

FBISE 1st Year Computer Science

New NBF Book Notes

All 8 Units - Chapter-Wise

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*Units 1-8: Computer Systems | Computational Thinking & Algorithms | Programming Fundamentals |
Data and Analysis | Application of Computer Science | Impacts of Computing | Digital Literacy |
Entrepreneurship in Digital Age*

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Unit 1: Computer Systems

Explanation

A computer system is a combination of hardware, software, data and people working together. Data inside a digital computer is stored as binary digits, 0 and 1. An analog signal changes smoothly and continuously, like sound waves, while a digital signal changes in clear steps, like 0 and 1. Digital logic uses logic gates - AND, OR and NOT - to make decisions from inputs. The Software Development Life Cycle (SDLC) is the planned sequence of steps used to build software: planning, analysis, design, implementation, testing and maintenance. A network topology is the arrangement of devices in a network, for example bus, star, ring and mesh. Cybersecurity means protecting computers, networks and data from misuse, theft and damage.

Important Points

- Binary is the language of a digital computer: 0 = off, 1 = on.
- Analog = continuous; Digital = discrete steps.
- AND gives 1 only when all inputs are 1; OR gives 1 when any input is 1; NOT reverses the input.
- SDLC keeps software work planned, tested and maintainable.
- Star topology connects devices to a central hub/switch; in bus topology devices share one main cable.
- Strong passwords, updates and careful clicking are basic cybersecurity habits.

Short Question-Answers

Q1. What is data representation in a digital computer?

A: Data such as text, numbers, images and sound is converted into binary form (0s and 1s) so the computer can store and process it.

Q2. What is the difference between analog and digital signals?

A: An analog signal varies continuously, while a digital signal takes only fixed values, usually 0 and 1.

Q3. What is SDLC?

A: SDLC is the step-by-step process of planning, analysing, designing, building, testing and maintaining software.

Q4. Why is cybersecurity important?

A: It protects personal data, systems and networks from hacking, viruses, fraud and unauthorised access.

Long Question-Answer

Q: Explain logic gates and network topology with examples.

A: Logic gates are the building blocks of digital circuits. An AND gate outputs 1 only if both inputs are 1, an OR gate outputs 1 if at least one input is 1, and a NOT gate turns 1 into 0 and 0 into 1. Together, gates let computers compare, decide and calculate. Network topology describes how computers are connected. In a star topology every device connects to a central switch, so one cable failure usually affects only one device. In a bus topology all devices share one backbone cable, which is cheaper but a break in the backbone can disturb the whole network. Choosing a topology depends on cost, reliability and ease of management.

MCQs - Answers at the end of the unit

1. Data in a digital computer is represented as: (a) Decimal digits (b) Binary digits (c) Roman numerals (d) Letters only
2. A NOT gate: (a) Adds inputs (b) Reverses the input (c) Stores data (d) Sends data
3. SDLC stands for: (a) Software Development Life Cycle (b) System Data Link Control (c) Software Design Language Code (d) Simple Digital Logic Circuit

4. In star topology, devices connect to: (a) One shared cable only (b) A central hub/switch (c) Each other directly (d) The internet only
5. Cybersecurity mainly protects: (a) Only hardware (b) Only printers (c) Data, systems and networks (d) Only keyboards

Answers: 1-b, 2-b, 3-a, 4-b, 5-c

Unit 2: Computational Thinking & Algorithms

Explanation

Computational thinking means solving a problem in a clear, step-by-step way that a computer can follow. It includes breaking a big problem into smaller parts, finding patterns, ignoring unnecessary detail, and writing a clear sequence of steps. A computational artifact is something created by a human using a computer, such as a program, a website, a video, a document or an app. An algorithm is a finite, ordered set of steps that solves a problem. Common computing algorithms include searching for an item, sorting items into order, and counting or finding a maximum or minimum value.

Important Points

- Decomposition: break a large problem into small parts.
- Pattern recognition: find similarities between problems.
- Abstraction: focus on important details, ignore the rest.
- Algorithm design: write steps in the correct order.
- An algorithm must be clear, finite and give a correct result.
- Searching finds data; sorting arranges data.

Short Question-Answers

Q1. What is a computational artifact?

A: Any creative product made with a computer, for example a program, app, website, animation or digital document.

Q2. What is an algorithm?

A: A step-by-step, finite procedure for solving a problem, written so clearly that it can be followed exactly.

Q3. Give two examples of common algorithms.

A: Searching (finding a name in a list) and sorting (arranging marks from lowest to highest).

