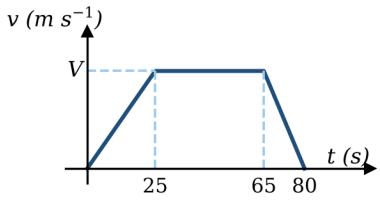
Day 357 **A Level Maths: A Tier 10-a-day**

1 The diagram shows the speed-time graph for a train journey of 960 m. Find (a) V, (b) the deceleration in the final stage. Give answers to 3 s.f. if not exact.



2 A curve has parametric equations $x = t^2 + 1$, $y = t^3 - t$.
Find $\frac{dy}{dx}$ in terms of t, and the equation of the normal at the point where $t = \frac{1}{2}$, in the form ax + by + c = 0 (integers).

3 Cars pass a junction at a mean rate of 5 per day, as a Poisson process.
Find the probability that in one such period there are
(a) exactly 6 (b) at least 6 (c) fewer than 6 (3 s.f.).

4 Particles A (2 kg) and B (4 kg) move in the same direction on a smooth horizontal line at 5 m s^{-1} and 5 m s^{-1}. They collide and coalesce. Find (a) the speed of the combined particle, (b) the kinetic energy lost in the collision.

5 A, B and C have position vectors $\begin{pmatrix} 4 \\ -3 \\ -4 \end{pmatrix}$, $\begin{pmatrix} 7 \\ -1 \\ -4 \end{pmatrix}$ and $\begin{pmatrix} -2 \\ k \\ -4 \end{pmatrix}$
relative to O, where k is a constant. Given that A, B and C are collinear, find k and the ratio AB : BC.

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6 $f(x) = \frac{5x-1}{4x+5}$, $x \in \mathbb{R}$, $x \neq -\frac{5}{4}$. Find $f^{-1}(x)$ and state its domain.	
7 (a) Express $16\cos\theta - 12\sin\theta$ in the form $R\cos(\theta + \alpha)$, where $R > 0$ and $0° < \alpha < 90°$. Give α to 1 d.p. (b) Solve $16\cos\theta - 12\sin\theta = 19$ for $0° \leq \theta < 360°$, giving answers to 1 d.p.	
8 A circle passes through A(4, −9) and B(−13, 8). Its centre lies on the line $y = 3x + 6$. Find the equation of the circle.	
9 $f(x) = x^2 - 2x + 3$, $x \in \mathbb{R}$, and $g(x) = \frac{3}{x+2}$, $x > -2$. (a) Find the range of f. (b) Show that gf is defined and find its range.	
10 The life of a battery is $N(63, 4^2)$. A battery is classed as 'special' if its life is more than 70. 10 batterys are chosen at random. Find the probability that exactly 2 are special (3 s.f.).	