DIPLOMA IN DATA MANAGEMENT AND ANALYTICS (DDMA)

LEVEL III

PYTHON DATA VISUALISATION

WEDNESDAY: 3 December 2025. Morning Paper. **Time Allowed: 3 hours.**

This paper has two (2) sections. SECTION I has twenty (20) short response questions of two (2) marks each. SECTION II has three (3) practical questions of sixty (60) marks. Answer ALL questions. Marks allocated to each question are indicated in the question.

Required resources:

- **A computer**
- **Python programming language**
- **Pycharm IDE**
- **Jupyter Notebook**

SECTION I (40 MARKS)

1. After the successful installation of Python on your PC, you need to confirm the installation. Which command is used to verify and provide more details about the installation? (2 marks)

2. A Python entry programmer wrote the following statement that led to a type error during program execution.

```
num1='234'
num2=455
res=num1 +num2
print(res)
```

Write a single line of code to explicitly convert num1 to an integer using a relevant predefined function to solve the problem. (2 marks)

3. State the name given to the canvas that contains the other elements of the plot during the data visualisation. (2 marks)

4. Given the two data sets X and Y below, which has a larger standard deviation than the other? (2 marks)

X	50	50	50	50	50
Y	10	30	50	80	90

5. Insight Data Labs is studying an experiment that can result in only two outcome, success or failure. The equipment is repeated multiple times independently. Which probability distribution best describes this scenario? (2 marks)

6. The type of data visualisation depicted in map form with shapes and colours that illustrate the relationship between specific location such as a choropleth or heatmap is known as_____. (2 marks)

7. Write the Python statement that will display an array of one row and five columns with a sequence of elements filled with ones. (2 marks)

8. What command-line tool is commonly used within Python virtual environments to manage and install external packages like NumPy or Matplotlib? (2 marks)

9. What Matplotlib command ensures that a plot is displayed in a Jupyter Notebook cell after being generated? (2 marks)

10. What Python module function is used to generate reproducible random numbers for Monte Carlo simulations in data analysis? (2 marks)

11. Which Pandas feature enables efficient handling of missing data in DataFrames through methods like fillna() and dropna()? (2 marks)

12. Which Pandas data structure is a two-dimensional, tabular format that supports heterogeneous data and labeled axes? (2 marks)

13. ABC Research Institute wants to determine whether the results of their recent experiment are statistically significant. Which statistical measure is primarily used for this purpose? (2 marks)

14. DataStat Analytics is analysing the likelihood of a certain number of successful outcomes occurring within a fixed number of independent trials. Which probability distribution is primarily used for this purpose? (2 marks)

15. A Python plot that shows the relationship between two variables as individual points on a Cartesian plane is known as a _____. (2 marks)

16. TechNova Solutions is developing a data analysis tool using Python and needs an efficient structure to store elements of the same type in a fixed-size, multi-dimensional format. Which core data structure in NumPy is used for this purpose? (2 marks)

17. When combining multiple pandas DataFrames along a particular axis while keeping only the rows or columns present in all frames, the how argument of the merge() or concat() function should be set to _____. (2 marks)

18. DataWorks Analytics needs to load and manipulate CSV files for data preprocessing in Python. Which Python module or method is commonly used for this purpose? (2 marks)

19. In Python scikit-learn library, the unified object that bundles together data preprocessing steps and an estimator so they can be treated as a single model is known as _____. (2 marks)

20. In Python, which is the function used in Matplotlib to display a chart or graph on the screen? (2 marks)

SECTION II (60 MARKS)

Create a folder on the desktop called "December_25" to save ALL your work.

21. Create a word document called "Question 21" to save and capture the screenshots for Questions 21. Create a Python script called "visual21" to perform the tasks in questions (a) to (d).

Year	TotalSales	OnlineSales	StoreSales	NewCustomers
2015	520000	120000	400000	3500
2016	580000	150000	430000	4000
2017	640000	200000	440000	4200
2018	720000	250000	470000	4600
2019	810000	310000	500000	5000
2020	900000	380000	520000	5500

(a) Write a Python script to create a line chart showing the trend of TotalSales over the years. The chart must have a title, axis labels, gridlines and markers. (5 marks)

(b) Write a Python script to create a bar chart comparing OnlineSales and StoreSales for each year. Ensure bars have different colours, a legend and axis labels. (5 marks)

(c) Write a Python script to generate a pie chart showing the proportion of OnlineSales and StoreSales in 2020.

Include percentages and a title. (5 marks)

(d) Write a Python script to create a scatter plot showing the relationship between NewCustomers and TotalSales.

Include a title, axis labels and gridlines. (5 marks)

Save "Question 21" and upload. **(Total: 20 marks)**

22. Create a word processing document named "Question 22" and use the word processor document to save your answers to questions (a) to (e).

Use the dataset below to answer the questions that follow.

Student name	Gender	Coursework_30	Final exam_70	Total mark_100
Alvin Ochieng	Male	25	67	92
Alice Moraa	Female	13	60	73
Christine Nekesa	Female	14	51	65
Janet Kertich	Female	19	21	40
Victor Kibet	Male	16	43	59
James Opiyo	Male	17	38	55
Stephen Mburu	Male	11	45	56
Norah Mwangi	Female	14	45	59
Cliff Rugongo	Male	15	41	56
Albert Makokha	Male	18	31	49
Alice Moraa	Female	13	60	73
Hellen Mwende	Female	21	32	53
Joseph Ouma	Male	19	25	44
Annete Njeri	Female	22	21	43
Viola Apiyo	Female	23	25	48
Janet Kertich	Female	19	21	40
Phillip Kyalo	Male	25	18	43
Diana Mwai	Female	27	16	43

(a) Create the dataset and save it as "myscores.csv". Use a formula to compute the total mark as the sum of final exam and coursework. (3 marks)

(b) Write the Python code to import the dataset into a Pandas data frame and clean it before displaying the first twelve rows. (4 marks)

(c) Write the Python code to rename the column "Final exam_70" to "Final_exam" and ensure that the Total_mark_100 column is consistent with the sum of coursework and exam marks. Display the last six rows to confirm that any inconsistencies have been corrected. (4 marks)

(d) Write the Python code that will use seaborn to create a boxplot of Total_mark_100 categorised by Gender. (4 marks)

(e) From the boxplot, write the Python code to analyse whether there is a noticeable difference in performance between genders. (5 marks)

Capture screenshots to demonstrate how you have performed the above task.

Save "Question 22" document and upload. **(Total: 20 marks)**

23. Create a Word document called "Question 23" and use it to save and capture the screenshots for Question 23.

Create a folder called "PDV25" and a Python script called "population" to perform the tasks in questions (a) and (b).

(a) The table below shows the dummy data on the Kenya population and households over the period of 10 years.

	A	B	C	D	E
1	**Year**	**TotalPopulation**	**MalePopulation**	**FemalePopulation**	**Households**
2	1985	19,876,972	9,740,000	10,137,000	3,800,000
3	1990	23,724,468	11,610,000	12,114,000	4,700,000
4	1995	27,768,185	13,590,000	14,178,000	5,600,000
5	2000	31,964,446	15,675,000	16,289,000	6,600,000
6	2005	36,624,784	17,950,000	18,675,000	7,600,000
7	2010	42,030,565	20,590,000	21,441,000	9,000,000
8	2015	47,878,225	23,460,000	24,418,000	10,300,000
9	2019	47,564,296	23,548,056	24,016,240	12,143,913
10	2020	53,771,185	26,345,000	27,426,000	12,800,000
11	2025	57,532,493	28,170,000	29,362,000	14,000,000

(i) Create the dataset in Excel and save it as a CSV file named "DummyPop" in the folder "PDV25". (5 marks)

(ii) Load the dataset created in 21 (i) and display the last five records using the pandas library. (3 marks)

(iii) Write the Python code to calculate and display the cumulative totals for the columns "TotalPopulation", "MalePopulation", and "FemalePopulation" for the 10 years. (2 marks)

(b) Use the list created in (a) (ii) to plot a line graph for population against the year for columns "TotalPopulation", "MalePopulation", and "FemalePopulation" for the 10 years.

Perform the following tasks:

(i) The title of the line chart is "Population Trends Over Time" with the X and Y axes well labeled. (2 marks)

(ii) Apply the colours for the line plot for each population, "TotalPopulation" (green), "MalePopulation" (blue), and "FemalePopulation" (yellow) (2 marks)

(iii) Display the bar chart output visualisation with a legend on the upper left (3 marks)

(iv) Display the final bar plot visualisation for insights within a grid (3 marks)

Save and upload "Question 23". **(Total: 20 marks)**

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DIPLOMA IN DATA MANAGEMENT AND ANALYTICS (DDMA)

LEVEL III
PYTHON DATA VISUALISATION

MONDAY: 18 August 2025. Morning Paper. **Time Allowed: 3 hours.**

Answer ALL questions. This paper has two (2) sections. SECTION I has twenty (20) short response questions of two (2) marks each. SECTION II has three (3) practical questions of sixty (60) marks. Marks allocated to each question are indicated in the question.

Required resources:
- **A computer**
- **Python programming language**
- **Pycharm IDE**
- **Jupyter Notebook**

SECTION I (40 MARKS)

1. NumPy's ability to interface with general-purpose database applications makes it one of the most useful libraries in Python Data Visualisation. Given the Python code:

```
import numpy,
p=      numpy.array([10,14,7,
80])
```


Write the code to replace the third element of the array with the integer value 55. (2 marks)

2. The summary statistic that is calculated for two related sets of observations to quantify the strength of the relation between them is known as _____. (2 marks)

3. The high-level, deep learning API that is written in Python and is used to make the implementation of neural networks easy is known as _____. (2 marks)

4. Which Python library is designed for building interactive visualisations and dashboards in web browsers with support for custom tools, widgets and real-time streaming of large datasets? (2 marks)

5. When comparing the shape of a distribution in Python, what measure of spread aids in determining the asymmetry of the probability distribution of a real-valued random variable about its mean? (2 marks)

6. What system variable needs to be configured during the installation of the Python environment for the operating system to locate and execute Python commands easily from any directory? (2 marks)

7. The operation used to filter rows in a DataFrame where the values in a column meet a condition is called _____. (2 marks)

8. State the output from the execution of the following Python code snippet:

```
import numpy

output = numpy.arange(9, 20, 2)
print(output)
```

(2 marks)

9. In Python, what term refers to the process of explicitly converting a floating-point number to an integer using functions like int ()? (2 marks)

10. What Matplotlib command is typically used to clear the current figure and avoid plot overlaps when generating multiple visualisations in the same session? (2 marks)

11. Which command-line tool is used to install external Python packages such as SciPy or Pandas? (2 marks)

12. Which statistical metric is used in Python to evaluate the strength and direction of a linear relationship between two numerical variables? (2 marks)

13. The software environment in Python which comes with code completion, debugging and project management features is known as _____. (2 marks)

14. The data wrangling technique in Python used to join datasets end-to-end either row-wise or column-wise is known as _____. (2 marks)

15. The built-in function in Python used to collect information entered through the console during program execution is called _____. (2 marks)

16. In Python programming, collections of modules that extend the language's functionality and can be easily installed and maintained are called _____. (2 marks)

17. In Python, when you want to split a single logical line of code across multiple physical lines for better readability, what special character can be used at the end of the first line to indicate that the statement continues on the next line? (2 marks)

18. _____ Python library provides a wide range of algorithms and tools for machine learning tasks like classification, regression, clustering and dimensionality reduction. (2 marks)

19. When a Python graph has more than one series or line, state the graphical object used to separate them by linking a name with each line or marker? (2 marks)

20. NumPy's main object is a multi-dimensional array of fixed-size, homogeneous items which is required for high-performance numerical operations. State the name given to this object. (2 marks)

SECTION II (60 MARKS)

21. Create a Word document named "Question 21" and use it to save and capture the screenshots for Question 21.

Create a Python script called "Statistics" to perform the tasks in questions (a) to (e).

(a) Write the Python code to load the following libraries:

(i) Load Numpy and assign an alias name. (1 mark)

(ii) Load the SciPy stats module and assign it an alias name. (1 mark)

(b) Write a Python code to create a list data structure to store the integer numbers given in the table below and display them on the console screen:

445	90	56	105	809	145	670	45	590	434

(3 marks)

(c) Write the Python code to perform the following exploratory tasks on the list data structure created in question 21 (b) above.

(i) Display the data type of the list. (1 mark)

(ii) Display the list sorted in both ascending order and descending order using the built-in function. (2 marks)

(iii) Display the first four elements of the list using the slicing concept. (2 marks)

(iv) Display the size of the list using the relevant function. (2 marks)

(d) Write the Python code to perform the following statistical computations of the list data structure created in question 21 (b).

(i) Compute and display the mean and the median of the integers stored in the list. (2 marks)

(ii) Compute and display the standard deviation. (1 mark)

(e) Using matplotlib and the seaborn libraries, visualise the dataset in question 21(b) using a well-labelled line graph and the trendline with the values against an index. (5 marks)

Save "Question 21" document and upload. **(Total: 20 marks)**

22. Create a Word document named "Question 22" and a Python script named "Livestock" to save and capture the screenshots for the answers to this question.

The following table represents a dataset about cattle in a research farm. Use the table to write the Python code to perform the tasks (a) to (f).

Cattle_ID	Breed	Age	Weight	Milk_Production	Location	Health_Status
101	Friesian	4	550	18	Nairobi	Good
102	Holstein	5	600	22	Kiambu	Good
103	Jersey	3	480	14	Nyeri	Average
104	Boran	6	700	10	Kisumu	Poor
105	Ayrshire	2	520	15	Mombasa	Good
106	Sahiwal	5	650	12	Nakuru	Average
107	Guernsey	4	570	17	Eldoret	Good
108	Nguni	6	620	13	Meru	Poor
109	Ankole	5	750	11	Kakamega	Average
110	Brown Swiss	3	490	16	Thika	Good

(a) Create a folder called "AnimalFarm" located in drive C. Use the data provided in the table to create a CSV dataset called "CattleFarm" in the folder. (4 marks)

(b) Load the appropriate library to enable you to load the dataset created in (a) as a DataFrame named "dfCattle" and display a few animals to confirm successful loading. (4 marks)

(c) Clean the dataset by dropping any observation with a missing value using the relevant Python function. (2 marks)

(d) Display the first ten records from the dataset created and its summary statistics. (3 marks)

(e) Group cattle by Breed and analyse milk production per breed. (3 marks)

(f) Create a well-labelled scatter plot to visualise the milk production of the cows against their age. (4 marks)

Save "Question 22" document and upload. **(Total: 20 marks)**

23. Create a word processing document named "Question 23" and use the word processor document to save your answers to questions (a) to (c).

(a) Given the dataset of A = (5,6,9,8,7,3,18,3,7,5,14,13,9,7), write the Python codes that will perform the following tasks:

(i) Compute and print the mean and standard deviation. (4 marks)

(ii) Compute and print the t-test and p-values. (5 marks)

(b) Given the data points U = (1,4,6,9) and V = (3,1,2,5), write the Python code that will create the interpolation function, define the interpolation values then plot the results. (5 marks)

(c) You are provided with the following dataset showing the number of students who passed a coding test out of 10 trials, recorded across different batches:

Batch	Successes	Trials
A	7	10
B	5	10
C	6	10
D	8	10
E	4	10

(i) Write the Python code to create the dataset and calculate the probability of exactly 6 successes in 10 trials assuming the probability of success p=0.6. (3 marks)

(ii) For each batch, calculate the probability of the observed number of successes using the binomial distribution. (3 marks)

Capture screenshots to demonstrate how you have performed the above task.

Save "Question 23" document and upload. **(Total: 20 marks)**

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DIPLOMA IN DATA MANAGEMENT AND ANALYTICS (DDMA)

LEVEL III

PYTHON DATA VISUALISATION

TUESDAY: 22 April 2025. Morning Paper. **Time Allowed: 3 hours.**

Answer ALL questions. This paper has two (2) sections. SECTION I has twenty (20) short response questions of two (2) marks each. SECTION II has three (3) practical questions of sixty (60) marks. Marks allocated to each question are indicated in the question.

Required resources:

- **A computer**
- **Python programming language**
- **Pycharm IDE**
- **Jupyter Notebook**

SECTION I (40 MARKS)

1. To facilitate code reusability Python Programming uses powerful features by creating a block of code executed when it runs. Which Keyword in Python is used to make this block of code? (2 marks)

2. Comments in Python Programming are text notes that help other programmers understand our code. Write the delimiters of multiple-line comments as used in Python Programming. (2 marks)

3. Combining datasets from multiple sources into a single dataset using the common columns or indices in Python Programming is known as _____. (2 marks)

4. The name given to the collection of data that holds a fixed number of values of the same type in Numerical Python (Numpy) is referred to as an _____. (2 marks)

5. In data visualisation with Python, the code "from matplotlib import pyplot as plt" is rewritten as _____. (2 marks)

6. State the most common type of chart in data visualisation used to present category-wise data. (2 marks)

7. Identify the name given to the element of the plots circled in the figure1 below. (2 marks)

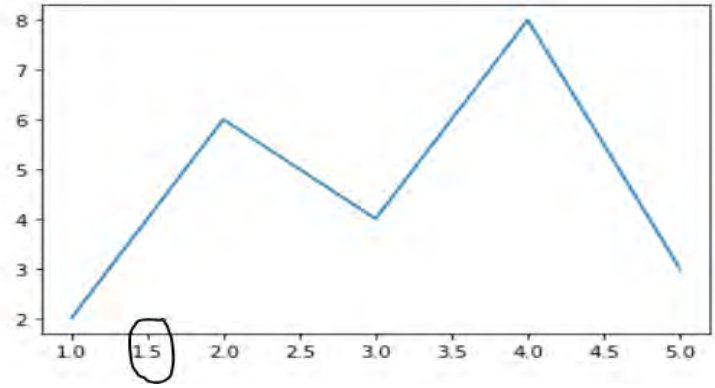

Figure 1

8. State the Python inbuilt function that is used to return the item at the given index position from a list and remove that item. (2 marks)

9. Identify the measure of central tendency that is computed using the formula in Figure 2. (2 marks)

$$\text{Mean} = \frac{\sum x_i}{n}$$

Figure 2

10. The non-primitive data structure in Python, containing an ordered collection of immutable elements is called _____. (2 marks)

11. In Python, the library often used to work with large datasets and supports integration with Matplotlib for visualisation is known as _____. (2 marks)

12. To visualise data on the Cartesian plane, you use data points of different types, sizes, and colors. State the name given to such a data point. (2 marks)

13. State the subsequence output after the following Python list is executed. (2 marks)

```
team = ['Cassam', 'Fredah', 'Evans', 'Anthony', 'Beryl' , 'Dickson']
print(team[1:3])
```

14. The type of data visualisation that is used to visualise hierarchical data as nodes with connecting lines showing a parent-child relationship is referred to as _____. (2 marks)

15. The principle in data visualisation that helps create clear effective visualisations and ensures that most ink consumed in a graphic is utilised to display data-related information, dynamically changing as the data changes is referred to as _____. (2 marks)

16. What is the name of the operator and its symbol that is used to divide the left-hand operand by the right-hand operand and return the remainder? (2 marks)

17. Write down the Python statement that is used to compute correlation in Pandas to compare the absolute value of the correlation between each pair of variables. (2 marks)

18. The summary of the probabilities of all possible outcomes of an experiment or situation is called _____. (2 marks)

19. The statistical method that tries to determine the strength and character of the relationship between one dependent variable and a series is referred to as _____. (2 marks)

20. What will be the display after the execution of the following looping control structure?

```
output = "PASSING"
for i in output:
   if i=='S':
      continue
   print(i, end=" ")
```

(2 marks)

SECTION II (60 MARKS)

21. Create a Word document called "Question 21" and use it to save and capture the screenshots for Question 21. Create a Python script called "DataVisual" to perform the tasks in questions (a) to (b).

(a) The table below shows the budgetary allocations for departments in an international company. In addition, it shows the colors and explodes to be used in visualisation of the data given.

percentage	dept	color	explode
50	Sales	magenta	0.1
20	HR	cyan	0.2
15	Finance	green	0.1
10	Production	red	0.2
5	Accounts	blue	0.1

(i) Import the relevant Python library for data visualisation that you will use in creating a pie chart for the data. (2 marks)

(ii) Create the Python lists to store the data shown in the table above. (6 marks)

(b) Use the list created in (a) (ii) to plot a pie chart with the following:

(i) The title of the pie chart is "Budgetary Allocation Pie Chart". (2 marks)

(ii) Apply the colors for each department as indicated in the table. (2 marks)

(iii) Display the portions exploded as indicated on the table for each department. (2 marks)

(iv) Display the percentage in each portion and format into one decimal place. (3 marks)

(v) Display a shadow in your pie chart output visualisation with a legend on the upper left. (3 marks)

Save "Question 21" document and upload. **(Total: 20 marks)**

22. Create a Word document called "Question 22" to save and capture the screenshots for tasks in questions (a) to (f).

The following dataset details the total sales, number of customers and marketing expenditure for Treetop LTD for each quarter for 2023 and 2024. Write the Python code to perform the following tasks in (a) to (f).

Quarter	**Sales ($)**	**Customers**	**Marketing Spend ($)**
Q1 2023	2500	290	500
Q2 2023	2300	300	750
Q3 2023	2750	535	1000
Q4 2023	3200	630	1450
Q1 2024	3700	680	1650
Q2 2024	6300	930	2350
Q3 2024	8100	1160	2850
Q4 2024	7850	1320	3600

(a) Use the data provided to create a Python data dictionary called "QuarteryData". (4 marks)

(b) Convert the data dictionary into a DataFrame name "df". (1 mark)

(c) Import the relevant data visualisation library and create a well-labeled line graph with a grid for the sales over the quarter. Label the graph title "Sales Trend Over Time" with a blue line, the x-ticks should be rotated at 45 degrees with a legend. Label the X and Y axes as "Quarters" and Sales ($) respectively. (5 marks)

(d) Create a pie chart for the marketing expenditure titled "Marketing Expenditure Distribution by Quarter". (3 marks)

(e) Create a correlation matrix for sales, customers and marketing spend titled "Variables Correlation Matrix". (3 marks)

(f) Create a scatterplot titled "Effect of Marketing Spend on Sales", setting the X and Y axis as used in 22 (c). (4 marks)

Save "Question 22" document and upload. **(Total: 20 marks)**

23. Create a Word document called "Question 23" and use it to save solutions to question (a) to (b) below.

Create a Python script called "SensorDataInfo" to perform the tasks in questions (a) to (b).

(a) The data below was captured from an IoT sensor collected at intervals of 10 minutes on the dates given. Study the table to answer the questions (i) to (iii).

Time	Temperature	Vibration	Pressure
9/17/2024 8:00	75	45.3	10000
9/17/2024 8:10	78	46	15000
9/17/2024 8:20	80	47.2	20000
9/17/2024 8:30	85	49	16450
9/17/2024 8:40	90	50.5	30000
9/17/2024 8:50	65	42	35000
9/17/2024 9:00	70	44	23500
9/17/2024 9:10	88	51	45000
9/17/2024 9:20	73	46.5	45000
9/17/2024 9:30	85	48.9	55000

(i) Create a dataset called "sensor_data" and save it in the appropriate locations on your local machine. (4 marks)

(ii) Import the appropriate libraries for visualising a line graph for data visualisation and data manipulation with relevant pseudonyms. (4 marks)

(iii) Write a Python script that will visualise the sensor readings over time using a well-labeled line graph from the dataset created in (i), including a legend and displaying the grid lines. (4 marks)

(b) Use the dataset about students' information provided below to answer questions (i) and (ii) below.

Name	Grade	Year	Marks
Kate	10	2020	85
Ndanu	9	2020	78
Mutia	9	2021	92
Mutuma	11	2020	88
Situma	10	2021	91
Arnold	12	2021	95
Masaki	11	2022	89
Tito	10	2020	87

(i) Convert the dataset as a Python dictionary data structure, importing appropriate data manipulation library and display the students' details. (4 marks)

(ii) Convert the dataset into a DataFrame, group the data by the year and display the details of all class 2020 students. (4 marks)

Save "Question 23" document and upload. **(Total: 20 marks)**

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DIPLOMA IN DATA MANAGEMENT AND ANALYTICS (DDMA)

LEVEL III

PYTHON DATA VISUALISATION

MONDAY: 2 December 2024. Morning Paper. **Time Allowed: 3 hours.**

Answer ALL questions. This paper has two (2) sections. SECTION I has twenty (20) short response questions. Each question is allocated two (2) marks. SECTION II has three (3) practical questions of sixty (60) marks. Marks allocated to each question are indicated in the question.

Required resources:

- **A computer**
- **Python programming language**
- **Pycharm IDE**
- **Jupyter Notebook**

SECTION I (40 MARKS)

1. The python mode of programming where a group of commands are put into a file before executing the file sequentially is known as _____. (2 marks)

2. Illustrate the output from the following Python code snippet as used in Python data visualisation:

```
for i in range (10):
if i % 2 = = 0:
      continue
  print(i)
```

(2 marks)

3. The principle of effective data visualisation defined as avoiding overcomplicating the visualisation with too many data points or chart types is referred as _____. (2 marks)

4. Write a Python script to add a title “Simple line Plot” to a graph. (2 marks)

5. What is the largest machine learning library with extensive APIs for performing tensor computations? (2 marks)

6. The unnecessary or distracting elements in data visualisations that do not enhance understanding are called _____. (2 marks)

7. Given the Python list: students = ["Kamau", "Otieno", "Juma", "Kamante", "Kodonyo", "Njok", "Bakari"], write a Python statement to insert the student "Ngetitch" between "Kamante" and "Kodonyo". (2 marks)

8. Given the Python dataset named “df_clients”, illustrate how you would display some statistical information from the dataset. (2 marks)

9. The SciPy library subpackage that includes the basic functions to solve eigenvalue problems, decompositions, matrix functions, special matrix functions, matrix equation solver functions and low level routines is referred to as _____. (2 marks)

10. The python function used to exclude the missing values from a data frame is referred to as _____. (2 marks)

11. A design pattern in Python that enables programmers to add new functionality to an existing object without altering its structure is referred to as _____. (2 marks)

12. Identify the type of visualisation in Figure 1 that is used in exploratory data analysis to illustrate statistical distributions in a dataset. (2 marks)

