Day 106	A Level Maths: B Tier 10-a-day
1 A sports club has 220 junior members, 260 senior members and 100 veteran members. A stratified sample of size 29 is taken. Find the number selected from each group.	
2 Prove that $n^3 + 7n + 12$ is even for all integers n.	
3 A biased coin with P(head) = 0.5 is tossed 6 times; X is the number of heads. This is done 200 times. Estimate the number of times that X = 4.	
4 Solve $\frac{dy}{dx} = \frac{6y}{x}$ for $x > 0$, given that $y = 4$ when $x = 1$.	
5 Prove that $2x^2 - 16x + 34 > 0$ for all real values of x.	

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6 A particle moves in a straight line. At time t s its velocity is $v = 8t - 4t^2$ m s^{-1}, for $t \geq 0$. Find the maximum speed of the particle and the time at which it occurs.	
7 Use the trapezium rule with 4 strips to estimate $\int_0^2 \frac{1}{1+x^2}\,dx$, giving your answer to 3 significant figures.	
8 A particle of mass 1 kg is suspended in equilibrium by two light strings attached to a horizontal ceiling. The strings make angles α and β with the ceiling, where $\tan\alpha = \frac{4}{3}$ and $\tan\beta = \frac{3}{4}$. Take $g = 9.8$ m s^{-2}. Find the tension in each string.	
9 The function $f(x) = e^x - 5x$. Show that $f(x) = 0$ has a root between $x = 2.5$ and $x = 3$.	
10 Find the coefficient of x^3 in the expansion of $(1 + 3x)^8$.	