HOME SCHOOLING MATERIAL
PASS O’ LEVEL
COMPUTER, MATH AND CHEMISTRY
1. C: Input devices receive data from a user and put it into a computer-understandable format. A memory unit is used to hold data, while output devices are used to display feedback to the user and an ALU is used to perform calculations on a computer. 

2. B: A computer uses electricity. Normally, electricity is either on or off, and electric switches are represented as either in the state of being on or off. These two states are represented by 1s and 0s, which we call bits and they formulate the binary language. 

3. C: RAM holds all program instructions which are running. A flash disk, compact disc and a hard disk are examples of secondary storage devices. They permanently store data which is not being actively worked upon by the processor. 

4. D: Application software is responsible for performing specific tasks for the user. An example of such software is WhatsApp. Android is an operating system, while a disk and antivirus are utility programs. 

5. B: Supercomputers are extremely powerful computers used for complex computations and processing, while mainframe are powerful computers used to host a large amount of data and programs available to a wide group of users. 

6. D: Fifth-generation computers are most commonly defined as those that are based on artificial intelligence, allowing them to think, reason and learn. Transistors are in the second generation, Microprocessors in the fourth, integrated circuits in the third. 

7. C: Presentation, spreadsheet and photo-editing software are examples of application software since they perform specific tasks for the user. OS & programming languages are types of system software which operate, control and extend the processing capabilities of a computer system. 

8. C: The results which are presented after processing are referred to as output. The picture has been taken (input) and processed appropriately, so, the actual print represents the output. 

9. C: Forensics deals with finding evidence on computers and other digital storage media, robotics deal with devices controlled by a computer that can move and react to sensory input. Simulation involves imitation of a situation and putting on a computer. Animation is a method in which pictures are manipulated to appear as moving images. 

10. B: A computer virus is designed to alter the way a computer operates or to cause harm to the computer system. Disk corruption of programs and deletion of files is some of the effects caused by a virus. 

11. D: A formula is an expression which calculates the value of a cell. A function is a predefined formula in excel. Cell address is used to identify a specific cell in a spreadsheet e.g A2. Values are numbers entered in a spreadsheet. 

12. D: You will need to know the email address of the person whom you are sending the message just like how you first get to know the phone number of the person you are contacting. 

13. C: The programs which can be run in a controlled environment are compiled in an executable file. 

14. D: To move a file, it means to copy the contents of the file, it means that the file must necessarily move the file. 

15. B: System software operate, control and extend the processing capabilities of a computer. Application software such as off shelf software perform specific tasks for the user. 

16. A: Online databases have search tools which can help someone easily access information. 

17. D: The first thing is to enter data (scan the picture) in the computer, then process it (resize) and give the output (print). 

18. D: A printer can easily be shared on a network. Joystick, mouse and keyboard may not be easily shared on a network. 

19. A: User interfaces control the interaction between the OS & the user. Language translator converts computer programs from one language to another. A platform is a group of technologies that is used as a base upon which other applications are developed. A screensaver is a program that is activated after the computer is inactive for a specified amount of time. 

20. A: CPU and simulator are not language processors. A compiler converts the entire program at once. 

SECTION B 

21. (a) A software licence is an agreement, either included in a software package or displayed on the screen when the software is installed or launched that specifies the conditions under which the program can be used. 

(b) Give two examples for each of the following type of software. 

(i) Freeware - Chrome (Web browser) 
- LibreOffice (office suite) 
- VLC Media Player (media player) 
- Evernote Basic (notetaking/archiving software) 
(ii) Shareware - WinZip (file compression program) 
- Video Edit Magic (video editing program) 
- Image Shrinker (image optimizer) 
- Deluxe Ski Jump 5 (game) 

(c) A Senior One student saw a presentation and spreadsheet software on a computer. Explain the use of each of them. 

(i) Presentation software - Allows users to create visual presentations to convey information easily to others 
(ii) Spreadsheet software - Provides users with a convenient way of creating documents containing complex mathematical calculations. 

22. (a) Data refers to raw, unorganised facts, while information refers to data that has been processed into a meaningful form. 

(b) Devices in an information processing cycle that are at the specified levels of operation. 

(iii) Input - Keyboard, Mouse, Scanner, Digital camera, Digital pen/stylus, Touchpad, joystick etc. 
(iv) Output - Monitor, printer, speaker, projector, speaker, projector 
(vi) Processing - Central Processing Unit (CPU), Graphics Processor Unit (GPU) 
(vii) Storage - Hard drive, CD/DVD/Blu-ray drives, Flash drive, Flash memory card reader. 

