Day 324	A Level Maths: A Tier 10-a-day
1 A ball is thrown vertically upwards at 29.4 m s^{-1} from a point h m above horizontal ground, and hits the ground 7 s later. Find (a) h, (b) the greatest height above the ground. Take g = 9.8.	
2 $f(x) = x^2 + 2$ and $g(x) = 2x - 3$. Solve $fg(x) = gf(x)$.	
3 X, the length (mm), is normally distributed with mean 83 and standard deviation 2. Find (a) $P(X > 78.2)$ (b) $P(78.2 < X < 79.6)$, each to 3 s.f.	
4 $f(x) = 3\arcsin(2x)$. State the domain and range of f, and find $f^{-1}(x)$.	
5 Given that $\sum_{r=1}^{n}(4r - 2) = 162$, find the value of n.	

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6 Find the exact value of $\int_0^{\ln 3} (5e^{2x} + 5e^{x})\,dx$.	
7 The line $5x + 12y = k$ is a tangent to the circle $(x + 2)^2 + (y + 1)^2 = 9$. Find the two possible values of k.	
8 A 4 kg box is pulled along rough horizontal ground, $\mu = 0.3$, by a rope at angle θ above the horizontal, where $\tan\theta = \frac{5}{12}$. The tension is 25 N. Find (a) the normal reaction, (b) the acceleration of the box. Take g = 9.8. Give answers to 3 s.f. if not exact.	
9 Solve the differential equation $y\frac{dy}{dx} = e^{x}$, given that y = 3 when x = 0 (y > 0). Give y in terms of x.	
10 X ~ B(100, 0.6). Use a normal approximation to estimate $P(X \leq 58)$ to 3 significant figures.	