Day 337	A Level Maths: A Tier 10-a-day
1 A curve has equation $x^2 - xy + 3y^2 = 99$. Find the coordinates of the points where the tangent is parallel to the x-axis.	
2 A particle of mass 5 kg is acted on by forces $F_1 = (2\mathbf{i} - 19\mathbf{j})$ N and F_2. Its acceleration is $(-2\mathbf{i} - 2\mathbf{j})$ m s^{-2}. Find (a) F_2, (b) the angle between F_2 and $\mathbf{i}$, to 1 d.p.	
3 Solve $\cos 2x + 3\sin x = 1$ for $-180° \leq x \leq 180°$.	
4 A systematic sample is taken from a numbered list of 330 items. The 4th item chosen is number 35 and the 6th item chosen is number 55. Find the sampling interval, the number of the first item chosen and the size of the sample.	
5 A 1200 kg car has engine power 40 kW and constant resistance 500 N. Find (a) its greatest steady speed on a horizontal road, (b) its acceleration at 24 m s^{-1} up a hill where $\sin\alpha = \frac{1}{20}$. Take g = 10. Give answers to 3 s.f. if not exact.	

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6 Find the value of $\sum_{r=1}^{5} 5 \times 3^r$.	
7 X ~ B(14, 0.2). Find P(X = 4 | X ≥ 2) to 3 significant figures.	
8 $f(x) = 2x^3 + ax^2 + bx + 48$, where a and b are constants. (x − 3) is a factor of f(x). The remainder when f(x) is divided by (x + 1) is 40. (a) Find a and b. (b) Solve f(x) = 0.	
9 A, B and C have position vectors $\begin{pmatrix} 2 \\ -4 \\ -4 \end{pmatrix}$, $\begin{pmatrix} 3 \\ -7 \\ -7 \end{pmatrix}$ and $\begin{pmatrix} 5 \\ -13 \\ k \end{pmatrix}$ relative to O, where k is a constant. Given that A, B and C are collinear, find k and the ratio AB : BC.	
10 $f(x) = \frac{16x - 6}{(1 - 3x)(1 - 2x)}$. (a) Express f(x) in partial fractions. (b) Hence expand f(x) up to x^2. (c) State the range of x for which the expansion is valid.	