Lesson 25 – Collecting and Analysing Data

By the end of the lesson you will understand:

- The difference between qualitative and quantitative data
- The difference between primary and secondary data

What does data mean?

Data refers to the information that is available in basic, pure, processed, or unorganised forms. It can be facts, details, evidence, and statistics collected by the researcher or any other person for the purpose of reference, reasoning, and analysis. Data is collected, organised, measured, analysed, and presented in the form of graphs, tables, charts, etc.

Quantitative Data VS Qualitative Data

When working with data, it is very important to know what kind of data you have as this information would help you decide how to use and deal with your data carefully.

Data is broadly classified into two types: quantitative data, which is also referred to as numeric data, and qualitative data, which is also referred to as categorical data.

Quantitative data is measurable or countable. That is, you can do basic arithmetic operations such as addition, subtraction, multiplication or division, and the output would make perfect sense. Quantitative data is further divided into two types:

- Discrete: Discrete data can only take particular values within a range. For example, the number of students in a class could be 30, 40 or one hundred students but there could not be a quarter or a half number of students, such as 30.5 students. Other examples of discrete data could be the number of defective parts that are manufactured in a plant or the number of road accidents happening in a day. So, discrete data can only take particular value within a range.
- Continuous: Continuous data can take any value within a range – 'any' means infinite number of values within a range. For example, weight can be 68.45, 68.456 or 68.45632kg or any value between these numbers and so on. Other examples could be height, distance, and temperature because this data has decimal values, which are infinitely many.

Qualitative data relates to descriptors or characteristics that cannot be easily measured but they can be observed such as taste, smell, etc. Qualitative data is divided into two parts:

- Nominal - Nominal data has names or labels associated with it and they do not have any intrinsic order or sequence. For example, eye colour can be black, blue, or brown, etc. Other examples would be blood group, state, and zip code (post code). State and zip code are labels that are usually given for geographical locations, and no one zip code is more significant than the others – they are just different.
- Ordinal - In ordinal data, the order is significant. For example, if you were to rate your favourite restaurant in a customer feedback form, you would rate them on a scale such as from 1 to 5, where 1 is 'very poor', 2 is 'bad', 3 is 'acceptable', 4 is 'good' and 5 is 'excellent'. Other examples would be ranks of students, or difficulty level of a game, etc. So, ordinal data has an order.

Primary Data VS Secondary Data

There are two categories in which data is classified – primary data and secondary data. Primary data refers to the data collected by the researcher for the very first time from different sources with a particular problem, question, or specific purpose in mind. Because it is the data gathered by the researcher or his or her team members for a specific purpose for the very first time, it is also called first-hand information. Furthermore, the data is collected from the source of origin and that is why it is also known as original data. Primary data can be collected through surveys, questionnaire, experiments, direct interviews, observation, and telephonic interviews.

Secondary data refers to the data collected by any person, organisation, or agency in the past through surveys, experiment or study for some other purpose but used by the researcher to deal with the problem at hand. That is, secondary data is any type of data which is previously collected for some other reason but, due to its connexion or similarity with the topic under new research, it is used by the investigator for his or her own purpose. The sources of secondary data are newspapers, websites, government publications, internal records, and books.

Below are the comparisons between primary data and secondary data:

Aspect	Primary data	Secondary data
Purpose	Gathered by the researcher or his/her team members directly from the source of origin for a definite purpose.	Used in research by the researcher that is originally gathered by some other person or organisation for some other purpose.
Nature of Data	Real-time data that is fresh or updated data.	Past data that is collected in the past by some other person for some other reason but used by the researcher in his/her recent study.
Form	Is always in its basic form that is pure and raw.	Refined data that is organised and processed by the previous researcher according to his/her needs.
Cost	Requires some investment to conduct the research on the topic. Hence, it is an expensive process.	Economical because the primary research is already performed by someone else.
Source	Collected through surveys, experiments, interviews, observation, and questionnaires.	Collected through books, journals, newspapers, internal records, government publications, websites etc.
Accuracy & Reliability	Always more accurate and reliable.	Less accurate and reliable.
Information	First-hand.	Second-hand.
Process	Collection requires high levels of research and effort from the researcher. Hence, it is a time-consuming process.	As the main research is conducted by some other person, secondary data collection is a quick and easy method.
Collector vs User	The collector and user of the information is always the same person.	The collector and user are different persons.
Facts & Figures	Freshly collected for the project.	Already collected and recorded by the primary researcher.
Data	Always related to the objective of the researcher.	Adjusted or used according to the need.

Activity 1

How would you define the word data?

Now look it up in a dictionary or online and see how closely it matches your definition.

Anyone using computer technology is exposed to an enormous amount of data on a daily basis.

There are two main types of data: qualitative and quantitative.

Video: Your teacher will show you a video explaining these definitions.

What is qualitative data? Give an example.

What is quantitative data? Give an example.

Which do you think is easier to analyse, quantitative or qualitative data?

Why?

Data can also be described as **primary** or **secondary**.

Primary data is data that you gather yourself - through interviews, questionnaires and surveys.

Secondary data is data that has been collected for one purpose but is then used for another. For example, invoice information (primary data) used to provide information about average monthly sales.

To use data for decision making purposes it should be:

Valid Is it appropriate and does it fit the purpose it is going to be used for?

Reliable If the same data was collected again would it be the same?

Accurate Is it all correct?

Activity 2

You are going to work as part of a team, completing your own mini research projects and gathering data.

Shoe Survey
Record the shoe size of everyone in your class:

Name	Size	Name	Size	Name	Size

What is the biggest shoe size?			
What is the smallest shoe size?			
What is the most common shoe size?			
What is the average size?	Mean	Median	Mode
How many students have shoes larger than the mode?			
How many students have shoes smaller than the mode?			

Is your data qualitative or quantitative?

Is your data primary or secondary?

Heart Rates

Measure the heart rate (pulse) for all the members of your group in two different states.

How To Take A Pulse

Place two fingers over your radial artery, which is on the thumb-side of your wrist between the bone and tendon.

Count the number of beats in 15 seconds and multiply by four to calculate the number of beats in minute.

First measure the resting heart rate of reach member of the group (sitting without any activity).

Then run for one minute and take your pulse again.

Name	Resting Heart Rate (bpm)	Active Heart Rate (bpm)

What is the lowest resting heart rate?	
What is the highest resting heart rate?	
What is the range? (The difference between the lowest and the highest)	
What is the lowest active heart rate?	
What is the highest active heart rate?	
What is the range between the highest and the lowest active heart rate?	

Is your data qualitative or quantitative?

_____

Is your data primary or secondary?

_____

Guidance notes for teachers

Activity 1

Ask the students to think of and write a definition of the word data before looking up the word in a dictionary (or online) and comparing the two.

Data can be defined as facts or information that are gathered and used to conduct research or make decisions. It is the collective term for facts and figures that can be recorded, collected, analysed and used to provide information.

If we choose to engage with technology we are exposed to an enormous amount of data on a daily basis. You may wish to share information from the following article with the class, or other suitable alternative:

- http://www.telegraph.co.uk/news/science/science-news/8316534/Welcome-to-the-information-age-174-newspapers-a-day.html

The following video explains the difference between qualitative and quantitative data. You may choose any suitable alternative.

- https://www.youtube.com/watch?v=dwFsRZv4oHA

Discuss examples of qualitative and quantitative data with the class.

Quantitative: numerical values that can be measured e.g. number of students in a class, number of children ordering a school meal, speed of a vehicle

Qualitative: information that be observed or defined but not measured e.g. hair colour, texture of fabric, taste, smell

Discuss the difference between primary and secondary data as a class.

Primary: data collected from an original source for a specific purpose
Secondary: data that is not collected for a specific purpose

Activity 2

Split the class into groups of 4-5 students (suggested).

Task 1 - Encourage teams to work together; do they each need to collect every shoe size or could they allocate the work between them? The students should be able to identify that the data is numerical and therefore quantitative.

Task 2 - Demonstrate how to take a pulse by placing two fingers over the radial artery and counting the number of beats per minute (or beats in 15 seconds, multiplied by four). Students record the resting heart rate for each member of their group. They then jog for one minute (on the spot; or any suitable alternative activity) and take a second reading. The group should work together to analyse their data. Students should be able to identify that the data is quantitative and primary.

Discuss the findings for each group as a class.

Resources

- Computers with Internet access.

Abbreviations

- **BPM** – beats per minute

Lesson 29 – Data Analysis

By the end of the lesson you will understand more about:

- How to carry out simple data analysis

Activity 1

Work with your group again from the last lesson.

Pass a copy of your questionnaire to each Member of your class.

You will also receive a copy of each group's questionnaire to complete.

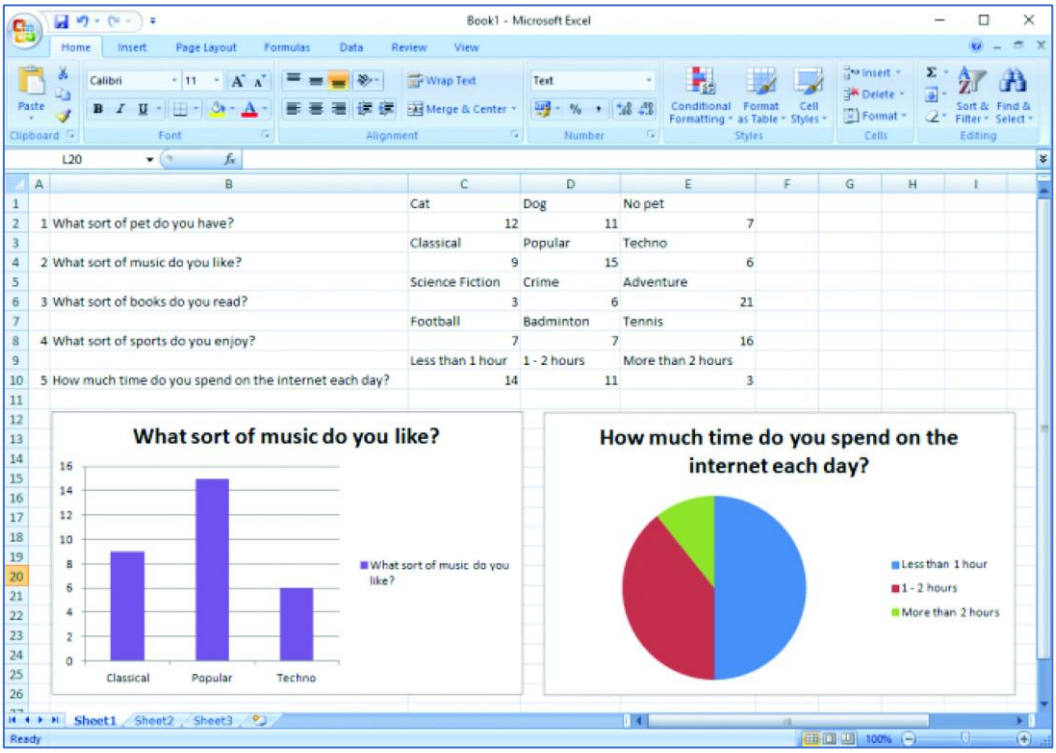
Return the completed questionnaires to the appropriate groups.

Activity 2

You are going to collate the data and analyse the answers using a spreadsheet.

