



QUESTION WORKBOOK

Functions in modelling

Algebra and functions · Year 12–13

7 questions · 24 marks

PRINT EDITION

SECTION A · Warm-up

- A1** Data set one grows by equal amounts in equal time steps; data set two grows by equal factors; data set three repeats every 24 hours. Name the function family suited to each. [3]

- A2** The depth of water in a harbour is modelled by $h = 6 + 1.8 \sin(30t)^\circ$, in metres and hours. Write down the maximum and minimum depths. [2]

SECTION B · Standard

- B1** The depth of water in a harbour is modelled by $h = 6 + 1.8 \sin(30t)^\circ$, in metres and hours. Find the period of the tide and the first time high tide occurs. [3]

- B2** The value of a machine is modelled by $V = 400 + 5600e^{-0.2t}$ pounds after t years. State the initial value and the long-term value, and find the value after 5 years to 3 significant figures. [4]

- B3** The value of a machine is modelled by $V = 400 + 5600e^{-0.2t}$ pounds after t years. Find when the machine's value reaches £1200, to 3 significant figures. [4]

SECTION C · Stretch

- C1** A bacterial culture is modelled by $P = 20e^{0.3t}$ after t hours, fitted to data from the first 10 hours. Explain why the model may serve well at $t = 12$ but should not be trusted at $t = 100$, referring to both the mathematics and the biology. [4]

- C2** For the harbour model $h = 6 + 1.8 \sin (30t)^\circ$, find the length of time in each cycle for which the depth exceeds 7 m. Give your answer to 3 significant figures. [4]