**14H Exponentials in Data**

$$y=ax^{n}$$

$$y=ab^{x}$$

1. The data shows the rank (by size) and population of some UK cities.

The relationship between $P$ and $R$ can be modelled by the formula:

$$P=aR^{n}$$

Where $a$ and $n$ are constants.

1. Draw a table giving values of $logR$ and $logP$ to 2 decimal places

 

1. Plot a graph of $logR$ against $logP$ using the values from your table, and draw a line of best fit
2. Use your graph to estimate the values of $a$ and $n$ to two significant figures
3. The graph shown represents the growth of a population of bacteria, $P$ over a period of $t$ hours. The graph has a gradient of 0.6 and meets the vertical axis at (0,2) as shown.

A scientist suggests that this growth can be modelled by the equation $P=ab^{t}$, where a and b are constants to be found.

1. Write down an equation for the line



1. Using your answer to part a or otherwise, find the values of $a$ and $b$, giving them to 3sf where necessary
2. Interpret the meaning of the constant $a$ in this model