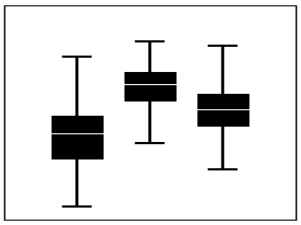
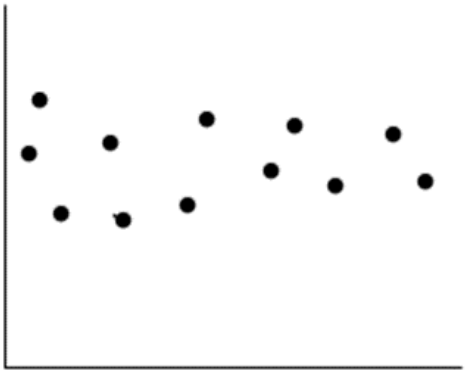


Figure 1

13. The plots used to determine whether a dataset or time series is random are known as _____. (2 marks)

14. Identify the correlation represented by the scatter plot below: (2 marks)



15. The process of extracting a portion of a list or string using a start and end index as used in Python programming is referred to as _____. (2 marks)

16. State the concept in Python programming which refers to a combination of the condition and action being repeated until the condition becomes false. (2 marks)

17. In Python data visualisation, a file that contains definitions and functions that can be imported into other programs is known as _____. (2 marks)

18. Indicate the mathematical operator in Python that is used for performing exponentiation operations. (2 marks)

19. Write the matplotlib statement that you could use to display the whole chart without displaying the axes as used in Python data visualisation. (2 marks)

20. State the output from the execution of the Python code: pow(5, 2, mod=9). (2 marks)

SECTION II (60 MARKS)

21. Create a Word document called "Question 21" and use it to save and capture the screenshots for Question 21. Create a Python script called "student" to perform the tasks in questions (a) to (g).

(a) Use the table shown below to create a CSV dataset called "stud" that contains the details on students' performance in a class and save it on the most appropriate location on your local machine. (3 marks)

GRADE	NUMBER
A	25
B	40
C	30
D	15
E	5

(b) Write a Python script to import the matplotlib and panda's libraries on the Python scripts "student" assigning the appropriate alias names. (3 marks)

(c) Load the dataset from the CSV file into a DataFrame called "studgrades". (2 marks)

(d) Display the contents of the dataset for verification purposes. (2 marks)

(e) Visualise your results by using a blue bar chart labelling both axes with the appropriate captions. (3 marks)

(f) Write a script to calculate and display the number of students in a class. (3 marks)

(g) Write a script to calculate and display the percentage performance for each grade. (4 marks)

Save "Question 21" document and upload. **(Total: 20 marks)**

22. Create a word processing document named "Question 22" and use the word processor document to save your answers to questions (a) and (b).

(a) Given the dataset of A= (5,6,9,8,7,3,18,3,7,5,14,13,9,7) write the python codes that will perform the following tasks:

(i) Compute and print the mean and standard deviation. (5 marks)

(ii) Compute and print the t-test and p-values. (5 marks)

(b) Given the data points U = (1,4,6,9) and V = (3,1,2,5), write the python code that will create the interpolation function, define the interpolation values and plot the results. (10 marks)

Capture screenshots to demonstrate how you have performed the above tasks.

Save "Question 22" document and upload. **(Total: 20 marks)**

23. Create a Word document called "Question 23" and use it to save and capture the screenshots for Question 23.

Create a Python script called "employees" to perform the tasks in questions (a) to (e).

(a) Study the table provided below showing the number of employees in each department for a non-governmental organisation and use it to answer questions (i) to (iii).

DEPARTMENTS	EMPLOYEES
HR	20
IT	50
Finance	15
Marketing	30
Sales	45

(i) Using Python list, create a list of the departments and the number of employees from the data provided in the table and import the matplotlib library. (4 marks)

(ii) Create the visualisation for the distribution of employees in the department using a labelled histogram chart adding titles and labels, grouping the data points into equal intervals of 5 bins with black edge color. (4 marks)

(iii) Create a labelled box plot to visualise the employees' data. (2 marks)

(b) Using the dataset provided in (a), define a Python dictionary to store the data in an object called "emprec". (3 marks)

(c) Extract the keys and values of the data dictionary created in (b) and display the results on the console screen. (2 marks)

(d) Write a Python script to create a labelled pie chart to visualise the data dictionary created in (b) above. (3 marks)

(e) Write a Python script to visualise the data using a labelled scatter plot. (2 marks)

Save "Question 23" document and upload. **(Total: 20 marks)**

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DIPLOMA IN DATA MANAGEMENT AND ANALYTICS (DDMA)

LEVEL III

PYTHON DATA VISUALISATION

MONDAY: 19 August 2024. Morning Paper. **Time Allowed: 3 hours.**

Answer ALL questions. This paper has two (2) sections. SECTION I has twenty (20) short response questions. Each question is allocated two (2) marks. SECTION II has three (3) practical questions of sixty (60) marks. Marks allocated to each question are indicated in the question.

Required resources:
- **A computer**
- **Python programming language**

SECTION I (40 MARKS)

1. State the python data type that includes list, tuple and range. (2 marks)

2. The python variables which are used for configuration of data that varies between deployment stations and for sensitive data that should not be stored directly in the code are referred to as _____. (2 marks)

3. In python, a one-dimensional array that holds data of any type is known as _____. (2 marks)

4. State the syntax for a python method that can be used to clear all the data from the set data structure. (2 marks)

5. Which function in Python generates random numbers from a normal distribution? (2 marks)

6. The high-level, deep learning API that is written in python and is used to make the implementation of neural networks easy is known as _____. (2 marks)

7. The python environment variable which is used to ignore all import statements while calling the python interpreter is called _____. (2 marks)

8. State the python function that can be used to get keyboard data from the user in python. (2 marks)

9. A fast and space efficient multidimensional array that provides vectorised arithmetic operations and sophisticated broadcasting capabilities in NumPy is called _____. (2 marks)

10. What is the name of the powerful framework for obtaining, processing and storing web data using Python? (2 marks)

11. The high-level neural networks API written in python and capable of running on top of TensorFlow and is designed to be modular, fast and easy to use is known as _____. (2 marks)

12. State the Python library for interactive data visualisation that generates plots using HTML and JavaScript, designed for modern web browsers to offer high-performance interactivity. (2 marks)

13. Which Python library is used in scientific and technical computing to improve the performance of optimisation, integration, interpolation and linear algebra? (2 marks)

14. After installing Pandas, state the command you would use to import the library to the python script or notebook. (2 marks)

15. Which Pandas method is used to determine pairwise correlation of columns that exclude NA/null values? (2 marks)

16. State the name given to the Python data visualisation function for analysing data by grouping it, based on one or more columns and then performing operations such as aggregation on those groups. (2 marks)

17. Which tool transforms basic columnar data into a two-dimensional table, offering a comprehensive summary of the dataset? (2 marks)

18. Which fundamental concept in statistical hypothesis testing allows you to measure the degree of evidence against the null hypothesis based on actual data? (2 marks)

19. What is the name given to two-dimensional, size-mutable and heterogeneous tabular data structure in pandas? (2 marks)

20. The test that assesses if there is a statistically significant difference between the expected frequencies and the reserved frequencies in one or more categories of a contingency table is known as _____. (2 marks)

SECTION II (60 MARKS)

21. Create a word processing document named "Question 21" and use the word processor document to save your answers to questions (a) to (e) below.

(a) Create the data set below and save it as **"stockdataset.csv".** (4 marks)

Date	Opening	Maximum	Minimum	Closing
21/04/2021	120467	123200	122400	123987
23/04/2021	430676	423000	422765	435876
28/04/2021	232657	222451	221543	234900
30/04/2021	373834	376544	367089	378799
2/5/2021	431290	434167	439088	432153
9/5/2021	431290	431167	429088	432153
11/5/2021	482747	485667	484655	487707
13/5/2021	540203	542803	541345	543261
14/5/2021	592660	597660	596655	598815
15/5/2021	373834	375544	366787	367007
3/5/2021	121987	123400	122900	124567
4/5/2021	433876	423090	422995	436233
5/5/2021	232900	222651	221443	235675
7/5/2021	373834	375544	368089	376599

(b) Write the python code that will import the data set into a data frame called "Stock data" and display the output after executing the code. (4 marks)

(c) Write the python code which will ensure that the Date variable is a datetime variable and sort the data in ascending order by the date. (5 marks)

(d) Write the python code which will create and display a line plot of date against closing and opening values. (4 marks)

(e) Write the python code which will add the legends Start and End for the opening and closing stocks respectively. (3 marks)

Capture screenshots to demonstrate how you have performed the above tasks.

Save and upload "Question 21". **(Total: 20 marks)**

22. Create a word document called "Question 22" to save and capture the screenshots for Questions 22. Create a Python script called "Question 22" to perform the tasks in questions (a) to (d) below.