23. (a) Examples of spreadsheet programs. 

- Microsoft Excel, Corel Quattro Pro, Google Sheets, Apple Numbers 

(b) Advantages of using a spreadsheet program. 

- It is easier to organise data, such as sorting it. 
- It allows multiple user access to the file. 
- It is easier to represent data in graphical form. 
- Easy to make changes and corrections to data on the worksheet. 

(c) Study the function provided 

=IF(A3>50, PASS, FAIL) 

(i) State the category under which the above function falls. 
Logical function 
(ii) State whether the above function will run or not when executed. 
Give the reason for your answer. 
- The function given will not run. The words PASS and FAIL are missing quotation marks. 
(b) Give two function which are in the same category as the one indicated above. 
- AND, FALSE, NOT, OR, TRUE. 

24. (a) (i) What is the difference between a web browser and web server? 

Web server refers to a computer that is continually connected to the internet and hosts web pages that are accessible through the internet while a web browser is a program used to view Web pages. 

(ii) Give two examples of web browsers. 

- Microsoft Edge, Internet Explorer (IE), Chrome, Safari, Opera, or Firefox 
- The screenshot below was obtained from a smartphone. 

(i) The labels A and B represent; 

- A-Wireless Fidelity 
- B-Bluetooth 

(ii) The major advantage of using convection over convection B? 

- It has a faster speed of connection. 
- It has a wider coverage compared to B. 

(iii) With an example, define a protocol. 

Protocol. Set of rules that govern the communication between the devices. 
Examples: FTP, HTTP, SMTP, TCP/IP. 

25. (a) (i) Optical disc is a type of storage medium used from and written to using a laser beam 
(ii) Disk cache is memory used in conjunction with a magnetic hard drive to improve system performance. 

(b) The following specifications were obtained from a compact disk drive: CDR-80, 7000MB/80 Min (2x-56x) CD-recordable 

In these specifications, “80 Min” means that a compact disk (CD) can record up to 80 minutes of audio version. 

(i) If you burn audio on a CD, it will fit 80 minutes of music. 

(ii) Sort the following storage media according to the categories given in the table. 

- Flash drive, CD, Memory card, DVD, SD card, Blu ray disk 

- Optical storage: CD, DVD, Blu ray disk 

- Solid state storage: Flash disk 

- DVD Memory card, SD card 

26. (a) Explain the following network area coversages. 

(i) Local Area Network 

A network that connects devices located in a small geographical area, such as within a building. 

(ii) Wide area Network 

A network that connects devices located in a large geographical area. 

(iii) Metropolitan Area Network 

A network designed to service a metropolitan area. 

(iv) Advantages of using; 

- Fiber optic cable 
- It is fast and supports high bandwidth. 
- It can be used for long distances because it suffers less attenuation. 
- It is more resistant to radio and electromagnetic interference than the twisted pair cable. 
- It can carry voice, data and video signal simultaneously. 

SECTION C 

27. (a) Computer crime is any illegal act involving a computer. 

(ii) Computer crimes 

- Hacking: Using a computer to break into a computing resource. 
- Fraud: Using computers to conceal information or cheat other people with the aim of gaining money or information. 
- Identity Theft: Using someone else’s identity to purchase goods or services or otherwise illegally misrepresent that individual. 

- Phishing: The use of spoofed electronic communications (typically e-mail messages) to obtain bank account numbers and other personal data to be used for fraudulent purposes. 

(b) Environmental threats/hazards to
1. Which of the following statements is true?
   A. Microcomputer refers works faster than
   B. Microcomputer works faster than
   C. Speed of both computers is the same
   D. Microcomputer is faster than a

2. The computer size was very large in the ...
   a) first Generation
   b) second Generation
   c) third Generation
   d) fourth Generation

3. A telecommunication company has a dedicated computer. This company may require to buy more since a dedicated computer
   a) is used by only one person.
   b) is assigned one and only one task.
   c) uses one kind of software.
   d) is meant for application software.

4. The instructions that tell a computer how to carry out the processing tasks are referred to as computer...
   a) programs
   b) processors
   c) integrated circuits
   d) memory chips.

5. Which of the following are functions of an operating system?
   i. Administering security
   ii. Buffering and spooling
   iii. Used to design websites.
   iv. Memory management
   v. Writing computer programs

6. When a computer program, the ....... designs the structure of the program.
   a) End user
   b) System Analyst
   c) Programmer
   d) web master

7. A computer user shared copyrighted files with her friends. Which of the following statements is valid about this user sharing the files?
   A. It is ethical, because it is legal.
   B. It is unethical because the files are being given for free.
   C. Sharing copyrighted files without permission breaks copyright laws.
   D. It is ethical because the files are being given for free.

