Day 140	A Level Maths: A Tier 10-a-day
1 $f(x) = -3x + 3$ and $g(x) = x^2 + 4$. Solve $gf(x) = 40$.	
2 Solve $\log_2(x + 6) + \log_2(x - 9) = 4$.	
3 Solve $9^{3x-2} = 3^{3x-2}$.	
4 A is acute and B is obtuse, with $\sin A = \frac{24}{25}$ and $\cos B = -\frac{12}{13}$. Find the exact values of $\tan(A+B)$ and $\sin(A-B)$.	
5 Expand $(1 + 2x)^{\frac{1}{3}}$ in ascending powers of x up to and including the term in x^2. State the range of values of x for which the expansion is valid.	

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6 A 5 kg box is pulled along rough horizontal ground, $\mu = \frac{1}{3}$, by a rope at angle θ above the horizontal, where $\tan\theta = \frac{4}{3}$. The tension is 35 N. Find (a) the normal reaction, (b) the acceleration of the box. Take g = 9.8.

7 The table summarises the mass, m grams, of eggs.
Estimate the mean and standard deviation (3 s.f.).

Class	Frequency
$40 \le m < 60$	19
$60 \le m < 80$	7
$80 \le m < 100$	7
$100 \le m < 120$	4
$120 \le m < 140$	20

8 A uniform rod AB (16 kg, 1.5 m) is smoothly hinged at A to a vertical wall, with a 4 kg particle at B. A light string from B to the wall above A holds the rod horizontal, at angle θ to it, $\tan\theta = \frac{4}{3}$. Find (a) the tension, (b) the magnitude of the hinge force. Take g = 9.8. Give answers to 3 s.f. if not exact.

9 The line l has equation $\mathbf{r} = \begin{pmatrix} -1 \\ 2 \\ -5 \end{pmatrix} + t\begin{pmatrix} 0 \\ -2 \\ 3 \end{pmatrix}$.
Find the coordinates of the foot of the perpendicular from P(1, 0, −2) to l, and the exact distance from P to l.

10 X ~ B(38, p). H_0: p = 0.4 is tested against H_1: p > 0.4 using a 5% significance level.
(a) Find the critical region. (b) State the probability of a Type I error.
(c) Find the probability of a Type II error when p = 0.6 (3 s.f.).