Day 6	A Level Maths: A Tier 10-a-day
1 θ is obtuse and $\sin\theta = \frac{4}{5}$. Find the exact values of $\sin 2\theta$, $\cos 2\theta$ and $\tan 2\theta$.	
2 The 6th term of an arithmetic sequence is 13 and the 13th term is 27. Find the first term and common difference, and the sum of the first 30 terms.	
3 Use the trapezium rule with 4 strips to estimate $\int_1^5 5(\ln x)\,dx$, giving your answer to 3 s.f. State, with a reason, whether your estimate is an overestimate or an underestimate.	
4 A ball is thrown vertically upwards at 14.7 m s^{-1} from a point h m above horizontal ground, and hits the ground 7 s later. Find (a) h, (b) the greatest height above the ground. Take g = 9.8.	
5 $f(x) = x^3 + 3x^2 - 3x - 1$. (a) Show that $(x - 1)$ is a factor of f(x). (b) Solve $f(x) = 0$, giving surds in simplest form.	

Day 6	A Level Maths: A Tier 10-a-day
6 Of 33 students, 13 study Maths (M), 16 Physics (P) and 15 Chemistry (C). 7 study M and P, 5 study M and C, 8 study P and C, and 3 study all three. One student is chosen at random. Given that a student studies Chemistry, find the probability that they study all three.	
7 A cyclist passes P with speed 7 m s^{-1} and accelerates uniformly. She travels 112.8 m in the next 12 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.	
8 A curve has parametric equations $x = -3 + 4\cos\theta$, $y = 1 + 4\sin\theta$. Find its Cartesian equation and describe the curve.	
9 Use the substitution $u = x^2 + 1$ to find the exact value of $\int_0^2 x(x^2 + 1)^4 \, dx$.	
10 The random variable X has probability density function $f(x) = kx(4 - x)$ for $0 \leq x \leq 4$, and 0 otherwise. (a) Find k. (b) Find E(X). (c) Find $P(X > \frac{4}{3})$.	