Day 319	A Level Maths: B Tier 10-a-day
1 A ship moves with constant velocity $(-2\mathbf{i} - 3\mathbf{j})$ m s^{-1}. At time t = 0 its position vector relative to a fixed origin O is $(4\mathbf{i} + 6\mathbf{j})$ m. Find (a) its position vector when t = 4, (b) the value of t when it crosses the line through O in the direction of $\mathbf{i}$.	
2 $f(x) = x^3 + 2x^2 + kx - 6$. Given that (x + 3) is a factor of f(x), (a) find the value of k, (b) factorise f(x) completely.	
3 The length X cm of a metal rod is normal with mean 40, s.d. 6. Find k (3 s.f.): (a) P(X < k) = 0.05, (b) P(X > k) = 0.01.	
4 A stone is projected vertically upwards with speed 26 m s^{-1} from ground level. Take g = 9.8 m s^{-2}. Find, to 3 significant figures, (a) the greatest height reached, (b) the time of flight.	
5 Describe the single transformation that maps the graph of y = f(x) onto the graph of: (a) y = f(3x) (b) y = f(−x) (c) y = −f(x)	

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6 $\mathbf{a} = \begin{pmatrix} 0 \\ -2 \\ 1 \end{pmatrix}$ and $\mathbf{b} = \begin{pmatrix} 5 \\ 5 \\ -2 \end{pmatrix}$. Find the angle between a and b, to 1 d.p.	
7 A coin is thought to land heads with probability 0.3. It is tossed 20 times and lands heads 2 times. Test, at the 5% significance level, whether the probability of heads is different from 0.3.	
8 The area of a square increases at a constant rate of 6 cm^2s^{-1}. Find the rate of increase of the side length when the side is 4 cm.	
9 Line l_1 has equation $5x - 9y = 35$ and line l_2 has equation $5x + 3y = -25$. The lines meet at P. Find the area of the triangle formed by l_1, l_2 and the x-axis.	
10 A curve has equation $2x^2y + 3y^3 - xy = -99$. Find $\frac{dy}{dx}$ in terms of x and y, and the gradient at $(2, -3)$.	