Day 3 **A Level Maths: A Tier 10-a-day**

1 A lift of mass 400 kg carries a person of mass 75 kg. The cable tension is 4797.5 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.

2 Solve $2\cos^2\theta - \sin\theta - 2 = 0$ for $0 \leq \theta \leq 2\pi$.

3 Solve $|x - 8| = |2x + 2|$.

4 The table summarises the journey time, t minutes of 73 items.
Use linear interpolation to estimate the 90th percentile.

Class	Frequency
$20 \leq t < 40$	13
$40 \leq t < 60$	19
$60 \leq t < 80$	14
$80 \leq t < 100$	20
$100 \leq t < 120$	7

5 A stone is dropped from rest from the top of a cliff. In the last 3 seconds before it hits the sea it falls 191.1 m. Find the height of the cliff. Take g = 9.8.

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6 Water drains from a tank so that the depth h metres falls at a rate proportional to $\sqrt{h}$. Initially h = 49, and after 6 hours h = 25. Form and solve a differential equation to find how long, in total, the tank takes to empty.	
7 n = 9 pairs of (x, y): $\Sigma x = 165$, $\Sigma y = 586$, $\Sigma x^2 = 3465$, $\Sigma xy = 11824$. (a) Find the equation of the regression line of y on x (3 s.f.). (b) Estimate y when x = 25.	
8 The second term of a geometric series is 8 and its sum to infinity is 50. Find the two possible values of the first term.	
9 Find the least integer n for which $3^n > 10^7$.	
10 Solve $3^{2x} - 12 \times 3^x + 27 = 0$.	