Day 172	A Level Maths: B Tier 10-a-day
1 The mass of a radioactive sample, M grams, after t days is $M = 80\,e^{-0.25t}$. Find (a) the half-life, (b) the rate of decrease in mass when t = 5, each to 3 s.f.	
2 Solve $5x + 10 \geq -2x - 3$.	
3 A block of mass 2 kg is projected along a rough horizontal surface with speed 8.4 m s^{-1} and comes to rest after sliding 12 m. Take g = 9.8 m s^{-2}. Use work and energy to find the coefficient of friction.	
4 Given that $\cos\theta + 3\sin\theta \equiv \sqrt{10}\cos(\theta - 71.6°)$, find the greatest value of $\frac{1}{(6 + \cos\theta + 3\sin\theta)}$.	
5 A seed supplier says that 0.25 of seeds germinate. In a sample of 30 seeds, 4 germinate. Test, at the 1% level, whether the true proportion is lower than claimed.	

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6 Given that $21\cos\theta + 20\sin\theta \equiv 29\cos(\theta - 43.6°)$, solve $21\cos\theta + 20\sin\theta = 2.5$ for $0 \leq \theta \leq 360°$. (1 d.p.)	
7 Express $\frac{x^2 - 13x + 34}{(x-2)(x-5)}$ in the form $P + \frac{Q}{(x-2)} + \frac{R}{(x-5)}$.	
8 The probability that a student passes a driving test first time is thought to be 0.25. In a sample of 40 students, 14 pass first time. Test, at the 5% significance level, whether the probability is different from 0.25.	
9 The line $y = -x - 8$ meets the circle $x^2 + (y+1)^2 = 169$ at the points A and B. Find the coordinates of A and B, and the exact length of the chord AB.	
10 A stone is projected horizontally at 147 m s^{-1} from a point high above the ground. Take $g = 9.8$ m s^{-2}. Find the speed and the direction of motion 20 s later, to 1 d.p. below the horizontal.	