Day 234	A Level Maths: S Tier 10-a-day
1 The pdf of X is $f(x) = kx^2$ for $0 \leq x \leq 2$, and 0 otherwise. (a) Find k. (b) Find E(X) and the standard deviation of X. (c) Find the median, to 3 significant figures.	
2 A cone with its vertex downwards and semi-vertical angle α, where $\tan\alpha = \frac{1}{2}$, is filled at 15π cm^3s^{-1}. Find the rate at which the depth h is rising when h = 3 cm. ($V = \frac{1}{3}\pi r^2 h$)	
3 A lift of mass 450 kg, carrying a passenger of mass 90 kg, is supported by a vertical cable. The lift is moving downwards and accelerating at 1.4 m s^{-2}. Find (a) the force the floor exerts on the passenger, (b) the tension in the cable. Take g = 9.8 m s^{-2}.	
4 A data set has lower quartile 24 and upper quartile 39. An outlier is a value more than 1.5 × IQR beyond the nearest quartile. (a) Find the range of values that are not outliers. (b) 8 observations have mean 29. The largest is 67, an outlier, and it is removed. Find the new mean.	
5 A uniform plank AB of length 8 m and mass 30 kg rests on supports at C and D, where AC = 2 m and DB = 3 m. A girl of mass 50 kg stands on it at distance x m from A. Find the range of x for which the plank stays in equilibrium on both supports.	

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6 Find the exact coordinates of the stationary point of $y = 2x^2 \ln x$ for $x > 0$, and determine its nature.	
7 Describe a sequence of two transformations that maps the curve $y = x^2$ onto the curve $y = -2x^2 - 20x - 46$.	
8 A geometric series has first term 3 and common ratio $\frac{5}{4}$. Find the least n for which $S_n > 16704$.	
9 The curve C has equation $x^2 + 3xy + 4y^2 = 112$. Find the coordinates of the points on C where the tangent is parallel to the y-axis.	
10 The diagram shows the curve C, its asymptotes (dashed) and a point P. C has equation $y = \frac{a}{x + p} + q$. Find a, p and q.  	