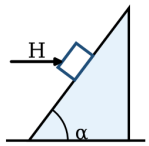
Day 312	A Level Maths: S Tier 10-a-day
1 The cdf of X is F(x) = 0 for x < 0, F(x) = $1 - (1 - \frac{x}{4})^3$ for $0 \leq x \leq 4$, and F(x) = 1 for x > 4. (a) Find the pdf of X. (b) Find E(X). (c) Find P(1 < X < 2) and the median, to 3 significant figures.	
2 A particle P moves in a plane. At time t seconds its position vector relative to a fixed origin O is r metres, where $\mathbf{r} = (-2.5t^2 - 7t)\mathbf{i} + (-3t^2 + 7t)\mathbf{j}$. Find (a) the value of t at which P is moving parallel to $(2\mathbf{i} + \mathbf{j})$, (b) the speed of P at this time (3 s.f. if not exact).	
3 A radioactive sample has mass $m = m_0e^{-kt}$ grams, t in days. Initially m = 500 and after 4 days m = 300. Find k, and the time for the mass to fall to 100 grams, to 3 s.f.	
4 Express $\frac{2 + 5\sqrt{5}}{1 - \sqrt{5}}$ in the form $p + q\sqrt{5}$, where p and q are rational numbers.	
5 A drink cools according to $\theta = 25 + Ae^{-kt}$, where θ °C is the temperature after t minutes. Initially $\theta = 85$, and after 8 minutes $\theta = 55$. Find A and k, then find when $\theta = 37$ (3 s.f.).	

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6 The curve C has parametric equations $x = 2t$, $y = 3t^2$. The line $y = -\frac{3}{2}x + 18$ meets C at A and B. Find the exact length AB.	
7 The size of a rod is $N(87, 3^2)$ mm. A rod is 'large' if it exceeds 90. (a) Find the probability that a rod is large. (b) 12 rods are chosen at random. Find the probability that at least 4 are large.	
8 The volume of a sphere increases at a constant rate of 50π cm^3s^{-1}. When the radius is 5 cm, find the rate of increase of (a) the radius, (b) the surface area. Volume = $\frac{4}{3}\pi r^3$.	
9 A particle of weight 145 N rests on a rough plane inclined at α to the horizontal, where $\tan\alpha = \frac{4}{3}$ and $\mu = 0.5$. A horizontal force H N, in the vertical plane through a line of greatest slope, holds it in equilibrium. Find the range of possible values of H. 	
10 Find the sum of all the integers from 1 to 760 inclusive that are divisible by 4 or by 10, but not by both.	