Day 154	A Level Maths: S Tier 10-a-day
1 A particle starts from rest at the top of a rough slope of length 10 m ($\sin\alpha = \frac{3}{5}$, $\mu = 0.3$), then slides along rough horizontal ground with the same μ. Use energy to find (a) its speed at the foot of the slope (3 s.f.), (b) the distance it slides on the ground. Take $g = 9.8$ m s^{-2}.	
2 Solve $\sqrt{x + 11} = x + 5$.	
3 Solve $\log_3(x + 1) + \log_3(x - 1) = 1$, justifying clearly any root that you reject.	
4 Prove that $5k = n^2 + 3$ has no integer solutions (k and n integers).	
5 For 25 observations x, $\Sigma(x - 60) = 45$ and $\Sigma(x - 60)^2 = 381$. (a) Find the mean of x. (b) Find the standard deviation of x. (c) Find the value of Σx^2.	

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6 Find the exact value of $\int_1^e \frac{1}{x(\ln x + 3)}\,dx$	
7 The number of customers arriving at a shop in one hour is Po(36). Use a suitable approximation to find $P(X \geq 42)$, to 3 significant figures.	
8 A box of weight 140 N is pulled at constant speed up a line of greatest slope of a rough plane ($\tan\alpha = \frac{3}{4}$, $\mu = \frac{3}{4}$) by a force P N at angle β above the plane. (a) Find P when $\tan\beta = \frac{12}{5}$. (b) Find the least possible value of P as β varies.	
9 The points A, B, C have coordinates $(-2, -3, -3)$, $(1, -2, 4)$, $(1, -2, -3)$. Find angle ABC to 1 d.p., and the exact area of triangle ABC.	
10 Solve $5^{2x} - 130 \times 5^x + 625 = 0$.	