Day 228	A Level Maths: B Tier 10-a-day
1 A has position vector $\begin{pmatrix} 5 \\ -2 \end{pmatrix}$ and B has position vector $\begin{pmatrix} -4 \\ 4 \end{pmatrix}$. The point P lies on AB with AP : PB = 2 : 1. Find the position vector of P.	
2 Solve $-7 < 4x + 2 \leq 2$.	
3 A particle has velocity $(3\mathbf{i} + 4\mathbf{j})$ m s^{-1} at time t = 0 and moves with constant acceleration $(-2\mathbf{j})$ m s^{-2}. Find its velocity and speed when t = 4.	
4 Evaluate $\sum_{r=1}^{5} 2 \times 2^r$.	
5 Differentiate y = 5 cot 2x with respect to x, and find the exact gradient when x = $\frac{\pi}{12}$.	

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6 Express $\frac{8 + 5\sqrt{2}}{\sqrt{2}}$ in the form $p + q\sqrt{2}$, where p and q are integers.

7 $\mathbf{a} = \begin{pmatrix} 2 \\ 1 \\ -2 \end{pmatrix}$ and $\mathbf{b} = \begin{pmatrix} 3 \\ 3 \\ 0 \end{pmatrix}$.
Find the angle between a and b, to 1 d.p.

8 A uniform rod AB of length 6 m and mass 6 kg hangs horizontally from two vertical strings attached 0.5 m from A and 0.5 m from B.
A particle of mass 2 kg is attached 2 m from A.
Take $g = 9.8$ m s^{-2}. Find the tension in each string.

9 Data are modelled by $y = ab^x$, where a and b are constants.
A plot of $\log_{10} y$ against x is a straight line with intercept 0.477 and gradient 0.699.
Find a and b to 2 significant figures.

10 The tree diagram shows probabilities for event E, followed by event F.
Find the probability that exactly one of E and F occurs.

