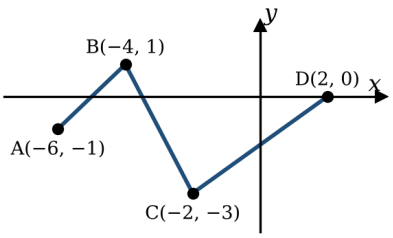
Day 89	A Level Maths: S Tier 10-a-day
1 A particle is projected at 4 m s^{-1} up a line of greatest slope of a rough plane inclined at α to the horizontal, where $\sin\alpha = \frac{4}{5}$ and $\mu = 0.4$. Find (a) the distance it travels up the plane, to 3 s.f., (b) its speed on returning to its starting point. Take g = 9.8 m s^{-2}.	
2 Express $\sqrt{49 + 20\sqrt{6}}$ in the form $a + b\sqrt{6}$, where a and b are positive integers.	
3 A particle of weight W N is on a rough plane inclined at α to the horizontal, where $\sin\alpha = \frac{3}{5}$. A force P N acts up a line of greatest slope; the particle stays at rest for $30 \leq P \leq 150$. Find (a) W, (b) the coefficient of friction, (c) the acceleration when P = 300. Take g = 9.8 m s^{-2}.	
4 Solve $\log_3(x + 27) + \log_3(x - 53) = 4$, justifying clearly any root that you reject.	
5 Data pairs (x, y) are coded by $u = x - 4$ and $v = \frac{y}{20}$. The regression line of v on u is $v = 3.8 + 6u$. (a) Find the regression line of y on x in the form $y = a + bx$. (b) Use it to estimate y when x = 6.	

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6 The diagram shows y = f(x), made of three straight line segments. Find the coordinates of the images of A, B, C and D on the graph of $y = -2f(-\frac{1}{2}x + 1)$.



7 A and B are acute angles with $\tan A = \frac{1}{8}$ and $\tan B = \frac{7}{9}$.

Find tan(A + B) and hence show that $A + B = \frac{\pi}{4}$.

8 A bulb's lifetime, in hours, is $N(58, 12^2)$. Given that it exceeds 46, find the probability that it exceeds 60.

9 Prove by contradiction that $\log_3 5$ is irrational.

10 $\frac{dy}{dx} = y(3 - y)$, and $y = \frac{3}{2}$ when x = 0.

Solve to find the value of x when $y = \frac{9}{4}$.