8. A malicious program that masquerades as something useful such as an application software is referred to as ............

9. Which of the following statements is true?
   A. Virus
   B. Trojan horse
   C. Worm
   D. Macro virus

10. The logical link between two terminals in a database is known as ............
    A. Primary Key
    B. Key
    C. Form
    D. Relationship

11. Which of the following can be used to select the entire document?
    a) CTRL+A
    b) ALT+F5
    c) SHIFT+S
    d) CTRL+S

12. What is the overall term for creating editing, formatting, storing, retrieving and printing a text document?
    a) Word processing
    b) Spreadsheet program
    c) Web design
    d) Database management

13. A compiler translates a program written in a high-level language into ............
    A. Machine language
    B. An algorithm
    C. A debugged program
    D. Java

14. When your turn on the computer, the boot routine will perform this test .........
    A. RAM test
    B. disk drive test
    C. memory test
    D. power on self-test

15. Computer programs are written in a high-level programming language; however, the human readable version of a program is called ............
    A. cache
    B. instruction set
    C. source code
    D. word size

16. When sending an e-mail, the ......... line describe the contents of the message.
    A. Subject
    B. To
    C. Contents
    D. CC

17. Computers that reside in other products such as ovens, cars to perform specific functions or tasks for that product are referred to as ............ computers.
    A. Server
    B. Embedded
    C. Robotics
    D. Mainframe

18. Which of the following places the common data elements in order from smallest to largest?
    A. Character, file, record, field, database
    B. Character, database, field, record, file
    C. Character, field, record, file, database
    D. Character, record, field, file, database

19. A USB communication device that supports data encryption for secure wireless communication is used by the user name is called a ............
    A. USB wireless network adapter
    B. wireless switch
    C. wireless hub
    D. router

20. Mechanism to protect private networks from outside attack is ............
    A. Firewall
    B. Antivirus
    C. Digital signature
    D. Formatting

21. (a) Differentiate a database from database management system?
    (b) State four advantages of using a database management system.
    (c) Explain the following terms in relation to database management systems.
    (i) Validation rule
    (ii) Validation text

22. (a) Explain the duties of each of the following computer specialists.
    (i) Database administrator
    (ii) ICT instructor
    (iii) Web master
    (iv) JQuery

23. (a) Define a transmission media.
    (b) List the two types of transmission media.
    (c) Distinguish a Hub from a switch.
    (d) Explain the different sections of a fiber optic cable.
    (e) Mention two advantages of using a fiber optic cable.

24. (a) Explain any two services offered by the internet.
    (b) Explain the following terms in relation to internet.
    (i) Cookie
    (ii) Webinar
    (iii) Wiki
    (iv) Blog

25. (a) State any four stages of a system development life cycle.
    (b) Explain the term system analysis in relation to software development.
    (c) State four roles of a system analyst in an ICT firm.
    (d) Identify the programming languages which were used in each of the following computer generations.
    (i) First generation
    (ii) Second generation

26. (a) Explain the following terms as used in information technology.
    (i) Troubleshooting
    (ii) Start up
    (iii) Cold booting
    (iv) Uninstalling

27. (a) A school has the following items:
    Intel® core ™ i5-7200U CPU @2.7 GHz
    (4 CPU), 8192 MB of RAM, sound card, speakers, monitor, keyboard, 500 GB hard disk, a floppy disk drive, a CD-R/W drive, mouse, modem, printer and a joystick.
    The software supplied include: windows 10 Pro, a compiler, spreadsheets, graphics, word processor, presentation, Adobe pdf reader, antivirus, and Microsoft Access.
    (a) Identify any three devices which shall be used to?
    (i) Do calculations and draw graphs.
    (ii) Write an essay.
    (iii) Make a poster.
    (iv) Students enjoy playing noisy computer games.
    (v) Which two hardware items are needed to produce sound?
    (vi) Which input device is mostly used for playing games?
    (vii) State two specifications you would consider when buying a computer.

28. Using a programming language of the choice, write a program that calculates roots of a quadratic equation (ax² + bx + c = 0).

