Yr 11 Mathematics
Pure Mathematics

MATHEMATICAL MODELLING

Folio Task

Population Growth

In this investigation we are going to look at fitting mathematical models to data which has been collected to look at the population of Earth. The model will then be used to answer a series of questions. The second part of this investigation will involve you collecting your own set of data and fitting your own model.

Task 1

World Population 1950-2000

The table below shows the World population at the start of various decades. This data is taken from the website www.npg.org/facts.htm

Year	1950	1960	1970	1980	1990	2000
Population (in billions)	2.555	3.039	3.706	4.453	5.277	6.081

Your Task

Your task is to enter this data into your Graphic Calculator and fit an appropriate model, and then answer the following questions.

1. Did you enter the "*Year*" as in the table or did you change the data? Please explain any changes that you did make.
2. Draw a clearly labelled scatterplot of the data.
3. Which model do you initially feel will best fit the data? Give a reason for your choice.
4. Find the model which you feel best fits the data, giving reasons why you chose this model. Write down the model using appropriate variables / pronumerals.
5. Use your model / graphic calculator to answer the following questions:
   (a) Calculate the population of the world for 2010 using your model. How does this compare to the real figure?
   (b) According to the model, what is the population in 2222? How reasonable is your answer?
   (c) How long will it take for the world to reach a population of 10 billion.

(d) Based on an estimate that there are 10 billion acres of arable land of the Earth and each acre can produce enough food to feed 4 people, some demographers believe that the Earth can support a population of no more than 40 billion people. If the population continues to grow as it has in the past, how long will it take to reach a population of 40 billion people?

6. Discuss the limitations of the model that you have fitted using any of the above answers to help discuss your answer.

Task 2 – Open Topic

Your task is to now go and find some appropriate data which you need to fit a model and also pose and answer some relevant questions. Please include any calculations and state any assumptions and limitations.

Possible options:

- Visit the Australian Bureau of Statistics for large amounts of data / graphs / statistics:

http://www.abs.gov.au/AUSSTATS/abs@.nsf/web+pages/statistics?opendocument#from-banner=GT

- Car stopping distances vs speed
- No. of people who own mobile phones (over time)
- Facebook users
- Population data of mouse plagues, countries, …
- Spread of disease

Please check your data with your teacher before proceeding.