Day 243	A Level Maths: A Tier 10-a-day
1 Show by counter-example that the statement "If ab is a multiple of 12, then a or b is a multiple of 12" is false.	
2 A cyclist passes P with speed 4 m s^{-1} and accelerates uniformly. She travels 91.2 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.	
3 X has E(X) = 4 and Var(X) = 1. (a) Find $E(X^2)$. (b) $Y = -2X + 9$. Find E(Y) and Var(Y). (c) X_1 and X_2 are independent copies of X. Find $Var(X_1 - X_2)$.	
4 A particle of mass 4 kg is acted on by forces $F_1 = (-16\mathbf{i} + 5\mathbf{j})$ N and F_2. Its acceleration is $(2\mathbf{i} + 3\mathbf{j})$ m s^{-2}. Find (a) F_2, (b) the angle between F_2 and $\mathbf{i}$, to 1 d.p.	
5 The region bounded by the curve $y = e^{2x}$, the x-axis, x = 0 and x = 1 is rotated through 360° about the x-axis. Find the exact volume of the solid formed.	

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6 A is $(-3, 1)$ and B is $(1, 3)$. (a) Find the equation of the perpendicular bisector of AB, in the form $ax + by = c$. (b) The perpendicular bisector meets the x-axis at P. Find the area of triangle ABP.	
7 Solve $e^x + 18\,e^{-x} = 11$, giving exact answers.	
8 $X \sim Po(18)$. Use a suitable approximation to find $P(X \leq 13)$, to 3 significant figures.	
9 A circle touches both coordinate axes and passes through the point $(-12, -6)$. Its centre lies in the third quadrant. Find the equations of the two possible circles.	
10 $y = (3x + 3)e^{-x}$. Find the exact coordinates of the stationary point and determine its nature.	