

A-Level Scenario-Based Math Questions

Surds

1. An engineer designs a square platform with area 72 m^2 . Express the side length in simplest surd form and explain its practical significance.
2. Simplify and express in the form $a\sqrt{b}$: $4\sqrt{50} - 3\sqrt{18} + \sqrt{8}$ in a chemical measurement context.
3. Rationalize the denominator of $7 / (\sqrt{5} - 2)$ and interpret the result in a physics formula.

Indices (Exponents)

4. A radioactive substance decays according to $N = 500 \times 2^{(-t/3)}$. Find the time t when $N = 62.5$.
5. Simplify: $(x^{(3/2)} \times x^{(-1/2)}) / x^{(1/3)}$ and express your answer in index form.
6. Solve for x : $9^{(x+1)} = 3^{(2x+5)}$.

Logarithms

7. The intensity of light follows $I = I_0 e^{(kt)}$. Taking logs, find t when $I = 10I_0$ given $k = 0.5$.
8. Solve: $\log_{10}(x - 1) + \log_{10}(x + 1) = 1$.
9. A chemical reaction rate is modeled by $\log_{10}(R) = 3t - 1$. Find R when $t = 2$.

Coordinate Geometry

10. A satellite moves between $A(-2, 4)$ and $B(6, 10)$. Find the distance and midpoint.
11. Find the equation of a line perpendicular to $y = 2x + 3$ passing through $(1, -1)$.
12. Determine whether the points $(1,2)$, $(3,6)$, and $(5,10)$ are collinear using slope.