G.C.E. O/L Grade 10 ICT · Lesson 1

1.3 Evolution of Computers and Computer Generations

Computers did not appear in one day. People first counted with simple tools, then built machines, and finally made electronic computers. In this note you will learn the main early devices, the five computer generations, how computers became better, and today's trends.

1. Early calculating devices

> 💡 Think of it like a family tree: the abacus is the great-grandparent, Babbage's engine is the grandparent, and your smartphone is the youngest child.

Device	Who / when	Simple idea
Abacus	Ancient times (thousands of years ago)	Beads on rods for adding and subtracting.
Napier's Bones	John Napier, 1617	Numbered rods to help multiply.
Pascaline	Blaise Pascal, 1642	Gear wheels that add and subtract – an early mechanical calculator.
Jacquard loom	Joseph Jacquard, 1804	Punched cards controlled the weaving pattern – the idea of a "program".
Difference and Analytical Engines	Charles Babbage, 1820s–1830s	Designs with input, store (memory), processing unit and output – like a modern computer. He is called the "Father of the Computer".
First program	Ada Lovelace, 1843	Wrote steps for the Analytical Engine – called the first computer programmer.
Tabulating machine	Herman Hollerith, 1890	Used punched cards to count the US census quickly.

2. The five computer generations

A **generation** is a stage in computer history based on the **main electronic part used to build the processor**.

Generation	Main technology	What it was like	Examples
1st (about 1940–1956)	Vacuum tubes	Huge (filled a room), very hot, used a lot of power, often broke down. Machine language.	ENIAC, UNIVAC

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2nd (about 1956–1963)	Transistors	Smaller, faster, cooler and more reliable. Assembly language.	IBM 1401
3rd (about 1964–1971)	Integrated Circuits (ICs)	Many transistors on one small chip. Keyboards, monitors and operating systems came in.	IBM System/360
4th (1971 – today)	Microprocessors (LSI, VLSI)	Whole CPU on one chip. Personal computers, laptops, the Internet, GUIs.	Intel 4004, IBM PC, laptops
5th (present and future)	AI, ULSI chips, parallel processing	Computers that understand speech and images, learn from data, and use many processor cores together.	AI assistants, chatbots, self-driving car research

💡 Easy memory trick: **V – T – I – M – A** = **V**acuum tube, **T**ransistor, **I**C, **M**icroprocessor, **AI**.

LSI = Large Scale Integration (thousands of transistors on a chip). **VLSI** = Very Large Scale Integration (millions or more). Today's phone chips contain billions of transistors.

3. How computers improved

Feature	Then (1st generation)	Now
Size	Filled a whole room	Fits in your pocket (smartphone)
Speed	Thousands of operations per second	Billions per second
Storage capacity	Very small memory	Gigabytes to terabytes on SSDs and in the cloud
Accuracy and reliability	Frequent breakdowns	Very reliable and accurate
Efficiency (power and heat)	Huge power use, lots of heat	Low power – runs on a battery
Cost	Extremely expensive	Affordable for homes and students

4. Today's trends (2026 syllabus)

NEW 2026 The 2026 syllabus asks you to know modern technology students use every day. Older devices like floppy disks are only history now.

Smartphones and tablets
A full computer in your pocket, with Android or iOS.

AI everywhere
Voice assistants, translation, photo enhancement, chatbots.

Cloud computing
Files and apps on the Internet – Google Drive, Microsoft 365.

IoT and wearables
Smart watches, smart TVs, smart home devices.

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SSD storage
Solid State Drives have no moving parts – faster and tougher than hard disks.

Fast networks
4G/5G, Wi-Fi 6 and fibre connect devices quickly.

Key Words

Abacus – An ancient counting frame with beads.

Charles Babbage – Designed the Analytical Engine; called the Father of the Computer.

Ada Lovelace – Considered the first computer programmer.

Punched card – A card with holes used to give instructions or data to machines.

Computer generation – A stage of computer history based on the main processor technology.

