PICTON HIGH SCHOOL

Creating Opportunities Achieving Success

YEAR 12 HSC Standard 1 Mathematics

Assessment Task 3 2020

Name: ……..

Due Date: Thursday 13th August 2020 Term 3 Week 4	**Assessment Name:** Assessment Task 3 - Investigation
Mark: /70	**Weighting:** 40 %

SYLLABUS OUTCOMES TO BE ASSESSED:

MS1-12-1 **uses** algebraic and graphical techniques to **evaluate** and **construct arguments** in a range of familiar and unfamiliar contexts
MS1-12-2 **analyses** representations of data in order to make **predictions** and **draw** conclusions
MS1-12-3 **interprets** the results of measurements and calculations and **makes judgements** about their reasonableness
MS1-12-6 **represents** the relationships between changing quantities in algebraic and graphical forms
MS1-12-7 **solves** problems requiring statistical processes
MS1-12-9 **chooses** and **uses** appropriate technology effectively and **recognises** appropriate times for such use
MS1-12-10 **uses** mathematical **argument** and **reasoning** to evaluate conclusions, c**ommunicating** a position clearly to others

DIRECTIVES TO BE ASSESSED:

Evaluate: Make a judgement based on criteria; determine the value of
Analyses: Identify components and the relationship between them; draw out and relate implications
Predict: Suggest what may happen based on available information
Interpret: draw meaning from the mathematical result
Informed decisions: to use information available to make a choice based on pros, cons and risks.
Communicates: Conveys and imparts knowledge
Answer: to provide a solution or result in response to a question
Develops: creates and builds on an idea or solution in response to or to answer a question
Argument: A reason or set of reasons given in support of an idea, action or theory
Reasoning: To use logical thinking to make sense of a situation or idea.
Construct: To draw a shape, line or angle accurately using a compass, ruler or geometrical instruments.
Represent: To show a general relationship that expresses similarities between objects.

TASK DESCRIPTION:

You will submit the 3 investigations as outlined below. Detailed instructions and marking criteria are on the following pages. Each part will be started in class but must be finished outside of class.

Part 2 must be submitted via Google Classroom. Parts 1 and 2 may be completed on paper and attached if preferred.

PLEASE SUBMIT THIS DOCUMENT ON THE DUE DATE AS IT HAS YOUR MARKING CRITERIA.

The 3 parts are:

a) Bivariate Data S3.2 (Ch 5): Body Measurements (25 marks)
b) Rates M4 (Ch 7, Ch 10): Heart Rate and Blood Circulation (25 marks)
c) Graphs of Practical Situations A3.2 (Ch 6): Exponentials in Health and Finance (20 marks)

Recommended Equipment:

- ❖ NESA approved scientific calculator
- ❖ Pens, ruler, pencils
- ❖ Grid paper – can be provided by your teacher
- ❖ Internet-connected device eg laptop computer (may be provided in class during some lessons)

ASSESSMENT CRITERIA – STUDENT CHECKLIST:

Have you:

- Attended all classes or caught-up when absent?
- Referred to the above chapters?
- Checked Google Classroom and the Y12 Maths Standard 1 Google Site for lesson content?
- Referred to the Marking Criteria below?
- Asked your teacher for clarification or direction with any problems?
- Attended the Maths / STEM Staffroom for help if needed?

Part 1. Bivariate Data: Body Measurements and Vitruvian Man (25 marks).

Circle: Paper attached or Google Classroom.

a) Create a suitable table to record names and 2 of the following measurements for *10 people*. (2 marks)

b) Measure and record 2 of the following, to the nearest cm: arm span, height, foot length, hand span, head circumference, leg length, arm length, waist measurement. (3 marks)

c) Create a scatterplot to represent the relationship between the variables. (5 marks)

d) Construct a line of best fit for the data. (2 marks)

e) Calculate the gradient, y-intercept and hence the equation of the line. (3 marks)

f) Use the line to predict the measurements of another person, not already measured. (2 marks)

g) Take measurements of that person and comment on the accuracy of the prediction. (2 marks)

h) Write a *brief* paragraph to discuss the limitations of your line of best fit equation. (3 marks)

i) Research the Vitruvian Man artwork by Leonardo Davinci. Write a *brief* paragraph discussing whether these ideas are supported by your measurements and findings. (3 marks)

