Bayview Secondary School
MDM4U - Grade 12 (SS2025)
Mathematics of Data Management, University Preparation
Culminating Task: Data Management Investigation

Curriculum Overall Expectations:
1. Design and carry out a culminating investigation that requires the integration and application of the knowledge and skills related to the expectations of this course
2. Communicate the findings of a culminating investigation

Part 1: Written statistical research analysis (10%)

1 Choosing a topic for the research analysis: (as a group)

1. Your group will…
   a) select two "companies" of the same industry to make comparison analysis of the companies' performance.
   Suggested industries:
      i) retails
      ii) technology
      iii) medical
      iv) agricultural
      v) communication technology
      vi) sports
      vii) countries
      viii) healthcare systems
      ix) education
      x) movies

   b) Compose an ISP Research Question for the research analysis that you are aiming to answer as the conclusion of the paper:
   Examples:
   - Which company is going to have a better financial growth in the next 3 years?
   - Which company is currently the leading one in industry?
   - Which company have a better financial management?
   - Which company is able to maximize its operating efficiency?
   - Which country would likely be reaching the lowest employment rate in the next 5 years?
   - Which movie is to get more successful and likely to get an award in Oscar this year?
   - Which NBA team will have a higher chance to be the next champion this year?
   - Which type of residential dwelling should be a better choice as an investment property in the next 5 years?

2 Design a plan for your research.

- Each group member will have to select 2 different variables to analyze for the entire research. (time can be used as the 3rd variable in your choice and won't count as a variable for any of your graphs)
- The two variables selected must have cause and effect or common cause factor causation involved to allow two-variable statistical analysis.
- **NONE** of the variables can be repeated among the group other than time

Variable #1: _____

Variable #2: _____

3 Gather secondary data from reliable sources/websites for all selected variables from above to work on your research.

You will need to submit your variables for approval on the specified due date with the data sets.
Each group member will be responsible for their own variables but the submission MUST be in one group.

Sample:

Title Page
- Topic of the research paper
- Names of the 2 companies

Page 2
Member #1: Name
Variable #1:_____
Variable #2: _____ causation: _____

Company 1		Company 2	
Variable #1 Independent	Variable #2 dependent	Variable #1	Variable #2
#####	#####	#####	#####
#####	#####	#####	#####
#####	#####	#####	#####
#####	#####	#####	#####
#####	#####	#####	#####
#####	#####	#####	#####
#####	#####	#####	#####
#####	#####	#####	#####

Page 3
Member #2: Name
Variable #1:_____
Variable #2: _____. causation: _____

Company 1		Company 2	
Variable #1 Independent	Variable #2 dependent	Variable #1	Variable #2
#####	#####	#####	#####
#####	#####	#####	#####
#####	#####	#####	#####
#####	#####	#####	#####
#####	#####	#####	#####
#####	#####	#####	#####
#####	#####	#####	#####
#####	#####	#####	#####

Page 4
Member #3: Name
 Variable #1:_____
 Variable #2: _____. causation: _____

Company 1		Company 2	
Variable #1	Variable #2	Variable #1	Variable #2
Independent	dependent		
#####	#####	#####	#####
#####	#####	#####	#####
#####	#####	#####	#####
#####	#####	#####	#####
#####	#####	#####	#####
#####	#####	#####	#####
#####	#####	#####	#####
#####	#####	#####	#####

Page 5
Member #4: Name
 Variable #1:_____
 Variable #2: _____. causation: _____

Company 1		Company 2	
Variable #1	Variable #2	Variable #1	Variable #2
Independent	dependent		
#####	#####	#####	#####
#####	#####	#####	#####
#####	#####	#####	#####
#####	#####	#####	#####
#####	#####	#####	#####
#####	#####	#####	#####
#####	#####	#####	#####
#####	#####	#####	#####

4 Write a statistical analysis report –

Layout of the written research analysis:

1) **Cover page** (include title/problem of the interest, name of all members)

2) **Table of contents** (including page number of each starting of each section with writers' name)

3) **Introduction** (include the rationale of this analysis, identify the problem of the interest) – **group mark** (maximum 1 page)

4) **Written analysis** (including writer's name on right top corner) – **individual mark in this section**

   Each individual member of the group MUST do ALL of the following in their own section: (maximum 3 pages individually)

   i) An introduction paragraph (3-5 sentences) to introduce which, why and how the two variables are being used in this section in assistance of answering the ISP research topic question.

   ii) After the instruction paragraph, the next section on page one is dedicated to the **data table of your two variables** , no written analysis shall be on this page. (You have already submitted before and now just copy and paste as part of your written analysis. You need to include the data table(s) of your two variables in your analysis for both companies at the beginning of your own section.)

   iii) Calculate minimum ONE one-variable statistical calculation learned from the course that would fit in your analysis for each of the two variables of your choice for both companies. You don't need to use all calculations learned from this course but only those that are suitable for your report. Place your **one-variable statistical calculations shown in a table form**, no steps are required to show how you get the numbers.

