Day 306	A Level Maths: B Tier 10-a-day
1 Prove that the sum of 5 consecutive odd integers is always a multiple of 5.	
2 The vector $\mathbf{a} = \begin{pmatrix} -9 \\ -2 \\ -6 \end{pmatrix}$. Find $\lvert\mathbf{a}\rvert$ and a unit vector in the direction of a.	
3 Ordered data, goals scored by a player in 11 seasons: 14, 17, 23, 23, 29, 31, 33, 33, 35, 35, 40. Find Q_1, Q_3, the IQR and any outliers (more than 1.5 × IQR beyond a quartile).	
4 In the binomial expansion of $(1 + kx)^n$, where n is a positive integer, the coefficient of x is 9 and the coefficient of x^2 is 36. Find the values of n and k.	
5 The continuous random variable X has pdf $f(x) = kx^4$ for $0 \leq x \leq 2$, and 0 otherwise. (a) Find the value of k. (b) Find $P(X > 1)$. (c) Find E(X).	

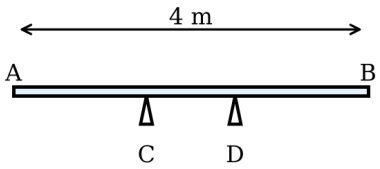
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6 A particle is in equilibrium under three forces: P N at angle θ above the positive x-axis, a force of 10 N in the negative x-direction and a force of Q N in the negative y-direction.
$\cos\theta = \frac{5}{13}$. Find P and Q.

7 Given that $21\cos\theta + 20\sin\theta \equiv 29\cos(\theta - 43.6°)$,
solve $21\cos\theta + 20\sin\theta = 3.5$ for $0 \leq \theta \leq 360°$. (1 d.p.)

8 The line $y = 3x + 16$ meets the circle $(x - 3)^2 + y^2 = 65$ at the points A and B. Find the coordinates of A and B, and the exact length of the chord AB.

9 A uniform plank AB of length 4 m and mass 30 kg rests horizontally on supports at C and D, where AC = 1.5 m and DB = 1.5 m.
A girl of mass 10 kg walks from D towards B.
Find how far she is from D when the plank is about to tilt.



10 Find (a) $\int 5\sec^2 5x\,dx$,

(b) the exact value of $\int_0^{\frac{\pi}{20}} 5\sec^2 5x\,dx$.