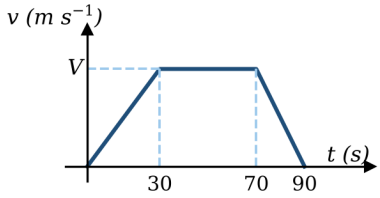
Day 227	A Level Maths: A Tier 10-a-day
1 Solve $\log_2(x + 1) + \log_2(x - 1) = 3$.	
2 The diagram shows the speed-time graph for a train journey of 1950 m. Find (a) V, (b) the deceleration in the final stage. 	
3 For n = 10 pairs of (x, y): $\Sigma x = 186$, $\Sigma y = 446$, $\Sigma x^2 = 4144$, $\Sigma y^2 = 23530$, $\Sigma xy = 9801$. Calculate the product moment correlation coefficient, and describe the correlation.	
4 $y = (3x + 1)e^{-3x}$. Find the exact coordinates of the stationary point and determine its nature.	
5 The 2nd term of a geometric sequence is 6 and the 5th term is 162. Find the common ratio and the first term. Find the sum of the first 8 terms.	

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6 A ball is projected from the ground at 37 m s^{-1} at angle α above the horizontal, $\tan\alpha = \frac{24}{7}$. At time T s, while in flight, it is moving perpendicular to its initial direction. Find (a) T, (b) the height of the ball then. Take g = 9.8. Give answers to 3 s.f. if not exact.

7 l_1: $\mathbf{r} = \begin{pmatrix} 10 \\ 0 \\ -3 \end{pmatrix} + \lambda \begin{pmatrix} 3 \\ -2 \\ -3 \end{pmatrix}$

l_2: $\mathbf{r} = \begin{pmatrix} 10 \\ 2 \\ -2 \end{pmatrix} + \mu \begin{pmatrix} -3 \\ 1 \\ 3 \end{pmatrix}$

Determine whether l_1 and l_2 intersect. If they do, find the point of intersection.

8 The line $12x + 5y = -36$ meets the circle $(x + 4)^2 + (y + 1)^2 = 9$ at the points A and B. Find the exact length of AB.

9 Faults are reported at random at an average of 10 per hour.
Find the probability that in a 90-minute period there are (a) zero events (b) at least 3.
(c) Find the probability that at least one occurs in each of two separate 90-minute periods.

10 (a) Expand $(1 + x)^{\frac{1}{2}}$ in ascending powers of x up to x^2.
(b) Use x = 0.01 to estimate $\sqrt{101}$ to 4 decimal places.