PICTON HIGH SCHOOL

Creating Opportunities Achieving Success

Year: 2025 Subject: Mathematics Standard

Due Date: **Week 2 Term 3** **Friday, 1st August 2025**	**Assessment Name:** Investigation Task
Mark/Grade: A-E	**Weighting (if applicable):** **30%**

TASK DESCRIPTION:

In this task, you will explore whether the amount of time students spend on their phones affects how much they study. Using real class data, you'll classify variables, calculate summary statistics, and use Excel to create visual representations such as bar charts, histograms, and Pareto charts. You'll also plot and analyse a linear relationship to investigate potential relationships between screen time and study hours. This task encourages you to interpret results, make predictions, and communicate your findings clearly in response to a real-world concern raised by a parent.

SYLLABUS OUTCOMES TO BE ASSESSED:

- **MS11-01**: Selects and applies algebraic techniques to solve problems involving equations and formulas.
- **MS11-02**: Models and interprets linear relationships to solve problems and make predictions in practical contexts.
- **MS11-06**: Makes informed decisions about financial and statistical information in personal and workplace contexts.
- **MS11-07**: Gathers, interprets and analyses data in context.
- **MS11-08**: Displays and analyses datasets using summary statistics and graphical representations.
- **MS11-09**: Uses appropriate technology to investigate, organise and interpret information in a range of contexts.
- **MAO-WM-01**: Develops understanding and fluency in mathematics through exploring and connecting mathematical concepts, choosing and applying mathematical techniques to solve problems, and communicating their thinking and reasoning coherently and clearly.

DIRECTIVES TO BE ASSESSED:

Analyse:	**To identify causes, key factors, relationships and possible results**
Apply:	**To use relevant information and skills for a given situation**
Interpret:	**To draw meaning from a mathematical situation**
Perform	**To work or operate mathematically**
Simplify	**To reduce a question to its most basic form**

Check your assessment booklet for the current PHS Assessment Policy procedures, located on the school's website. This includes information on submission dates, plagiarism, malpractice and the use of AI.

ASSESSMENT CRITERIA AND STUDENT CHECKLIST
Have you:

- Put the due date in your calendar
- Completed all classwork and checked CANVAS
- Asked your teacher for clarification or assistance on any problems
- Have a NESA-approved scientific calculator, pens, rulers, pencils and erasers

ASSESSMENT MARKING CRITERIA

MARKING GUIDELINES	GRADE
The student has an extensive knowledge and understanding of the content and can readily apply this knowledge. In addition, the student has achieved a very high level of competence in the processes and skills and can apply these skills to new situations.	**A**
The student has a thorough knowledge and understanding of the content and a high level of competence in the processes and skills. In addition, the student is able to apply this knowledge and these skills to most situations.	**B**
The student has a sound knowledge and understanding of the main areas of content and has achieved an adequate level of competence in the processes and skills.	**C**
The student has a basic knowledge and understanding of the content and has achieved a limited level of competence in the processes and skills.	**D**
The student has an elementary knowledge and understanding in few areas of the content and has achieved very limited competence in some of the processes and skills.	**E**

Feedback/Comments

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Check your assessment booklet for the current PHS Assessment Policy procedures, located on the school's website. This includes information on submission dates, plagiarism, malpractice and the use of AI.

Year 11 Mathematics Standard Assessment Task

This task is designed as an extended statistical investigation in response to a real-world concern raised by a parent:

"Are students spending too much time on their phones, and is it affecting how much they study?"

Using a class-wide data set on screen time, study hours, and related behaviours, you will analyse patterns, construct visual representations, and apply mathematical reasoning to explore relationships between variables. You will also model data using linear relationships and test the validity of the Pareto Principle.

This task focuses on the following content areas:

- **S1.1 Classifying and Representing Data**
- **S1.2 Summary Statistics**
- **MS-M1 Linear Relationships**

Submission Details

- Due Date: Friday, 1st August 2025
- Submit via: Canvas Upload and In-Class Submission
- Format: Submit completed written responses. In addition, upload your Excel spreadsheet with all charts and calculations to Canvas.