Q4. Why is decomposition useful?

A: It makes a difficult problem easier by dividing it into smaller, manageable parts.

Long Question-Answer

Q: Explain computational thinking and how an algorithm solves a problem.

A: Computational thinking starts by understanding the problem, then breaking it into parts, looking for patterns, and removing unneeded detail. After that, a clear algorithm is written: inputs are defined, steps are ordered, and an output is produced. For example, to find the highest marks in a class, the algorithm reads each mark, keeps the largest seen so far, compares it with the next mark, and at the end reports the largest. This method is reliable because every step is clear, the steps are finite, and the same steps give the same correct result each time.

MCQs

1. Computational thinking mainly helps to: (a) Memorise answers (b) Solve problems step by step (c) Draw pictures only (d) Avoid computers
2. A computational artifact is: (a) A computer part (b) A product created using a computer (c) A virus (d) A cable
3. An algorithm must be: (a) Infinite and unclear (b) Finite and clear (c) Only written in code (d) Only for experts
4. Sorting means: (a) Deleting data (b) Arranging data in order (c) Hiding data (d) Copying data
5. Pattern recognition means: (a) Ignoring all details (b) Finding similarities in problems (c) Making random guesses (d) Writing long essays

Answers: 1-b, 2-b, 3-b, 4-b, 5-b

Unit 3: Programming Fundamentals

Explanation

A computer program is a set of instructions that tells a computer what to do. Python is a popular, easy-to-read programming language. A Python Integrated Development Environment (IDE) is software that helps you write, run and debug code, for example by highlighting errors. Turtle graphics lets beginners draw shapes by moving a "turtle" on screen. A library is a collection of ready-made code that you can import and reuse instead of writing everything yourself. A variable stores a value under a name. Input/output (I/O) means taking data in (for example with `input()`) and showing results (for example with `print()`). Operators perform actions such as addition, comparison and logical tests. Iteration means repeating steps, usually with a loop. A list stores several values in one variable in order. A function is a named block of code that performs a task and can be reused. Debugging means finding and fixing errors in a program.

Important Points

- Python uses indentation to show blocks of code.
- Variables store values; their names should be meaningful.
- `input()` reads text; `print()` displays output.
- Common operators: `+` `-` `*` `/` , `==` `!=` `<` `>` , and, or, not.

- for and while loops repeat actions.
- A list is ordered and changeable; items are accessed by index starting at 0.
- Functions avoid repetition and make code readable.
- Syntax errors break a program; logic errors give wrong results.

Short Question-Answers

Q1. What is a Python IDE?

A: Software that provides an editor, a runner and debugging tools to help write and test Python programs easily.

Q2. What is a variable in Python?

A: A named storage location that holds a value, for example marks = 85.

Q3. What is the difference between a list and a single variable?

A: A single variable holds one value, while a list holds many values in order under one name.

Q4. What is debugging?

A: Finding, understanding and correcting errors in a program so it runs correctly.

Long Question-Answer

Q: Explain loops, functions and libraries in Python with examples.

A: A loop repeats a block of code. A for loop repeats a fixed number of times, for example printing numbers 1 to 5, while a while loop repeats until a condition becomes false. A function groups code under a name so it can be called again and again, for example a function to calculate an average can be used for many students. A library is ready-made code written by others, such as the math library for calculations or the turtle library for drawing. Using functions and libraries saves time, reduces errors and makes programs shorter and clearer.

MCQs

1. Python is: (a) A hardware device (b) A programming language (c) A network cable (d) An operating system only
2. In Python, print() is used to: (a) Take input (b) Display output (c) Delete files (d) Draw only
3. The first item of a Python list has index: (a) 1 (b) 0 (c) -1 (d) 10
4. A function is used to: (a) Repeat code without a name (b) Reuse a named block of code (c) Hide the program (d) Stop the computer
5. Debugging means: (a) Writing new code (b) Finding and fixing errors (c) Buying a computer (d) Printing a program

Answers: 1-b, 2-b, 3-b, 4-b, 5-b

Unit 4: Data and Analysis

Explanation

Data analysis means collecting data, organising it, and finding useful meaning from it. Statistical modeling uses mathematical ideas to describe data and make simple predictions, for example finding an average or a trend. Experimental design in data science means planning how data will be collected fairly, so results are reliable - for example deciding the sample, the method and what will be measured. Once data is collected, we analyse pre-existing datasets to create summary statistics such as mean, median, mode and range, and we present results with charts: bar charts compare categories, pie charts show parts of a whole, and line graphs show change over time.

Important Points

- Summary statistics summarise a dataset in a few numbers.
- Mean = average; Median = middle value; Mode = most common value; Range = highest minus lowest.
- A bar chart compares groups; a pie chart shows shares of a total; a line graph shows trends.
- Good experimental design avoids bias and uses a fair sample.
- Always label charts with a title and axes.

Short Question-Answers

Q1. What is statistical modeling?

A: Using mathematical models to describe data, find patterns and make reasoned predictions.

Q2. What is the mean of 10, 20 and 30?

A: $(10 + 20 + 30) / 3 = 20$.

Q3. Which chart shows parts of a whole?

A: A pie chart, because each slice represents a share of the total.

Q4. Why is experimental design important?

A: It plans fair data collection, so conclusions are trustworthy and not based on biased or incomplete data.

Long Question-Answer

Q: How do we analyse a dataset and present it with charts?

A: First, clean and organise the data. Then calculate summary statistics: the mean gives the average, the median shows the middle value, the mode shows the most frequent value, and the range shows the spread. Next, choose the right chart: use a bar chart to compare categories such as marks in different subjects, a pie chart to show shares such as how students travel to college, and a line graph to show change over time such as temperature across a week. Finally, add clear titles and labels, and write one or two sentences explaining what the chart shows, without exaggerating beyond the data.

MCQs

1. The median is: (a) The average (b) The middle value (c) The largest value (d) The smallest value
2. A line graph is best for showing: (a) Parts of a whole (b) Change over time (c) Only names (d) Random data
3. Experimental design helps to: (a) Create bias (b) Collect data fairly (c) Hide results (d) Skip analysis
4. The range is: (a) Highest minus lowest (b) Highest plus lowest (c) Most common value (d) Middle value
5. A bar chart is mainly used to: (a) Compare categories (b) Show time only (c) Write essays (d) Store data

Answers: 1-b, 2-b, 3-b, 4-a, 5-a

Unit 5: Application of Computer Science

Explanation

The Internet of Things (IoT) means everyday devices connected to the internet so they can send and receive data, for example smart bulbs, fitness bands and sensors. Technologies that enabled IoT include cheap sensors, wireless networks, cloud computing and small, low-cost processors. Blockchain is a shared, linked record system in which data is stored in blocks chained together, making past records hard to change without agreement. Technologies that enabled blockchain include cryptography, distributed networks and consensus methods. When blockchain and IoT are integrated, IoT devices can record data in a shared, tamper-resistant ledger, which can improve trust in supply chains and sensor data. Stakeholders in AI systems include users, developers, owners, regulators and people affected by decisions; their interests include safety, fairness, privacy and accountability.

Important Points

- IoT = connected devices exchanging data automatically.
- Sensors collect data; networks carry it; cloud stores and analyses it.
- Blockchain blocks are linked and protected by cryptography.
- Blockchain + IoT can increase trust in recorded data.
- AI stakeholders care about safety, privacy, fairness and clear responsibility.

Short Question-Answers

Q1. What is the Internet of Things?

A: A network of physical devices with sensors and internet connections that collect and share data automatically.

Q2. What is blockchain in simple words?

A: A linked, shared record of blocks that is hard to alter, because each block is connected to the previous one and protected by cryptography.

Q3. Give one benefit of integrating blockchain with IoT.

A: Sensor data can be stored in a shared, tamper-resistant record, increasing trust in the data.

Q4. Who are stakeholders in AI systems?

A: Users, developers, owners, regulators and anyone affected by the system's decisions.

Long Question-Answer

Q: Explain IoT, blockchain and stakeholder interests in AI.

A: IoT connects everyday objects to the internet, allowing them to sense, share and act on data - for example a smart meter reporting electricity use. Blockchain provides a shared ledger where records are grouped in blocks, chained and secured, so changing an old record is very difficult. Together, IoT devices can write trustworthy data to a blockchain, useful where many parties must agree on the same record. In AI systems, different stakeholders have different interests: users want safe and useful results, developers want clear rules, owners want efficiency, and regulators and affected people want fairness, privacy and accountability when an AI decision affects them.

