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# basic education

Department:  
Basic Education  
**REPUBLIC OF SOUTH AFRICA**

## **NATIONAL SENIOR CERTIFICATE**

**GRADE 12**

**INFORMATION TECHNOLOGY P2**

**NOVEMBER 2023**

**MARKS: 150**

**TIME: 3 hours**

**This question paper consists of 17 pages.**

## INSTRUCTIONS AND INFORMATION

1. This question paper consists of SIX sections:

SECTION A:	Short Questions	(20)
SECTION B:	Systems Technologies	(25)
SECTION C:	Communication and Network Technologies	(30)
SECTION D:	Data and Information Management	(20)
SECTION E:	Solution Development	(22)
SECTION F:	Integrated Scenario	(33)

2. Read ALL the questions carefully.
3. Answer ALL the questions.
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: SHORT QUESTIONS****QUESTION 1**

- 1.1 Choose a term from COLUMN B that matches the description in COLUMN A. Write only the letter (A–P) next to the question numbers (1.1.1 to 1.1.10) in the ANSWER BOOK, e.g. 1.1.11 Q.

<b>COLUMN A</b>		<b>COLUMN B</b>	
1.1.1	The efficient and environmentally responsible design and disposal of computer equipment	A	virtual reality
		B	DBMS
1.1.2	The interconnection of computing devices embedded in everyday objects, enabling them to send and receive data via the internet	C	ergonomics
		D	wiki
		E	domain name
1.1.3	A term used to describe memory that loses its data when the power is switched off	F	ROM
		G	URL
1.1.4	The study and design of computer equipment to enhance the comfort and safety of the user	H	green computing
		I	IoT
1.1.5	A collaborative website where users can publish and organise a body of content for free	J	volatile
		K	virtualisation
1.1.6	The real-time integration of text, graphics, audio and other virtual enhancements with real-world objects	L	augmented reality
		M	jpeg
1.1.7	The process of extracting specific information from a database based on a set of criteria or conditions	N	mp4
		O	BitTorrent
1.1.8	The file extension of an image file	P	query
1.1.9	Refers to the unique address of a web page		
1.1.10	A peer-to-peer protocol used for the sharing and transfer of large files across a network		

(10 x 1)

(10)

1.2 Various options are provided as possible answers to the following questions. Choose the answer and write down only the letter (A–D) next to the question numbers (1.2.1 to 1.2.5) in the ANSWER BOOK, e.g. 1.2.6 D.

1.2.1 ... refers to a group of compromised computers or mobile devices connected to a network used to attack other networks.

- A Botnet
- B Zombie cookie
- C Skynet
- D RAID

(1)

1.2.2 ... is a temporary storage area.

- A ROM
- B SSD
- C HDD
- D Cache memory

(1)

1.2.3 Linux is an example of ... software, which means its code is provided free for use, modification and redistribution.

- A Proprietary
- B Shrink-wrapped
- C Open-source
- D Virtual

(1)

1.2.4 Most of today's internet connections are ... connections that are capable of transmitting large amounts of data across the network.

- A dial-up
- B ADSL
- C broadband
- D coaxial

(1)

1.2.5 The answer to the expression given below:

$$24 \text{ MOD } 7 * 5 \text{ DIV } 2$$

- A 3
- B 6
- C 7
- D 7.5

(1)

- 1.3 Give ONE word/term for each of the following descriptions. Write only the word/term next to the question numbers (1.3.1 to 1.3.5) in the ANSWER BOOK, e.g. 1.3.1 Computer.
- 1.3.1 A third-party program that extends the built-in functionality of an application or browser (1)
- 1.3.2 A data structure that consists of a collection of tables that are joined through linked fields (1)
- 1.3.3 A type of malware that prevents a user from accessing his or her data on a device until a fee is paid (1)
- 1.3.4 A creator's exclusive legal right to reproduce, publish or sell intellectual property (1)
- 1.3.5 The ability of a system to increase or decrease its resources depending on the number of users (1)
- TOTAL SECTION A: 20**

