Day 167	A Level Maths: A Tier 10-a-day
1 X, the length (mm), is normally distributed with mean 80 and standard deviation 2. Find (a) P(X > 83.6) (b) P(83.6 < X < 86.4), each to 3 s.f.	
2 $u_1 = 22$ and $u_{n+1} = \frac{1}{3} u_n + 12$. (a) Find the limit L of the sequence as $n \to \infty$. (b) Find the least n for which $\lvert u_n - L \rvert < 0.001$.	
3 Use the trapezium rule with 4 strips to estimate $\int_1^3 5(\frac{1}{x})\, dx$, giving your answer to 3 s.f. State, with a reason, whether your estimate is an overestimate or an underestimate.	
4 A 3 kg particle moves on a smooth horizontal line. At time t s a single force of $(15 - 3t)$ N acts along the line. When t = 0 its speed is 2 m s^{-1}. Find (a) its speed when t = 1, (b) its greatest speed.	
5 Bulbs are defective with probability 0.2, independently. A pack of 6 bulbs is rejected if it has at least 2 defective. From 6 such packs, find the probability that exactly 4 are rejected (3 s.f.).	

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6 Solve $\lvert x + 4\rvert < \lvert -2x + 3\rvert$.	
7 A particle P has position vector $\mathbf{r} = (t^3 - t)\mathbf{i} + (3t^2 - 6t)\mathbf{j}$ metres at time t s. Find (a) the speed of P when t = 2, (b) the value of t when P is moving parallel to $\mathbf{i}$. Give answers to 3 s.f. if not exact.	
8 An open-topped box has a square base of side x cm and volume 256 cm^3. Show that its surface area is $A = x^2 + \frac{1024}{x}$, and find the least possible value of A, justifying that it is a minimum.	
9 Water pours into a cone, vertex down, at 50 cm^3s^{-1}. The surface radius is always $\frac{h}{2}$. Find the rate at which the depth is rising when h = 5 cm.	
10 The circle $x^2 + y^2 - 4x + 6y - 12 = 0$ passes through P(−1, −7). (a) Find the equation of the tangent at P, in the form ax + by = c. (b) Find the coordinates of the point where this tangent crosses the x-axis.	