29. (a) Explain why the following controls should be implemented for computer-based systems.
    i) Backups
    ii) Air conditioners
    iii) Uninterruptable power supply (UPS)
    iv) Fire
    v) Passwords
    (b) Computer systems need maximum security to prevent an unauthorized access. State five precautions that you would expect an organization to take to prevent illegal access to its computer-based systems.
1. a) The new price is UGX 3750

\[ \text{Percentage increase} = \frac{3750 - 3000}{3000} \times 100 = 25\% \]

\[ \text{Let the percentage for the new price be } N \]

\[ N = 125 \]

Comparing with \( a + b\sqrt{c} \)

\[ a = 9, \quad b = \frac{21}{5}, \quad c = 5 \]

b) The ratio of corresponding sides is equal to the ratio of corresponding sides of the similar figures.

\[ \frac{16}{5} = \frac{-3}{-2} \]

\[ \therefore y = \frac{1}{4} x^2 \]

2. \( y = kx^2 \)

\[ y_1 - y_2 = 36k - 100k = -64k = 16 \]

\[ k = \frac{16}{-64} = -\frac{1}{4} \]

\[ \therefore y = -\frac{1}{4} x^2 \]

3. \( \frac{a + 3}{-1 + b} = (5, 2) \)

\[ \frac{a + 3}{2} = 5, a = 7 \]

\[ \frac{-1 + b}{2} = 2, b = 5 \]

\[ A(7, -1), B(3, 5) \]

\[ \overline{AM} = \overline{OM} - \overline{OA} = \binom{5}{2} - \binom{-1}{-3} = \binom{-2}{3} \]

\[ |\overline{AM}| = \sqrt{(-2)^2 + (3)^2} = \sqrt{13} = 3.6056 \text{ units} \]

4. Table:

<table>
<thead>
<tr>
<th>Number (x)</th>
<th>Standard form</th>
<th>Log(x)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.841</td>
<td>8.41×10^{-1}</td>
<td>1.9250</td>
</tr>
<tr>
<td>32.7</td>
<td>3.27×10^1</td>
<td>1.5145</td>
</tr>
<tr>
<td>32.7×0.841</td>
<td>3.019×10^{-1}</td>
<td>0.4798</td>
</tr>
</tbody>
</table>

\[ \therefore \sqrt{32.7 \times 0.841} = 3.02 \]

5. \( \frac{1}{\sqrt{5}} + \sqrt{5} + 2 \)

\[ = \frac{1}{\sqrt{5}} \sqrt{5} + \sqrt{5} + 2 \]

\[ = \frac{\sqrt{5} + 5 + 2\sqrt{5} + 4}{5} \]

\[ = \frac{\sqrt{5} + 21\sqrt{5}}{5} = \frac{26\sqrt{5}}{5} = 9 + 21\sqrt{5} \]

Comparing with \( a + b\sqrt{c} \)

\[ a = 9, \quad b = \frac{21}{5}, \quad c = 5 \]

6. \( f(x) = \frac{x - 1}{x^2 - x - 12} \)

is undefined when the denominator is 0

\[ x^2 - x - 12 = 0 \]

either \( x - 4 = 0 \quad x = 4 \)

or \( x + 3 = 0 \quad x = -3 \)

7. a) The percentage for the old price is 100%

Let the percentage for the new price be \( N \)

Newprice: Old price = 5: 4

100% → 4

N\% → 5

\[ \frac{N}{100} = \frac{4}{5} \]

\[ 500 = 4N \]

\[ N = 125 \]

Percentage increase = 125 – 100 = 25%

100

\[ \frac{N}{5} = \frac{4}{5} \]

500 = 4N

N = 125

Percentage increase = 125 – 100 = 25%

125

3000 = 3750

\[ \therefore \text{The new price is UGX 3750} \]

8. a) \( x = 55^\circ \) (alternating angles)
c) Number of students who preferred only one type of means

Probability = \[ n(B' \cap T' \cap P') + n(B' \cap T \cap P') + n(B \cap T' \cap P') \]

\[ n(B' \cap T' \cap P') + n(B' \cap T \cap P') + n(B \cap T' \cap P') = 4 + 3x + x = 4 + (3 \times 2) + 2 = 12 \]

Probability = \[ \frac{12}{10} \times \frac{4}{10} = 0.4 \]

The probability that an employee picked at random preferred only one mean of transport is 0.4

12. a) \( f(x) = x^2 - 1 \)

Let \( y = x^2 - 1 \)

\[ \sqrt{y^2 + 1} = x \]

\( x \rightarrow f^{-1}(x) \)

\( y \rightarrow x \)

\( f^{-1}(x) = \sqrt{x^2 + 1} \)

