justify your answer. (2)
 - (b) What is the most effective storage media to use for these backups? Justify your answer. (2)
 - (c) Software used to perform the backup is classified as utility software. In general, what is *utility software*? (2)
- 2.5.6 The school has an ADSL connection with a 100 GB cap per month. They want to transfer the surveillance data to the analysis company via the Internet.
- (a) Briefly explain what an *ADSL connection* is. (2)
 - (b) Do you think transferring the surveillance data via the Internet is a good idea? Give a reason for your answer. (2)
- 2.5.7 The security company suggests RAID on the server.
- (a) Explain what *RAID* is. (2)
 - (b) They recommend RAID level 1. Does RAID level 1 protect against data loss? Give a reason for your answer. (2)

TOTAL SECTION B: 54

SECTION C: APPLICATIONS AND IMPLICATIONS**QUESTION 3: e-COMMUNICATION**

The security company makes use of the Internet to advertise their company and to do business-related research. However, they have realised that the use of the Internet can lead to problems regarding security and information overload.

- 3.1 Recently, the security company received an e-mail from an unauthorised source requesting the security password for the building. According to the e-mail, one of their employees had to urgently collect important documents from the building and he had forgotten the password.
- 3.1.1 Which term is used when an unauthorised source uses an e-mail to try to convince someone to provide security-related information? (1)
- 3.1.2 A link in the e-mail navigated the user to a web page that looked almost exactly like that of the security company. What is this type of communication scam called? (1)
- 3.2 The company often experiences DoS attacks launched by its opposition.
- 3.2.1 Explain what is meant by a *DoS attack*. (2)
- 3.2.2 Give an example of a typical DoS attack. (1)
- 3.3 Although there are search engines available, it is not always easy to find information on the Internet.
- 3.3.1 What is a *search engine*? (2)
- 3.3.2 Name a search engine that you would recommend someone to use. (1)
- 3.3.3 State TWO techniques or hints that could reduce the number of hits on an Internet search. (2)
- [10]**

QUESTION 4: SOCIAL AND ETHICAL ISSUES

The use of information technology at the security company can have positive and negative consequences for the company.

- 4.1 Do you think an electronic security system poses a threat to the availability of job opportunities in the security industry? Justify your answer. (2)
- 4.2 Use an example to explain why accuracy and validity of data is extremely important in any electronic security system. (2)
- 4.3 State TWO ways in which social networking can be used to prevent people from becoming crime victims in South Africa. (2)
- 4.4 The security company can use the Google Earth software application to get 3-D images of the residences of its clients. Suggest a possible ethical issue regarding the Google Earth software application. (1)
- 4.5 State THREE precautionary measures that the company can take to protect the data of their customers against theft or damage due to viruses, worms and trojan horses. (3)

[10]**TOTAL SECTION C: 20**

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

The school requires a database that keeps record of all persons entering and exiting the school grounds. The security company has installed a bar-coded ID card system and cameras to control the access points.

- 5.1 The design of the database to be used needs to be carefully considered.
- 5.1.1 The personal information of each staff member must be grouped together to be captured in a **tblStaff** table. Which term is given to the group of fields related to one staff member? (1)
- 5.1.2 The data that is captured in a database should be valid.
- (a) Explain the difference between *valid data* and *invalid data*. Give ONE example of EACH. (4)
- (b) The use of input masks is one of the ways to restrict the entering of invalid data. Use a date that has to be entered as an example to explain what an input mask is. (2)
- (c) State TWO other ways of ensuring that valid data is captured in a database. (2)
- 5.1.3 Which term is used for extracting data from a database, using specific criteria? (1)
- 5.2 The **SecurityDB** database contains three tables, namely **tblCodes**, **tblEntry** and **tblExit**. Each individual is allocated a unique code that enables him/her to enter and exit the school grounds. This code is stored along with his/her name and surname in the **tblCodes** table. The date and time that authorised people enter and exit the school grounds is stored in the other two tables respectively.

The table structures are shown below.

tblCodes : Table		
	Field Name	Data Type
🔑	Code	Text
	Name	Text
	Surname	Text

tblEntry : Table		
	Field Name	Data Type
🔑	EntryNo	AutoNumber
	Date	Date/Time
	TimeIn	Date/Time
	Code	Text

tblExit : Table		
	Field Name	Data Type
🔑	ExitNo	AutoNumber
	Date	Date/Time
	TimeOut	Date/Time
	Code	Text