   Part 1:
   One-Variable Statistical Analysis:

   i) Generate minimum TWO one-variable graphs (you are allowed to put two companies of the same variable on the same grid) learned in this course. Placing it along with "Time" is considered as one-variable statistics ONLY. Analyze and compare the calculations and graphs you have generated and interpret what they mean. Draw a meaningful conclusion from your comparison analysis to how they assist in answering the problem of the interest.

Part 2:
Two-Variable Statistical Analysis:
i)   Generate a scatter plot using the two variables from part (a) and have both companies on the same grid.

ii)   In the scatter plot, include the equations of the linear regression/non-linear regression, and coefficient of correlation/determination.

iii)   Make sure you carefully determine which one is independent and which one is dependent variable.

iv)   Analyze and compare the rates of change and r-values from the two companies and draw a meaningful conclusion.

Part 3:
Short paragraph to summarize and conclude your own section of comparison and analysis. (3-5 sentences)

5)   **Conclusion – group mark** Draw a final conclusion from the analysis of the data to answer your ISP research question after gathering all group members analysis, (e.g., determine which company is currently in a better financial position in the industry), evaluate the strength of the evidence (e.g., by considering factors such as sample size or bias). (maximum 1 page)

6)   **Limitations and suggestions – group mark**

   i.   Analyze the validity of the sources gathering data.
   ii.   Specify any limitations of the conclusions
   iii.   Suggest a follow-up problem for further investigation. (maximum 1 page)

7)   **Bibliography/References (APA format)** References will be grouped and listed by person

Checklist for formatting a written report:

	Font: between 10-12pt
	Single-/Double-spaced throughout the report
	Margin: **0.5-1-inch** (Top/Bottom/Left/Right)
	Your written report should be done in <u>**third-person**</u> point of view
	Each member should have max 3 pages of individual section analysis of written report (including graphs and table)
	Name of the writer should be placed on the top right corner of each responsible page
	Page number at the bottom-centered for all pages except cover page Cover page is "page 1"
	While writing, assume your reader **knows little to nothing** about your subject. Add details and definitions to topic in the paper
	Don't copy anyone's work. Not only because you are lazy, it's called **plagiarizing**, which is illegal
	Proofread your report by yourself and someone else for spelling, grammar and punctuation errors
	Analysis must be handed in both paper copy AND uploaded to D2L to check for plagiarism (<10% tolerance level on similarity, otherwise, report will be returned to students to re-work).

Part 2: Culminating investigation Presentation (5%)

**** The presentation is meant to be a summary of the overall research that you are going to present to your target audience in a meeting professionally. (You are not reading the entire research analysis for the presentation.)

Estimated duration of one presentation:
$\sim approximately\ 3-5\ minutes\ per\ person\ \times\ \#of\ people\ in\ your\ group$

You must present with technology (in-person live presentation) and include the following:
1. introduction of the research and the problem of the interest
2. background information needed to make sure target audience can understand the rest of the presentation
3. highlight/summarize the key points and findings for the target audience
4. follow the scenario setting

The presentation does not have a specific requirement for how you deliver the content so you can be as **creative as you can to present your analysis to the audience you way.

You will be evaluated based on the following considerations:

Group performance:
✓ Content   (Adequate amount of information that highlights the key issues to target audience)   ✓ Visual aids   (Ensure text and graphs are large enough to be read at the back of the class, include graphs and analysis from Excel and Fathom, suitable slide transitions and within-slide animations,   Legibility – large font size, contrast, neutral background, extensive use of point form, large graphs with legible headings and labels   Layout – effective positioning of text & graphs; no irrelevant pictures or backgrounds, font types, bullet & slide transitions)   ✓ Organization of content   (Make sure the content of the presentation is in a logical order and there are no obvious errors)
Individual performance:
✓ Language, tone, voice, appearance, eye contacts   **(Do not read the slides or your essay to the class)**   ✓ Preparation   ✓ Knowledge of the content   ✓ Coordination with group members

- Everyone must be ready by the first day of the presentation regardless of the order of the presentation.
- Fail to present when you are being prompt to will result in negative impact on your mark.
- Audience's attention and engagement will impact your mark.