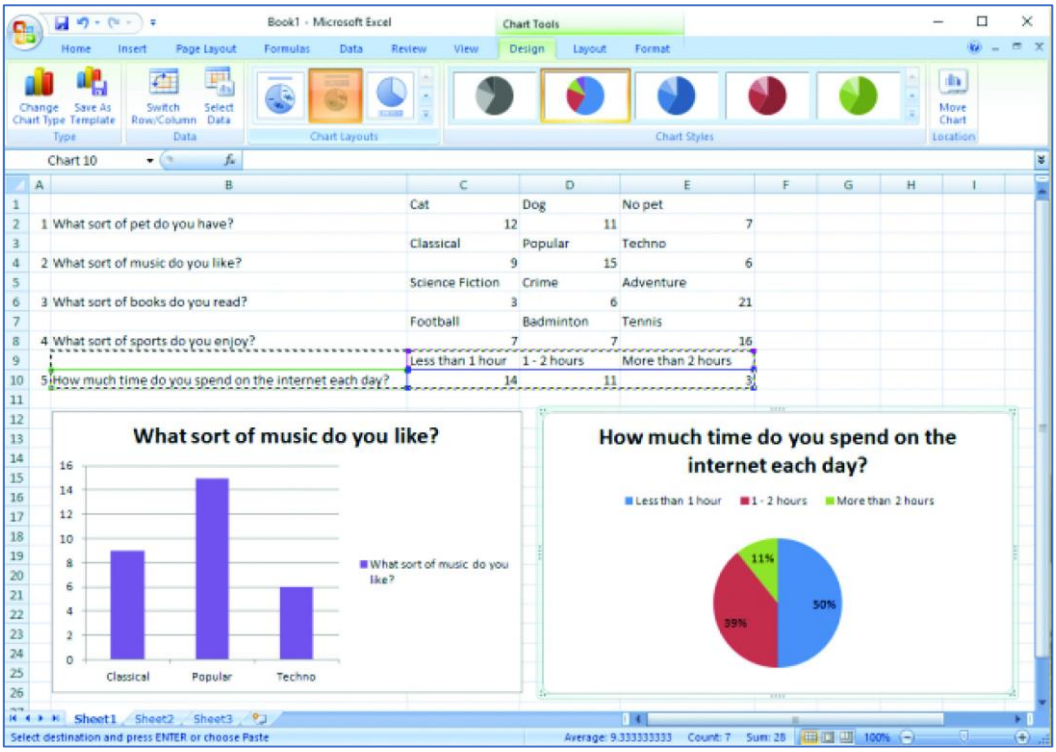
You should be able to make a few early judgements about your data simply by reading the numbers.

Represent some of your data as a chart or graph, like the MS Excel example below:



		Cat	Dog	No pet
1	What sort of pet do you have?	12	11	7
		Classical	Popular	Techno
2	What sort of music do you like?	9	15	6
		Science Fiction	Crime	Adventure
3	What sort of books do you read?	3	6	21
		Football	Badminton	Tennis
4	What sort of sports do you enjoy?	7	7	16
		Less than 1 hour	1 - 2 hours	More than 2 hours
5	How much time do you spend on the internet each day?	14	11	3

Using the pie chart function you can automatically calculate and display percentages.



Decide as a group how you are going to process the responses from your questionnaire.

Dependent upon the data you have collected, you could decide to work out:

- The mathematical range
- Averages, mean, median and mode
- Highest and lowest outcome

Use the spreadsheet software to analyse the responses and draw conclusions from you study, based on the data.

What did you find out? Your teacher may ask you to present your findings to the class.

Guidance notes for teachers

Activity 1

Following on from the previous lesson students complete the questionnaires created by each group.

Dependent upon your classroom layout and organisation, you may choose to put the questionnaires on a shared drive for the students to print off themselves, or prepare the resources in advance, printing off sufficient copies for each member of the class.

Activity 2

When the students have completed the questionnaire for each group, they return them to the originators.

Encourage groups to collate their results and create a spreadsheet in order to conduct some simple data analysis. Work through the examples in the student book before setting the groups to work on their task.

You may need to assist students to choose the most relevant techniques to analyse their data, based on the questions in their survey. Remind them to use the knowledge acquired in previous lessons, analysing range, average and using charts.

Allow sufficient time for each group to present their findings to the class.

Resources

- Computers with spreadsheet software

Terminology

- **Analysis** - detailed study of information or data
- **Collate** - to collect and combine text, information or data

Lesson 30 – Presenting Research Findings

By the end of the lesson you will:

- Present recent data collection and analysis

Activity 1

You have studied different methods for collecting and analysing data. In recent classes you have used these methods to research different topics/questions.

Let's Review

Chose one of the topics you have researched and create a short presentation (or animation!) to show the following:

- The topic or question you researched
- What data collection methods you used (qualitative or quantitative)
- Who participated in your research
- What did you find out (i.e. the results)

Finished?

Well done! Remember to save your work.

Your teacher may ask you to show your presentation to the class.

Guidance notes for teachers

Activity 1

Allow students the opportunity to use presentation software or – more ambitiously perhaps – some previously used animation or programming software (such as Scratch) to present a review of a recently researched topic. Provide lots of encouragement towards maximum creativity in putting together presentations.

If time permits at the end of the lesson share some of the students' completed work.

Resources

- Computers with presentation and/or animation software