**SECTION B: SYSTEMS TECHNOLOGIES****QUESTION 2**

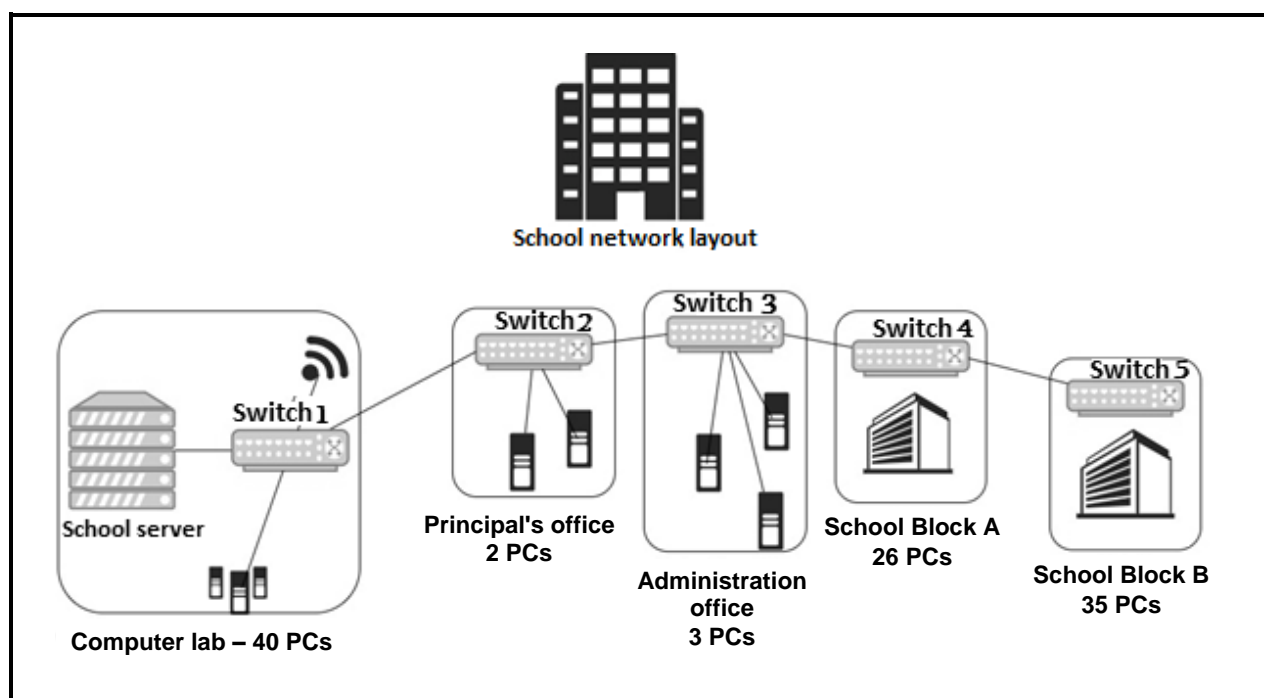
A university called 'LearnMore' is currently receiving student applications for the new year.

- 2.1 It has been suggested that the desktop computers in the administration building should be replaced.
- 2.1.1 State TWO characteristics of a motherboard that should be considered when purchasing new desktop computers. (2)
- 2.1.2 Except for the CPU, name ONE other component that will process data in a computer system. (1)
- 2.1.3 The secondary storage capacity is an important consideration when purchasing devices.
- Give TWO examples of flash storage devices that could be used in the administration building. (2)
- 2.2 The IT department at the university suggested that cloud-based servers could be used for the administration department.
- 2.2.1 Briefly explain what a *cloud-based virtual server* is. (2)
- 2.2.2 Justify the use of cloud-based virtual servers. (2)
- 2.2.3 Software as a Service (SaaS) is currently used on the computers in the administration building.
- Except for the benefit of renting instead of buying software, state TWO other benefits of using SaaS. (2)
- 2.2.4 Some of the software being used requires licences.
- Motivate why acquiring a site licence is better than acquiring a single-user licence for each of the users. (2)