Use the table below and the questions that follows:

Programming language	Popularity
Java	22.2
Python	17.6
PHP	8.8
JavaScript	8
C#	7.7
C++	6.7

(a) Import the Pandas and Matplotlib libraries and assign the aliases using the common convention. (2 marks)

(b) Create a Python dictionary called "popu" using the table provided above. (3 marks)

(c) Generate and display a bar chart using Matplotlib, including the grid lines, customise the minor grid and sets the title of the plot to "Popularity of Programming Languages", the X-axis (Languages) and Y-axis (Popularity) respectively. (9 marks)

(d) Using relevant Python libraries, write a program to generate 2000 random numbers between 1 and 500 and visualise the data using a well labeled horizontal bar chart and save the script as "horizontalB". (6 marks)

Save and upload "Question 22". **(Total: 20 marks)**

23. Create a word document called "Question 23" to save and capture the screenshots for Questions 23. Create a Python script called "Question23" to perform the tasks in questions (a) to (b) below.

Use the table below to answer the questions that follow:

Name	Age	Allowance
Mary	20	20,000
Olive	18	18,000
Nick	21	17,000
Sam	19	8,000

(a) (i) Create Python dictionary called "casual" and use it to create a DataFrame called "emp". (4 marks)

(ii) Write the Python code to display the second row and the row where the name Nick exists. (2 marks)

(iii) Write the Python code to add a new column for gender for each record labelled as 'M' for male and 'F' for female. (2 marks)

(iv) Write the Python code to rename the column for "Age" to "Allowance". (2 marks)

(b) Data visualisation relates to the use of visual tools like charts, graphs and maps to visually represent and understand trends, outliers and patterns in data.

Write a Python program to create bar plot from a DataFrame.

Sample Data Frame:
a b c d e
2 4,8,5,7,6
4 2,3,4,2,6
6 4,7,4,7,8
8 2,6,4,8,6
10 2,4,3,3,2

(i) Import the Pandas dataframe, numpy and Matplotlib libraries and assign the aliases using the common convention. (3 marks)

(ii) Create the array called 'a' and dataframe 'df' with the frame provided above. (3 marks)

(iii) Plot a bar chart from the data above. Turn on the grid and minor ticks with line width set to 0.5 and color green and black. (4 marks)

Save and upload "Question 23". **(Total: 20 marks)**

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DIPLOMA IN DATA MANAGEMENT AND ANALYTICS (DDMA)

LEVEL III

PYTHON DATA VISUALISATION

MONDAY: 22 April 2024. Morning Paper. **Time Allowed: 3 hours.**

Answer ALL questions. This paper has two (2) sections. SECTION I has twenty (20) short response questions. Each question is allocated two (2) marks. SECTION II has three (3) practical questions of sixty (60) marks. Marks allocated to each question are shown at the end of the question.

Required resources

- **A computer**
- **Python program**

SECTION I (40 MARKS)

1. The python library that includes built-in functions for solving differential equations is referred to as: (2 marks)

2. The python function that defines the values of how data items are categorised is called: (2 marks)

3. The open-source Python library that extends the capabilities of Pandas to allow for easy manipulation and analysis of geospatial data is called: (2 marks)

4. State the Python inbuilt method used to generate N random numbers between 0 and 1 sampled from a uniform data set. (2 marks)

5. _____ is the measure of the asymmetry of the probability distribution of a real-valued random variable about its mean. (2 marks)

6. The python package that creates a parse tree for parsed web pages based on specific criteria that can be used to extract, navigate, search and modify data from HTML is referred to as: (2 marks)

7. What is the measure of the difference between the highest and lowest values in a dataset? (2 marks)

8. The basic component of a plot in data visualisation that displays the horizontal and vertical lines that help readers gauge the values of data points is known as: (2 marks)

9. _____ in data visualisation involves presenting data in a narrative format to covey a specific message or insight effectively. (2 marks)

10. Write down the python commands to import the pandas library then load a dataset from the csv file known as "level3.csv" into a data frame object called "ddma". (2 marks)

11. The symbol used to represent data points in a scatter plot such as a dot, circle or a square is referred to as: (2 marks)

12. State the name of the python command that can be used to add a subplot to an existing 2-D plot in order to draw a 3-D plot. (2 marks)

13. The fundamental aspect of Python syntax used to define the structure of code blocks, such as loops, conditional statements and function definitions typically done using spaces or tabs is called _____. (2 marks)

14. _____function is used in matplotlib to save a plot as an image such as PNG or JPEG format. (2 marks)

15. The lightweight data-interchange format that is human-readable and easy for both humans and machines and represents data in key-value pairs is known as: (2 marks)

16. _____ provides a comprehensive environment for writing, debugging and running Python code such as Jupyter Notebook, Spyder and IDLE. (2 marks)

17. _____ refers to using one value to describe multiple data points for example calculating average value of many student scores. (2 marks)

18. The python module that is used to read from or write to Excel files is referred to as: (2 marks)

19. State the name given to the Python data visualisation function for analysing data by categorising it based on one or more columns and then performing operations such as aggregation on those groups. (2 marks)

20. _____is a python module with a highly-productive interface for solving machine learning (ML) problems with a focus on modern deep learning. (2 marks)

SECTION II (60 MARKS)

21. Create a word document called "Question 21" to save and capture the screenshots for Question 21.

Create a Python script called "visual21" to perform the tasks in questions (a) to (b).

(a) Use the table below to answer the questions that follow:

Year	Sales
2015	10000
2016	12000
2017	15000
2018	18000
2019	20000
2020	25000

(i) Write the python code to import the Pandas and Matplotlib libraries and assign the aliases using the common convention. (2 marks)

(ii) Create a Python dictionary called "allData" using the table provided above. (3 marks)

(iii) Create a two-dimensional Pandas DataFrame called "dfSales" using the data dictionary created in (ii) above. (2 marks)

(iv) Write the python code to save the DataFrame "dfSales" to a file named "sales_data.csv". (2 marks)

(v) Write the python code to generate and display a solid line plot with dots markers using Matplotlib, including the grid lines and sets the title of the plot to "Yearly Sales Trend", the X-axis (Years) and Y-axis (Sales) respectively. (5 marks)

(b) Using relevant Python libraries, write a program to generate 100 random numbers between 1 and 10, visualise the data using a well labelled boxplot and save the script as "boxplot". (6 marks)

Capture a screenshot to demonstrate how you have performed the above task.

Save and upload "Question 21". **(Total: 20 marks)**

22. Create a word document called "Question 22" and use it to save and capture the screenshots for Questions 22.

Create a Python script called "visual22" to perform the tasks in questions (a) to (b).

(a) Use the table below to answer the questions that follow:

Name	Age	Salary
Dan	25	50000
Anita	30	60000
Susan	35	55000
Caleb	40	80000

(i) Use the table shown above to create Python dictionary called "staff" and use it to create a DataFrame called "emp". (4 marks)

(ii) Write the Python code to display the second row and display the row where name is "Susan". (2 marks)

(iii) Write the Python code to add a new column for gender for each record labeled as 'M' for male and 'F' for female. (2 marks)

(iv) Write the Python code to rename the column for "Age" to "Years". (2 marks)

(b) Write python codes to answer the data visualisation questions in b (i) to b (iii).

(i) Display a multiple plot lines for years against name and gender respectively using the relevant library. (4 marks)

(ii) Use the Matplotlib library to create a new figure and a set of subplots within that figure. Set the title for the subplots to "Age Vs. Name", the X-Axis as "Years" and Y-axis as "Name". (3 marks)

(iii) Create a line plot for "Years" against the "Names", on a set of axes using the data from a DataFrame. The data points should be represented by circular markers in blue with a dashed line connecting them. (3 marks)

Capture a screenshot to demonstrate how you have performed the above task.

Save and upload "Question 22". **(Total: 20 marks)**

23. Create a word document called "Question 23" to save and capture the screenshots for Questions 23. Create a Python script called "visual23" to perform the tasks in questions (a) to (e).

(a) Write a Python script to import the data visualisation libraries Seaborn and matplotlib, load the inbuilt dataset "tips" and display the data. (5 marks)

(b) Using Seaborn, Create and display a scatter plot for "tips" against the "total bill"from the dataset loaded in question 23 (a). Using Python, Label the title, X and Y axes. (5 marks)

(c) Write a Python script to display only rows where the total bill is greater than 30. (3 marks)

(d) Write a Python script to calculate the tip percentage of the total bill. (4 marks)

(e) Write a Python script to calculate the tip percentage of the total bill. (3 marks)

Capture a screenshot to demonstrate how you have performed the above task.

Save and upload "Question 23". **(Total: 20 marks)**

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DIPLOMA IN DATA MANAGEMENT AND ANALYTICS (DDMA)

LEVEL III

PYTHON DATA VISUALISATION

MONDAY: 4 December 2023. Morning Paper. **Time Allowed: 3 hours.**

Answer ALL questions. This paper has two (2) sections. SECTION I has twenty (20) short response questions. Each question is allocated two (2) marks. SECTION II has three (3) practical questions of sixty (60) marks. Marks allocated to each question are shown at the end of the question.

