Day 327 **A Level Maths: S Tier 10-a-day**

1 Each shot Amira takes scores with probability $\frac{2}{5}$, independently.

(a) Find the probability that her second score comes on shot number 9.

(b) Find the probability that her second score comes on or before shot number 9.

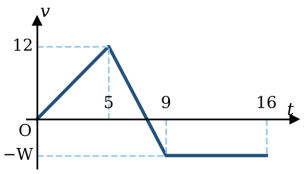
2 A ball is dropped from a height of 4 m. After each bounce it rises to $\frac{3}{5}$ of its previous height.

(a) Find the total distance it travels before it stops.

(b) After how many bounces does it rise less than 0.01 m?

3 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 16 s, P is back at its starting point.

Find (a) the value of W, (b) the greatest distance of P from its starting point.



4 The curve $y = 5^x - 3x$ has one stationary point. Find its coordinates to 3 s.f. and show that it is a minimum.

5 A box of weight 110 N is pulled at constant speed up a line of greatest slope of a rough plane ($\tan\alpha = \frac{12}{5}$, $\mu = \frac{5}{12}$) by a force P N at angle β above the plane.

(a) Find P when $\tan\beta = \frac{5}{12}$. (b) Find the least possible value of P as β varies.

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6 $u_{n+1} = u_n + 3n - 5$, $u_1 = 6$. (a) Show that $u_n = an^2 + bn + c$ and find a, b, c. (b) Find the least n for which $u_n > 689$.	
7 The points A, B, C have coordinates (0, −1, 2), (5, 0, −3), (5, 1, −1). Find angle ABC to 1 d.p., and the exact area of triangle ABC.	
8 Two fair 4-sided dice, numbered 1 to 4, are rolled. M is the larger of the two scores. (a) Show that $P(M = m) = \frac{(2m - 1)}{16}$ for m = 1, 2, ..., 4. (b) Find P(M = 3) and E(M).	
9 The roots of $x^2 + kx + 16 = 0$ are in the ratio 4 : 1. Find the possible values of k.	
10 A population N satisfies $\frac{dN}{dt} = -0.005N^2$, with N = 100 when t = 0. Find N when t = 2, and the time taken for N to halve.	