- 2.3 Critical to the success of the institution is ensuring no downtime and that regular backups of important data at the university are made.
- 2.3.1 Explain what a *backup strategy* is and how it can help prevent downtime at the university. (3)
- 2.3.2 A cloud storage service could be used to backup data off-site.  
State TWO disadvantages of using cloud storage to backup data off-site. (2)
- 2.4 An Engineering Graphics and Design course, using AutoCAD as a drawing tool, is offered at the university.  
Give ONE term for the type of computer user associated with the course above by choosing a term from the list below. Write only the term next to the question number (2.4) in the ANSWER BOOK.
- |  |
|--|
| home office user; power user; mobile user; small office user |
|--|
- (1)
- 2.5 Data security is essential to safeguard computer systems at the university against malware threats. One such threat is a computer worm.
- 2.5.1 State TWO characteristics of a computer worm. (2)
- 2.5.2 Explain why an antivirus product, rather than a firewall, will protect a system from being infected by a computer worm. (2)
- 2.6 The new computers will be equipped with solid-state drives which do not need to be defragmented to optimise performance.  
Discuss why there is no need to defragment a solid-state drive. (2)
- TOTAL SECTION B: 25**

**SECTION C: COMMUNICATION AND NETWORK TECHNOLOGIES****QUESTION 3**

A school governing body decided to invest funds in communication and network technologies to upgrade the network of the school. The school network layout is shown in the diagram below.



3.1 Study the school network layout and answer the questions below.

- 3.1.1 Define the term *network*. (2)
- 3.1.2 Why do you think the school will benefit from investing in modern communication and network technologies? (2)
- 3.1.3 Identify and motivate the need for at least TWO components used in a LAN. (4)
- 3.1.4 The switches are connected to one another from the computer lab to Block B of the school (from Switch 1 to Switch 5). (2)
- (a) Describe a potential disadvantage of this layout. (2)
- (b) Draw a basic diagram to suggest an alternative layout for the network that will prevent the potential problem described in QUESTION 3.1.4(a). (2)

- 3.2 A network can be made up of wired and wireless communication media.
- 3.2.1 Suggest ONE type of wireless technology that can be utilised in an extended network. (1)
- 3.2.2 Explain how the wireless capability of the school's network can be extended to cover the entire school grounds. (2)
- 3.2.3 The school needs to provide network access to their hostel at another location about one kilometre away.
- Suggest a possible solution and indicate how your solution would solve this problem. (2)
- 3.3 The school would like to incorporate VoIP technology in the classrooms.
- 3.3.1 (a) Write out the acronym *VoIP*. (1)
- (b) How does VoIP differ from traditional telephone calls? (2)
- 3.3.2 Assess the possible technical challenges that might be faced when using VoIP at school. Discuss at least TWO challenges. (4)
- 3.4 One of the short-term goals of the school is to set up an intranet.
- Briefly explain what an *intranet* is and give a practical example of how it could be used in a school environment. (2)
- 3.5 Below is an advertisement that the school received to introduce remote teaching and learning.

**Work from anywhere –  
securely, easily and fully  
immersive**

**The ultimate remote access and work solution for remote  
employees, freelancers and hybrid systems**

- 3.5.1 Recommend why a remote desktop connection should be used for people working from home. (2)
- 3.5.2 An example of 'remote access' is being able to access the school security while away from the school.
- State ONE advantage and ONE disadvantage of using remote access. (2)

**TOTAL SECTION C: 30**

**SECTION D: DATA AND INFORMATION MANAGEMENT****QUESTION 4**

The school stores all the information of the learners in a database with multiple tables. Data was obtained from printed class lists provided by the register class teachers.