MCQs

1. IoT devices mainly: (a) Work without any data (b) Collect and share data over the internet (c) Only store paper (d) Replace all computers
2. Blockchain stores data in: (a) Single files only (b) Linked blocks (c) Paper books (d) Random folders
3. Cryptography in blockchain helps to: (a) Make data readable to all (b) Secure and protect records (c) Delete data (d) Slow networks only
4. A stakeholder in AI is: (a) Only the programmer (b) Anyone affected by or involved in the system (c) Only the seller (d) Only the user
5. IoT was enabled by: (a) Expensive sensors only (b) Cheap sensors, wireless networks and cloud computing (c) Paper records (d) No technology

Answers: 1-b, 2-b, 3-b, 4-b, 5-b

Unit 6: Impacts of Computing

Explanation

Information is processed data that is useful for a decision. Information sources include books, websites, databases, experts and official records. Safe use means checking the source, respecting copyright and privacy, and avoiding harmful or false content. Bias in data means the data unfairly favours one group or view, which can lead to unfair results. Reliable information comes from trustworthy, accurate and up-to-date sources, while unreliable sources may be outdated, biased, anonymous or unsupported. Data searches should use clear keywords and filters. Data source verification means checking who published the data, when, and whether other sources agree. Some tasks are suitable for humans, such as judgement, creativity and ethical decisions, while computers

are better at fast, repetitive calculations. Increased connectivity affects the environment (more devices and energy use, but also smart energy management), culture (global sharing of ideas, but also pressure on local traditions), and people (easier communication, but also distraction and privacy risks). Assistive devices help people with disabilities, for example screen readers and hearing aids. The digital divide is the gap between people who have access to technology and those who do not. Technological innovations keep changing work, learning and daily life.

Important Points

- Check source, author, date and evidence before trusting information.
- Bias in data can cause unfair decisions.
- Humans are better at judgement and ethics; computers are better at speed and repetition.
- Connectivity brings benefits and costs for environment, culture and people.
- Assistive technology increases independence and inclusion.
- The digital divide affects education, jobs and services.

Short Question-Answers

Q1. What is bias in data?

A: When data unfairly represents or favours one group, leading to unfair or incorrect conclusions.

Q2. How can you verify a data source?

A: Check the author and publisher, the date, the evidence given, and whether other reliable sources agree.

Q3. What is the digital divide?

A: The gap between people who have access to digital technology and the internet and those who do not.

Q4. Give an example of an assistive device.

A: A screen reader, which reads screen text aloud for a person with visual difficulty.

Long Question-Answer

Q: Discuss the positive and negative impacts of increased connectivity.

A: Increased connectivity lets people communicate instantly, learn online and work from many places, and it helps share culture and knowledge worldwide. It can also support smart energy use and better services. On the other hand, it increases device production and energy use, which affects the environment; it can pressure local cultures through dominant global content; and for people it can cause distraction, privacy risks and over-dependence on screens. The solution is balanced use: use connectivity for learning and inclusion, protect privacy, check information carefully, and ensure access is shared fairly so the digital divide does not grow.

MCQs

1. Reliable information is: (a) Anonymous and old (b) Accurate, trustworthy and up to date (c)

Always popular (d) Always long

2. Bias in data can lead to: (a) Fair results (b) Unfair results (c) No results (d) Faster computers

3. The digital divide is about: (a) Screen size (b) Unequal access to technology (c) Computer speed (d) Book prices

4. An assistive device helps: (a) Only gamers (b) People with disabilities to use technology (c) Only teachers (d) Only programmers

5. A task suitable for humans is: (a) Fast calculation (b) Ethical judgement (c) Sorting millions of records (d) Repeating one step endlessly

Answers: 1-b, 2-b, 3-b, 4-b, 5-b

Unit 7: Digital Literacy

Explanation

Digital literacy means being able to find, understand, evaluate, create and share information using digital tools, safely and responsibly. Data collection strategies are planned ways of gathering data for a research question, for example surveys, interviews, observations and existing records. The choice depends on the question, the people involved, time and cost. Data presentation for research questions means showing results clearly so the reader can understand the answer: use tables for exact values, charts for patterns, and short written explanations for conclusions. Good presentation is honest - it does not hide missing data or exaggerate a small difference.

Important Points

- Digital literacy includes safety, privacy and critical thinking, not just using devices.
- Choose a data collection method that fits the research question.
- Surveys reach many people; interviews give deeper detail; observation records real behaviour.
- Present data with clear titles, labels and units.
- Explain what the data shows and what it does not prove.

Short Question-Answers

Q1. What is digital literacy?

A: The ability to find, evaluate, use and share digital information safely, responsibly and effectively.

Q2. Name two data collection strategies.

A: Surveys (written questions to many people) and interviews (detailed spoken answers from fewer people).

Q3. Why is clear data presentation important?

A: It helps readers understand the answer to the research question quickly and correctly, without confusion or misleading impressions.

