Day 363	A Level Maths: B Tier 10-a-day
1 Given that $y = \sqrt{2x - 3}$, find $\frac{dy}{dx}$, and the gradient of the curve when $x = 6$.	
2 Solve $-5 < 4x - 3 < 7$.	
3 A drone moves with constant velocity $(6\mathbf{i} - 8\mathbf{j})$ m s^{-1}, where $\mathbf{i}$ and $\mathbf{j}$ are unit vectors east and north. Find its speed and the acute angle its direction makes with $\mathbf{i}$, to 1 d.p.	
4 A has position vector $\begin{pmatrix} -3 \\ 3 \end{pmatrix}$ and B has position vector $\begin{pmatrix} 6 \\ -3 \end{pmatrix}$. The point P lies on AB with AP : PB = 2 : 1. Find the position vector of P.	
5 X ~ B(8, 0.2) and Y ~ B(9, 0.25) are independent. Find P(X = 3 and Y ≤ 2), to 3 significant figures.	

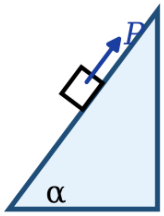
Day 363 **A Level Maths: B Tier 10-a-day**

6 Prove that $n^3 + n + 4$ is even for all integers n.

7 (a) Write $\frac{-4x - 15}{(x + 3)(x + 4)}$ in partial fractions.

(b) Hence evaluate $\int_0^2 \frac{-4x - 15}{(x + 3)(x + 4)}\,dx$, giving the answer as a single logarithm.

8 A block of mass 5 kg is held on a rough plane ($\tan\alpha = \frac{4}{3}$, $\mu = 0.4$) by a force P N up the plane, as shown.
Take $g = 9.8$ m s^{-2}. The block is about to move up the plane. Find P.



9 Given that each lottery ticket wins a prize independently with probability 0.3, find the least number of tickets needed for the probability of at least one success to exceed 0.95.

10 Solve $(x - 2)(x - 5)(x - 1) \geq 0$.