- 5.2.1 Name the type of relationship between the **tblCodes** and the **tblEntry** tables. (1)
- 5.2.2 The **Code** field appears in the **tblCodes** table as the primary key. This field also appears in the **tblEntry** and the **tblExit** tables.
- (a) What is the purpose of the **Code** field in the **tblEntry** and the **tblExit** tables? (2)
- (b) Which term is used for the **Code** field in the **tblEntry** and the **tblExit** tables? (1)
- 5.2.3 Give a reason why 'AutoNumber' is the most suitable data type for the **EntryNo** field in the **tblEntry** table. (1)
- 5.2.4 Explain why the **Code** field cannot be used by itself as a primary key in the **tblEntry** table or in the **tblExit** table. (1)
- 5.2.5 Refer to the **tblEntry** table. In the event of the **EntryNo** field being unavailable, state whether the following combinations of fields can be used as a primary key. In EACH case, give a reason for your answer.
- (a) **Date** and **Timeln** (2)
- (b) **Date**, **Timeln** and **Code** (2)
- 5.2.6 The process of normalisation should always be part of the design of any database. State TWO advantages of normalisation. (2)
- 5.3 Object-oriented programming will be applied during the design of the software.
- Indicate whether the following statements are TRUE or FALSE. Write only 'true' or 'false' next to the question number (5.3.1–5.3.5) in the ANSWER BOOK.
- 5.3.1 Private data fields can be used outside the class in which it is declared. (1)
- 5.3.2 Mutator methods must have parameters. (1)
- 5.3.3 An accessor method is known as a get method. (1)
- 5.3.4 A variable declared in a method cannot be accessed from another method. (1)
- 5.3.5 A method that returns a Boolean value can only be called in an 'IF' statement. (1)

5.4 Loops will be used in the program. A loop can be classified as a conditional or an unconditional loop.

5.4.1 Which loop in the programming language that you have studied can be classified as an unconditional loop? (1)

5.4.2 The school has twenty staff members. A staff meeting has been arranged but some of the staff members may not be able to attend.

The following algorithm will be used to enter the names of the staff members as they arrive and to display their names on the screen:

1. total \leftarrow 0
2. do while total is less than 20
3. input name
4. display name
5. end loop

(a) The loop in the given algorithm is supposed to terminate after 20 names have been entered, but when tested, the loop does not terminate at all.

(i) One of the programmers suggests that statement 1 and statement 2 should be swapped.

Example:

1. do while total is less than 20
2. total \leftarrow 0
- ...

Explain why this suggestion will cause a problem. (1)

(ii) Another programmer identifies the problem as a statement that has been left out, causing an endless loop to occur.

Write out the missing statement AND use the given line numbers to indicate where the statement has to be inserted into the given algorithm to solve the problem. (2)

- (b) Assume that the problem regarding the endless loop has been solved and that the loop will be terminated once the names of twenty staff members have been entered.

However, if fewer than 20 staff members arrive, the loop will again not be terminated. Suggest the best possible way in which the given algorithm can be improved to accommodate the possibility of fewer than 20 names of staff members to be entered.

Rewrite the given algorithm to show your suggested solution. (4)

5.5 Software should be free of errors. Therefore, debugging is an essential part of the development of software.

5.5.1 State TWO methods of debugging a program. (2)

5.5.2 Classify EACH of the following errors as either a **syntax** error or a **logical** error:

(a) The data type of a variable has not been declared. (1)

(b) The time that an individual has spent on the school grounds has been calculated using data from a data file, but the calculation is incorrect. (1)

(c) The data has been sorted according to the time the individuals have entered the school grounds. The unsorted list is displayed instead of the sorted list. (1)

5.6 Statistics regarding the number of visitors entering the school grounds need to be recorded. The programmer decides to use an array containing test data for planning purposes. Answer the following questions based on arrays:

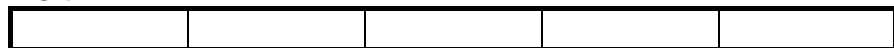
5.6.1 One way of populating an array is to use input from the keyboard. State TWO other ways of populating an array. (2)

5.6.2 Study the algorithm below that supposedly calculates and displays the average number of visitors per day, and then displays the days on which the number of visitors exceeded the average number of visitors per week. The algorithm reads the total number of visitors for each day of the week from the keyboard as test data.

Line number	Description
1	Create visitArr with a maximum of 5 values
2	Create daysArr containing the names of the days of the week
3	Initialise total to 0
4	Input number of visitors
5	Start a loop to execute 5 times
6	Input number of visitors
7	visitArr[loop_value] ← number of visitors
8	total ← total + visitArr[loop_value]
9	End loop
10	Display the average
11	Start loop
12	If visitArr[total] > average
13	Display daysArr[loop_value]
14	End loop

(a) Redraw the following diagram representing the **visitArr** in your ANSWER BOOK.

visitArr



(i) Use the given algorithm and the following test data to populate **visitArr** in the diagram in your ANSWER BOOK:

Test data: 8, 6, 9, 4, 1

(2)

(ii) You should have noted that the array has been incorrectly populated because of an error occurring in the algorithm. This error occurs between line numbers 1 and 9. Indicate how the algorithm must be changed in order to correct the error.

(1)

- (b) Assume that the error in the algorithm (referred to in QUESTION 5.6.2 (a) (ii)) has been corrected and that the array has been populated with the following values:

visitArr

8	6	9	4	1
---	---	---	---	---

The following is displayed by statements 10 to 14 of the algorithm:

0
Monday
Tuesday
Wednesday
Thursday
Friday

Rewrite statements 10 to 14 to display the correct average and the names of the days on which the number of visitors exceeds the average number of visitors per day.

