

**AS Use of Maths - Exponential Growth and Decay****Population Growth**

Year t	Population P (billions)	Model $P = 8.7 \times 10^{-12} e^{0.0136t}$
1900	1.65	
1910	1.75	
1920	1.86	
1930	2.07	
1940	2.30	
1950	2.56	
1960	3.04	
1970	3.71	
1980	4.46	
1990	5.28	
2000	6.08	

1 Plot the data and the model on the same axes.

For which years in the 20<sup>th</sup> century does the model

a) Over-estimate   b) Under-estimate the world population?

2. Calculate the percentage error in the predicted value for the world population in the year 2000.

3. The world population in the year 1800 was approximately 900 million. Compare this with the predicted value.

4. What is the value of P when  $t = 0$ ? What should this value predict? Comment on your answer.



5. a) What does the model predict will happen as  $t \rightarrow \infty$ ?

b) What do you actually think will happen?

6. Using the model, in what year

a) will the world population be 10 billion?

b) was the world population 1 million?