Assessment Brief

Module title:	Maths for Data Science
Module code:	COM7023
Assignment title:	Maths for Data Science Portfolio
Assignment format:	Report
Word/time limit:	3000
File type	.docx file
Percentage of final grade	This assignment is worth 100% of your final grade for this module.
Submission deadline	See module iLearn page for date of submission
Grade release	You will normally receive your provisional grade and feedback within 20 working days of the submission deadline

Useful terms:

Learning outcomes (LOs)	The skills and knowledge that you should be able to show in your work.
Rubric/Marking Matrix	A set of rules or guidelines used to grade or assess work.

Task summary:

As part of the formal assessment for the programme you are required to submit a written **Mathematics for Data Science** assessment. Please refer to your Student Handbook for full details of the programme assessment scheme and general information on preparing and submitting assignments.

Description: The assessment is a written assessment and has been designed to check your fundamental understanding of the mathematical topics which under pins Data Science methodologies, such as Linear Algebra, Calculus, Probability and Statistics.

A clear, concise analysis for all Tasks is to be given within the submission, complimented with screenshot evidence of all processes and results. **You are to submit a single Word document for all tasks. The numerical calculations for your investigation are to be formatted using appropriate mathematical software editor tools. No handwritten, or photographs of written calculations will be accepted for this assessment. Your student ID number must be clearly defined upon the uploaded file.**

Assignment instructions:

For this task you must produce a written mathematical investigation. The numerical calculations for your investigation are to be formatted using appropriate mathematical software editor tools. No handwritten, or photographs of written calculations will be accepted for this assessment. You are to concisely detail what each result represents to compliment your calculations with an overall final report at the end.

Mathematical Assessment

Your employer has various official health contracts, one of which involves the World Population Agency. Your Line Manager wishes to check your competency across multiple mathematical disciplines, which include Linear Algebra, Calculus, Probability and Statistics for a particular population project on concentrated populations before she gives you a more complex problem on the topic.

The initial investigation will begin with modelling the interaction of two ethnic groups from which you will determine the characteristic equation of the transition matrix. To delve deeper, determine the eigen vectors and eigen value for population stability. The interaction of the two populations is modelled as

$$x_{n+1} = \begin{bmatrix} 1.2 & 0.1 \\ 0.05 & 1.1 \end{bmatrix}$$

Where $x_n = \begin{bmatrix} x_n \\ y_n \end{bmatrix}$ represents the population of the species *X* and *Y* at year *n*.

Once the stability approximation has been calculated, your manager wants you to further determine the population growth rate of Paris as a function of time over a 20-year period and calculate the maximum growth rate based upon

$$P(t) = 1000e^{0.03t}, t\ is\ representative\ of\ years$$

Your line manager now wishes that you investigate the number of random immigration events per year in Paris, modelled by a Poisson distribution with $\lambda = 5$, so that you can calculate the expected value and variance of the distribution and report on your results.

For the final numerical investigation you have been given data on 8 randomly selected districts within Paris and their relevant population numbers, which are stated below

$$1050, 1070, 1065, 1080, 1045, 1075, 1060, 1070$$

Assuming that the data is normally distributed, calculate the sample mean and standard deviation and construct a 95% confidence interval for the true mean population of the districts.

Once you have completed all the numerical calculations for each requirement, critically evaluate the results and write a relative, concise report on your findings, which can be presented to non-technical employees at the World Population Agency, so population growth can be efficiently monitored around Paris.

(100 Total marks)

(LO's: 1, 2, 3 & 4)

(2000 Word equivalent for analysis)

(1000 words)

Learning outcomes (LO)

By completing this assessment, you will have shown and be assessed on **all** four of the learning outcomes:

1. Develop an advanced understanding of mathematical concepts and their application in data science LO 1

2. Apply mathematical principles to solve data science-related problems. LO 2

3. Deploy mathematical functions and equations to derive advance analytical solutions. LO 3

4. Graduate Attribute:

Identify and solve novel and complex problems related to aims and desired outcomes. Critically evaluate and reflect on the approaches and solutions identifying and embedding possibilities for originality or creativity. LO4

You will be graded based on how well you meet these learning outcomes. Your marker will use a rubric/marking matrix to grade your work, and you can find this on the “My Assessment” tab on the module iLearn page.

Guidelines and policies

You can find links to more useful information about the assignment and university policies below.

Word/time limit policy	Click here to view the Arden University word count/time limit policy
Referencing guidelines Please follow the referencing guidelines that are appropriate for your degree programme. If you are unsure which you should be using, please contact your module team.	Click here for Harvard referencing guidelines
Academic integrity and misconduct policy	Click here to view Arden University's policy on academic integrity and misconduct
Statement on use of artificial intelligence on assessment	Click here to view Arden University's statement on the use of artificial intelligence on assessment
Support information	Click here to view guidance on how to apply for short-term extensions Click here to view guidance on how to apply for extenuating circumstances Please click here for link to academic skills team support