Student Notes:

Marking Criteria: Part 1

Question	Marks	Description
a. Table	2	Clear table, column headings, neat.
	1	One element above is missing.
	0	Missing or totally incorrect.
b. Measurements	3	10 people measured, nearest cm, names, both measurements.
	2	1 element above is missing.
	1	2 elements above are missing.
	0	Missing or totally incorrect.
c. Scatterplot	5	Title, axes labelled, appropriate scales, data correctly plotted, data complete – digital or paper.
	4	1 element above is missing.
	3	2 elements above are missing.
	2	3 elements above are missing.
	1	4 elements above are missing.
	0	Missing or totally incorrect.
d. Line of Best Fit	2	Straight line, correctly placed – digital or paper.
	1	1 element above is missing.
	0	Missing or totally incorrect.
e. Equation of Line	3	Equation correct, gradient correct (with working, unless digital), vertical intercept correct.
	2	1 element above is missing.
	1	2 elements above are missing.
	0	Missing or totally incorrect.
f. Prediction	2	Person named, both predicted measurements recorded.
	1	1 element above is missing.
	0	Missing or totally incorrect
g. Prediction checked	2	Both actual measurements recorded, sentence written commenting on difference or similarity.
	1	1 element above is missing.
	0	Missing or totally incorrect
h. Equation limitations	3	Paragraph structure, 2 sensible observations made.
	2	One element listed is missing or incorrect
	1	Two elements listed are missing or incorrect
	0	Missing or totally incorrect
i. Vitruvian Man	3	Paragraph structure, 2 sensible observations made comparing your observations to the theory of the VM.
	2	One element listed is missing or incorrect
	1	Two elements listed are missing or incorrect
	0	Missing or totally incorrect

Total = / 25

Comment:

Part 2. Rates: Heart Rate and Blood Circulation (25 marks)

This part must be submitted on Google Classroom.

a) Open the spreadsheet **"Pulse Rates"** from Google Classroom. Save with appropriate file name. (1 mark)

b) Use the formula for maximum heart rate (males): "220 – age in years" **or** "226 – age in years" (females) to complete the "Maximum Pulse" column (2 marks)

c) Use formulas to calculate the minimum and maximum heart rate for the "Weight Loss", "Aerobic" and "Anaerobic" columns for ages up to 100. (7 marks)

d) Measure your resting heart rate. Record clearly on the spreadsheet in bpm. (2 marks)

e) Now jog up and down some stairs or similar light exercise for one minute. Record your heart rate on the spreadsheet again. (2 marks)

f) Use your age and gender to calculate your maximum heart rate (1 mark)

g) Calculate what percentage of your maximum heart rate you were at after exercise (2 marks).

h) Which of the three categories of exercise were you in? (1 mark)

i) Based on this result, predict what would be the result for you, if you continued this activity for 30 min, four times per week, for 6 weeks. (1 mark)

j) Estimate your blood volume according to your body mass (weight) using the formulas:
75mL/kg for males **or** 65mL/kg for females. (1 mark)

k) *At rest*, a typical heart pumps 70mL of blood per beat. Calculate the volume of blood your heart pumps in one minute. (1 mark)

l) Calculate the time, to the *nearest second*, that your heart would take to circulate your entire blood supply around your body, when at rest. (2 marks)

m) Repeat this for your heart rate *after exercise*, with an elevated pump rate of 90mL/beat. (2 marks)

Student Notes:

Marking Criteria: Part 2

Question	Marks	Description
a. File name	1	Suitable file name
	0	Missing or unsuitable
b. Max pulse	2	Complete column, formula used and filled down.
	1	1 element above is missing.
	0	Missing or totally incorrect.
c. Exercise type columns	7	6 formulas used, all filled down to 100
	6	1 element above is missing.
	5	2 elements above are missing.
	4	3 elements above are missing.
	3	4 elements above are missing.
	2	5 elements above are missing.
	1	6 elements above are missing.
	0	Missing or totally incorrect.
d. Resting Heart Rate	2	Clearly recorded with calculation shown – spreadsheet formula or manual
	1	1 element above is missing.
	0	Missing or totally incorrect.
e. Exercise Heart Rate	2	Clearly recorded with calculation shown – spreadsheet formula or manual
	1	1 element above is missing.
	0	Missing or totally incorrect.
f. MHR	1	Clearly stated with calculation shown – spreadsheet formula or manual
	0	Missing or totally incorrect.
g. Percentage of MHR	2	Clearly stated with calculation shown – spreadsheet formula or manual
	1	1 element above is missing.
	0	Missing or totally incorrect.
h. Exercise Category	1	Correct Answer, according to table
	0	Missing or incorrect
i. Prediction	1	Answer sensible, according to exercise category
	0	Missing or not supported by category
j. Blood Volume	1	Correct answer with calculation shown using body mass given, correct units given – spreadsheet or manual
	0	Incorrect, no working or missing
k. 1 min of Blood	1	Correct answer with calculation shown using RHR – spreadsheet formula or manual
	0	Incorrect, no working or missing
l. Blood circulation - resting	2	Correct answer, calculation shown, rounded correctly – spreadsheet formula or manual
	1	1 element above is missing.
	0	Missing or totally incorrect.
m. Blood circulation - exercise	2	Correct answer, calculation shown, rounded correctly – spreadsheet formula or manual
	1	1 element above is missing.
	0	Missing or totally incorrect.

Total = / 25

Comment:

Part 3. Graphs of Practical Situations: Exponentials in Health and Finance (20 marks)

Individual data will be provided by your teacher in class.

Use grid paper or a spreadsheet to do this part.

You win $..... and invest it at a compound interest rate of ……..% compounded annually.

a) Create a table or spreadsheet to show the exponential growth of your account balance (A) for time (t) values of 0 to 20 years (2 marks)

b) Graph this data over the same timeframe as a line graph (5 marks)

c) How long did (or will) it take you to double your money? (1 mark)

d) How much will you have when you retire at the age of 70? (1 mark)

There are …….. people in your town who are currently infected with the zombie virus.

They infect others at a rate of …… per day.

e) Write an exponential equation in the form of I = …… x …….^{t} to calculate how many people will be infected over ***t*** weeks. (1 mark) – *refer to Example 4 p176 for help!*

f) By creating a spreadsheet or manually on paper, create a table showing the number of daily infections over 28 days. (2 marks)

g) Graph the number of infections, over the same time period, as a line graph. (5 marks)

h) By extrapolating this graph or otherwise, determine the length of time it will take for the entire population of Australia to be infected. (2 marks)

i) *Briefly* outline your strategy to survive the zombie apocalypse. (1 mark)

Student Notes:

Marking Criteria: Part 3

Question	Marks	Description
a. Table of values	2 1 0	Table complete: *t* values from 0 to 20, *A* values to match are correct – manual or spreadsheet One element above is missing. Missing or totally incorrect.
b. Line Graph	5 4 3 2 1 0	Title, axes labelled, appropriate scales, data correctly plotted, data complete – manual or spreadsheet . 1 element above is missing. 2 elements above are missing. 3 elements above are missing. 4 elements above are missing. Missing or totally incorrect.
c. Doubling	1 0	Correct from table or sensible prediction Missing or totally incorrect.
d. Retirement	1 0	Correct prediction using formula or extending table and graph Missing or totally incorrect.
e. Equation	1 0	Correct formula Missing or totally incorrect.
f. 28 days	2 1 0	Table complete: *t* values from 0 to 28, *I* values to match are correct – manual or spreadsheet One element above is missing. Missing or totally incorrect.
g. Line Graph	5 4 3 2 1 0	Title, axes labelled, appropriate scales, data correctly plotted, data complete – manual or spreadsheet . 1 element above is missing. 2 elements above are missing. 3 elements above are missing. 4 elements above are missing. Missing or totally incorrect.
h. Prediction	2 1 0	Correct, with calculations shown or graph extended – manual or spreadsheet Two elements listed are missing or incorrect Missing or totally incorrect
i. Survival Strategy	1 0	Identify a realistic strategy to avoid infection. Missing

Total = / 20

Comment: