SARS

Data Sheet

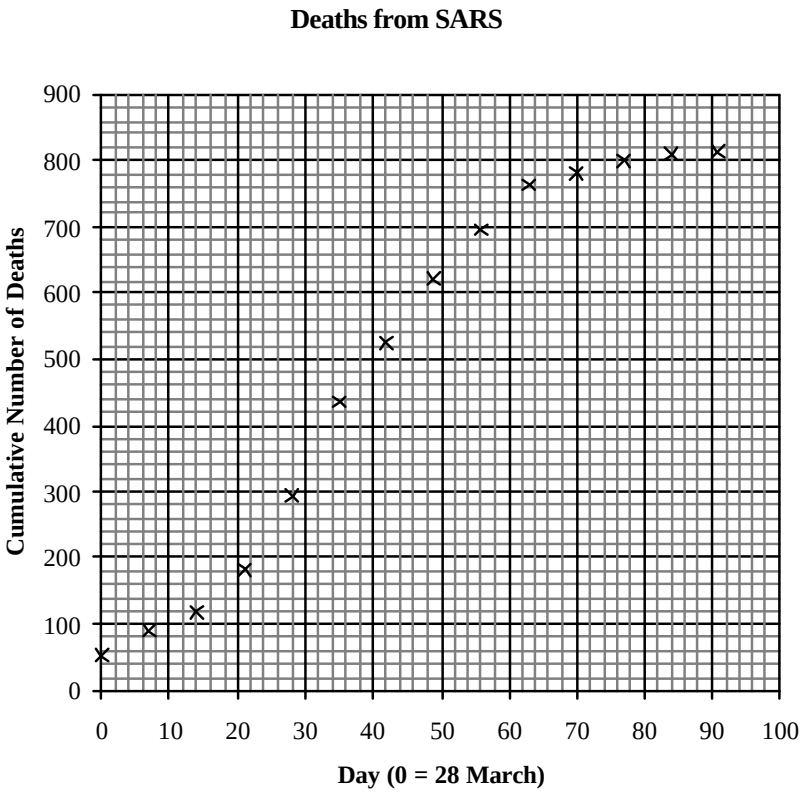
In 2003 a new illness called Severe Acute Respiratory Syndrome (SARS) swept across Asia, North America, and Europe. SARS begins with a fever, headache and body aches, then after 2 to 7 days patients usually develop a dry cough and have trouble breathing; in some cases they die.

In March 2003 the World Health Organisation (WHO) issued a global alert. There was widespread fear that SARS would develop into an epidemic that would be very difficult to stop. People living in the worst affected areas began to wear facemasks to protect themselves. Thankfully the authorities in the affected areas took effective action and on July 5th WHO announced that SARS was at last under control.

The table and graph below shows how the total number of deaths from SARS increased each week between March and July 2003.

Day (0 = 28 March)	Cumulative number of deaths
0	53
7	89
14	119
21	182
28	293
35	435
42	526
49	623
56	696
63	764
70	784
77	801
84	809
91	812

Source of data:
www.who.int/csr/sars/en



SARS

Assignment

Your assignment is to find and evaluate functions to model the data given on the Data Sheet.

Which of the following types of functions do you think would be suitable to model all or part of the data given in the table and graph? Briefly explain the reasons for your choice of functions.

Linear? Quadratic? Other Polynomial? Power? Exponential? Trigonometric?

Choose **two** different types of function to model different parts of the data set

either:

- one type of function for the full data set, and another for part(s) of the data set,

or:

- two different types of function for different sections of the data set.

Explain how you chose the parameters of your functions and how your functions are related to basic functions of their type. Describe how the main features of your functions would relate to the real situation.

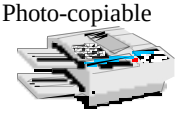
Plot graphs to compare the given data with values given by your models.
(At least one of your graphs should be drawn using a graphic calculator or computer software.)

Consider how errors or inaccuracies in the given data may affect your models and explain how, in general terms, the functions you found could be different.

Choose two (or more) of the values listed in the Total Number of Deaths row of the table below. Use your functions to predict the times when the number of deaths reached these values, then compare each prediction with the actual number of days given in the table.

Total Number of Deaths	100	200	300	400	500	600	700
Day	10	22	29	34	40	48	57

Summarise your findings and consider the effectiveness of each of your functions as a model of the data. Indicate clearly when your functions can be considered valid models for the data and describe any limitations they have.



Teacher Notes

Unit Advanced Level, Working with algebraic and graphical techniques

Notes
This assignment is intended to address many parts of the first coursework portfolio requirement given below:

1a
• find two different types of function to model different parts of the same data set (*either:*
  • *one function for the full data set, another for part of this*, or
  • *two different functions for different sections of the data.*)
where you:
• plot at least one set of data and one function using a graphic calculator or computer software
• consider the effectiveness of each function as a model
• use your graphs of functions to predict what will happen in cases for which you have no data
• explain how the functions you used are related to the basic functions of their type
• consider qualitatively how errors or inaccuracies in your data may affect your model of the situation by considering how, in general terms, the function you found could be different
	• choose **appropriate** functions to model different parts of your data set
	• explain how you chose the parameters of your functions referring to how they relate to the basic function of their type
	• indicate clearly the circumstances in which your functions can be considered valid models for your data

b use key features of graphs including each of (i) intercepts with axes, (ii) gradients, (iii) changes and trends in gradients, (iv) local maximum and minimum points, for functions that model real situations in order to solve problems and explain how the function relates to the real situation	• indicate clearly the key features of models and solutions to problems on your graphs and describe these clearly in real world terms in your report
c use algebraic techniques to solve problems for (i) a polynomial model and (ii) one other model from the following types: trigonometric, exponential or logarithmic.	• show clearly the stages of your working when using algebra • use correct algebraic notation

The assignment is written in a way that encourages students to work independently and this will enable more able students to achieve high marks for their portfolio. However some students will find it difficult to make decisions about which functions to use and how to approach the tasks. You could use discussion with individuals or the whole class to help them decide which of the types of functions listed are the most suitable before they try to find particular functions for themselves. Weaker students can be given guidance at any point, but of course this should be reflected in their final mark.

There is a variety of different functions that can be used to model the data and a range of methods that could be used to complete the tasks set. The data is provided on an Excel spreadsheet so that students can use a computer if they wish. They could also use a graphic calculator and/or do some work by hand if preferred.

In the assignment students should produce work that covers all of 1a and some of 1b and 1c, (depending on which functions and methods they choose to use).