Day 258	A Level Maths: A Tier 10-a-day
1 A cyclist passes P with speed 6 m s^{-1} and accelerates uniformly. She travels 90 m in the next 10 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.	
2 The equation $x^2 + (k + 3)x + (k + 6) = 0$ has no real roots. Find the set of possible values of k.	
3 A stone is dropped from rest from the top of a cliff. In the last 3 seconds before it hits the sea it falls 249.9 m. Find the height of the cliff. Take g = 9.8.	
4 A curve has parametric equations $x = 3t^2 - 3$, $y = -2t(t^2 - 9)$. Find the coordinates of the points where the curve meets the x-axis.	
5 A group of 6 men and 8 women. A team of 3 is chosen at random. Find the probability that the team has exactly 2 of the women.	

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6 Use integration by parts to find the exact value of $\int_0^2 x\, e^{-x}\, dx$.	
7 Find the coefficient of x^{15} in the expansion of $(2x^3 + \frac{2}{x})^9$.	
8 A curve has equation $x^2 - 2xy + 4y^2 = 3$. Find the coordinates of the points where the tangent is parallel to the x-axis.	
9 Water pours into a cone, vertex down, at 20 cm^3s^{-1}. The surface radius is always $\frac{h}{4}$. Find the rate at which the depth is rising when h = 5 cm.	
10 X, the mass (g), is normally distributed with mean 63 and standard deviation 5. Find (a) P(X > 74.5) (b) P(74.5 < X < 82), each to 3 s.f.	