Day 192	A Level Maths: A Tier 10-a-day
1 $y = 2^x$. Find the exact gradient of the curve at $x = 1$ and the equation of the tangent there.	
2 A particle of mass 3 kg is acted on by forces $F_1 = (2\mathbf{i} - 15\mathbf{j})$ N and F_2. Its acceleration is $(-\mathbf{i} - \mathbf{j})$ m s^{-2}. Find (a) F_2, (b) the angle between F_2 and $\mathbf{i}$, to 1 d.p.	
3 A circle has equation $x^2 + y^2 + 10x + 12y + 35 = 0$. (a) Find the centre and radius of the circle. (b) Determine whether P(1, −3) lies inside or outside the circle.	
4 X has a binomial distribution with mean 10 and variance 7.5. (a) Find n and p. (b) Find P(X = 11) to 3 significant figures.	
5 (a) Solve $4x - 6 < -4$. (b) Solve $x^2 + 7x + 12 \geq 0$. (c) Hence find the values of x satisfying both inequalities.	

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6 A drink at 92°C is left in a room at 22°C. Its temperature θ °C satisfies $\frac{d\theta}{dt} = -k(\theta - 22)$. After 15 minutes the temperature is 67°C. Find k, then the time for it to reach 42°C, to 3 s.f.	
7 A 4 kg particle is in equilibrium on a rough plane inclined at α, $\tan\alpha = \frac{8}{15}$, $\mu = 0.2$. A horizontal force of P N, in the vertical plane through a line of greatest slope, pushes it towards the plane. Find the least and greatest values of P. Take g = 9.8. Give answers to 3 s.f. if not exact.	
8 X ~ B(16, 0.3). Find $P(X = 4 \mid X \geq 2)$ to 3 significant figures.	
9 Solve $4\text{cosec}^2\theta + 6\cot\theta - 8 = 0$ for $0° < \theta < 360°$. Give answers to 1 d.p.	
10 The second term of a geometric series is 3 and its sum to infinity is 16. Find the two possible values of the first term.	