Day 72	A Level Maths: B Tier 10-a-day
1 The first term of an arithmetic series is 7 and the common difference is 1. The sum of the first n terms is 444. Find the value of n.	
2 The vector $a = \begin{pmatrix} 2 \\ -3 \\ 6 \end{pmatrix}$. Find $\lvert a \rvert$ and a unit vector in the direction of a.	
3 $f(x) = 4x - 3$ for $1 \leq x < 7$. Find the range of f.	
4 A sledge of mass 4 kg is pulled along rough horizontal ground by a horizontal force of 15.84 N. It accelerates at 2 m s^{-2}. Take g = 9.8 m s^{-2}. Find the coefficient of friction between the sledge and the ground.	
5 The length X cm of a metal rod is normal with mean 60. Given P(X < 67.9) = 0.7, find the standard deviation (3 s.f.).	

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6 A rocket is projected from ground level with initial velocity components 23 m s^{-1} horizontally and 49 m s^{-1} vertically upwards. Take g = 9.8 m s^{-2}. Find (a) the greatest height, (b) the speed at the greatest height.	
7 X ~ B(150, 0.4). Use a normal approximation to find P(X ≤ 56), to 3 significant figures.	
8 The line $3x + 4y = k$ is a tangent to the circle $(x + 1)^2 + y^2 = 100$. Find the two possible values of k.	
9 Line l_1: $\mathbf{r} = \begin{pmatrix} -10 \\ -4 \\ 7 \end{pmatrix} + \lambda \begin{pmatrix} 3 \\ 1 \\ -1 \end{pmatrix}$. Line l_2: $\mathbf{r} = \begin{pmatrix} 3 \\ 1 \\ 6 \end{pmatrix} + \mu \begin{pmatrix} -2 \\ -1 \\ -1 \end{pmatrix}$. Show that l_1 and l_2 intersect and find the point.	
10 (a) Write $\frac{-3x - 14}{(x + 4)(x + 5)}$ in partial fractions. (b) Hence evaluate $\int_0^4 \frac{-3x - 14}{(x + 4)(x + 5)}\,dx$, giving the answer as a single logarithm.	