Day 327	A Level Maths: A Tier 10-a-day
1 $f(x) = e^x - 2x - 8$. Show that the equation $f(x) = 0$ has a root α in the interval $[2, 3]$.	
2 Summary statistics for the daily mean windspeed (knots) in the same month are: Heathrow: mean 9, standard deviation 5.1; Leuchars: mean 22, standard deviation 0.9. Make two comparisons.	
3 Show that $\frac{3}{\sqrt{11}-1} + \frac{4}{\sqrt{11}+1}$ can be written as $p + q\sqrt{11}$, and find p and q.	
4 A lift of mass 300 kg carries a person of mass 50 kg. The cable tension is 3640 N and the lift is accelerating. Find (a) the magnitude and direction of the acceleration, (b) the force of the floor on the person. Take $g = 9.8$.	
5 $\lvert a\rvert = 6$, $\lvert b\rvert = 6$ and the angle between a and b is 120°. Find the exact values of $a \cdot b$ and $\lvert a + b\rvert$.	

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6 A non-uniform rod AB (length 2 m, mass 6 kg) has its centre of mass at G, AG = 0.5 m. It hangs horizontally from vertical strings at A and B. A particle of mass m kg is fixed at P, AP = 1.5 m, making the tensions equal. Find (a) m, (b) the tension. Take g = 9.8.

7 A circle passes through A(5, 12) and B(−1, −6).
Its centre lies on the line $y = -x + 3$.
Find the equation of the circle.

8 Solve $4\text{cosec}^2 x - 4\cot x - 52 = 0$
for $0° < x < 360°$. Give answers to 1 d.p.

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

Class	Frequency
$40 \le m < 60$	8
$60 \le m < 80$	9
$80 \le m < 100$	9
$100 \le m < 120$	15
$120 \le m < 140$	3
$140 \le m < 160$	7

10 (a) Expand $(1 + 3x)^{\frac{1}{2}}$ in ascending powers of x up to x^2.
(b) Use x = 0.01 to estimate $\sqrt{103}$ to 4 decimal places.