Q4. What should you do about missing data?

A: State it honestly instead of hiding it, because hiding it can mislead readers.

Long Question-Answer

Q: How would you collect and present data for a research question?

A: Start with a clear research question, for example: "How many hours do students study each day?" Choose a method: a short survey can reach many students quickly. Collect data fairly, protect privacy, and record answers carefully. Then organise the data into a table, calculate simple summaries such as averages, and choose a chart - a bar chart to compare groups, for example. Finally, write a short conclusion stating what the data shows, note any limits such as a small sample, and avoid claiming more than the data supports.

MCQs

1. Digital literacy includes: (a) Only typing fast (b) Finding, evaluating and sharing digital information safely (c) Only playing games (d) Buying devices
2. A survey is useful to: (a) Interview one person deeply (b) Collect answers from many people (c) Observe without asking (d) Hide data
3. A table is best for: (a) Exact values (b) Only pictures (c) Hiding numbers (d) Long stories
4. Honest data presentation should: (a) Hide missing data (b) State limits clearly (c) Exaggerate differences (d) Remove titles
5. Interviews give: (a) Less detail than surveys (b) Deeper, detailed answers (c) No data (d) Only numbers

Answers: 1-b, 2-b, 3-b, 4-b, 5-b

Unit 8: Entrepreneurship in Digital Age

Explanation

Entrepreneurship in the digital age means starting and growing a business using digital tools, platforms and ideas. Product development is the process of turning an idea into a product people want: find a problem, think of a solution, design it, test it and improve it. Understanding prototypes means knowing that a prototype is an early, simple version of a product made to test an idea quickly and cheaply. Creating prototypes involves building that early version, even if it is rough, using simple tools or digital mockups. Testing prototypes means showing it to real users, collecting feedback, and finding problems. Building and launching the MVP - Minimum Viable Product - means releasing the simplest version that still solves the main problem, learning from real users, and then improving step by step.

Important Points

- Start from a real problem, not just a product idea.
- A prototype tests an idea before spending a lot of money.

- Feedback from users is more valuable than guessing.
- An MVP is minimal but viable: it must actually work for its main purpose.
- Launch, learn, improve, repeat.

Short Question-Answers

Q1. What is a prototype?

A: An early, simple version of a product made to test an idea quickly and cheaply before full development.

Q2. What is an MVP?

A: Minimum Viable Product - the simplest version of a product that still solves the main problem for real users.

Q3. Why test a prototype with users?

A: To find problems, understand real needs, and improve the product before launching it fully.

Q4. What is the first step in product development?

A: Finding a real problem that users face and understanding it clearly.

Long Question-Answer

Q: Explain the journey from idea to MVP.

A: The journey starts by identifying a problem and the people who face it. Next, a solution idea is designed and a prototype is created - a rough version that shows the main features. The prototype is tested with real users, feedback is collected, and problems are fixed. Then the team builds the MVP, the simplest working version that solves the core problem, and launches it to real users. After launch, the team watches how users use it, collects more feedback, and improves the product step by step, adding features only when users actually need them.

MCQs

1. A prototype is: (a) The final product (b) An early version to test an idea (c) An advertisement (d) A business plan only
2. MVP stands for: (a) Most Valuable Person (b) Minimum Viable Product (c) Maximum Value Price (d) Main Video Program
3. Testing a prototype helps to: (a) Waste time (b) Find problems early (c) Hide feedback (d) Avoid users
4. Product development starts with: (a) Advertising (b) Finding a real problem (c) Selling shares (d) Hiring many staff
5. After launching an MVP, a team should: (a) Stop improving (b) Learn from users and improve (c) Ignore feedback (d) Close the business

Answers: 1-b, 2-b, 3-b, 4-b, 5-b

Revision Checklist - All 8 Units

- Unit 1: Binary, signals, logic gates, SDLC, topologies, cybersecurity
- Unit 2: Computational thinking, artifacts, algorithms, searching and sorting
- Unit 3: Python basics, IDE, variables, I/O, operators, loops, lists, functions, debugging
- Unit 4: Summary statistics, experimental design, bar/pie/line charts
- Unit 5: IoT, blockchain, blockchain + IoT, AI stakeholders
- Unit 6: Information sources, bias, verification, connectivity impacts, assistive devices, digital divide
- Unit 7: Digital literacy, data collection strategies, data presentation
- Unit 8: Product development, prototypes, testing, MVP

End of notes. These are original revision notes only - not official FBISE notes, not leaked, not guaranteed.