MARKING SCHEME for the WRITTEN REPORT __ Name of the writer _____

(attach the only written report marking scheme one per group member)

Individual Variables Proposal Submitted and Approved
- 2 variables selected with proper causation for analysis   0   1   2
- Data from the two selected variables are presented in a table   0   1   2
- Independent and dependent variables correctly identified   0   1   2

Early ISP Mark Submission: /6

Group Introduction
- Problem of interest introduced clearly   0   1
- Purpose of the research stated clearly   0   1
- Background information provided   0   1

Individual Data Analysis
- Data from the two selected variables are presented in a table   0   1
- Appropriate one-variable statistics selected & calculated   0   1   2
- Appropriate one variable graphs and tables presented   0   1   2

- Meaningful discussion of results communicated in writing to demonstrate understanding of the concepts learned in class and ability to apply the concepts into this research paper. Ideas stand out and are not generic responses. Analyze, detect points of views, interpret, evaluate, synthesize, form conclusions based on the statistics collected in this section.
    0   1   2   3

- Appropriate two-variable graph(s) presented   0   1   2
- Appropriate two-variable statistics calculated   0   1   2

- Meaningful discussion about appropriateness of model, correlation, and relationships communicated in writing to demonstrate understanding of the concepts learned in class and ability to apply the concepts into this research paper. Ideas stand out and are not generic responses. Analyze, detect points of views, interpret, evaluate, synthesize, form conclusions based on the statistics collected in this section.
    0   1   2   3

- Conclusion of your own section to satisfy the purpose written at the beginning of your own section.
    0   1   2   3

- Analysis is written within the page limit   0   1

Group Conclusions, Limitations, and Suggestions
- Uses results from data analysis to solve the problem   0   1   2   3
- Identifies possible limitations on the data analyzed and effects that it has on your analysis
    0   1   2   3
- Can your results be used by your audience   0   1   2   3

References
- References are properly cited including in-text citation   0   1   2

Overall Formatting
- The analysis includes all members' work as a whole   0   1
- Third-person point of view is used   0   1
- Format of a research paper is used   0   1
- Graphs/tables are titled, labeled in sequence   0   1
- Page number, table of contents, names of the writer at the right top corner in each individual analysis section
    0   1   2
- **Late submission will result in 2 marks deduction per school day.**

Remaining total marks for written report: /38

Topic		Presenter's Name			
Criteria	**Appearance, pace, tone, language, timing**	**Introduction of the problem of interest, Background, Conclusion**	**Analysis**	**Text Layout**	**Graphics Layout**
	Delivery (individual)	**Content** (group)	(individual)	**Slideshows** (individual)	
Level 4	-Appears confident & relaxed; -Using appropriate pace, -Loud, and clear voice; -Varied intonation; -100% eye contact with audience -Speaks in proper sentences using data terms; -Discrete use of speaker notes; -Contribute between 3 & 5 min overall in the presentation -Well-prepared and rehearsed prior to the actual	-creative format of presentation -Clearly & concisely introduces investigation; -background is relevant -Conclusion and limitations are presented -able to capture all audiences and maintain interest throughout the entire presentation	-summarize the overall presentation and provide the key information to audience -presented logically with no extraneous or missing content; -includes all relevant graphs	-Bulleted points with few sentences in legible, large, -easily visible fonts. -Great contrast and eye catching!	-Graphic backgrounds & transitions do not distract from content; -graphs are properly sized -font size of all labels can be easily red -includes no tables
Level 3	-Fairly confident & relaxed -Appropriately paced, -Uses a fairly loud and clear voice; -Somewhat varied intonation -lots of eye contact with audience -Speaks mostly in proper sentences and some use of data terms -Use speaker notes to assist; -Contribute between 3 & 5 min overall in the presentation -Somewhat prepared and rehearsed prior to the actual	-Some creative design on presentation format, -Introduces investigation fairly well with background knowledge -Conclusion and limitations are presented -able to capture some audiences and maintain interest most of the time	-go over most of the content from the report without filtering out key points -presented logically with no or little extraneous or missing content; -includes all relevant graphs	-Bulleted points with few sentences in legible, large, -easily visible fonts -with good contrast with background.	-Most graphic backgrounds & transitions do not distract from content; -most graphs are properly sized -some font size of the labels can be read -includes no tables
Level 2	-Little confident and relaxed -A little slow or fast and or voice is somewhat clear and discernible, -Little variation in intonation -some eye contact with audience -Vocabulary; sentence structure is somewhat appropriate -Very dependent on slides or speaker notes; -Contribute less than 3 min or greater than 5 min -Show little preparation	-Little create design on presentation format -Introduces investigation somewhat coherently and background is somewhat relevant -Some conclusion and limitations are presented -Able to capture few audiences and maintain little interest	-Go over all the content from the ISP without filtering any key points and make summary of any findings -presented with some extraneous or missing content; -includes most relevant graphs	-Too many or too few points on each slide and/or paragraphs used instead of points; -font is fairly large & discernible. -Average quality work -Colour contrast is not strong	-Some graphic backgrounds & transitions do not distract from content; -few graphs are not properly sized -few font size of the labels can be read; -includes some tables
Level 1	-Anxious & tense -Pace is much too slow or too fast and voice is fairly hard to hear or discern, - No variation in intonation -little eye contact with audience -Vocabulary and sentence structure is weak -Completely dependent on slides or speaker notes; -Contribute less than 2 min or greater than 6 min -No preparation and rehearsal prior to the actual	-No creative design on presentation format -Introduction is weak and topic is not clear and or background is only mildly relevant -No conclusion and limitations are presented -Cannot capture audience attention and not interesting	-Completely go through everything from the written report -presented with some extraneous or missing content; -includes some relevant graphs	-Most text is in paragraph format and/or slides not easy to read; -fonts are too small or too large -Quality is poor	-Many graphic backgrounds & transitions distract from content; -few graphs are properly sized -few/all font size of the labels cannot be read; -includes several tables
Mark	**/4**	**/4**	**/4**	**/4**	**/4**
+3 marks of attentions from audience during presentation, your attendance of others' presentations, your attention to others' presentations				Total	/23

