

Previous Learning (What You Already Know)

- Statistical Investigation: Knowing that it involves collecting data to answer a question.
- Data Types: How to collect categorical and discrete data.
- Computing Tools:
 - Data loggers (e.g., sensors recording temperatures every hour).
 - Spreadsheets (used to keep track of data such as expenses).
 - Databases (a collection of information, such as where people like to go on holiday).
 - Other productivity software (such as a word processor for writing up investigations).

Learning Objectives (What We Are Going to Learn)

- Identify different computing tools used in a statistical investigation.
- Explore how to plan a statistical investigation.
- Explore how to collect continuous data.
- Design an appropriate form to collect continuous data.

Key Vocabulary

- **Collaborate:** Working together with other people on the same document at the same time.
- **Continuous Data:** Numerical data that can have any value (including fractions or decimals) and is not usually countable with your eyes.
- **Criteria:** Requirements needed when searching or filtering data.
- **Questionnaire:** A series of questions that you want to ask people.
- **Question Type:** The format or way in which a question is presented (e.g., short answer, multiple choice, ranking).
- **Statistical Investigation:** The collection of data to help find the answer to a question.
- **Validation Rules:** Restrictions applied to questions ensuring only specific types or formats of answers are accepted.

2. Classroom Discussion

A. What is a Statistical Investigation?

A statistical investigation is the process of collecting and analyze data to help answer a specific question.

- *Example 1:* Finding the favorite fruit of teachers in NIHOC School.

B. Types of Data

Data Type	Description	Key Characteristics	Textbook Examples
Categorical	Data that can be grouped into categories.	Usually an opinion, a description, or a range of numbers.	Favourite cupcake flavour, pet colour, favourite cat type, favourite lesson, favourite book, age group (7 to 11).
Discrete	Numerical data with fixed, whole values.	Can only be whole numbers (e.g., 0 or 1 or 17 or 13) often countable.	Number of learners in a class, number of customers in a shop, number of pets, age.
Continuous	Numerical data that can have any value.	Can include decimals/fractions (e.g., 1.5, 17.75); highly accurate; not usually countable with eyes.	Temperature, length, height, weight, amount of rainfall, time in a race.

C. Planning a Statistical Investigation

To plan an investigation effectively, address the following five questions:

1. **What do you want to find out?** (e.g., what sort of pets classmates have).
2. **What questions will help you find this out?** (Questions must give exact information; decide whether to provide set choices or allow free answers).
3. **Who will you ask?** (Needs to be specific: *"Which pets do people in my class have?"* is specific; *"Which pets do people have?"* is not).
4. **How will you collect the data?** (Use questionnaires for opinions/favourites; use data loggers and spreadsheets for automated readings like temperature).
5. **How will you analyse the data?** (Represent and review results using suitable charts or graphs).

D. Computing Tools for Data Collection & Management

- **Data Loggers:** Devices using sensors to collect continuous data automatically over time.
 - *Benefits:* Operates without human assistance; can be placed in hazardous or remote locations (e.g., Antarctica, volcanoes).
 - *Applications:* Weather stations (recording hourly temperature and wind speed), science labs (testing acid levels in drinks, investigating voltage vs. volume), sports lessons (heart rate monitoring), and seismographs (recording earthquakes).
- **Spreadsheets:** A digital document with cells arranged in rows and columns. (like Excel or Google Sheets) used to store data, performs mathematical operations (* for multiplication, / for division, addition, subtraction, averages), and visually display data via charts or graphs.
- **Databases:** A database is a systems used for storing, organising, searching, and filtering data according to criteria. some database software includes Microsoft Access.

- **Word Processors:** Software used to write reports or produce question sheets, which includes automatic spelling checks and easy sharing via email or printing.
- **Online Forms / Questionnaires:** Tools like Google Forms used to gather responses digitally over the web without printing paper copies. Responses are automatically arranged and collated into a spreadsheet.

Contextualizing Scenario: Why would a scientist measuring volcanic heat use a data logger instead of a paper clipboard?