The extract below is from a table called **tblLearners**.

ID	FirstName	Surname	Age	Gender	RegisterClass	Teacher
1	John	Smith	16	Male	10A	Boyd
2	Jane	Doe	18	Female	12C	Nkwe
3	James	Brown	15	Male	9A	Peterson
4	Emily	Davis	16	Female	10A	Boyd
5	Michael	Johnson	18	Male	12C	Nkwe

4.1 Study the table above and answer the questions that follow.

4.1.1 State the purpose of a primary key in a table. (1)

4.1.2 State a requirement of a primary key, except not having duplicate values. (1)

4.1.3 The structure of the table above will result in anomalies.

(a) What design error in this table might lead to an anomaly? (2)

(b) Suggest how this design error can be resolved and explain how a solution can be accomplished. (4)

4.2 Data verification and data validation are important database management processes.

Compare the concepts of *verification* and *validation* to clearly indicate why validation does not remove the need for verification. (4)

4.3 The school uses a 'Microsoft Access' database as their DBMS solution.

4.3.1 What programming language is mostly used to extract data from a database? (1)

4.3.2 Identify a typical scenario when a server-based database would be required and explain how a server-based database would serve to cater for the needs of the scenario identified. (3)

4.4 An audit trail is used in the school's database.

4.4.1 How does the creation of an audit trail enhance data security in the school database? (2)

4.4.2 Besides using an audit trail, suggest an alternative method to enhance the security of the school's database and explain how it can be used. (2)

**TOTAL SECTION D: 20**

**SECTION E: SOLUTION DEVELOPMENT****QUESTION 5**

- 5.1 Efforts are made to identify and improve code segments in the current software system utilised by the administration department.

Study the extract of Delphi code below and answer the questions that follow:

```
1   iCounter := 0;
2   for iRow := 1 to 3 do
3       begin
4           sLine := '';
5           for iCol := 1 to 5 do
6               begin
7                   sLine := sLine + '*';
8                   inc(iCounter);
9               end;
10          end;
11  redOutput.Lines.Add(sLine);
```

- 5.1.1 Write down the line number of any line of code from the provided code segment above that implements the following:

(a) Initialisation (1)

(b) Looping (1)

- 5.1.2 What will be the value of **iCounter** after the above code has been executed?

**NOTE:** Assume that all the variables are declared correctly and there are no errors in the code. (1)

- 5.1.3 Provide the output of the program after the code above has been executed. (2)