Title Page

Topic: Which XXXXXXXXXXXXXXXXX?
Group Members' Names:
      1)   **Alex Wang**
      2)   **Barsam Sokuva**
      3)   **Mark Vincent**
      4)   **Julian Collon**

Page 1

Table of Contents

Page 2

Introduction (Executive Summary) (estimated length (1/2 -1 page single sided, single-spaced)

XXXXxXXXXxXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXxxXXXXXx

XXXXxXXXXxXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXxxXXXXXx

XXXXxXXXXxXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXxxXXXXXx

XXXXxXXXXxXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXxxXXXXXx

XXXXxXXXXxXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXxxXXXXXx

XXXXxXXXXxXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXxxXXXXXx

Page 3

Analysis

Alex Wang

In the past 10 years of the companies' investment income performance from 2013-2023,…

Data of the two companies:

Variable #1 Year	Company A	Company B
2013	XXXXXX	XXXXXX
.	.	.
.	.	.
.	.	.
2023	.	.

Variable #2 Year	Company A	Company B
2013	XXXXXX	XXXXXX
.	.	.
.	.	.
2023	.	.

One-Variable Statistical Calculations:

Variable #1: (independent) The earning of the investments in the past 10 years….

	Company A	Company B
Mean	XXX	XXX
Median	XXX	XXX
Standard Deviation	X.XX	XX.xx
Variance	XXX	XXX.X
Outliers	XXX	XXXXX
… …More calculations if needed		

Variable #2: (Dependent) The book cost of the investment in the past 10 years…..

	Company A	Company B
Mean	XXX	XXX
Median	XXX	XXX
Standard Deviation	X.XX	XX.XX
Variance	XXX	XXX.X

Page 4

Given the data from Company A, the standard deviation is……., compared to Company B, the standard deviation is……. The smaller standard deviation from Company A indicates the recorded data of Company A is less spread out with smaller range. Data is more cluster to the mean. This can also interpret as the performance of Company is more consistent than Company B. When customers seek for services in the long run, consistent would also be a priority over the price when quality matters. From the above charts, it can conclude that……..
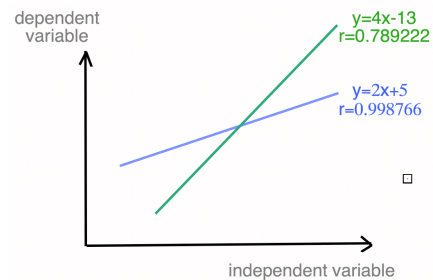

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Alex Wang

Analyzing the two variables from both companies using the scatter plot, the linear regressions show that…..

Comparing the two linear regressions, the rates of change show…………it can conclude that ……..
The reliability from the coefficient of correlation has shown that ……..

Overall, the results have shown…….

Page 6

.
.(Repeat for all group members for the same format in proper sequence).
.

Conclusion (estimated max length 1 page single-sided for both sections together, single spaced)

XXXXxXXXXxXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXxXXXX

XXXXxXXXXxXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXxXXXX

Limitation and Suggestions

XXXXxXXXXxXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXxXXXXx

XXXXxXXXXxXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXx

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Bibliography
Alex:
XXXXxXXXXxXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXxXXXXXx

XXXXxXXXXxXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXxXXXXXx
Julian:
XXXXxXXXXxXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXxXXXXXx

XXXXxXXXXxXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXxXXXXXx

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