Because a data logger records data automatically without needing a person present in a dangerous, inaccessible location.

E. Designing Forms to Collect Continuous Data

When designing a form to record continuous data, apply the following design rules:

- **Precise Phrasing:** State the exact conditions. For example, use *"What was the temperature in your classroom at 12:00 p.m. on Monday?"* instead of *"What is the temperature?"*.
- **Frequency & Time Period:** State clearly how often (e.g., three times a day) and over what period (e.g., daily for a week) measurements must be recorded.
- **Units of Measurement:** Specify the expected unit (e.g., mm, cm, kg, lb).
- **Precision / Decimal Requirements:** Specify how many digits are required after the decimal point (e.g., one or two decimal places).

Question Types & Form Constraints

- **Open Text Questions:** Allow free typing. They should be paired with **validation rules** (restrictions that only accept specific formats, like numbers) to prevent invalid text submissions.
- **Multiple Choice Questions:** Allow users to pick from set options. Unsuitable for continuous data because continuous measurements have infinite possibilities and cannot all be listed.
- **Ranking Questions (Linear Scale):** Useful for rating opinions (e.g., 1 to 5 scale), but cannot be used to collect continuous or discrete data.
- **Filter / Screening Questions:** Used to ensure the respondent meets necessary conditions before answering further questions (e.g., *"Would you like to be in the class photo?"* or *"Do you have a pet?"*).

Section A: Short Answer Questions (Q&A)

Q1: What is a statistical investigation?

Ans: A statistical investigation is a process of collecting and analyzing data to help us find the answer to a question. For example, Sofia collected data in NIHOC school to find the favorite fruit in her class.

Q2: Define continuous data and give two examples.

Ans: Continuous data is numerical data that can have any value, including decimal points, examples are temperature and height.

Q3: What is discrete data and give two examples.

Ans: Data that can be counted and can only have specific whole number values.

Examples:

Number of students in a class = 30

Number of books on a shelf = 12

Q4: How does discrete data differ from continuous data?

Ans: Discrete data can only have specific whole values (such as 0 or 1 or 13 or 7) because items cannot be split into decimals, however continuous data can take any value, including decimals (such as 3.33 or 1.17 or 13.33 or 7.1).

Q5: What is a data logger and how does it collect information?

Ans: A data logger is a computing device that uses sensors to collect data over time. It can collect continuous data automatically without needing a person to be present.

Q5: State two advantages of using online forms instead of paper questionnaires.

Ans: Online forms allow you to collect responses from people far away without printing paper copies, also they automatically gather data directly into a spreadsheet.

Q6: Why is it important to ask specific questions when planning an investigation?

Ans: Specific questions ensure that you get the exact information you need to reach your goal. It also helps you identify exactly which group of people you need to ask.

Q7: Explain the purpose of validation rules in an online form.

Ans: Validation rules are restrictions applied to open text questions to ensure that only acceptable answer types are submitted.

For example, they prevent people from typing text into a box meant for numerical measurements.

Q8: What mathematical calculations can you perform using spreadsheet software?

Ans: Spreadsheets can perform calculations such as adding, subtracting, multiplying (using *), dividing (using /), and finding averages.

Q9: Why are charts and graphs useful when presenting spreadsheet data?

Ans: Charts and graphs represent data visually, which makes it much easier to understand patterns and understand the collected data.

Q10: What is a database and how does it use criteria?

Ans: A database is a structured tool used to store, organise, and analyse records. It uses criteria which are specific search requirements to filter and display only the records that match what you need.

Section B: Second Order Thinking Skills Questions

Q11 Look at these two questions designed for an investigation:

Question A: What is the temperature?

Question B: What was the temperature in your classroom at 12:00 p.m. on Monday?

Explain Which question is more suitable for capturing continuous data.

Ans: Question B is more suitable because it specifies the exact location (classroom), the exact time (12:00 p.m.), and the specific day (Monday).

Question A is vague and does not tell the person when or where the measurement should be taken, which leads to incorrect data.