

Pearson BTEC Levels 4 and 5 Higher Nationals in Engineering (RQF)

Unit 2: Engineering Maths (core)

Unit Workbook 2

in a series of 4 for this unit

Learning Outcome 2

Statistical Techniques

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Section 2: Statistical Techniques

Sample

INTRODUCTION

Investigate applications of statistical techniques to interpret, organise and present data, by using appropriate computer software packages.

Summary of data:

Mean and standard deviation of grouped data.

Pearson's correlation coefficient.

Linear regression.

Probability theory:

Binomial and normal distribution.

GUIDANCE

This document is prepared to break the unit material down into bite size chunks. You will see the learning outcomes above treated in their own sections. Therein you will encounter the following structures;

Purpose

Explains *why* you need to study the current section of material. Quite often learners are put off by material which does not initially seem to be relevant to a topic or profession. Once you understand the importance of new learning or theory you will embrace the concepts more readily.

Theory

Conveys new material to you in a straightforward fashion. To support the treatments in this section you are strongly advised to follow the given hyperlinks, which may be useful documents or applications on the web.

Example

The examples/worked examples are presented in a knowledge-building order. Make sure you follow them all through. If you are feeling confident then you might like to treat an example as a question, in which case cover it up and have a go yourself. Many of the examples given resemble assignment questions which will come your way, so follow them through diligently.

Question

Questions should not be avoided if you are determined to learn. Please do take the time to tackle each of the given questions, in the order in which they are presented. The order is important, as further knowledge and confidence is built upon previous knowledge and confidence. As an Online Learner it is important that the answers to questions are immediately available to you.. Contact your Unit Tutor if you need help.

Challenge

You can really cement your new knowledge by undertaking the challenges. A challenge could be to download software and perform an exercise. An alternative challenge might involve a practical activity or other form of research.

Video

Videos on the web can be very useful supplements to your distance learning efforts. Wherever an online video(s) will help you then it will be hyperlinked at the appropriate point.

Sample

2.1 Tabular and Graphical Form

2.1.1 Data Collection Methods

Data can be collected in a number of ways, including ...

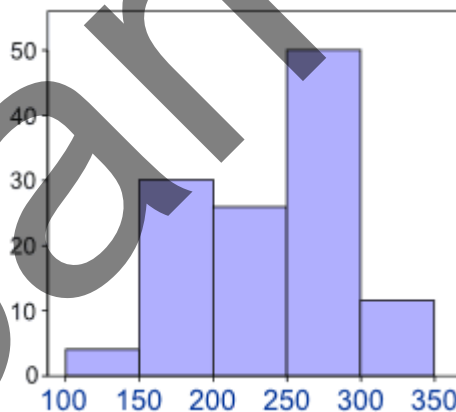
- Using test instruments such as multimeters, frequency counters, strain gauges etc.
- By observation – i.e. counting events, performance analysis
- Software simulation
- Wireless telemetry
- Artificial Intelligence
- Mobile phone applications

Continuous data can have any value, with potentially an unlimited number of decimal places in the data. An example is the voltage reading on an analogue voltmeter. *Discrete* data is obtained by some form of counting, such as recording the number of products on a production line.

There are several ways of presenting acquired data. These are discussed below.

2.1.2 Histograms

A histogram is a representation of data which is grouped into ranges. An example histogram is shown below...



