**ATMAS Unit 4**

**Investigation 4 – Function Modelling**

**Semester 2, 2019**

**Name: Due:**

**Rumour has it that the WACE Exam answers have been leaked!**

**How long before everyone knows?**

The spread of a rumour amongst a group of people can be modelled mathematically using the suitable functions.

**The Spread of a Rumour Experiment**

The premise of the experiment is:

1. An initial person knows a rumour on the first day and tells someone on the second day.
2. On any given day, each person who knows the rumour on that day tells someone the next day.
3. The process is repeated daily until all the people in the class know the rumour.

The total number of people who know the rumour is noted each day and recorded. On any given day some people who already know the rumour might be told again. These people will not be counted twice.

**Generating the Experimental Data**

Using technology to provide the experimental data.

The **rand(** function on the ClassPad can be used to determine who speaks to who each day. For example, using **rand(1, 32)** would allow us to simulate a class of 32 people.

Start by randomly selecting a person to be the initial person.

On each day, anyone who has heard the rumour already selects another person at random to tell.

If the first person selected their own number on the first day, there would be only one person who knew the rumour on day two.

The selected students on each day may or may not have already been selected. If a student who had already been told was selected again, that person was not counted again.

Continue the simulation until the entire group has heard the rumour.

**Collect data** showing the number of people who have heard the rumour in total each day.

The Statistics tab on the ClassPad can be used to display the data, both in tabular and graphical form. It can also be used to perform Regression (**Calc>Regression**), which will produce a function and also a graph of the function.

**So, how long before everyone hears the rumour?**

Investigate the way a rumour spreads through a group of people and the length of time it takes for an entire group to be aware of the rumour.

Submit the findings from your investigation in the form of a report.

**The format of the investigation report may be written or multimodal. Reports can be submitted electronically via Connect.**

**The report should include the following:**

* an outline of the problem and context (Clarifying the Problem)
* the method used to find a solution, in terms of the mathematical model or strategy used (Choosing and Using Appropriate Mathematics and justifying the choices)
* the application of the mathematical model or strategy, including
* relevant data and/or information
* mathematical calculations and results, using appropriate representations
* the analysis and interpretation of results, including consideration of the reasonableness and limitations of the results
* the results and conclusions in the context of the problem.
* a short bibliography if applicable

What could you do?

Design, perform and record suitable simulations that allow you to investigate the spread of rumours in groups.

Use suitable technology to assist in performing simulations and representing your findings.

Investigate factors that effect the spread of the rumour. Do they always spread at the same rate? Do they always take the same amount of time to spread to everyone?

Discuss the suitability of the functions produced – how well does the function model the situation?

Consider any limitations of the model and the process.

Have you made any assumptions? Why did you make them? How did they effect what you did?

Have you considered any improvements to your investigation?

**The investigation report must be a maximum of 7 x A4 pages if written, or the equivalent in multimodal form. The maximum page limit is for single-sided A4 pages with minimum font size 14. Page reduction, such as 2 A4 pages reduced to fit on 1 A4 page, is not acceptable.**

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| **Specialist Mathematics Investigation 4 – Function Modelling**  **Marking Guide (Student Version)**  **Name:** | **Marks** |
| **Modelling the Spread of a Rumour** | **14 marks** |
| Designs and explains the simulations | 0 1 2 |
| Uses a suitable number of simulations | 0 1 2 |
| Investigates different group sizes | 0 1 2 |
| Shows the results of the simulations | 0 1 2 |
| Uses suitable technology to represent data and findings | 0 1 2 |
| Uses mathematical techniques correctly throughout | 0 1 2 |
| Produces a suitable function for each situation | 0 1 2 |
| **Communication** | **10 marks** |
| **Clarify the problem**  **Chooses and justifies an appropriate model**  **Discussion of any assumptions (list and explain), limitations and possible improvements** | 0 1 2 3 4  0 1 2  0 1 2 3 4 |
| **Total:** |  |

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| **Specialist Mathematics Investigation 4 – Logistic Modelling**  **Marking Guide (Teacher Version)** | **Marks** |
| **Modelling the Spread of a Rumour** | **14 marks** |
| Designs and explains the simulations  +1 – suitable simulations used  +1 – explains the simulation | 0 1 2 |
| Uses a suitable number of simulations  1 – one simulation per group size  or 2 – uses multiple simulations for each group size | 0 1 2 |
| Investigates different group sizes  1 – investigates 2 different group sizes  or 2 – investigates 3 or more different group sizes | 0 1 2 |
| Shows the results of the simulations  +1 – uses tables to display the data  +1 – displays data graphically | 0 1 2 |
| Uses suitable technology to represent data and findings  +1 – uses technology for graphs and tables  +1 – uses technology to record the simulation (not just ClassPad) | 0 1 2 |
| Uses mathematical techniques correctly throughout | 0 1 2 |
| Produces a Logistic Function for each situation | 0 1 2 |
| **Communication** | **10 marks** |
| **Clarify the problem**  Outlines the problem and context  Relates to real world applications  Makes reference to their research  Bibliography  **Chooses and justifies an appropriate model**  An explanation of logistic modelling  Justifies the use of the model  **Discussion of any assumptions (list and explain), limitations and possible improvements**  Lists suitable assumptions  Discusses how the assumptions were used in the context of the problem  Discusses limitations  Discusses possible improvements | 0 1 2 3 4  0 1 2  0 1 2 3 4 |
| **Total:** |  |

Lesson structure available at

<https://education.ti.com/html/t3_free_courses/calculus84_online/mod05/mod05_1.html>