Required resources

- **A computer**
- **Python program**

SECTION I (40 MARKS)

1. When using python, which command can be typed at the command prompt to install the core SciPy packages? (2 marks)

2. The python environment variable that contains a list of directories where Python searches for modules when there is need to import them in to the scripts is referred to as _____. (2 marks)

3. The Numpy array attribute that returns a tuple with each index having the number of corresponding elements is called _____. (2 marks)

4. The comprehensive software tool that provides features for writing, debugging, and running Python code with features like code completion, debugging tools and project management in Python data visualization is called_____. (2 marks)

5. The python function activity that gives the function a name, specifies the parameters that are to be included in the function and structures the blocks of code is called _____. (2 marks)

6. The python multi-line statements are usually denoted by_____. (2 marks)

7. A two-dimensional labeled data structure with columns of potentially different data types similar to a spreadsheet commonly used in Pandas structure for data manipulation, analysis and modeling is referred to as _____. (2 marks)

8. The Bokeh python data visualisation interface that provides high flexibility to application developers is referred to as _____. (2 marks)

9. Write the equation of a simple linear regression model used in Python data visualisation. (2 marks)

10. The python pandas method that returns the headers and a specified number of rows starting from the top is referred to as _____. (2 marks)

11. Write the python code that will import pyplot from Matplotlib. (2 marks)

12. Write the Python statement to create a histogram to visualise the distribution of data as used in Python data visualisation. (2 marks)

13. The python package that extends the datatypes used by pandas to allow spatial operations on geometric types is referred to as_____. (2 marks)

14. Write the python function that can be used to find the mode of a dataframe. (2 marks)

15. You have been given a dataset containing information about customer purchases at a retail store. State the exploratory data analysis function that you would use in Python to understand the data types and check for missing values. (2 marks

16. Write the python code that will load and read a CSV dataset in Python using pandas. (2 marks)

17. Which python function is used to find the skewness value? (2 marks)

18. Write the python code to generate a random 1x10 distribution for 2 occurrences. (2 marks)

19. Which is the python library that supports the statistical hypothesis test for independence between categorical variables? (2 mark)

20. The activity of processing the data in various formats for the purpose of analysing or getting them ready to be used with another set of data is referred to as: (2 marks)

SECTION II (60 MARKS)

21. Create a folder on the desktop called "PDV2023" to save your work. Create a word processing document called "Question 21" and use it to save and capture the screenshots for Questions 21. Create a Python script called "Quadratic" to perform the tasks in questions (a) to (f).

    A quadratic equation is created using the data values 9, 27, 81, 243, 729, 2187. You are required to:

    (a) Import the matplotlib and numpy libraries and give them relevant alias names. (2 marks)

    (b) Use the data values to create a list called "lstquad" and one-dimensional array called "quad" using Numpy and display the array. (4 marks)

    (c) Generate a line plot graph to visualise the array, add a label to the x-axis and y-axis as "X-AXIS" and "Y-AXIS" respectively and set the title of the plot as "Quadratic equation plot". Save your line plot as an image file called "plot.png". (5 marks)

    (d) Customise the appearance of the plot in question 21 (c) to change the line style to dashed and red color? (2 marks)

    (e) Create a scatter plot with green circular markers ('o') and add a label to identify it as a scatter plot. (3 marks)

    (f) Create a bar plot with the red, green and blue colors and labels "A, B, C, D, E, F". (4 marks)

    Save "Question 21" and upload.

    (Total: 20 marks)

22. Create a word processing document called "Question 22" to save and capture the screenshots for Questions 22. Save it in the "PDV2023" folder. Create a Python script called "3Dplot" to perform the tasks in questions (a) to (g).

    (a) Create three list data structures with mylst1, mylst2 and mylst3 of size 5 and populate then with arbitrary integer values between 1 and 25. (4 marks)

(b) Create and display a three dimension scatter plot by importing the relevant Python libraries. (5 marks)

(c) Customise and display your scatter plot to have star markers of size of the data point to 500. (3 marks)

(d) Modify the 3D scatter plot code to add relevant labels to the x, y, and z axes and provide a title for the plot. (2 marks)

(e) Write a Python code to retrieve and display a slice of the first three elements from "mylst2". (2 marks)

(f) Write a Python code to get and display the last element of "mylst3" using negative indexing. (2 marks)

(g) Write a Python code to extract and display a slice of the elements from index 1 to 4 from "mylst1". (2 marks)

Save "Question 22" and upload.

(Total: 20 marks)

23. Create a word document called "Question 23" to save and capture the screenshots for Questions 23 and save it in the "PDV2023" folder. Create a Python script called "Timeseries" to perform the tasks in questions (a) to (g) below. Use the CSV dataset provided below to answer the questions that follow:

```
Date, Total Sales
2023-01-01,15000
2023-02-01,17500
2023-03-01,18500
2023-04-01,22000
2023-05-01,25000
2023-06-01,28000
2023-07-01,30000
2023-08-01,31000
2023-09-01,28500
2023-10-01,25000
2023-11-01,21500
2023-12-01,19000
```


(a) Write a python code to import the pandas and matplotlib libraries using the relevant aliases. (2 marks)

(b) Create a Python dataset as a dictionary and assign it to an object called "data". (4 marks)

(c) Create and display the pandas DataFrame named "sales". (2 marks)

(d) Write the Python code to convert the 'Date' column to a datetime object. (2 marks)

(e) Plot the time series for the dataset to produce the output as shown in figure 1. (6 marks)

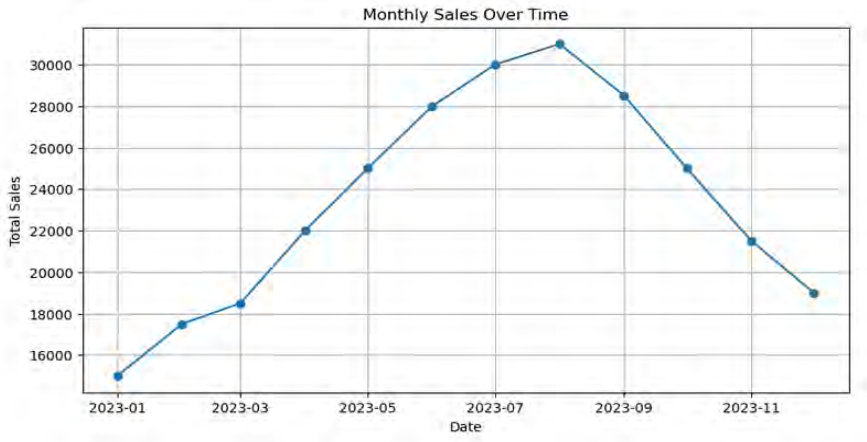

Figure 1

(f) Write the Python code to retrieve and display the total sales for 1st January 2023 from the "data" dictionary. (2 marks)

(g) Write the Python code to access and display the list of dates from the 'data' dictionary in reverse order. (2 marks)

Save "Question 23" and upload.

(Total: 20 marks)

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DIPLOMA IN DATA MANAGEMENT AND ANALYTICS (DDMA)

LEVEL III

PYTHON DATA VISUALISATION

MONDAY: 21 August 2023. Morning Paper. **Time Allowed: 3 hours.**

Answer ALL questions. This paper has two (2) sections. SECTION I has twenty (20) short response questions. Each question is allocated two (2) marks. SECTION II has three (3) practical questions of sixty (60) marks. Marks allocated to each question are shown at the end of the question.

Required resources

- **A computer**
- **Python program**

SECTION I (40 MARKS)

1. The name given to a set of horizontal and vertical lines that help with reading values from a plot in data visualisation chart is called_____. (2 marks)

2. The linear regression module that helps to conduct statistical tests and estimate models is called _____. (2 marks)

3. The open source python library which is used in mathematics, engineering, scientific and technical computing is referred to as _____. (2 marks)

4. State the method used to create a scatter plot in python. (2 marks)

5. The type of distribution that is used to model the number of events that occur within a fixed interval of time or space, given the average rate of occurrence as used in statistical data analysis is called _____. (2 marks)

6. Name two libraries that support Python Data Aggregation. (2 marks)

7. State the python function that will be used to label the title of a graph as “Car Graph”. (2 marks)

8. State the name given to the Python library which is used to create 2D graphs and plots using python scripts. (2 marks)

9. A file containing Python code that can be imported and used in other programs to allow the organisation of code into separate files for better modularity and reusability is called _____. (2 marks)

10. The python package designed for geospatial data processing in order to produce maps and other geospatial data analyses is referred to as _____. (2 marks)

11. The overall window that houses all the subplots and elements of visualisation as used in Python data visualisation is known as _____. (2 marks)

12. State the function used by the Python Pandas library to support the detection of missing values. (2 marks)

13. State the function of the pandas library which is used to read the contents of a comma separated values (CSV) file into the python environment. (2 marks)

14. A single value or observation within a dataset represented by a dot or marker in visualisation is called _____. (2 marks)

15. Name the python function that is used to read the entire html file. (2 marks)

16. The interactive visual displays that consolidate and present multiple data visualisations in a single view is referred to as _____. (2 marks)

17. What is the name given to the open-source Python library that allows programmers to build powerful tools, dashboards and complex applications _____. (2 marks)

18. Name the command used for installing Python Scikit-learn (Sklearn) libraries. (2 marks)

19. The python object that consists of contiguous one-dimensional segment of computer memory, combined with an indexing scheme that maps each item to a location in the memory block is called? (2 marks)

20. In python, which name best describes the data structure that stores only items that are of the same single data type? (2 marks)

SECTION II (60 MARKS)

QUESTION 21

Create a word document called "Question 21" and use it to save solutions to questions (a) to (g) below.

