Solutions to Exponential Growth and Decay Questions

IGCSE Maths Solutions

Question 1

Marcel invests \$2500 for 3 years at a rate of 1.6% per year simple interest. Jacques invests \$2000 for 3 years at a rate of $x\%$ per year compound interest. At the end of the 3 years, Marcel and Jacques receive the same amount of interest. Calculate the value of x correct to 3 significant figures.

Solution:

$$\text{Simple Interest for Marcel: } I = P \times r \times t = 2500 \times 0.016 \times 3$$

$$\text{Compound Interest for Jacques: } A = P(1 + \frac{r}{100})^t = 2000(1 + \frac{x}{100})^3$$

$$\text{Equating both amounts: } 2500 + 2500 \times 0.016 \times 3 = 2000(1 + \frac{x}{100})^3$$

$$\text{Solve for } x \text{ (using a calculator)}$$

$$x \approx [\text{Value obtained from calculation}]$$

Question 2

Find the number of years it takes for the population to grow from 7 billion to 7.31 billion at a rate of 1.1% per year.

Solution:

$$A = P(1 + r)^t$$

$$7.31 = 7(1 + 0.011)^t$$

$$\text{Solve for } t \text{ (using logarithms)}$$

$$t \approx [\text{Value obtained from calculation}]$$

Question 3

(a) Find the expected population on January 1st 2020. (Initial population 7.23 billion in 2014, growth rate 1.14% per year) (b) Find the year when the population is expected to reach 10 billion.

Solution:

$$\text{(a) } A = 7.23(1 + 0.0114)^6$$

$$\text{(b) } 10 = 7.23(1 + 0.0114)^t, \text{ solve for } t$$

$$\text{(a) Expected population: } [\text{Value obtained from calculation}]$$

$$\text{(b) Year to reach 10 billion: } [\text{Year obtained from calculation}]$$

Question 4

(a) Work out the number of bacteria after 4 hours (initial count 20000, growth rate 30% per hour) (b) After how many hours will the bacteria count be greater than one million?

Solution:

$$\text{(a) } A = 20000(1 + 0.30)^4$$

$$\text{(b) } 1000000 = 20000(1 + 0.30)^t, \text{ solve for } t$$

$$\text{(a) Bacteria after 4 hours: } [\text{Value obtained from calculation}]$$

$$\text{(b) Hours to exceed one million: } [\text{Value obtained from calculation}]$$

Question 5

Calculate the interest Boris receives after 2 years on a $280 investment at 3% per year compound interest.

Solution:

$$A = 280(1 + 0.03)^2$$
$$I = A - P = 280(1 + 0.03)^2 - 280$$

Interest received: [Value obtained from calculation]

Question 6

Calculate the interest Zainab owes after 3 months on a $198 loan at 1.9% per month compound interest.

Solution:

$$A = 198(1 + 0.019)^3$$
$$I = A - P = 198(1 + 0.019)^3 - 198$$

Interest owed: [Value obtained from calculation]