Day 211 **A Level Maths: B Tier 10-a-day**

1 Find the exact value of

$\int_0^{\frac{\pi}{6}} (5 \sin 3x + \cos 3x)\, dx$.

2 The table shows the number of siblings, x, of 41 students.
Calculate the mean and standard deviation (3 s.f.).

x	0	1	2	3	4
Frequency	12	5	4	10	10

3 Simplify $\frac{(2x^2)^2 \times 6x^4}{3x^7}$.

4 Find the exact value of

$\int_0^{\ln 4} \frac{e^x}{e^x + 2}\, dx$,

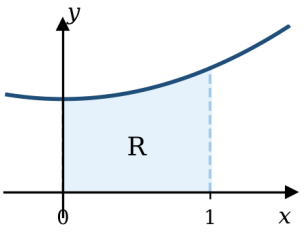
giving your answer in the form a ln b.

5 A particle moves on a straight line. Its displacement from O at time t seconds is $s = 2t^3 + t^2 - 8t$ metres.
Find its velocity and acceleration when $t = 2$.

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6 $X \sim B(12, 0.2)$ and $Y \sim B(12, 0.3)$ are independent.
Find $P(X = 1 \text{ and } Y \leq 3)$, to 3 significant figures.

7 The region R is bounded by the curve $y = x^2 + 3$, the x-axis
and the lines $x = 0$ and $x = 1$.
R is rotated through 360° about the x-axis. Find the exact volume generated.



8 A coach accelerates uniformly from rest at 2 m s^{-2} for 10 s, then travels at constant speed for 20 s, and finally decelerates uniformly at 1 m s^{-2} to rest.
Find the total distance travelled and the total time of the journey.

9 A curve has parametric equations
$x = 1 + \cos t$, $y = -4 + \sin t$, for $0 \leq t < 2\pi$. Find a Cartesian equation of the curve.

10 (a) Write $-x^2 + 2x + 6$ in the form $a(x + p)^2 + q$.
(b) Write down the coordinates of the maximum point of $y = -x^2 + 2x + 6$.