Day 224 **A Level Maths: A Tier 10-a-day**

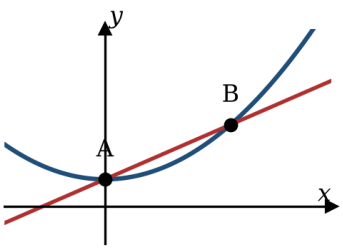
1 10 values have $\Sigma x = 230$ and $\Sigma x^2 = 5930$.
One value was recorded as 47 but should have been 30.
Find the correct mean and standard deviation (3 s.f.).

2 A curve has equation $x^2y + 2y^3 + 2x = 20$.
Find $\frac{dy}{dx}$ in terms of x and y, and the gradient of the normal at $(-2, 2)$.

3 Simplify $\frac{x^2 - 16}{(x - 3)} \div \frac{(x + 4)}{(3x - 1)}$.

4 Forces $F_1 = (6\mathbf{i} - 2\mathbf{j})$ N, $F_2 = (24\mathbf{i} + 7\mathbf{j})$ N and $F_3 = (a\mathbf{i} + b\mathbf{j})$ N keep a 5 kg particle in equilibrium. Find (a) a and b. F_2 is then removed; (b) find the magnitude of the acceleration.

5 The diagram shows the curve $y = x^2 + 2$ 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.



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6 A 8 kg box is pulled along rough horizontal ground, $\mu = 0.1$, by a rope at angle θ above the horizontal, where $\tan\theta = \frac{3}{4}$. The tension is 35 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.	
7 Find the coefficient of x^{-2} in the expansion of $(3x^2 + \frac{3}{x^2})^7$.	
8 (a) Express $\frac{-2x-9}{(x+4)(x+3)}$ in partial fractions. (b) Hence find $\int_0^1 \frac{-2x-9}{(x+4)(x+3)}\,dx$, giving the answer in the form ln k.	
9 X has pdf $f(x) = \frac{4}{625}x^3$ for $0 \leq x \leq 5$, and 0 otherwise. Find E(X), Var(X) and the standard deviation of X (3 s.f.).	
10 A curve has equation $2x^2 + 4xy - 3x - 3y = 19$. Show that $P(-1, -2)$ lies on the curve and find the equation of the tangent at P in the form ax + by + c = 0 with integer a, b, c.	