Day 259	A Level Maths: A Tier 10-a-day
1 Solve $3^{3x-1} = 7^{x-2}$. Give your answer to 3 significant figures.	
2 A cyclist passes P with speed 6 m s^{-1} and accelerates uniformly. She travels 280 m in the next 20 s, reaching Q. Find (a) her acceleration, (b) her speed at Q, (c) her speed at the midpoint of PQ. Give answers to 3 s.f. if not exact.	
3 Find the sum of all the multiples of 3 that lie strictly between 138 and 455.	
4 A sector of a circle of radius 5 cm has perimeter 13 cm. Find (a) the angle of the sector in radians, (b) the area of the sector.	
5 A particle P has constant acceleration $(3\mathbf{i} - 2\mathbf{j})$ m s^{-2}. When t = 0, P is at $(3\mathbf{i} - \mathbf{j})$ m moving with velocity $(-9\mathbf{i} + 2\mathbf{j})$ m s^{-1}. Find (a) when P moves parallel to $\mathbf{j}$, (b) its position vector then.	

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6 In the expansion of $(1 + kx)^n$, where n is a positive integer, the coefficient of x is 18 and the coefficient of x^2 is 135. Find n and k.	
7 The mass of an egg is $N(70, 5^2)$. An egg is classed as 'special' if its mass is less than 65. 11 eggs are chosen at random. Find the probability that exactly 3 are special (3 s.f.).	
8 The line l has equation $\mathbf{r} = \begin{pmatrix} 7 \\ -6 \\ -1 \end{pmatrix} + t\begin{pmatrix} -2 \\ 2 \\ 0 \end{pmatrix}$. Find the coordinates of the foot of the perpendicular from P(3, 2, −1) to l, and the exact distance from P to l.	
9 $f(x) = \frac{x - 1}{(1 + 2x)(1 + x)}$. (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.	
10 $X \sim N(\mu, \sigma^2)$, with $P(X < 58) = 0.0228$ and $P(X > 73) = 0.3085$. Find μ and σ.	