Vacuum tube – Glass tube used as a switch in 1st-generation computers.

Transistor – A small electronic switch used from the 2nd generation.

Integrated Circuit (IC) – Many transistors on one small silicon chip (3rd generation).

Microprocessor – A whole CPU on one chip (4th generation).

VLSI – Very Large Scale Integration – millions of transistors on one chip.

ENIAC – An early 1st-generation electronic computer (1946).

SSD – Solid State Drive – fast storage with no moving parts.

Sample Q&A

1. What was the abacus used for?

> **Answer:** For counting, adding and subtracting by moving beads on rods.

2. Why is Charles Babbage called the Father of the Computer?

> **Answer:** His Analytical Engine design had input, memory (store), a processing unit and output – the same main parts as a modern computer.

3. What technology was used in first-generation computers?

> **Answer:** Vacuum tubes. That is why they were huge, hot and used a lot of electricity.

4. What is a microprocessor?

> **Answer:** A single chip that contains the whole CPU. It started the 4th generation (Intel 4004, 1971).

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5. What is special about fifth-generation computers?

> **Answer:** They use Artificial Intelligence – they can understand speech, recognise images and learn from data.

6. Why is an SSD better than an old hard disk?

> **Answer:** An SSD has no moving parts, so it is faster, quieter and less likely to break if dropped.

MCQ

1. Which is the oldest calculating device?

A. Abacus
B. Smartphone
C. Pascaline
D. ENIAC

2. The Pascaline (1642) could mainly:

A. Print colour photos
B. Browse the Internet
C. Add and subtract using gears
D. Recognise faces

3. Napier's Bones were used to help with:

A. Multiplication
B. Storing photos
C. Sending emails
D. Weaving cloth

4. Punched cards were first used to control patterns in the:

A. Abacus
B. Jacquard loom
C. Smartphone
D. Vacuum tube

5. Who is known as the "Father of the Computer"?

A. Herman Hollerith
B. John Napier
C. Charles Babbage
D. Blaise Pascal

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6. Who is considered the first computer programmer?

A. Blaise Pascal
B. Charles Babbage
C. Joseph Jacquard
D. Ada Lovelace

7. First-generation computers used:

A. Transistors
B. Microprocessors
C. Vacuum tubes
D. AI chips

8. Which was a problem of first-generation computers?

A. They were too small to see
B. They had touch screens
C. They used very little power
D. They produced a lot of heat

9. Second-generation computers replaced vacuum tubes with:

A. Gears
B. Transistors
C. Beads
D. Integrated circuits

10. Many transistors placed on one small chip is called a(n):

A. Integrated Circuit (IC)
B. Vacuum tube
C. Abacus
D. Punched card

11. The microprocessor (whole CPU on one chip) belongs to the:

A. First generation
B. Fourth generation
C. Second generation
D. Third generation

12. VLSI stands for:

A. Very Low Speed Internet
B. Variable Light Sensor Input
C. Very Large Scale Integration
D. Visual Language System Interface

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13. Which feature mainly describes fifth-generation computers?

A. Artificial Intelligence
B. Gear wheels
C. Vacuum tubes
D. Punched cards only

14. As computers developed from generation to generation, they became:

A. Bigger and slower
B. Hotter and less reliable
C. More expensive and heavier
D. Smaller, faster and cheaper

15. Which modern storage device has no moving parts?

A. Floppy disk drive
B. SSD (Solid State Drive)
C. Hard disk drive
D. Magnetic tape drive

Structured Questions

1. (i) Name two early calculating devices and the person who made each. (4 marks)
(ii) What was the main use of the abacus? (1 mark) *(5 marks)*

> (i) Any two: Napier's Bones – John Napier; Pascaline – Blaise Pascal; Analytical Engine – Charles Babbage; Jacquard loom – Joseph Jacquard; Tabulating machine – Herman Hollerith.
> (ii) Counting / adding and subtracting with beads.

