Day 321	A Level Maths: A Tier 10-a-day
1 (a) Express $8 \sin \theta - 15 \cos \theta$ in the form $R \sin(\theta - \alpha)$, where $R > 0$ and $0° < \alpha < 90°$. Give α to 1 d.p. (b) Solve $8 \sin \theta - 15 \cos \theta = 1$ for $0° \leq \theta < 360°$, giving answers to 1 d.p.	
2 A cyclist passes P with speed 6 m s^{-1} and accelerates uniformly. She travels 60.8 m in the next 8 s, reaching Q. Find (a) her acceleration, (b) her speed at Q, (c) her speed at the midpoint of PQ. Give answers to 3 s.f. if not exact.	
3 Find the quotient and the remainder when $9x^3 + 3x^2 + 9x + 6$ is divided by $(3x + 1)$.	
4 A particle of mass 3 kg is acted on by forces $F_1 = (33\mathbf{i} + 19\mathbf{j})$ N and F_2. Its acceleration is $(3\mathbf{i} + 4\mathbf{j})$ m s^{-2}. Find (a) F_2, (b) the angle between F_2 and $\mathbf{i}$, to 1 d.p.	
5 Find the sum of all the multiples of 8 that lie strictly between 85 and 579.	

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6 A car costs £15000 new. Its value falls by 10% each year, so after t years its value is £V. (a) Write down V in terms of t. (b) Find, to 3 s.f., the time when the value is £5000.	
7 The times in seconds of two groups: group X has n = 27, mean 42, sd 7; group Y has n = 24, mean 25, sd 7. Find the mean and standard deviation of all 51 values (3 s.f. for the sd).	
8 A drink at 102°C is left in a room at 22°C. Its temperature θ °C satisfies $\frac{d\theta}{dt} = -k(\theta - 22)$. After 5 minutes the temperature is 67°C. Find k, then the time for it to reach 32°C, to 3 s.f.	
9 At one location, the daily mean cloud cover in a month is modelled by N(5.6, 1.7^2). (a) Find the probability that on a randomly chosen day the value exceeds 7 oktas. (b) Estimate the number of such days in a period of 92 days.	
10 A circle passes through A(5, 7) and B(−9, 5). Its centre lies on the line y = 3x + 2. Find the equation of the circle.	