Day 360	A Level Maths: A Tier 10-a-day
1 $f(x) = x^2 - 4\cos x - 7$. Show that the equation $f(x) = 0$ has a root α in the interval [2, 3] (x in radians).	
2 The 2nd term of an arithmetic sequence is 11 and the 9th term is 60. Find the first term and common difference, and the sum of the first 15 terms.	
3 Find the exact value of $\int_0^2 (2x + 1)^2 \, dx$.	
4 Emails arrive at a mean rate of 2.5 per day, as a Poisson process. Find the probability that in one such period there are (a) exactly 3 (b) at least 3 (c) fewer than 3 (3 s.f.).	
5 A is acute and B is obtuse, with $\sin A = \frac{4}{5}$ and $\cos B = -\frac{12}{13}$. Find the exact values of sin(A+B) and cos(A−B).	

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6 The line l has equation $x - 2y = -1$. (a) Find the coordinates of the foot of the perpendicular from P(1, 6) to l. (b) Hence find the shortest distance from P to l, in exact form.	
7 A 10 kg box is pulled from rest along rough horizontal ground by a horizontal force of 30.5 N and moves 7.5 m in 5 s. Find (a) the coefficient of friction. The force is then removed; (b) find the further distance moved. Take g = 9.8. Give answers to 3 s.f. if not exact.	
8 X ~ B(200, 0.25). Use a normal approximation to estimate $P(X \leq 50)$ to 3 significant figures.	
9 Ball A is dropped from rest 34.3 m above the ground. At the same instant ball B is projected upwards at 34.3 m s^{-1} from the ground directly below A. Find (a) the time when they collide, (b) the height of the collision. Take g = 9.8.	
10 The line $-3x + 4y = k$ is a tangent to the circle $(x - 1)^2 + (y - 2)^2 = 25$. Find the two possible values of k.	