The table below contains an employee data set.

Employee	Age	Salary	Department
John	35	50,000	Sales
Emily	28	60,000	Marketing
Michael	42	70,000	Finance
Sophia	31	55,000	Sales
William	45	80,000	Finance
Olivia	33	65,000	Marketing

Required:

Using the Employees data set given above, create a Python script called "Employees" to perform the tasks in questions (a) to (g) below:

(a) Import the matplotlib and numpy libraries and give them relevant alias names. (2 marks)

(b) Use the dataset to create a data dictionary data structure called "employees". (4 marks)

(c) Extract the ages, salaries, departments from the data dictionary. (3 marks)

(d) Use a relevant function to extract the number of department and store the results in an object called "department_counts". (2 marks)

(e) Create the data visualisation using a bar chart showing the number of departments from the employees dataset with a well labeled x-axis as "Department" y-axis as "Count" and title as "Employee Distribution by Department". (4 marks)

(f) Create a pie chart for age distribution with the title "Employee Age Distribution". (2 marks)

(g) Create a well labeled scatter plot for salary against age. (3 marks)

Save question 21 document and upload. **(Total: 20 marks)**

QUESTION 22

Create a word document called "Question 22" and use it to save solutions to questions(a) to (g) below.

Use the data set provided below to answer the questions that follow:

A	B	C
1	2	3
2	4	6
3	6	9
4	8	12
5	10	15

Create a python script called "Boxplot" to perform the tasks in question (a) to (g).

(a) Import the appropriate data visualisation library for creating a box plot. (2 marks)

(b) Use the dataset above to create a Data Frame called "boxplot". (4 marks)

(c) Create a box plot of size 8 by 6. (3 marks)

(d) Plot the box plot using the values from the Data Frame created in (b) above. (2 marks)

(e) Sets the x-axis tick positions to be evenly spaced from 1 to the number of columns in the Data Frame. (3 marks)

(f) Set the x-axis label and the y-axis as "Variables" and "Values" respectively. (3 marks)

(g) Set the title of the plot as "Box Plot" and display the plot. (3 marks)

Save question 22 and upload. **(Total: 20 marks)**

QUESTION 23

Create a word document called "Question 23" and use it to save solutions to questions (a) and (b) below.

(a) Create a python script called "Floors" that will perform the tasks below:

The number of floors for the tallest buildings in Nairobi is as follows; 44,38,35,23,35,27,31. You are required to:

(i) Create a list data structure called "floors" and display the output on the console screen. (3 marks)

(ii) Display the last three elements of the list, accessing the list from right to the left. (3 marks)

(iii) Use a relevant list function to display the size of the list. (3 marks)

(iv) Display the elements of the list in ascending order using the relevant function. (3 marks)

(v) Use a list function to add another building with 28 floors at the end of the list. (2 marks)

(b) The LeadTech LTD decides to increase the salary for its programmers based on their performance. The programmers' rating ranges from lowest (1) to the highest (5). If the programmer's rating is greater than 4, the programmer gets an increment of 10%, else an increment of 5%.
Write a Python script called "salary" and assign a constant salary for an employee and the rating. The program should then calculate the programmer's increment and display the current, and new salary. (6 marks)

Save question 23 document and upload. **(Total: 20 marks)**

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DIPLOMA IN DATA MANAGEMENT AND ANALYTICS (DDMA)

LEVEL III

PYTHON DATA VISUALISATION

MONDAY: 24 April 2023. Morning Paper. **Time Allowed: 3 hours.**

Answer ALL questions. This paper has two sections. SECTION I has twenty (20) short response questions of two (2) marks each. SECTION II has three (3) practical questions of sixty (60) marks. Marks allocated to each question are shown at the end of the question.

Required resources

- **A computer**
- **Python program**

SECTION I (40 MARKS)

1. Name the data type for the python command x = ["John", "Alice", "Victor"] (2 marks)

2. A 3-Dimension plot can be represented in a 2-Dimension graph using a python data visualisation technique called: (2 marks)

3. The python syntax that does not mix tabs with spaces and uses blank lines to separate top-level function and class definitions is referred to as: (2 marks)

4. State the command that can be used to load python into memory from the command prompt. (2 marks)

5. The python library that is extensively used for scientific and technical computations due to its efficient routines is referred to as: (2 marks)

6. _____is a python environment variable that contains the path of an initialisation file containing python source code and is executed every time the interpreter is started. (2 marks)

7. Which type of data visualization is used to represent word frequency and to show the most commonly used words in a text dataset? (2 marks)

8. The process of transforming raw data into a format that can be used for analysis that involves cleaning, transforming, and aggregating the data to make it suitable for the analysis is called: (2 marks)

9. The block of code that performs a specific task in python, can be reused throughout a program and accepts arguments is referred to as: (2 marks)

10. The python data operation which involves the processing of data into different formats such as merging, grouping and concatenating is referred to as: (2 marks)

11. In python, the term that refers to a series of data points in which each data point is associated with a timestamp is referred to as: (2 marks)

12. The python term used to describe the use of python in statistical data analysis which is a special case of the binomial distribution where a single experiment is conducted so that the number of observations is 1 is referred to as: (2 marks)

13. Which python function is used to find the linear regression relationship of two variables? (2 marks)

14. Given the Python list, age=[34,23,13,61,22], what would be the output when the statement print(age[::-1]) (2 marks)

15. What name is given to the technique used to convert categorical variables into numerical data that can be used in the analysis? (2 marks)

16. Using python, illustrate how to create a 1D array in numpy with three integers numbers between 1 and 5. (2 marks)

17. Write the python code that will return the number of elements in the "boxes" array. (2 marks)

18. What kind of data visualisation chart is created using Seaborn sns.displot(data, bins=20, kde=False)? (2 marks)

19. State the two python functions that can be used to convert user input into a whole number. (2 marks)

20. State a commercial tool used for data visualisation in Python programming? (2 marks)

SECTION II (60 MARKS)

21. Create a word processing document named "Question 21" and use the word processor document to save your answers to questions (a) to (e).

(a) Create a file named "Student" using the data below and save it in csv format. (4 marks)

Student number	Student name	AFR marks	AFM marks	AAA marks
KAD234	Anne Morgan	45	76	65
KAD345	Morris Ogechi	67	78	43
KAD453	Alice Reegan	54	47	56
KAD453	Alice Reegan	54	47	56
KXE567	Donald Benard		65	63
KHY678	Violet Jones	45	73	34
KUT779	Michael Nketia	56		49
KNM555	Kevin Ndiga	76	42	
KLT666	Joseph Borch	54	45	73
KRT778	Anita Ngunyi	45	76	65
KDE887	Steven Mike	67	58	81

(b) Write the python code that will return a new data frame with no empty cells. (4 marks)

(c) Write the python code that will remove all rows with NULL values. (4 marks)

(d) Write the python code that will replace NULL values with the number 76. (4 marks)

(e) Write the python code that will draw a line in a diagram from position (1, 4) to position (7, 10). (4 marks)

Upload Question 21

(Total: 20 marks)

22. Create a word processing document named "Question 22" and use the word processor document to save your answers to questions (a) to (g)

(a) Write the code to define and display a 2-Dimensional arrays for the data provided in tables A and B using Numpy. (4 marks)

A

1	2
3	4

B

5	6
7	8

(b) Write the code to calculate the product of the two matrices A and B created in 22 (a) and display the result. (2 marks)

(c) Write the code get the inverse of the array B using a relevant python function and display the result. (2 marks)

(d) Write the code get the transpose of the array B using a relevant python function and display the result. (2 marks)

(e) Plot A and B as scatter plots with red and blue colors respectively using seaborn library. (4 marks)

(f) Adding labels to the X and Y axis of the scatter plot using the relevant plot functions. (3 marks)

(g) Add legend and show the plot for the scatter plot. (3 marks)

Upload Question 22

(Total: 20 marks)

23. Create a word processing document named "Question 23" and use the word processor document to save your answers to questions (a) to (f).

Write the Python program to do the following:

(a) Import pandas and matplotlib libraries. (2 marks)

(b) Use the table shown below to create a dataset called "employees" using python dictionary data structure**.** (4 marks)

Employee	Age	Salary	Job Group
Tim Kabi	32	50000	Group A
Raymond Tanui	28	55000	Group B
Seth Orlale	42	60000	Group A
Abigael Mugi	35	65000	Group C
Fabian Tom	40	70000	Group B

(c) Use pandas to create a data frame called "employees". (2 marks)

(d) Create a well labeled bar plot with X and Y axes, legend and a title, to group average "Salary" by "Job Group**.** (4 marks)

(e) Create a well labeled histogram to show the distribution of ages. (4 marks)

(f) Create a well labeled scatter plot for "Age" versus "Salary". (4 marks)

Upload Question 23.

