Day 292	A Level Maths: B Tier 10-a-day
1 A has position vector $\begin{pmatrix} 0 \\ -5 \\ -1 \end{pmatrix}$ and B has position vector $\begin{pmatrix} -5 \\ 5 \\ -6 \end{pmatrix}$. The point P lies on AB with AP : PB = 3 : 2. Find the position vector of P.	
2 60 people: 35 own a cat, 12 own a dog, 17 do neither. (a) How many do both? (b) Given a person who owns a cat, find P(this person owns a dog).	
3 Expand and simplify $(1 - 3\sqrt{7})(1 - 2\sqrt{7})$, giving your answer in the form $a + b\sqrt{7}$.	
4 A drone moves with constant velocity $(-24\mathbf{i} + 32\mathbf{j})$ 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.	
5 Solve the simultaneous equations $2x + y = -10$ $x^2 + y^2 = 425$	

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6 The mass X g of a flour bag is normal with mean 60, s.d. 6. Find, to 3 s.f., the probability a value is (a) more than 54, (b) between 54 and 57.	
7 Line l_1: $\mathbf{r} = \begin{pmatrix} -7 \\ 2 \\ 0 \end{pmatrix} + \lambda \begin{pmatrix} 2 \\ -1 \\ -1 \end{pmatrix}$. Line l_2: $\mathbf{r} = \begin{pmatrix} -3 \\ -3 \\ -1 \end{pmatrix} + \mu \begin{pmatrix} 2 \\ 2 \\ -2 \end{pmatrix}$. Show that l_1 and l_2 intersect and find the point.	
8 The line $y = -7x - 6$ meets the circle $(x - 3)^2 + (y + 2)^2 = 25$ at the points A and B. Find the coordinates of A and B, and the exact length of the chord AB.	
9 A curve has equation $4x^2y + 3xy + 3y^3 = 48$. Find $\frac{dy}{dx}$ in terms of x and y, and the gradient at (3, 1).	
10 A particle moves so that its position vector relative to O at time t s is $\mathbf{r} = (3t^2)\mathbf{i} + (t^3 + 5t)\mathbf{j}$ metres. Find the velocity when t = 1, and the speed at that time.	