InkMaths

QUESTION WORKBOOK

Functions in modelling

Algebra and functions · Year 12–13

7 questions · 24 marks

NAVY SCREEN EDITION

inkphysics.co.uk/maths/ · youtube.com/@InkPhysics

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