13. a)

i) \[ \left( \frac{16}{625} \right)^{1/3} \times (0.16)^{1/2} \times \left( \frac{5}{2} \right)^{1/3} = \left( \frac{16}{625} \right)^{1/3} \times \left( \frac{16}{100} \right)^{1/2} \times \left( \frac{5}{2} \right)^{1/3} = \left( \frac{625}{16} \right)^{1/3} \times \left( \frac{100}{16} \right)^{1/2} \times \left( \frac{2}{5} \right)^{1/3} \]

\[ \left( \frac{5^{2/3}}{2^{1/3}} \right) \times \left( \frac{5^{1/3}}{2^{1/3}} \right) \times \left( \frac{5^{2/3}}{2^{1/3}} \right) = \frac{5^{2/3} \times 5^{1/3} \times 5^{2/3}}{2^{1/3} \times 2^{1/3} \times 2^{1/3}} = \frac{5^{1+1+2}}{2^{1+1+1}} = 5 \]

\[ \left( \frac{16}{625} \right)^{1/2} \times (0.16)^{1/2} \times \left( \frac{5}{2} \right)^{1/3} = \left( \frac{16}{625} \right)^{1/2} \times (0.16)^{1/2} \times \left( \frac{5}{2} \right)^{1/3} = \left( \frac{16}{625} \right) \times \left( \frac{16}{100} \right) \times \left( \frac{5}{2} \right)^{1/3} \]

\[ \left( \frac{5^{2/3}}{2^{1/3}} \right) \times \left( \frac{5^{1/3}}{2^{1/3}} \right) \times \left( \frac{5^{2/3}}{2^{1/3}} \right) = \frac{5^{2/3} \times 5^{1/3} \times 5^{2/3}}{2^{1/3} \times 2^{1/3} \times 2^{1/3}} = \frac{5^{1+1+2}}{2^{1+1+1}} = 5 \]

ii) \[ \frac{1}{2} \log_{16} 16 - \log_{16} \left( \frac{a}{5} \right) + \log_{16} \left( \frac{a}{5} \right) = \log_{16} 16 - \log_{16} \left( \frac{a}{5} \right) + \log_{16} \left( \frac{a}{5} \right) = \log_{16} 4 - \left( \log_{16} a^2 \right) + \log_{16} a^2 \]

\[ \log_{16} 4 - \log_{16} a^2 + \log_{16} 25 + \log_{16} a^2 = \log_{16} 4 + \log_{16} 25 = \log_{16} (4 \times 25) = \log_{16} 100 = 2 \]

\[ \frac{1}{2} \log_{16} 16 - 2 \log_{16} \left( \frac{a}{5} \right) + \log_{16} a^2 = 2 \]

b) Train = two

Walking = \[ \frac{1}{3} \times \frac{1}{3} = \frac{1}{9} \]

Bus = \[ \frac{7}{8} \times \frac{1}{3} = \frac{7}{24} \]

Walking = \[ \frac{1}{8} \times \frac{1}{3} = \frac{1}{24} \]

\[ \frac{1}{24} \times A = x, A = 24x \]

\[ \frac{7}{24} = A \times (x + 3), A = 24x \]

\[ \frac{7}{24} \times 24x = (x + 3), 7x = x + 3 \]

\[ 6x = 3x, x = \frac{3}{2} \]

\[ A = 24x = 24 \times \frac{3}{2} = 12\text{km} \]

Therefore, the complete journey is 12 kilometers.
14. Maximum volume = Volume of a cone
\[ \text{Volume of a cone} = \frac{1}{3} \pi r^2 h \]
\[ = \frac{1}{3} \times \pi \times 3^2 \times 4 \]
\[ = 12 \pi \]
\[ = 37.6991 \text{cm}^3 \]
(ii) Volume of pyramid = Volume of a cone
\[ \frac{1}{3} \times 6 \times 10 \times 6 \times \frac{1}{3} \times \pi \times 3^2 \times 4 \]
\[ = \frac{1}{3} (360 - 36 \pi ) \]
\[ = 120 - 12 \pi \]
\[ = 82.3009 \text{cm}^3 \]
(iii) Surface Area of the remaining solid = Area of slanting slides + Area of curved part of the curve + Area of rectangular base – Area of circular base of the cone