2. (i) Why is Charles Babbage called the "Father of the Computer"? (2 marks)
(ii) What was Ada Lovelace's contribution? (2 marks) *(4 marks)*

> (i) He designed the Analytical Engine, which had input, a store (memory), a mill (processing unit) and output – the basic parts of a modern computer.
> (ii) She wrote instructions (an algorithm) for the Analytical Engine, so she is called the first computer programmer.

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3. Copy and complete the table.

| Generation | Main technology |

| 1st | ..... |

| 2nd | ..... |

| 3rd | ..... |

| 4th | ..... |

| 5th | ..... | (5 marks) *(5 marks)*

> 1st – vacuum tubes; 2nd – transistors; 3rd – integrated circuits (ICs); 4th – microprocessors (LSI/VLSI); 5th – artificial intelligence (ULSI, parallel processing).

4. (i) Write two disadvantages of first-generation computers. (2 marks)
(ii) Write two advantages of transistors over vacuum tubes. (2 marks) *(4 marks)*

> (i) Very large size; produced a lot of heat; used a lot of electricity; broke down often; very expensive (any two).
> (ii) Smaller; faster; less heat; less power; more reliable; cheaper (any two).

5. Computers improved in size, speed, capacity, accuracy and efficiency.
(i) Explain how any three of these changed from the 1st generation to today. (3 marks)
(ii) What is a microprocessor? (2 marks) *(5 marks)*

> (i) Size: from room-size to pocket-size. Speed: from thousands to billions of operations per second. Capacity: from tiny memory to gigabytes/terabytes. Accuracy: from frequent errors to very reliable. Efficiency: from huge power use to battery power (any three).
> (ii) A single integrated-circuit chip that contains the whole CPU (e.g. Intel 4004, 1971).

6. (i) Write two features of fifth-generation computers. (2 marks)
(ii) Name three modern computing trends that students use today. (3 marks) *(5 marks)*

> (i) Use of artificial intelligence; understand natural language (speech); recognise images; parallel processing; ULSI chips (any two).
> (ii) Any three: smartphones/tablets, cloud computing (Google Drive, Microsoft 365), AI assistants/chatbots, IoT and wearables, SSD storage, 4G/5G and Wi-Fi 6.

Summary

- Early devices: abacus, Napier’s Bones, Pascaline, Jacquard loom, Babbage’s engines, Hollerith’s tabulator.
- Charles Babbage is the Father of the Computer; Ada Lovelace was the first programmer.
- Generations are based on processor technology: vacuum tubes → transistors → ICs → microprocessors → AI.
- LSI and VLSI put thousands to millions of transistors on one chip.

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- Each generation became smaller, faster, more accurate, more efficient, with more capacity and lower cost.
- The 5th generation uses AI: understanding speech and images and learning from data.
- Today’s trends: smartphones, cloud, IoT and wearables, SSDs, 4G/5G and Wi-Fi 6.

MCQ answer key – 1.3

1. **A** – The abacus was used thousands of years ago.
2. **C** – Pascal’s machine was a mechanical adding machine.
3. **A** – Napier’s numbered rods made multiplication easier.
4. **B** – Jacquard’s loom (1804) used punched cards – like a program.
5. **C** – Babbage designed the Analytical Engine with the parts of a modern computer.
6. **D** – Ada Lovelace wrote steps (an algorithm) for the Analytical Engine.
7. **C** – 1st generation = vacuum tubes (e.g. ENIAC).
8. **D** – Vacuum tubes got very hot and used a lot of power.
9. **B** – Transistors were smaller, cooler and more reliable.
10. **A** – ICs started the 3rd generation.
11. **B** – Intel 4004 (1971) began the 4th generation.
12. **C** – VLSI chips hold millions of transistors.
13. **A** – 5th generation focuses on AI, learning and natural language.
14. **D** – Size and cost went down; speed, capacity and reliability went up.
15. **B** – SSDs use flash memory chips, so they are fast and tough.

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