Grade 8 ICT – Final Study Guide

UNIT 1 – LESSON 1

Project Design

1. Design Thinking

Design thinking = a way to design solutions and devices that really fit users' needs.
It has 5 main steps:

1. **Empathize**
   - Understand the **feelings, needs, and problems** of the user.
   - Talk to them, observe them, ask questions.

2. **Define**
   - Clearly write the **problem statement**.
   - Example: "Drivers need a way to track their car's location easily and safely."
3. **Ideate**
   - Brainstorm **many ideas** (no judging at first).
   - Draw sketches, think of different ways to solve the problem.

4. **Prototype**
   - Build a **simple version** of your idea (model, mock-up, basic circuit, or app).
   - It doesn't have to be perfect, just enough to test.
5. **Test**
   - Give the prototype to users.
   - Watch how they use it, ask what works and what doesn't.
   - Use their feedback to **improve** the design.

You don't follow these steps once – you often loop: test → improve → test again.

2. Parts of a Technological Device

Almost every tech device can be broken into 4 categories:

1. **Input devices** – send data *into* the system
    - Examples: microphone, camera, keyboard, mouse, temperature sensor, GPS, switches.
2. **Storage** – keeps data for now or for later
    - Examples: hard drive, SSD, memory card, cloud storage.
3. **Processing** – where data is **analyzed or transformed**
    - Examples: CPU, microcontroller, smartphone processor.
    - Runs algorithms and makes decisions.
4. **Output devices** – show results or act on the environment
    - Examples: screen, speakers, LEDs, motors, vibration, printer.

Typical flow:

Input → Processing → Storage (optional) → Output

3. Example: Voice-Controlled Location Tracker for a Car

- **Inputs:**
    - Microphone (for voice commands)
    - GPS module (for location)
- **Processing:**Small computer/processor runs voice-recognition and GPS software.

- **Storage:**
    - Saves locations to memory or cloud.
- **Output:**
    - Display screen (map)
    - Speaker (reads directions)

4. Choosing Components – What to Think About

When you choose parts for a device, you don't only think "Does it work?", you also think:

1. **Functionality**
    - Does the component actually do the job?
    - Example: Does this sensor measure temperature accurately?
2. **Cost**
    - Is it **affordable**?
    - Maybe two components do the same job, but one is much cheaper.
3. **Space / Size**
    - Does it physically **fit** in the device?
    - Example: a smartwatch needs tiny components and small battery.
4. **Speed / Performance**
    - Is it fast enough?
    - Example: a gaming controller needs very fast response times.

5. **Accessibility**
    - Can **different types of users** use it easily?
    - Consider:
        - Large buttons vs small buttons
        - Clear fonts and colours
        - Voice control for people who can't use touch screens

5. User-Centered Design

User-centered design = always thinking "How will **real people** use this?"

Steps:

- **Plan a usability test**
    - Decide what tasks users should try (e.g., "Set an alarm on this smartwatch").
- **Observe users**
    - Watch where they get stuck.
    - Time how long tasks take.
- **Collect feedback**
    - Ask: "What was easy?" "What was confusing?"
- **Improve design**
    - Change layout, buttons, colours, instructions based on feedback.

6. Bias and Accessibility

Bias in technology = when a device or app **works better for some groups** and worse for others, often by accident.

Examples from the book:

- Facial recognition working better on some skin tones than others.
- Small touch controls that are hard for users with motor problems.
- Small text that is hard for users with visual impairment.

Accessibility = making sure everyone can use the technology, including:

- People with **low vision** – need bigger text, high contrast, screen readers.
- People with **hearing loss** – need captions or visual alerts instead of only sound.
- People with **physical disabilities** – need larger touch targets, alternative input methods.

In Microsoft Word, for example, there are **Accessibility Checkers** and tools like **Read Aloud** that help users with visual difficulties.

UNIT 1 – LESSON 2

Data Transmission and Protocols

1. What Is Data Transmission?

Data transmission = sending and receiving data between devices.

Any data transmission has 4 main components:

1. **Source** – where the data starts
    - Example: your phone when you send a text.
2. **Message** – the actual data being sent
    - Example: the text “Where are you?” or a photo.
3. **Medium** – the path the data travels through
    - Wires (Ethernet), fiber-optic cables, radio waves (Wi-Fi, mobile network).
4. **Destination** – where the data arrives
    - Example: your friend’s phone.