Area of slanting sides
\[ NE = 5^2 + 6^2 \]
\[ NE = \sqrt{25 + 36} = 7.8102 \]
\[ ME = \sqrt{3^2 + 6^2} = \sqrt{45} \]
\[ = 6.7082 \text{ cm} \]
Height of triangular face ADE = 7.8102 and ABE = 6.7082cm
Area = \[ \frac{1}{2} \times (6 \times 6) \] 7.8102
\[ = 40.2492 + 7.8102 \]
\[ = 118.3512 \text{ cm}^2 \]
Area of curved surface = \[ \pi rl \]

\[ l = \sqrt{3^2 + 4^2} = \sqrt{9 + 16} = 5 \]
\[ = \pi \times 3 \times 5 = 15 \pi \]
\[ = 47.1239 \text{ cm} \]
Area of the rectangular base = 10 \times 6 = 60 \text{ cm}^2
Area of circular part = \[ \pi r^2 \]
\[ = 120 - 12 \pi \]
\[ = 82.3009 \text{ cm}^3 \]

b) (i) After 3 hours and 30 minutes
The speed is 70kmh
(ii) After 5 hours
The speed of car A = 100kmh
Car B = 150kmh
Difference = 150 – 100 = 50kmh
After 5 hours, car B travels at 50kmh faster than car A.
(iii) Distance covered by A is 8 hours
= Area under the graph

\[ \text{Distance} = \frac{1}{2} \times 8 \times 160 \]
\[ = 640 \text{ km} \]

b) Car A cover 640km in 8 hours

E is mid-point of A\( \overrightarrow{BE} \)
\[ \overrightarrow{OD} : \overrightarrow{OB} = 2 : 3 \]
F is a point of intersection of \( \overrightarrow{OE} \) and \( \overrightarrow{AB} \)
\[ \overrightarrow{AB} = \overrightarrow{OE} - \overrightarrow{OA} - h - q \]
\[ \overrightarrow{OE} = \overrightarrow{OA} + \overrightarrow{AE} \]
\[ = q + \frac{1}{2} h - q \]
\[ = \frac{1}{2} (h - b) \]
\[ \overrightarrow{OE} = q - \frac{1}{2} h = \frac{1}{2} h \]
\[ \overrightarrow{AD} = \overrightarrow{AO} + \overrightarrow{OA} \]
\[ = - \overrightarrow{OA} + \overrightarrow{OD} \]
\[ = \frac{1}{2} \overrightarrow{OE} \]
\[ \overrightarrow{AD} : \overrightarrow{DB} = 2 : 3 \]

16. a) Velocity-time graph for car A and B

\[ \overrightarrow{OF} = k \overrightarrow{OE} \]
\[ k \overrightarrow{OF} = k \overrightarrow{OE} \]
\[ \overrightarrow{OE} \text{ is a scalar multiple of } \overrightarrow{OE} \text{ and therefore } \overrightarrow{OF} \text{ is parallel to } \overrightarrow{OE} \text{ Since O is a common point, O, F and E are collinear.} \]

17. a) Allowances per month
Allowance per month
Transport = UGX 45,000
Insurance = UGX 64,000
Feeding = UGX 22,500
Water and electricity = UGX 11,800
Airtime and communication = UGX 40,000
Family for children aged 7, 12 and 18 years = UGX 5000 + 15000 + 15000 = UGX 35000
Total allowance = UGX 45,000 + 64,000 + 525,000 + 11800 + 40000 + 35000 = UGX 248300

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From page V
b) his income tax as a percentage of his gross monthly income

\[
\text{Taxable income} = \text{gross income} - \text{allowance}
\]

\[
12 \times (20000 - 50000) = 12 \times 150000 = \text{UGX 180000}
\]

\[
25 \times (300000 - 200000) = 25 \times 100000 = \text{UGX 250000}
\]

\[
32 \times (396700 - 300000) = 32 \times 96700 = \text{UGX 309440}
\]

Total income tax = 18000 + 25000 + 30944 = UGX 73944

Income tax as a percentage of his gross monthly income

\[
= \frac{\text{income tax}}{\text{gross income}} \times 100 = \frac{73944}{645000} \times 100\% = 11.4624\%
\]

c) His net income = gross income – income tax

\[
= 645000 - 73944 = \text{UGX 571056}
\]

### SECTION A

1. Solve the quadratic equation \(3x^2 - 7x + 4 = 0\).

2. Given that \(A = \begin{pmatrix} 3 & -1 \\ 4 & 1 \end{pmatrix}\), find the inverse of \(A\).

3. If \(\tan \theta = \frac{5}{12}\) and \(90^\circ \leq \theta \leq 180^\circ\), determine the value of \(\sin \theta\) and \(\cos \theta\).

