Day 160	A Level Maths: S Tier 10-a-day
1 A bag has 2 green counters and some black counters, n in total. Two are taken without replacement. P(at least one green) = $\frac{5}{6}$. Find n.	
2 Solve $\tan(3\theta - 45°) = -\frac{1}{\sqrt{3}}$ for $0° \leq \theta \leq 360°$.	
3 Show that $\frac{7+\sqrt{6}}{7-\sqrt{6}} - \frac{7-\sqrt{6}}{7+\sqrt{6}}$ can be written in the form $k\sqrt{6}$, and find k.	
4 For 25 observations x, $\Sigma(x - 50) = 5$ and $\Sigma(x - 50)^2 = 351$. (a) Find the mean of x. (b) Find the standard deviation of x. (c) Find the value of Σx^2.	
5 Find the term independent of x in the expansion of $(x + \frac{1}{x})^{10}$.	

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6 A shell is projected from level ground with horizontal and vertical velocity components 29.4 and 53.9 m s^{-1}. Find (a) the two times at which it moves at 45° to the horizontal, (b) the horizontal distance between those two points. Take g = 9.8 m s^{-2}.	
7 The curve $y = 3x^2\sqrt{5 - x}$, for $0 < x < 5$, has one stationary point. Find its exact coordinates and determine its nature.	
8 The line l has equation $\mathbf{r} = \begin{pmatrix} -5 \\ -2 \\ 4 \end{pmatrix} + t\begin{pmatrix} 2 \\ 2 \\ -2 \end{pmatrix}$. The point P has coordinates $(-3, 5, 1)$. Find the coordinates of the foot F of the perpendicular from P to l, and the exact distance PF.	
9 A box of weight 40 N is pulled at constant speed up a line of greatest slope of a rough plane ($\tan\alpha = \frac{7}{24}$, $\mu = \frac{3}{4}$) by a force P N at angle β above the plane. (a) Find P when $\tan\beta = \frac{3}{4}$. (b) Find the least possible value of P as β varies.	
10 A geometric series has first term 2 and common ratio 5. Find the least n for which $S_n > 59544$.	