Day 316	A Level Maths: A Tier 10-a-day
1 A lift of mass 300 kg carries a person of mass 75 kg. The cable tension is 3487.5 N and the lift is accelerating. Find (a) the magnitude and direction of the acceleration, (b) the force of the floor on the person. Take g = 9.8.	
2 X, the length (mm), is N(82, 2^2). The lowest 15% of values are below k. Find k to 3 significant figures.	
3 A 4 kg box is pulled from rest along rough horizontal ground by a horizontal force of 22.8 N and moves 10 m in 5 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.	
4 Solve $\cos 2\theta - 3\cos\theta = -2$ for $0° \leq \theta \leq 360°$.	
5 Given that $(x - 4)$ is a factor of $f(x) = x^3 + x^2 - 14x - 24$, solve $f(x) \leq 0$.	

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6 A curve has parametric equations $x = t^2 + 1$, $y = t^3 - t$. Find $\frac{dy}{dx}$ in terms of t, and the equation of the normal at the point where $t = -1$, in the form $ax + by + c = 0$ (integers).	
7 In the expansion of $(1 + kx)^n$, where n is a positive integer, the coefficient of x is 20 and the coefficient of x^2 is 180. Find n and k.	
8 The random variable X has pdf $f(x) = \frac{4}{256}x^3$ for $0 \leq x \leq 4$, and 0 otherwise. (a) Find the cumulative distribution function F(x) for $0 \leq x \leq 4$. (b) Find $P(X > 2)$. (c) Find the median of X to 3 s.f.	
9 $y = x \operatorname{cosec}(3x)$. Find the exact gradient at $x = \frac{\pi}{9}$.	
10 $f(x) = \frac{-18x + 2}{(1 - 3x)(1 + 3x)}$. (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.	