4. Solve the simultaneous equations

\[
\begin{align*}
5x + 6y &= 17 \\
4x + 3x - 25 &= 0
\end{align*}
\]

5. The table below shows the marks obtained by 47 students in a mathematics test.

<table>
<thead>
<tr>
<th>Number of students</th>
<th>3</th>
<th>5</th>
<th>7</th>
<th>12</th>
<th>8</th>
<th>6</th>
<th>4</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marks out of 100</td>
<td>20-29</td>
<td>30-39</td>
<td>40-49</td>
<td>50-59</td>
<td>60-69</td>
<td>70-79</td>
<td>80-89</td>
<td>90-99</td>
</tr>
</tbody>
</table>

Draw accumulative frequency curve (ogive) for the data.

6. Find the value of angle \(x\), \(y\), and \(z\) from the diagram below.

7. Factorise completely \(i) \ 3x^2 - 4\) \(ii) \ 5h^2 - 3h - 8\)

8. Make \(c\) the subject of the formula.

\[
x = \frac{b \pm \sqrt{b^2 - 4ac}}{2a}
\]

9. Given that \(a + b = a - b\) and \(a + b = 0\), evaluate \(i) \ 2 + 2\) \(ii) \ 3 - m = -3\)

10. Rotate the point \((4, 5)\) on a graph paper through \(180^\circ\).

Hence state the new position of \(P\).

### SECTION B

11. a) Copy and complete the table below for the quadratic equation

<table>
<thead>
<tr>
<th>(x)</th>
<th>-3</th>
<th>-2</th>
<th>-1</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>4x</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>8</td>
<td>12</td>
<td>16</td>
</tr>
<tr>
<td>(-x^2)</td>
<td>0</td>
<td>4</td>
<td>8</td>
<td>12</td>
<td>16</td>
<td>20</td>
<td>24</td>
<td>28</td>
</tr>
<tr>
<td>(y)</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

b) Draw a graph \(y = 3x^2 - 4x - 4 = 0\)

c) Use your graph to state the roots of

\[
i) \ 4x - 3x^2 + 4 = 0\]  
\(\text{and} \ ii) \ 3x + 2 = 3x^2
\]

12. a) The table below shows the marks obtained by 56 students of senior four of a certain school in a biology exam marked out of 100

<table>
<thead>
<tr>
<th>Marks</th>
<th>52</th>
<th>58</th>
<th>62</th>
<th>67</th>
<th>70</th>
<th>78</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students</td>
<td>32</td>
<td>25</td>
<td>12</td>
<td>8</td>
<td>6</td>
<td>4</td>
</tr>
</tbody>
</table>

b) Draw a histogram and use it to estimate the modal mark.

c) Hence state the new position of \(P\).

13. a) On the same axes plot the graph of \(y = \cos 2x\) and \(y = \sin x\) for values of \(x\) ranging from 0 to 360\(^\circ\). Use the interval of 60\(^\circ\)

b) Use your graphs in (a) to state the values \(x, y\), the point of intersection.

14. a) Use matrix method to solve the following part of simultaneous equations.

\[
\begin{align*}
3y &= 5x - 10 \\
4y - 2x &= 0
\end{align*}
\]

(b) Shamim is a businesswoman who deals in agricultural produce. She visited four markets in a certain week.

- In market A, she bought 5 bags of beans, 3 bags of maize, 8 bags of Irish potatoes and 2 bags of millet.
- In market B she bought 2 bags of beans, 3 bags of Irish potatoes and 1 bag of millet.
- In market C she bought 4 bags of beans, 5 bags of Irish potatoes and 2 bags of millet.
- In market D she bought 5 bags of beans, 3 bags of maize, 5 bags of Irish potatoes and 3 bags of millet.

She bought each bag of beans, 50 cm\(^3\), of maize at UGX 150. A bag of Irish potatoes at UGX 100,000 and a bag of millet at UGX 185,000. She later sold all the produce she bought at UGX 350,000 per bag of beans, UGX 180,000 per bag of maize, UGX 145,000 per bag of Irish potatoes and UGX 200,000 per bag of millet.

i) Form a 4 \(\times 4\) matrix for the produce Shamim bought from the four markets.

ii) Form a cost matrix to the price of the produce.

iii) By matrix multiplication, find the amount of money spent on the produce in each market.

iv) Find also the amount of money she got from the sale of the produce.

v) Find her profit.

