Day 8	A Level Maths: S Tier 10-a-day

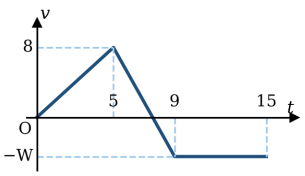
1 The cdf of X is F(x) = 0 for x < 0, $F(x) = \frac{x^4}{81}$ for 0 ≤ x ≤ 3, and F(x) = 1 for x > 3.
(a) Find the pdf of X.
(b) Find E(X).
(c) Find P(0.75 < X < 1.5) and the median, to 3 significant figures.

2 (a) Express 4 cos θ − 3 sin θ in the form R cos(θ + α), where R > 0 and 0 < α < 90°. Give α to 1 d.p.
(b) Hence solve 4 cos θ − 3 sin θ = 4 for 0 ≤ θ < 360°, giving answers to 1 d.p.

3 Prove that $7k = n^2 + 2$ has no integer solutions (k and n integers).

4 The tangent to $y = \frac{2}{x^2 + 5}$ at the point where x = 1
meets the axes at A and B. Find the exact area of triangle OAB,
where O is the origin.

5 The diagram shows the velocity-time graph of a particle P moving on a straight line (velocity in m s^{-1}, time in s). At time 15 s, P is back at its starting point.
Find (a) the value of W, (b) the greatest distance of P from its starting point.



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6 In the expansion of $(1 + kx)^n$, where n is a positive integer, the coefficient of x is -8 and the coefficient of x^2 is 28. Find n and k.	
7 Two fair 6-sided dice, numbered 1 to 6, are rolled. M is the smaller of the two scores. (a) Show that $P(M = m) = \frac{(13 - 2m)}{36}$ for m = 1, 2, ..., 6. (b) Find P(M = 5) and E(M).	
8 The curve C has equation $x^2 + 3xy + 3y^2 = 9$. Find the coordinates of the points on C where the tangent is parallel to the y-axis.	
9 A particle of weight W N is on a rough plane inclined at α to the horizontal, where $\sin \alpha = \frac{12}{13}$. A force P N acts up a line of greatest slope; the particle stays at rest for $56 \leq P \leq 112$. Find (a) W, (b) the coefficient of friction, (c) the acceleration when P = 224. Take g = 9.8 m s^{-2}.	
10 Find the binomial expansion of $(9 + 5x)^{-\frac{3}{2}}$ in ascending powers of x up to and including the term in x^3. State the values of x for which it is valid.	