

## GCSE Growth and Decay (Exponential Functions) – www.m4ths.com

(1) Fred invests £4000 in a bank which pays 3% compound interest at the end of each year. Find how much money he will have (to the nearest pound) at the end of the 3<sup>rd</sup> year if he leaves his money in his account.

(2) A rock is eroding. Each year the mass of the rock reduces by 11%. The initial mass of the rock is 1300g. Find the mass of the rock after 8 years. Give your answer to the nearest gram.

(3) The population of a small island is increasing by 15% each year. There were 300 people on the island to begin with. (a) Find how many people there are on the island after 5 years. (b) Find the number of years it will take for the population to exceed 1000.

(4) The population of another island is modelled by the equation  $P = 2000 \times 0.93^t$  where  $P$  is the total population and  $t$  is the time in years after the population is first measured.

(a) Is the population increasing or decreasing? (b) What is the % change in the population each year? (c) What was the initial population? (d) What will be the population 3 years after the initial observation? (e) What will happen to the population as  $t$  gets very large? (e) Sketch a graph to show the population over time.

(5) The table below shows how bacteria are growing in a laboratory.

Day (start of)	1	2	3	4	5	6
Size	400	480	576	691.2		

(a) Find the % rate at which the bacteria are growing. (b) Complete the table (c) Find out how much bacteria is present at the end of the 12<sup>th</sup> day (d) Explain what will happen to the number of bacteria as time goes on.

(6) The table below shows the value of a car after its purchase from new.

Year (start of)	1	2	3	4	5	6
Value (£)	22'000	20'680	19'439.20			

(a) Find the rate at which the car is depreciating. (b) Complete the table (giving your answer to the nearest penny). (c) Find the value of the car after 10 years. (d) Find which year the car's value will fall below £10'000. (e) Explain the limitations of the model to find the value. (f) Sketch the graph of the value of the car over time.

(7) Martin buys a house for £125'000 in 2016. His house will increase by 1.5% in value each year. (a) Find out how much his house will be worth at the end of 2022. (b) Find the year in which the value of his house will exceed £145'000.

(8) Jim invests £3000 in a bank account paying 5% compound interest. Sue invests £2000 in a different bank account paying 8% compound interest at the same time. (a) Explain what happens in the 15<sup>th</sup> year after Jim and Sue invest their money. (b) Sketch a graph to show Jim's investment and Sue's investment on the same set of axes. (c) Who will have more money in their account in the (i) The first 10 years after the initial investment? (ii) From years 20-50?

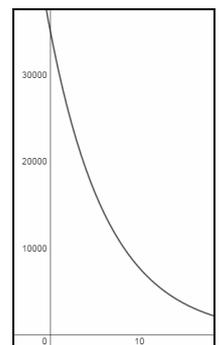
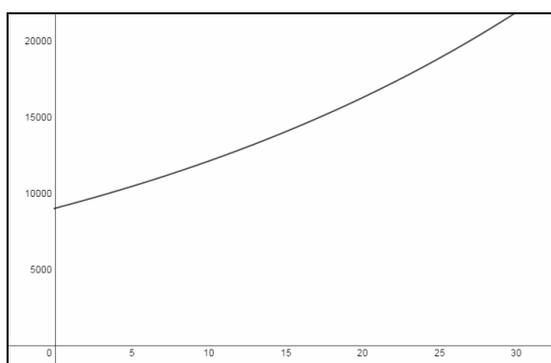
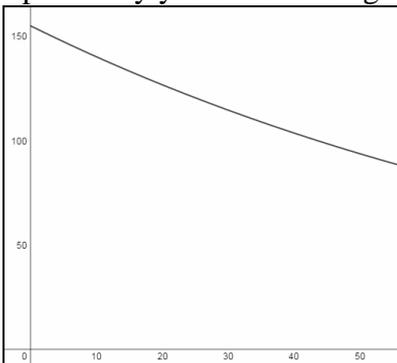
(9) (a) Match the statements with the graphs below;

(i) Bob invests £9000 in a bank account that pays 3% compound interest.

(ii) A car has an initial value of £35000 and depreciates at 14% per annum.

(iii) The IQ of a human decreases by 1% from 155 over ten years.

Explain why you chose each graph to match each statement and label each set of axes on the graph.



(b) Write an equation to model each situation.