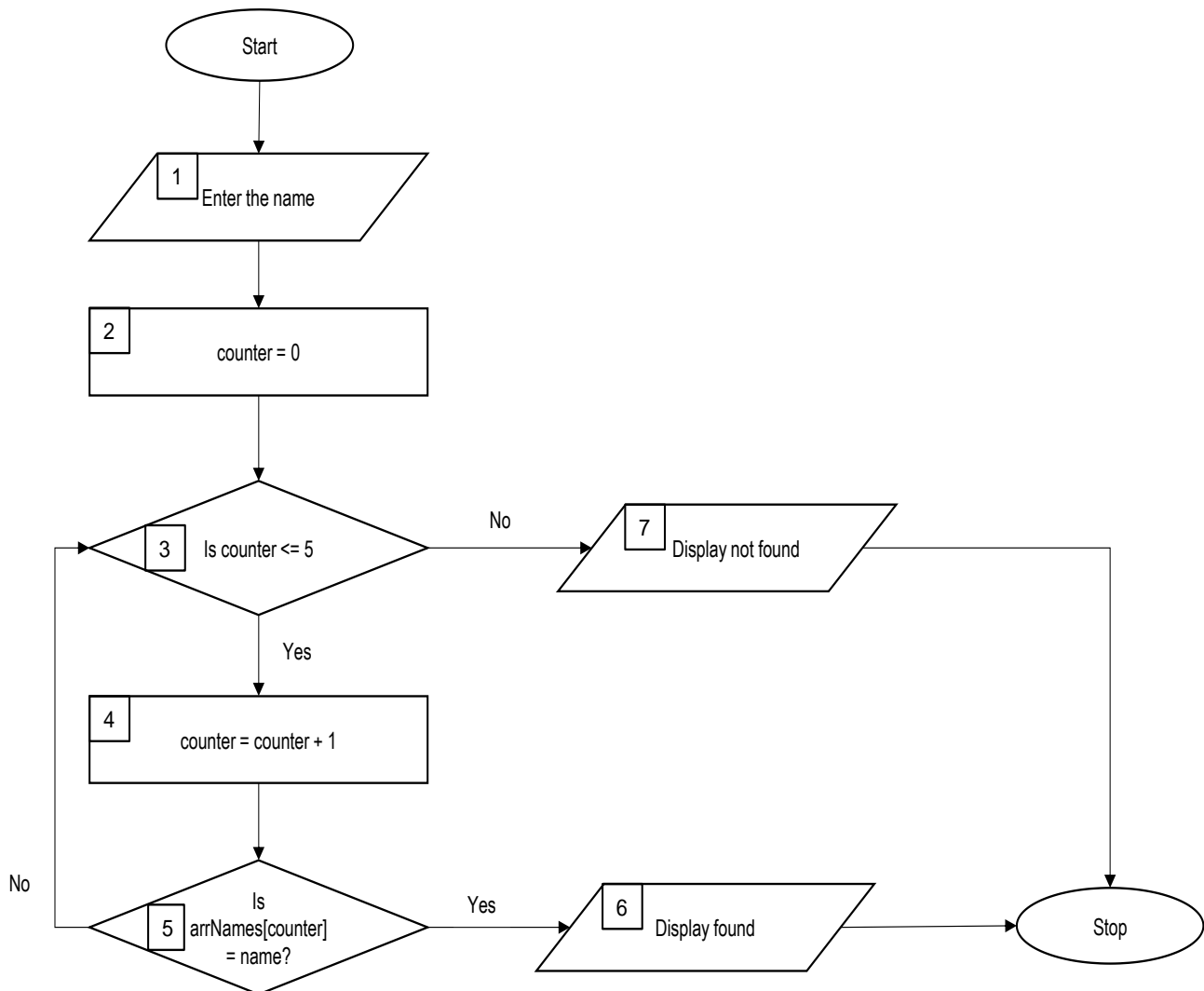
- 5.1.4 Rewrite the second loop (for iCol := 1 to 5 do) as a conditional loop. (3)

- 5.2 A prototype application was developed for the human resources (HR) department that will allow them to search for student names.

An array has been declared as follows:

```
arrNames: array [1..5] of String =  
    ('Trevor', 'Mpho', 'Lebo', 'Steven', 'Verushka');
```

Study the flow diagram below and answer the questions that follow:



Copy the trace table below in your ANSWER BOOK and complete the table to determine the output of the provided flow diagram if the name 'Lebo' is the input in the component labelled number 1 in the diagram.

name	counter	Is counter <= 5?	Is arrNames [counter] = name?	Display
Lebo				

**NOTE:** You need to add more rows to the trace table to complete tracing through the flow diagram.

(4)

5.3 Write pseudocode to input a word and display the word in reverse letter order.

EXAMPLE:

If the word 'database' was entered as the input word, the word in reverse letter order will be displayed as 'esabatad'.

The first step in the pseudocode algorithm is:

Input sWord

**NOTE:** The pseudocode must work correctly for any word that is entered, not only the word in the example. (4)

5.4 An object class is required to create a student card object.

The details required on the student card are shown in the table below.

Details on student card:	Example:
Unique student number	013795
Name of the student	'Trevor'
Surname of the student	'Chabale'
Year of study	2

Draw a unified modelling language (UML) class diagram to represent the object class called **TStudentCard**.

The diagram must contain the following:

- All the attributes of the **TStudentCard** object indicating data types and public/private scope
- A constructor method indicating values received for all four attributes via a parameter list
- A mutator method called **setStudyYear** to receive a new year of study as a parameter (6)

**TOTAL SECTION E: 22**

**SECTION F: INTEGRATED SCENARIO****QUESTION 6**

Open days at schools are used to take learners on tours where they can see the facilities of the institution.

- 6.1 Registration for an open-day event at a school takes place by using QR (quick response) codes to open a link to a form. The information entered on the form is then used to e-mail an application form to the learner.
- 6.1.1 Explain what a *QR code* is and how it can be captured. (2)
- 6.1.2 When completing a form online, it often happens that personal information, such as your e-mail address, is automatically entered into the fields. How does that happen? (1)
- 6.2 A video of a 3D tour of the school campus is placed on the school's website for learners who cannot attend the open day.
- 6.2.1 A computer with the latest operating system and multiprocessing specifications was used to create the video.
- (a) Explain what *multiprocessing* is. (2)
- (b) Discuss how the different processes are managed by the operating system to ensure that all applications will have adequate resources. (2)
- 6.2.2 When a person visits the school's website more than once, it opens much faster because of the web cache.
- Explain the process of web-caching. (2)
- 6.2.3 The online 3D tour can be downloaded or streamed.
- Critically discuss the increased use of streaming material rather than downloading. (4)
- 6.3 The school's website is an example of a Web 1.0 generation website.
- 6.3.1 State TWO characteristics of a Web 1.0 website. (2)
- 6.3.2 Give any TWO reasons that led to websites evolving from Web 1.0 to Web 2.0. (2)

6.4 All the data of the prospective learners are saved in an online database.

The following variations of data was recorded:

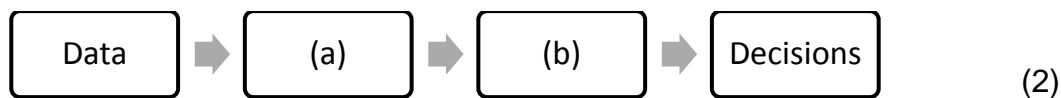
Surname	Grade
Chetty	7
Franklin	seven
Gumede	Gr. 7
Venter	Grade 7

6.4.1 Discuss why the data above might compromise the quality of input data. (2)

6.4.2 State TWO different techniques on how the form, in which the data is captured, could be optimised to prevent this type of input. (2)

6.4.3 Data gathered from a form needs to be used for decision-making. The process of transforming data in the information cycle is depicted in the diagram below.

Provide the missing labels for parts (a) and (b).



6.5 The school is one of many schools in the 'LearnMore School' franchise enrolling new learners.

A distributed database is used to save the data required for use by the school.

6.5.1 Why would a distributed database be a more suitable option for this scenario? (1)

6.5.2 Private information that is transferred over public networks, such as the internet, should always be encrypted.

Briefly explain how *encryption* works. (2)

6.5.3 Suggest which distributed database model will be most suitable for this scenario and motivate your answer. (2)

6.6 Technology has made it possible for more people to gain access to information.

6.6.1 Give TWO examples of digital communication platforms that can be used to promote the open-day event of the school. (2)

6.6.2 It has been reported that confidential information about parents and learners have been distributed without their knowledge.

Which policy document can be used as motivation for the need to take disciplinary action against the perpetrator? (1)

6.7 The school decided to host a workshop on artificial intelligence (AI) and invited the primary school learners to attend.

ChatGPT as an AI tool is frequently used to generate information based on user input.

State TWO potential risks associated with the use of ChatGPT. (2)

**TOTAL SECTION F: 33**  
**GRAND TOTAL: 150**