



eClassroom

GCSE Mathematics

Growth & Decay

Worked Solutions

Pearson Edexcel GCSE & iGCSE Mathematics



Section A — Foundation — Worked Solutions

[Fluency] Question 1

$$3000 \times 1.04^3 = 3000 \times 1.124864$$

$$\therefore \text{£}3374.59$$

[Fluency] Question 2

$$15000 \times 0.88^4 = 15000 \times 0.59969536$$

$$\therefore \text{£}8995.43$$

[Reasoning] Question 3

$$A: 2000 + (2000 \times 0.05 \times 3) = 2000 + 300 = \text{£}2300$$

$$B: 2000 \times 1.048^3 = 2000 \times 1.150957 = \text{\$}2301.91$$

$$\therefore \text{Option B gives more (£}2301.91 \text{ vs £}2300.00)$$

[Fluency] Question 4

$$8000 \times 1.03^5 = 8000 \times 1.15927$$

$$\therefore 9274$$

[Fluency] Question 5

$$N = 500 \times 2^4 = 500 \times 16$$

$$\therefore 8000 \text{ bacteria}$$

[Reasoning] Question 6

$$(1 + r)^{12} = 2 \Rightarrow 1 + r = 2^{1/12}$$

$$r = 2^{1/12} - 1 \approx 0.0595$$

$$\therefore \text{Approximately } 5.95\% \text{ per annum}$$

[Problem Solving] Question 7

(a) Initial value ($n=0$): $V = \text{£}20\,000$

(b) $V = 20000 \times 0.75^3 = 20000 \times 0.421875 = \text{£}8437.50$

(c) $n=4$: $20000 \times 0.75^4 = \text{£}4746.09 < \text{£}5000$ ✓ ($n=4$ first below)

$$\therefore \text{(a) £}20\,000 \quad \text{(b) £}8437.50 \quad \text{(c) 4 years}$$

**[Reasoning] Question 8**

$$24 \text{ years} = 3 \text{ half-lives } (24 \div 8 = 3)$$

$$\text{Remaining} = 200 \times (1/2)^3 = 200 \times 1/8 = 25\text{g}$$

\therefore **25 g**

[Problem Solving] Question 9

$$(a) r = 5899/5618 - 1 = 0.05 = 5\%$$

$$(b) P = 5618/1.05^2 = 5618/1.1025 = \text{£}5095.69$$

\therefore **(a) 5% (b) £5095.69**

[Problem Solving] Question 10

$$(a) 100 \times 1.025^{\supset 10} = 100 \times 1.2801 = \text{£}128.01$$

$$(b) \text{Today's } \text{£}100 = 100/1.2801 = \text{£}78.12 \text{ in today's purchasing power}$$

\therefore **(a) £128.01 (b) Worth £78.12 in real terms**



Section B — Higher — Worked Solutions

[Fluency] Question 1

$$500 \times 0.8^6 = 500 \times 0.262144$$

$$\therefore \mathbf{131.07}$$

[Fluency] Question 2

17190/5730=3 half-lives

$$(1/2)^3=1/8 \text{ remaining}$$

$$\therefore \mathbf{1/8 \text{ of original}}$$

[Fluency] Question 3

$$1.03^n = 1.5 \Rightarrow n = \frac{\log 1.5}{\log 1.03}$$

$$\therefore \mathbf{n \approx 13.7, \text{ so after 14 complete years}}$$

[Reasoning] Question 4

$$4000 \times 1.035^n < 3800 \times 1.042^n$$

Testing: n=8: A=5271, B=5235 (A still ahead); n=9: A=5306, B=5455

Wait — B overtakes A between year 8 and 9

$$\therefore \mathbf{B \text{ first exceeds A after 9 complete years}}$$

[Reasoning] Question 5

$$e^{-0.1t} = 0.25 \Rightarrow -0.1t = \ln(0.25)$$

$$t = -\frac{\ln(0.25)}{0.1} = \frac{\ln 4}{0.1} \approx 13.86$$

$$\therefore \mathbf{t \approx 13.86}$$

[Reasoning] Question 6

Linear: constant additive change each period (e.g. £100 interest on £1000 every year).

Exponential: constant multiplicative change (e.g. bacteria doubling every hour).

Real world: linear=salary raises of fixed £; exponential=compound interest/population growth.

$$\therefore \mathbf{\text{See explanation above.}}$$

**[Problem Solving] Question 7**

$$1.02^t > 1.5 \Rightarrow t > \frac{\log 1.5}{\log 1.02} \approx 20.48$$

\therefore After 21 complete years

[Problem Solving] Question 8

$$(1 + r)^{15} = 2 \Rightarrow r = 2^{1/15} - 1$$

$\therefore r \approx 4.729\%$

[Problem Solving] Question 9

$$200 \times 0.75^n < 50 \rightarrow 0.75^n < 0.25$$

$$n=4: 0.75^4 = 0.316 > 0.25; n=5: 0.75^5 = 0.237 < 0.25$$

\therefore After 5 complete hours

[Problem Solving] Question 10

$$FV = 1000 \times \frac{1.05^{10} - 1}{0.05} \times 1.05$$

$$= 1000 \times 12.5779 \times 1.05 = \pounds 13206.79$$

\therefore $\pounds 13\,207$ (nearest pound)