Day 263	A Level Maths: A Tier 10-a-day
1 A driver at constant speed sees a hazard 62.25 m ahead. After a reaction time of 0.4 s she brakes with deceleration 2 m s^{-2} and stops exactly at the hazard. Find (a) her initial speed, (b) the total time from seeing the hazard to stopping.	
2 Find the exact value of $\int_0^{\frac{\pi}{12}} 4\sec^2 3x \, dx$.	
3 (a) Solve $5x + 6 < 3$. (b) Solve $x^2 + 9x + 20 \geq 0$. (c) Hence find the values of x satisfying both inequalities.	
4 A particle of mass 4 kg is acted on by forces $F_1 = (8\mathbf{i} - 7\mathbf{j})$ N and F_2. Its acceleration is $(3\mathbf{i} - \mathbf{j})$ m s^{-2}. Find (a) F_2, (b) the angle between F_2 and $\mathbf{i}$, to 1 d.p.	
5 The mean time taken (minutes) is normally distributed with standard deviation 5; it was previously 67. A random sample of 9 has mean 68.9. Test, at the 5% level, whether the mean has changed.	

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6 $y = x^4 \ln x$ for $x > 0$. Find the exact coordinates of the stationary point and show that it is a minimum.	
7 X is normally distributed with mean μ and standard deviation 6. Given that $P(X > 55) = 0.1587$, find μ to 3 significant figures.	
8 Expand $(27 - 3x)^{\frac{1}{3}}$ in ascending powers of x, up to and including x^2. State the range of x for which the expansion is valid.	
9 A charity raises £600 in its first year and in each later year raises £40 more than in the previous year. (a) How much does it raise in year 11? (b) In which year does the total raised first exceed £5000?	
10 Solve $3\text{cosec}^2 x - 9\cot x - 15 = 0$ for $0° < x < 360°$. Give answers to 1 d.p.	