Day 112	A Level Maths: A Tier 10-a-day
1 X is normally distributed with mean 69 and standard deviation σ. Given that P(X > 70) = 0.3085, find σ to 3 significant figures.	
2 A circle has equation $x^2 + y^2 - 10x - 2y - 19 = 0$. (a) Find the centre and radius of the circle. (b) Determine whether P(5, −4) lies inside or outside the circle.	
3 Particles A (8 kg) and B (2 kg) move in the same direction on a smooth horizontal line at 8 m s^{-1} and 2 m s^{-1}. They collide and coalesce. Find (a) the speed of the combined particle, (b) the kinetic energy lost in the collision.	
4 Cars pass a junction at a mean rate of 3 per minute, as a Poisson process. Find the probability that in one such period there are (a) exactly 3 (b) at least 3 (c) fewer than 3 (3 s.f.).	
5 $f(x) = x^3 + 4x - 8$. Use the Newton-Raphson method with $x_0 = 1.5$ to find x_1 and x_2, giving your answers to 4 d.p.	

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6 A particle moves on the x-axis. At time t s its acceleration is $(6t - 6)$ m s^{-2}. When t = 0 it is at O with velocity -2 m s^{-1}. Find (a) its velocity when the acceleration is zero, (b) its displacement from O then.	
7 (a) Express $\frac{-6x - 33}{(x + 5)(x + 6)}$ in partial fractions. (b) Hence find $\int_0^4 \frac{-6x - 33}{(x + 5)(x + 6)}\,dx$, giving the answer in the form ln k.	
8 The curve y = f(x), where $f(x) = \frac{2}{x - 2} + 4$, is translated by $\begin{pmatrix} -2 \\ 1 \end{pmatrix}$. Write down the equations of the asymptotes of the new curve, and find where it crosses the x-axis.	
9 Solve $\sec^2 x - 5\tan x + 5 = 0$ for $0° \leq x \leq 360°$. Give answers to 1 d.p.	
10 $f(x) = \frac{4x - 2}{(1 - x)(1 + x)}$. (a) Express f(x) in partial fractions. (b) Hence expand f(x) up to x^2. (c) State the range of x for which the expansion is valid.	