(Total: 20 marks)

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DIPLOMA IN DATA MANAGEMENT AND ANALYTICS (DDMA)

LEVEL III

PYTHON DATA VISUALISATION

MONDAY: 5 December 2022. Morning Paper. **Time Allowed: 3 hours.**

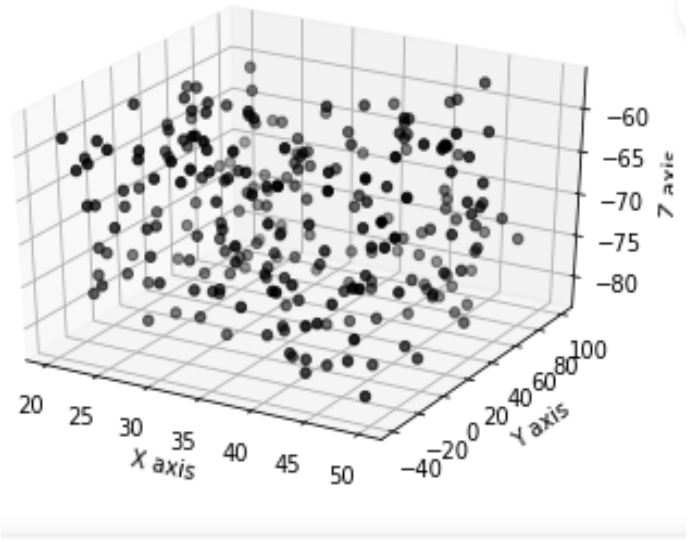
Answer ALL questions. This paper has two sections. SECTION I has twenty (20) short response questions of two (2) marks each. SECTION II has three (3) practical questions of sixty (60) marks. Marks allocated to each question are shown at the end of the question.

Required resources

- A computer
- Python program

SECTION I (40 MARKS)

1. A Scatterplot is a type of plot used to look at a predictive or correlational relationship between variables on a Cartesian coordinate. Write the name of the scatter plot shown in the figure below. (2 marks)



2. Name the set of tools and techniques supporting the analysis of geospatial data through the use of interactive visualisation to allow data exploration and decision-making processes. (2 marks)

3. State the name given to the visualisation of a single feature of the dataset by use of charts such as histograms and pie charts. (2 marks)

4. Outline how you create an empty list called age in Python programming. (2 marks)

5. The main cause of type I and type II errors in statistical analysis is due to observations that lacks certain information, on the variables in data sets. This tends to compromise the quality of data visualisation. State the term used to describe the lack of such information as used in data pre-processing. (2 marks)

6. The term given to things that we use while coding, to organise multiple pieces of data in different ways such as lists, tuples, trees and graphs in Python programming is_____. (2 marks)

7. Variables whose value cannot be determined before they happen are termed as random variables. State the name given to the type of random variable that can take any value from a range of values. (2 marks)

8. A scientific discipline used in the field of statistics that uses mathematical tools and techniques to make forecasts and projections by analysing a given dataset is known as _____.

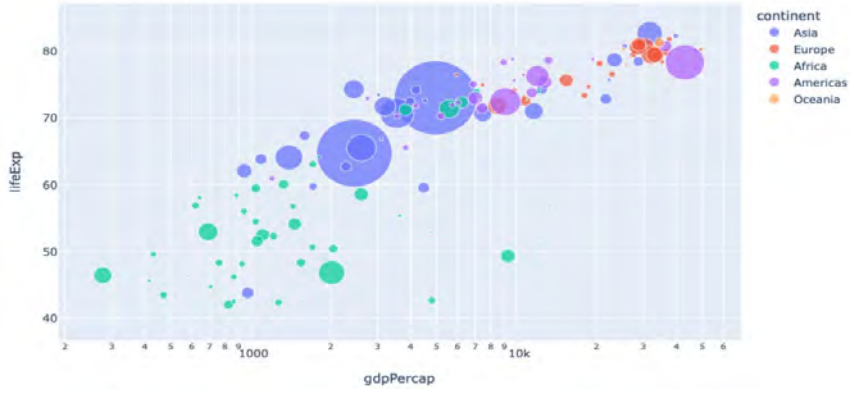
9. Identify the function used in Python to write records stored in a data frame to an SQL database? (2 marks)

10. The statistical measurement used to validate a hypothesis against observed data is referred to as _____. (2 marks)

11. Using the statement "**import numpy as np",** write a Python code to create an array object called "**obj**" shown below? (2 marks)

```
[[1, 2]
 [3, 4]]
```

12. Identify the chart shown in the figure below as used in data visualisation. (2 marks)



13. The mathematical science and methods of collecting, organizing and analyzing data in such a way that meaningful inferences can be drawn from them is called: (2 marks)

14. The feature that enables you to extract portions of arrays, strings, tuples and lists to generate new ones in python programming is known as: (2 marks)

15. In linear regression visualisation, the distance between an actual, observed value and the value predicted by the regression line is referred to as? (2 marks)

16. A Python based open-source library for solving mathematical, scientific, engineering, and technical problems which allows users to manipulate the data and visualize it and usually depends on numpy library is known as? (2 marks)

17. There exists a huge number of data sources available on the internet today for free use by anyone for their needs such as models testing and experimentation. State the name of the data source that is openly accessible, exploitable, and editable and shared by anyone. (2 marks)

18. The process consisting of a number of steps in which the raw data are transformed and processed in order to produce data visualisations to make predictions by use of analytical and statistical tools is referred to as: (2 marks)

19. State the name given to the Python programming data structure which is based on the concept of Key-Value pairs? (2 marks)

20. Rewrite a python statement that is equivalent to: "**from matplotlib import pyplot as plt",** in relations to Python data visualisation. (2 marks)

SECTION II (60 MARKS)

21. Create a word processing document named "Crops" and use the word processor document to save your answers to questions (a) to (d).

The table shown below contains the comparison of the produce of two crops; tea and avocados for six consecutive years in tons in one acre of land in Meru County. Study the tables to answer the questions that follow.

Year	**Tea**	**Avocados**
2011	2000	4000
2012	1900	3800
2013	2300	2700
2014	2500	2800
2015	2345	3950
2016	2390	4200

(a) Using Python programming language create lists of year, tea and avocados and display their values on the console screen. (5 marks)

(b) Use the list created in question (a) above to create a well labelled bar graph plot with X and Y axis and titles to show the production of tea against the years. (5 marks)

(c) Use the list created in question (a) above to create a well labelled line graph. Use the default line style, colour and a circle marker to show the production of avocados against the years. (5 marks)

(d) Use the list created in question (a) above to create a well labelled stacked bar graph, containing a title to show the production of tea and avocados against the years. (5 marks)

Upload Crops document.

(Total: 20 marks)

22. Create a word processing document named "Library" and use the word processor document to save your answers to questions (a) to (d).

(a) Import the Python library for seaborn using "sns" as an alias and load the seaborn dataset called ("tips) in an object called "custtips" and display the dataset on the console screen. (4 marks)

(b) Use the dataset in question (a) above to create bar plot to visualise the average day-wise bill amount (Y-Axis) of tips by customers for different days (X-Axis) of the week with X and Y axes clearly labeled. (4 marks)

(c) Use the dataset in question (a) above to create bar plot to visualise the bill amount (Y-Axis) of tips by customers for different days (X-Axis) of the week labeled. (2 marks)

(d) Write user friendly Python programming scripts to answer the following questions:

(i) Given a list of numbers 5, 6, 7, 8, 9 create a tuple called "numbers" and display on the console screen. (2 marks)

(ii) Write a python function to calculate the total of the elements of the tuple created in part d (i). (2 marks)

(iii) Display the last element of the tuple "numbers". (2 marks)

(iv) Display the elements of the tuple created in d (i) in reverse. (2 marks)

(v) Using a relevant tuple function, display size of the tuple created in d (i). (2 marks)

Upload Library document.

(Total: 20 marks)

23. Create a word processing document named "Random" and use the word processor document to save your answers to questions (a) to (e) below.

(a) Import Python numpy and matplotlib libraries, and assign them aliases "np" and "plt" respectively. (2 marks)

(b) Use the numpy to create an object called "myrange" to store random numbers in the range of 50 to 80 with a step up of 0.05 and display the values on the console screen. (2 marks)

(c) Convert the random numbers created in question (b) above and display the values on the console screen. (2 marks)

(d) Visualise using a line graph, the conversion to the random numbers created in question (b) above to its equivalent cosines numbers, with X-axis labeled as "Random Numbers" and Y-axis labeled as "Cosines" with the title as "Cosine of random cosine numbers". (4 marks)

(e) (i) Create the dataset shown below and save it on your PC's drive C as "examanalysis.csv". (4 marks)

Reg. No	Mean	Grade
001	56	C
002	78	A
003	67	B
004	82	A
005	45	D

(ii) Use pandas' relevant function to load the dataset created in e (i) into an object called exams. (3 marks)

(iii) Display the contents of the object created in part e (ii). (1 mark)

(iv) Create a histogram to visualise grades scored by the students in the class. (2 marks)

Upload Random document.

(Total: 20 marks)

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