Day 190	A Level Maths: A Tier 10-a-day
1 On each independent trial, the probability that a basketball player scores is $\frac{1}{3}$. X is the number of trials up to and including the first success. (a) Find P(X = 4) and E(X). (b) Find the least m with P(X ≤ m) > 0.9.	
2 A cyclist passes P with speed 7 m s^{-1} and accelerates uniformly. She travels 85 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.	
3 The curve y = f(x) has a minimum point at (−2, −6). Find the coordinates of the corresponding point on: (a) y = f(x) − 4 (b) y = f(x + 2) (c) y = −f(x)	
4 f(x) = 4 arcsin(3x). State the domain and range of f, and find $f^{-1}(x)$.	
5 Evaluate $\sum_{r=7}^{31}(3r + 6)$.	

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6 Solve $2\text{cosec}^2 x + 10\cot x + 6 = 0$ for $0° < x < 360°$. Give answers to 1 d.p.	
7 The circle $x^2 + y^2 - 8x + 4y - 5 = 0$ passes through P(0, 1). (a) Find the equation of the tangent at P, in the form $ax + by = c$. (b) Find the coordinates of the point where this tangent crosses the x-axis.	
8 Find the coordinates of the stationary points of $y = \frac{x}{x^2 + 1}$.	
9 n = 10 pairs of (x, y): $\Sigma x = 154$, $\Sigma y = 475$, $\Sigma x^2 = 2942$, $\Sigma xy = 8708$. (a) Find the equation of the regression line of y on x (3 s.f.). (b) Estimate y when x = 11.	
10 At t = 0, P and Q have position vectors $(-3\mathbf{i} + 9\mathbf{j})$ m and $(-\mathbf{i} + 3\mathbf{j})$ m and velocities $(-\mathbf{i} - 2\mathbf{j})$ m s^{-1} and $(-3\mathbf{i})$ m s^{-1}. Find (a) the time when they are closest, (b) the least distance between them. Give answers to 3 s.f. if not exact.	