Day 159	A Level Maths: A Tier 10-a-day
1 $y = (x - 5)^3$. Find $\frac{dy}{dx}$ and the gradient of the curve at $x = 1$.	
2 Find the value of $\sum_{r=1}^{8} 3 \times 4^r$.	
3 Find the exact value of $\int_0^{\ln 2} (5e^{2x} + e^x)\, dx$.	
4 A group of 6 boys and 7 girls. A team of 3 is chosen at random. Find the probability that the team has exactly 2 of the girls.	
5 A 5 kg block is released from rest on a rough plane inclined at α, $\tan\alpha = \frac{5}{12}$, $\mu = 0.2$, and slides 4 m down a line of greatest slope. Use work and energy to find (a) the work done against friction, (b) its speed after 4 m. Take $g = 10$. Give answers to 3 s.f. if not exact.	

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6 The line $12x + 5y = k$ is a tangent to the circle $(x + 4)^2 + (y + 4)^2 = 9$.
Find the two possible values of k.

7 A regression line of v on w is $v = 1001 + 5w$, where $w = \frac{t - 2010}{10}$.
(a) Find the regression line of v on t in the form $v = p + qt$.
(b) Estimate v when $t = 2050$.

8 Particle A (1 kg) rests on a smooth table, joined by a light string over a smooth pulley at the edge to particle B (9 kg), hanging 1.2 m above the floor. Released from rest. Find (a) the tension, (b) the speed of B as it hits the floor. Take $g = 9.8$. Give answers to 3 s.f. if not exact.

9 Solve $3\text{cosec}^2 x - 6\cot x - 12 = 0$
for $-180° < x < 180°$, $x \neq 0$. Give answers to 1 d.p.

10 The diagram shows the curve $y = x^2 + 3x - 8$ and the line $y = 2x - 2$, meeting at A and B.
(a) Find the coordinates of A and B.
(b) Find the coordinates of the midpoint of AB.