NOTE: Additional statements might be required. (4)

TOTAL SECTION D: 49

SECTION E: INTEGRATED SCENARIO**QUESTION 6**

The school has requested the security company to send a consultant to the school to explain the operation and benefits of the new security system. This consultant will also address issues concerning the location of the cameras and the integrity of the data. The school has also requested the consultant to give a talk to inform the learners on e-safety and computer crimes.

- 6.1 The consultant warns learners that any information they uploaded or posted to social networking sites can be dangerous to their personal safety. He also warns the learners of identity theft, cyber-bullying and data-mining.
- 6.1.1 Name THREE items of personal information that should not be posted on a social networking site. (3)
- 6.1.2 What is *identity theft*? (2)
- 6.1.3 State TWO preventative measures that can be taken to avoid identity theft. (2)
- 6.1.4 Name TWO types of malicious software which someone could use to obtain your personal information without your knowledge. (2)
- 6.1.5 Cyber-bullying is becoming increasingly common.
- (a) What is *cyber-bullying*? (1)
- (b) Give an example of an action you would consider as cyber-bullying. (1)
- 6.1.6 Data-mining on the Internet takes place when an individual or a company automatically collects data from various sources on the Internet. The consultant tells the learners that their personal data can be mined if it is available.
- (a) Give TWO possible reasons why companies may want to perform data-mining. (2)
- (b) Give ONE example of a learner's personal data that may be openly available on a school website. (1)
- (c) Do you think data-mining of public data for commercial gain is ethical? Justify your answer. (2)

- 6.2 The staff members at the school have various questions about the new security system that has been installed.
- 6.2.1 Apart from access control, name ONE other practical use for a bar-coded ID card in the school context. (1)
- 6.2.2 A staff member is concerned about who has access to the surveillance data and how it will be backed up. He also has questions regarding the copyright of the video data.
- (a) Name TWO people in the school environment who should NOT have access to the security data. (2)
- (b) What is *copyright*? (1)
- (c) Give ONE reason why the video surveillance data should be copyrighted. (1)
- (d) State TWO potential dangers of not controlling access to the security data. (2)
- 6.2.3 Do you think the video surveillance at the school will infringe on the privacy of the learners and staff? Justify your answer. (2)
- 6.3 The consultant warns that learners should exercise caution when using Wi-Fi Internet access in public places such as coffee shops, airports and shopping malls, because malicious people can intercept their data when it is transmitted.
- 6.3.1 What is *Wi-Fi*? (1)
- 6.3.2 Name TWO types of devices that are able to make use of Wi-Fi. (2)
- 6.3.3 Explain why connecting to a Wi-Fi network does not necessarily mean you will have free Internet access. (2)
- 6.3.4 Which term is used to refer to the practice of intercepting data packets on a network? (1)
- 6.3.5 For EACH of the following technologies, state whether it is able to protect your data from being intercepted and used. Give a reason for your answer in EACH case.
- (a) Firewall (2)
- (b) Encryption (2)
- (c) Virus scan (2)
- 6.3.6 You decide it is safer not to use any Wi-Fi networks. Suggest an alternative Internet connection which is portable and can be used almost anywhere. (1)

- 6.4 Below is a picture of a hoax e-mail that has been sent to one of the staff members at the school. Study the e-mail carefully and answer the questions that follow.

From : johns@segres.co.za
To : helen@yahoo.co.uk, larry23@gmail.com, reeceh@mpark.school.za, reza@hotmail.com, sizwe@rtt.co.za, navesh@lincolnstate.com, duduzile@mumtalk.co.nz
CC :
BCC :
Subject : FWD: FWD: Two moons on 27 August!!!!

Two moons on 27 August!!!!



27th August the whole world is waiting for

Planet Mars (on the right) will be the brightest in the night sky starting August.

It will look as large as the full moon to the naked eye. This will culminate on 27 Aug. when Mars comes within 34.65M miles of the earth. Be sure to watch the sky at 12:30am on 27 Aug. It will look like the earth has two moons. The next time Mars may come this close is in 2287.

Share this with your friends as NO ONE ALIVE TODAY will ever see it again!!

- 6.4.1 After receiving this e-mail, the staff member received many e-mails from larry23@gmail.com. How is it possible that this person knows the staff member's e-mail address? (1)
- 6.4.2 How should the original sender of the e-mail have entered the addresses of the recipients to ensure that they could not use each other's e-mail addresses? (2)
- 6.4.3 The staff member is unsure of whether the contents of the e-mail are true or not. Explain TWO ways that the staff member can go about verifying the accuracy of the content. (2)
- 6.4.4 Explain the difference between *phishing* and a *hoax e-mail*. (2)
- 6.4.5 What does the 'FWD: FWD: ...' part in the subject line of the e-mail refer to? (1)
- 6.4.6 What does the '.co.za' part in the e-mail address of the sender refer to? (1)

TOTAL SECTION E: 47
GRAND TOTAL: 180