GENMATHS RESOURCES

GROWTH & DECAY

Task 1

1) A new social media app launches with 500 users. If the number of users grows at a rate of 12% per month, how many users will there be after 18 months?

2) A farmer has a population of 200 rabbits. The population decreases by 5% per month due to predators. How many rabbits will there be after 2 years?

3) An investment account starts with £1,200. The balance increases by 4% per year. How much will be in the account after 2 years?

4) A car's value is £28,000 when new. The value depreciates by 18% each year. What will be its value after 6 years?

5) A country's population is currently 2 million and grows by 1.6% annually. How long will it take for the population to reach 3 million?

6) A rare plant population in a nature reserve is 1,000. Due to climate change, its population decreases at a rate of 7% per year. How many years will it take until the population falls below 500?

7) A music streaming service currently has 60 million subscribers. If it grows by 2.5% per quarter, how many subscribers will it have after 5 years?

8) The number of active volcanoes in a region is decreasing at 4% per decade. If there are currently 45 volcanoes, how many will there be in 100 years?

9) A stock worth £120 grows by 1.5% per week. How many weeks will it take for the stock to double in value?

10) A scientist is studying bacteria that doubles in quantity every 5 hours. If there are 80 bacteria at the start, how many will there be after 1 day?

Task 2

11) The function $P(t) = 200 \times 1.05^t$ models a town's population (in thousands) after t years.
    a. What is the initial population of the town?
    b. What is the growth rate as a Percentage?
    c. Estimate the town's population after 15 years.

12) The function $V(t) = 30{,}000 \times (0.88)^t$ represents the value of a car after t years.
    a. What does $V(0)$ represent?
    b. After 5 years, what is the value of the car?
    c. What percentage does the car depreciate each year?

13) The graph of $y = ab^x$ passes through the points (0, 12) and (3, 96).
Work out the values of a and b.

14) The graph of $y = ab^x$ passes through the points (0, 6) and (4, 1536).
Work out the values of a and b.

15) The graph of $y = ab^x$ passes through the points (0, 8), (2, 18), and (5, p).
Work out the value of p.

16) The graph of $y = ab^x$ passes through the points (0, 7), (2, 63), and (p, 5103).
Work out the value of p.

Challenge

17) **A population of rare birds is modelled by $y = ab^x$, where y is the number of birds and x is the number of years since the study began.**
The population is 240 when $x = 2$ and 1920 when $x = 5$.
Work out the values of a and b

18) **The value of a vintage car is modelled by $y = ab^x$ where y is the value in pounds and x is the number of years after 2010. The car was worth £12,000 in 2012 and £16,200 in 2014.**
Work out the value of a to the nearest thousand and the value of b to 3 decimal places. Then, interpret what they mean in this context.