(c) Three statistical terms that can be used to demonstrate the central tendency of a set of data are median, mode and mean. Explain and, showing all of your workings, determine the following for the data set to one decimal place:

- The median
- The mode
- The mean

(12 marks)

QUESTION 5

The sources of variation that are present in all processes are frequently described as common or random causes and special or assignable causes. The level of this variation will affect the ability of a process to provide the products and services that are required.

(a) Explain the terms 'common cause' and 'special cause' when used to describe sources of variation. Provide and explain **two** commonly recognised examples of sources of common cause variation and **two** commonly recognised examples of sources of special cause variation to illustrate your answer.

(12 marks)

(b) In terms of common cause and special cause variation, explain the meaning of statistical control and statistical capability when applied to describe the performance of a process.

(5 marks)

(c) The figure below shows the four conditions that are possible when considering statistical control and statistical capability. For each of the four conditions listed beneath the figure, explain in terms of common and special causes of variation, what action should be taken to improve the process.

(i)   The process is in statistical control and statistically capable
(ii) The process is in statistical control but is not statistically capable
(iii) The process is out of statistical control but is statistically capable
(iv) The process is out of statistical control and is not statistically capable

(8 marks)

Notes for candidates

Attempt **BOTH** questions in **Section A**.
Attempt **Any TWO** questions from **Section B**.
If you attempt all three questions in Section B, only the first two will be marked.

Questions may be attempted in any order.
All questions carry equal marks.
The maximum marks for each part of each question are shown.

Begin each question at the top of a fresh side of paper.
Do not write in the margins.

QUESTION 1

Data mining is used to seek out trends and patterns that can be utilised to target potential customers, users and other groups with information about the things that they need and may benefit them.

(a) Data mining can also be used for negative reasons. Identify and describe **one** area where the risks associated with data mining can be seen to present ethical issues.

(5 marks)

(b) Data mining can be applied to many sources of data across a variety of areas. Describe how it can be utilised in each of the three areas below:

   i.   Business and marketing
   ii. Medical data
   iii. Political data

(15 marks)

(c) Identify and explain **one** risk of changing habits, fashions and attitudes when applying data mining to business and marketing data.

(5 marks)

QUESTION 2

Data collection is key to providing information to enable effective monitoring and analysis of performance. However, it is essential that the right data is collected and managed to provide the information needed to control processes.

(a) Identify and explain the factors that need to be considered to ensure effective process control when setting up data collection systems.

(12 marks)

(b) In relation to the retention of inspection and test records, explain why they are held, how they should be held and how long they should be held for.

(10 marks)

(c) Identify **three** problems that can occur when data is captured from automatic data collection systems.

(3 marks)

QUESTION 3

Recent updates to ISO 9000 included changing the quality management principle of 'factual approach to decision-making' to 'evidence-based decision-making'. Although this change has some significance, it is clear that this is fundamentally the same principle.

(a) Explain the principle of using 'facts' or 'evidence' as a basis for decision-making. Include in your answer what the principle means, the reasoning behind adopting it within an organisation and identify and explain **two** key benefits of adopting this principle in an organisation.

(11 marks)

(b) Explain acceptance sample inspection and how it can contribute to a 'fact' or 'evidence' based decision-making approach.

(9 marks)

(c) Explain how the producer and consumer risks associated with applying sample inspection to control the release of products or services can be reduced.

(5 marks)

QUESTION 4

Understanding and interpreting distributions are a key part of data interpretation, with some of the important characteristics of distributions being shape and position. The data shown below has been collected from a process over a short period of time.

12, 10, 8, 11, 10, 9, 12, 10, 11, 10, 12, 7, 11, 11, 10, 9, 11, 13, 9, 11, 8, 10, 11

(a) Plot the distribution of the data. Briefly comment on whether the data has a normal distribution.

(8 marks)

(b) Range and standard deviation are two measures of the spread of a distribution. Briefly describe each and calculate the range for the above data.

(5 marks)