15. a) i) Construct triangle PQR in which QR = 7.5 cm, QR = 10.2 cm and angle QPR = 75\(^\circ\).

b) Draw the three triangles on the same coordinate axes.

By matrix multiplication, find the amount of money

\[
\text{RFM of XOH} = \frac{\text{concentration}}{\text{molarity}}
\]

16. Using a ruler and a pair of compasses only.

\[
i) \ \text{Construct triangle PQR in which QR = 7.5 cm, QR = 10.2 cm and angle QPR = 75^\circ}.
\]

\[
j) \ \text{Measure angle QPR}.
\]

\[
k) \ \text{Construct a circle through the vertices of the triangle PQR}.
\]

\[
l) \ \text{Measure the radius of the circle}.
\]

\[
m) \ \text{Calculate the area of the circle (take } \pi = 3.142\).
\]

A geography club of a certain school wishes to go for a field trip. The club wishes to hire a bus and mini bus to take the students.

Each trip for a bus costs UGX 500000 and that for a mini bus costs UGX 300000. The bus has a capacity of 65 students and a mini bus has a capacity of 18 students. The maximum number of students allowed to go for a trip is 200. The number of trips that the bus makes do not have to exceed those made by the mini bus. The money available for transport is UGX 3000000.

i) Write down five inequalities representing the above information.

ii) Plot these inequalities on the same axes.

iii) By shading out the unwanted regions, show the region satisfying the above inequalities.

iv) List the possible number of trips each vehicle can make.
6. a) i) Magnesium continues to burn, forming greenish yellow powder
ii) \( \text{Mg(s) + N}_2(g) \rightarrow \text{MgN}_2(s) \)
iii) This is because magnesium reacts with nitrogen to form a nitride. 
b) It is used to make fertilisers, nitric acid, nylon, dyes and explosives.

7. a) - Wrong drying agent — Calcium oxide will react with the chlorine gas.
- Incorrect method of gas collection — No gas will be collected/clarified is denser than air.
   i) \( 2\text{KMnO}_4(s) + \text{HCl(aq)} \rightarrow 2\text{MnCl}_2(aq) + 8\text{H}_2\text{O}(l) + 5\text{Cl}_2(g) \)
   ii) It is a disinfectant used to treat drinking water and swimming pool water.
   It is also used to make hundreds of consumer products from paper to paints and from textiles to insecticides.
b) Because without water hypochlorous acid, which bleaches, cannot be formed. Therefore, a dry litmus will not be bleached.

8. a) Carbonate (\( \text{CO}_3^{2-} \))
b) \( \text{Ba}^{2+}(aq) + \text{CO}_3^{2-}(aq) \rightarrow \text{BaCO}_3(S) \)
c) - Making soft drinks/aerated drinks.
- In refrigeration.
- In extinguishing fires.
- Making baking powder; Manufacture of sodium carbonate; Cloud seeding.

9. \( 2\text{NaOH(aq)} + \text{H}_2\text{X(aq)} \rightarrow \text{NaX(aq)} + \text{H}_2\text{O(l)} \)
mole ratio base to acid is 2:1

10. a) Monochlorine sulphur/beta sulphur/prismatic sulphur b)

11. a) i) Saturated hydrocarbons are hydrocarbons that contain only single bonds between carbon atoms.
   b) Propane, \( \text{CH}_3\text{CH}_2\text{CH}_3 \)
   c) \( \text{CH}_4 \)
   d) Ethene
ii) \( \text{S} + 2\text{H}_2\text{SO}_4(l) \rightarrow \text{3SO}_2(g) + 2\text{H}_2\text{O(l)} \)

12. a) i) Concentrated sulphuric acid
   ii) Concentrated sulphuric acid.
b) i) Pale green solid is formed
   ii) \( \text{Fe(s) + 2HCl(g)} \rightarrow \text{FeCl}_2(s) + \text{H}_2(g) \)
c) i) Hydrogen gas
   ii) \( \text{H}_2(g) + \text{O}_2(s) \rightarrow \text{H}_2\text{O}(l) \)
d) i) Funnel arrangement is used to prepare HCl gas to avoid back suction. It prevents and minimises back suck of water and provides a large surface area for absorption of HCl gas.
   ii) Lower a jar containing hydrogen chloride closer to another containing ammonia, dense white fumes of ammonia chloride are formed.

ii) Hydrogen chloride ionises in water, forming hydrogen ions, which make the solution acidic; however, when hydrogen chloride gas dissolves in methylbenzene, the molecules do not split up. A solution of HCl in methylbenzene does not contain hydrogen ions, so it is not acidic.