Learning Outcomes Assessed This task assesses your ability to:

- **MS-11-01:** Uses algebraic and graphical techniques to compare alternative solutions to contextual problems
- **MS-11-02:** Represents information in symbolic, graphical and tabular form.
- **MS-11-06:** Makes predictions about everyday situations based on simple mathematical models.
- **MS-11-07:** Develops and carries out simple statistical processes to answer questions posed.
- **MS-11-09:** Uses appropriate technology to investigate, organise and interpret information in a range of contexts
- **MAO-WM-01:** Develops understanding and fluency in mathematics through exploring and connecting mathematical concepts, choosing and applying mathematical techniques to solve problems, and communicating their thinking and reasoning coherently and clearly.

Ensure you respond to all questions with full working out, appropriate explanations, and accurate use of technology where required.

Excel Chart Submission Checklist Tick each box as you complete your required Excel visual displays:

Chart Created in Excel	✓
Bar chart comparing average screen time between two groups.	
Frequency histogram of a selected numerical variable.	
Pareto chart displaying total screen time by app category.	

Section 1: Setting up the investigation

All year 11 Mathematics Standard students are required to complete the Google Forms Survey honestly by 8am on Friday Morning, 1 July 2025.

This information will be used as the population data.

The following questions are included in the survey:

1. Name
2. Surname
3. Roll Call Class
4. Hours of Screen Time this week
5. Gender
6. Which App do you spend the most time on weekly?
7. How much time do you spend on this App in a Week?
8. What type of English do you study?
9. Do You Play A Sport?
10. How many days do a week do you participate in this sport?
11. Do you play video games excluding mobile games (xbox, ps5, PC)?
12. Do you Play Mobile Games?
13. Which mode of transport do you use to travel school?
14. How long does it take you to travel to school?
15. How many hours do you study a week?

You do not have to include all questions in your research task, pick the ones that are interesting to you and your investigation.

Task 1: What factors influence how much screen time students have?

It's important to select relevant variables when investigating patterns found in data.
Select 2 categorical data variables and 2 numerical data from the survey that you think are worth exploring.

Categorical

- Ordinal
- Nominal

Numerical

- Discrete
- Continous

For each variable you have identified, classify it according to the classifications above and justify why you think it could relate to student screen time.

Variable 1: **Classification:**

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Variable 2: **Classification:**

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Variable 3: **Classification:**

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Variable 4: **Classification:**

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Task 2: Can Small Samples Tell the Whole Story?

There are different kinds of sampling methods used when obtaining data from a population. These include, but are not limited to:

- Systematic Sampling
- Simple Random Sampling
- Stratified Sampling

Select one sampling methods from the list above and implement them within your Mathematics Standard cohort to obtain sample data. You will investigate how well a **small sample** reflects the full Year 11 Mathematics cohort when it comes to screen time habits. *NOTE: You do not need to re-survey students.*

1. **Choose and apply a sampling method**

   (a) Select **one** of the sampling methods listed above.

   (b) Explain the method and describe exactly how you applied it to select **15 students** from the population data.

(c) Justify your choice of method. What are its advantages and disadvantages?

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2. **Analyse your sample**

(a) Use Excel to calculate the following values for your sample:

- Mean (average)
- Median (middle value)
- Standard Deviation (how spread out the values are)

(b) Present your results in the table below:

Statistic	Sample	Population
Mean		
Median		
Standard Deviation		

(c) Compare and Interpret your results

i. How does your sample's mean compare to the population mean?

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ii. What does your sample's median tell you about the screen time in your sample?

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iii. How does your sample's standard deviation compare to the population's?

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iv. If another student took a different sample of 15 students, would their results be the same as yours?

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v. Would you consider your sample a good representation of the population?

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Section 2: Displaying your Data

In this section, you will explore patterns in the screen time data by selecting meaningful variables to classify and display.

Task 1: Who's on their phone more? - A Bar Chart Comparison

You will investigate how screen time differs across a group of students.

1. Choose a categorical variable from the dataset and write in the space below:

   Examples: Gender, Plays a sport (Yes/No), English Subject Studied, Mobile Gaming Status

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2. Access the *Section 2 Task 1 Bar Chart* sheet and create a bar chart for your chosen variable.

3. **Answer the following questions**

   (a) Which group had the higher average weekly screen time?

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   (b) What could explain the difference in average weekly screen time across the student groups for your chosen variable?

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   (c) What might the average screen weekly time not tell us?

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   (d) Would this comparison change if you used the median instead of the mean (average)? Why/Why not?

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Task 2: Me vs The Class - Graphing a Numerical Variable

In this task, you will choose a numerical variable and create a graph to help you understand how your own data compares to the rest of the year group.