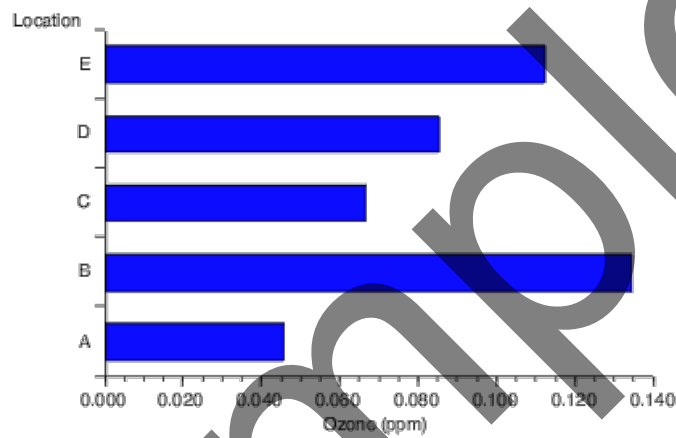
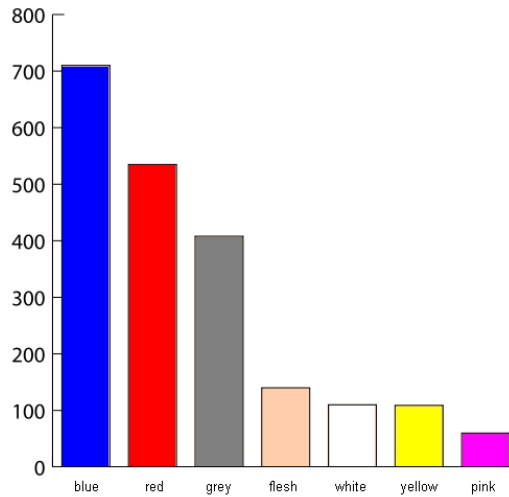
Here it can be seen, for example, that there were 30 occurrences of recorded data between 150 and 200 units.

2.1.3 Bar Charts

A bar chart can represent data in a similar way to a histogram. There are two **differences between a bar chart and a histogram...**

- A bar chart has spaces between the rectangles. A histogram does not.
- A bar chart can represent data as either horizontal or vertical rectangles. Histograms are vertical.

Examples of bar charts are shown below...



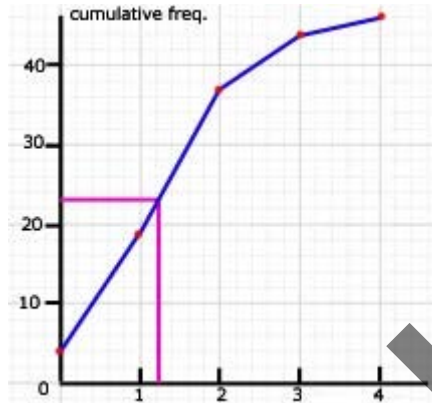
2.1.4 Line Diagrams

These represent discrete transitions to new data, marked by straight lines to specific data points, as per the example below...



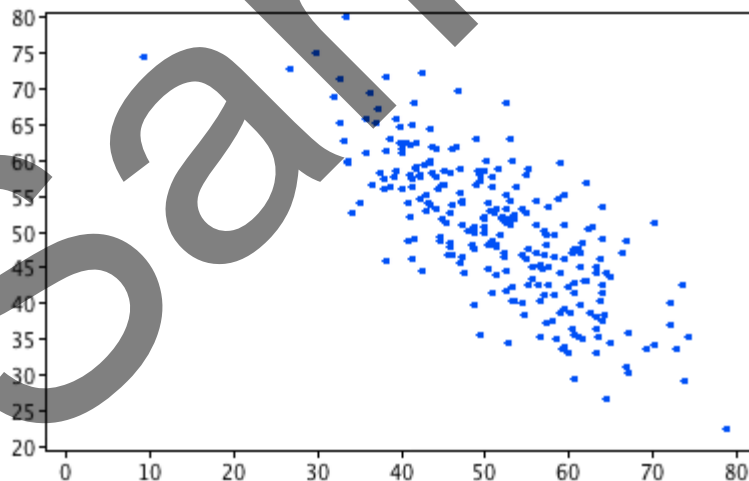
2.1.5 Cumulative Frequency Distribution Diagrams

These can be thought of as a running total in ascending order of the units on the horizontal axis. An example is shown below...



2.1.6 Scatter Plots

These are plotted with dots at matching vertices. Usually a line of 'best fit' may be drawn through the points. This line can be constructed using an equation or by estimation. A typical scatter plot is shown below...



2.1.7 Tally Charts

These are used to record observed data in groups. A vertical line is used to record an event. Usually a fifth event is recorded by inserting a diagonal line through the previous four vertical lines, as per the example below...