Day 71	A Level Maths: A Tier 10-a-day
1 Find the coefficient of x^4 in the expansion of $(2 + 3x)^5$.	
2 A stone is projected from a cliff top 42.5 m above the sea at 20 m s^{-1}, at angle α above the horizontal, $\tan\alpha = \frac{4}{3}$. Find (a) the time to reach the sea, (b) the horizontal distance travelled, (c) the speed on impact. Take g = 9.8. Give answers to 3 s.f. if not exact.	
3 Find the value of $\sum_{r=1}^{6} 5 \times \frac{3}{2}^r$.	
4 y = cosec(2x). Find $\frac{dy}{dx}$ and its exact value at $x = \frac{\pi}{12}$.	
5 An arithmetic series has first term 8 and common difference 6. The sum of the first n terms is 848. Find n.	

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6 A 5 kg particle rests on a smooth plane inclined at α, $\tan\alpha = \frac{4}{3}$, held by a string in the vertical plane through a line of greatest slope, at angle θ above the slope, $\tan\theta = \frac{5}{12}$. Find the tension and the normal reaction. Take g = 9.8. Give answers to 3 s.f. if not exact.	
7 $y = x - 2\sin x$ for $0 \leq x \leq 2\pi$. Find the exact coordinates of the stationary points and determine their nature.	
8 X has pdf $f(x) = \frac{6}{64}x(4 - x)$ for $0 \leq x \leq 4$, and 0 otherwise. Find E(X), Var(X) and the standard deviation of X (3 s.f.).	
9 Solve $2\text{cosec}^2 x + 5\cot x - 5 = 0$ for $0° < x < 180°$. Give answers to 1 d.p.	
10 The times in seconds of two groups: group X has n = 33, mean 37, sd 5; group Y has n = 27, mean 57, sd 3. Find the mean and standard deviation of all 60 values (3 s.f. for the sd).	