Day 42	A Level Maths: A Tier 10-a-day
1 P(A) = 0.3 and P(A ∪ B) = 0.79. (a) Given that A and B are independent, find P(B). (b) Given instead that A and B are mutually exclusive, find P(B). (c) In the case in (a), find P(A′ ∩ B).	
2 Find the coefficient of x^2 in the expansion of $(1 - 3x)^7$.	
3 Find the exact value of $\int_1^4 (2\sqrt{x} + \frac{2}{\sqrt{x}})\, dx$.	
4 The random variable X has probability density function f(x) = kx(6 − x) for 0 ≤ x ≤ 6, and 0 otherwise. (a) Find k. (b) Find E(X). (c) Find P(X > 2).	
5 Find the least integer n for which $2^n > 10^7$.	

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6 A non-uniform rod AB (length 3 m, mass 10 kg) has its centre of mass at G, AG = 1 m. It hangs horizontally from vertical strings at A and B. A particle of mass m kg is fixed at P, AP = 2.5 m, making the tensions equal. Find (a) m, (b) the tension. Take g = 9.8.	
7 $f(x) = 3x^2 + 1$, $x \geq 0$. Find $f^{-1}(x)$ and state its domain.	
8 A 12 kg box is pulled from rest along rough horizontal ground by a horizontal force of 54.24 N and moves 4.8 m in 4 s. Find (a) the coefficient of friction. The force is then removed; (b) find the further distance moved. Take g = 9.8. Give answers to 3 s.f. if not exact.	
9 l_1: $\mathbf{r} = \begin{pmatrix} 12 \\ 3 \\ -8 \end{pmatrix} + \lambda \begin{pmatrix} -3 \\ -2 \\ 3 \end{pmatrix}$ l_2: $\mathbf{r} = \begin{pmatrix} 6 \\ -2 \\ -2 \end{pmatrix} + \mu \begin{pmatrix} -3 \\ 0 \\ 1 \end{pmatrix}$ Determine whether l_1 and l_2 intersect. If they do, find the point of intersection.	
10 $f(x) = \frac{7x + 1}{(1 - x)(1 + x)}$. (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.	