There is also a **set of rules** called a **protocol** that defines how data is formatted and transmitted (like languages and grammar for computers).

2. Testing Data Transmission – The `ping` Command

`ping` is a command used to check if one device can reach another over a network.

In Windows:

1. Open **Command Prompt**.
2. Type: `ping google.com` (for example) and press Enter.

The output shows:

- **Packets sent** – how many test messages you sent.
- **Packets received** – how many replies you got.
- **Packet loss** – if some get lost, you have connection problems.
- **Round-trip time (ms)** – min, max, and average time for messages to go and come back.

Lower times = faster connection. 0% loss = healthy connection.

3. Speed of Data Transmission

- Measured in **bits per second (bps)**, often **Mbps** (megabits per second).
- Higher speed = faster downloads, smoother streaming, less lag.

Why it matters:

- Watching HD or 4K videos
- Online gaming
- Video calls
- Downloading or uploading large files

Websites like speed-test sites measure:

- **Download speed** – how fast you receive data.
- **Upload speed** – how fast you send data.

4. Data Security During Transmission

When data moves across the internet, it can be **intercepted** if not protected.

To keep data safe, systems use:

- **Encryption** – scrambling data so only someone with the correct key can read it.
- **Digital signatures** – prove that a message really came from a specific sender and wasn't changed.

Example:

- Sending an email with an attachment.
- Encryption hides the content.
- A digital signature can confirm the sender's identity.

UNIT 2 – LESSON 1

Effective Data Analysis

1. Data Points and Data Relevance

A **data point** = one small piece of information within a larger dataset.

Example table (like in the book):

Number of Pets	Favorite Color	Study Time (minutes)	Grade Level
2	Blue	60	8

This **row** is a data point.

Data relevance = whether a data point is **useful for your question**.

Example question:

> "How does study time affect grade level?"

- Relevant columns: **Study Time**, **Grade Level**
- Not relevant here: **Favorite Color**, **Number of Pets**

So, when analyzing data:

1. **Understand the problem** – What are you trying to find out?
2. Decide which data points are **relevant**.
3. Ignore or remove data that doesn't help answer the question.

2. Conditional Formatting in Excel

Conditional Formatting = Excel feature that changes the look of cells based on rules.

You can:

- Highlight values **greater than** a number.
- Colour the **highest** or **lowest** values.
- Show colour scales (green to red) to show ranges.

3. Data Validation

Data validation = rules that control what data can be entered into a cell.

Why it's important:

- Keeps data **accurate** – avoids typos (e.g., 1000 instead of 100).
- Keeps data **complete** – no missing required fields.
- Keeps data **consistent** – same format for dates, names, etc.

Examples:

- Allow only numbers between **0 and 100**.
- Use a **drop-down list** of allowed values (e.g., grade levels 6, 7, 8, 9).
- Force dates to be **within a certain year**.

In Excel, you use the **Data Validation** tool (Data tab → Data Validation) to set those rules.

4. Organizing Data – Transpose

Sometimes you want to **swap rows and columns** to see data differently.

Transposing = switching rows ↔ columns.

Example:

- Original:

	A	B
1	Student	Score
2	S1	90
3	S2	80

After transpose:

	A	B	C
1	Student	S1	S2
2	Score	90	80

In Excel:

1. Copy the range.

2. Right-click another cell → **Paste Special…** → check **Transpose** → OK.

5. Advanced Excel Functions – UNIQUE and FILTER

5.1 `UNIQUE` Function

`UNIQUE` returns a list of **unique (non-duplicate)** values from a range.

Example data:

A
Apple
Banana
Banana
Orange
Apple

Formula:

=UNIQUE(A1:A5)

Result:

| Apple |
| Banana |
| Orange |

Use it to:

- Find **distinct** items (different colours, products, names).

5.2 `FILTER` Function

`FILTER` shows only rows that meet a certain **condition** (criteria).

General structure:

=FILTER(range, condition_range = "something")

Example:

- You have a table with a “Brand” column.
- To show only entries where the brand is `"Adidas"`:

=FILTER(A2:D10, C2:C10 = "Adidas")

This returns only the rows where the brand = Adidas.

Use it to:

- Focus on **specific categories** (city, grade, product, etc.).
- Do market analysis for one group at a time.