1. **Choose one numerical variable from the dataset:**

   Examples: Hours of Study per week, Time Spent on Favourite App, Travel Time to School

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2. Access the *Section 2 Task 2 Histogram* sheet and create a histogram for your chosen variable using the provided frequency table.

3. **Answer the following questions**

   (a) Describe the shape of the histogram. (Is the distribution symmetrical, skewed or uneven?)

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   (b) Which interval has the highest frequency? (What does this tell you about most students)

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(c) Where does your own value fall? (Are you in the most common intevral or outside of it?)

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(d) Would you describe your value as typical? Why or why not?

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(e) What might explain why your value is higher or lower than others?

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(f) Could there be any bias in the way the data was collected or grouped?

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Task 3: The Big Scrollers - A Pareto Analysis

In this task you will find out which applications used dominate total screen time your year group. Consider the following:

"The Pareto principle (also called the 80/20 rule) suggests that roughly 80% of outcomes come from 20% of causes"

In this context: Do 20% of apps account for 80% of total screen time.

1. Access the *Section 2 Task 3 Pareto Chart* sheet and create a Pareto chart using the distribution table provided.
2. **Answer the following questions**

   (a) Which application categories account for approximately 80% of the total screen time?

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   (b) Does this support the Pareto principle? Why/Why not?

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(c) What does this suggest about how students use their phones?

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(d) Is it possible that some screen time is misclassified into the wrong category?

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(e) How could this chart be misleading without the number of users per category?

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(f) What is a limitation of using total screen time instead of average screen time?

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Section 3: Linear Relationships

You overheard a parent complain about their child's grades and mobile phone usage:

"I'm fed up with seeing my child's grades drop while they spend hours glued to their mobile phone! It's clear that their dependence on these devices is distracting them from their studies and ruining their academic performance. Something needs to change before it's too late!"

Carry out the following investigation to research the mobile usage of year 11 Mathematics Standard students to whether the parent's opinion could be justified.

Using the Year 11 Population Data, investigate the relationship between **average daily hours of screen time** and **average daily hours of study per week**.

a) Identify the dedependent variable and justify your response.

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b) Identify the independent variable and justify your response.

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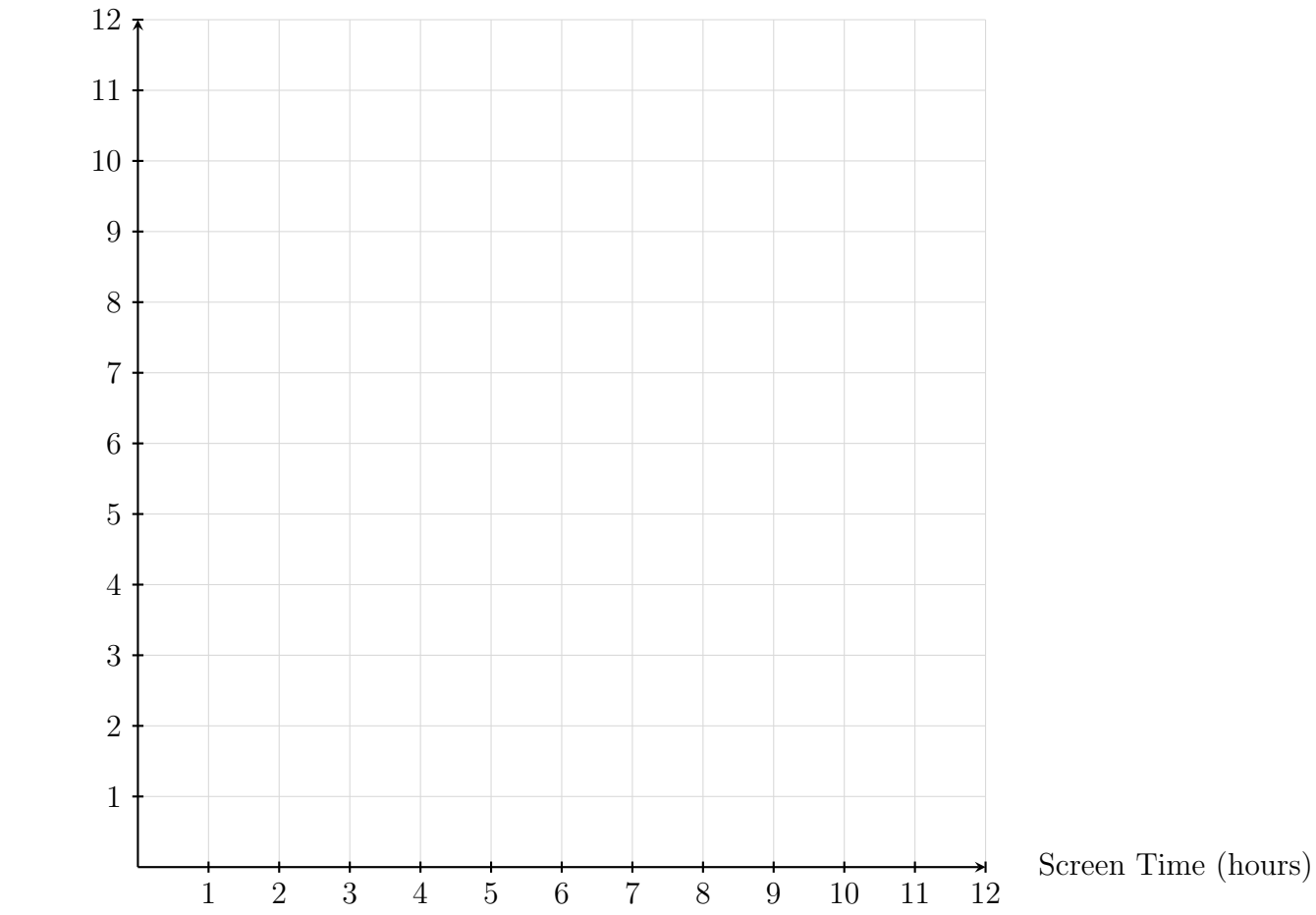
c) Select two points from the population data, writing them in the coordinates space below:

Point 1: (,) Point 2: (,)

d) Plot the points on the following cartesian plane and construct a line.



e) For the line your have constructed:

- Calculate the gradient

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- Determine the y-intercept

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- Determine the equation of the line.

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- Use your equation to predict study time based on a screen time of 25 hours.

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f) Predict your screen time based on your study time

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g) Using your own hours of screen time and study, describe the location of your point. Is it on the line, above or below the line?

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h) A new student joins the class and reports having 12 hours of screen time per week.

(a) Use your equation to predict how many hours they would be expected to study.

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(b) Do you think this prediction is realistic? Why/Why not?

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i) Does your model support the parent's concern that phone use is affecting study time?

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j) What assumptions are you making when you use a line to model this data?

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Marking Rubric Overview

Question	Outcomes	Grade A	Grade B	Grade C	Grade D	Grade E
Section 1, Task 1	MST-11-08, MAO-WM-01	Insightful classification and strong justification for all variables.	Mostly accurate classification with general justifications.	Basic classification with limited justification.	Misclassifies or gives unclear reasoning for variables.	No meaningful classification or justification.
Section 1, Task 2	MST-11-08, MS11-09	Clear application and strong explanation of sampling with justified method and reflection.	Appropriate sampling method applied with sound justification and some reflection.	Applies sampling method but with limited detail or reflection.	Sampling method poorly explained or partially completed.	Sampling not attempted or incorrect method.
Section 2, Task 1	MST-11-08, MS11-09	Creates accurate bar chart, thoroughly explains insights, and critically compares averages.	Accurate chart with sound interpretation and some critical reflection.	Presents chart, interprets surface features, basic use of averages.	Chart is flawed or lacks interpretation.	Chart not attempted or completely inaccurate.

Section 2, Task 2	MST-11-08, MS11-09	Chooses meaningful variable, clearly interprets histogram, and reflects on own data.	Reasonable variable and clear interpretation with some personal comparison.	Constructs histogram and describes general shape only.	Histogram produced but not interpreted meaningfully.	Histogram missing or irrelevant.
Section 2, Task 3	MST-11-08, MS11-09	Accurately applies Pareto principle, clearly interprets results, and questions limitations.	Uses Pareto chart correctly, with general interpretation and some consideration of principle.	Basic chart use, minimal link to 80/20 rule or critical insight.	Limited chart use with major misinterpretation of findings.	Pareto chart missing or unrelated to data.
Section 3, Linear Relationships	MST-11-02, MST-11-01, MAO-WM-01	Accurately models data, forms justified predictions, and critically evaluates linear fit.	Models line of best fit correctly with general interpretation and prediction.	Forms a linear equation with minimal justification and prediction.	Line drawn but little or no reasoning behind it.	No attempt to model data or reflect on relationship.