Day 269 **A Level Maths: S Tier 10-a-day**

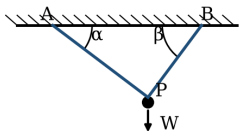
1 Solve $\frac{-1}{(x+1)} < \frac{-2}{(x-2)}$.

2 Solve $\sec(2\theta + 45°) = \sqrt{2}$ for $0° \leq \theta \leq 180°$.

3 A school has 120 students in Year 10, 60 in Year 11 and 180 in the sixth form.
A stratified sample of 30 students is taken.
(a) Find the number sampled from each group.
(b) Two students are chosen at random from the sample. Find the probability they are from the same group.

4 A(−7, 12) and B(−2, −13). The point C lies on the x-axis and CA = CB. Find the coordinates of C and the area of triangle ABC.

5 A particle P of weight 62 N hangs in equilibrium from two light strings AP and BP attached to a horizontal ceiling at A and B (see diagram), where $\tan\alpha = \frac{3}{4}$ and $\tan\beta = \frac{4}{3}$.
Find (a) the tension in each string, (b) the greatest weight P could have if neither tension may exceed 101.6 N.



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6 $f(x) = \frac{kx + 1}{x - 3}$ for $x \neq 3$. Given that f is self-inverse, find k, and hence solve $f(x) = x$.	
7 A drink cools according to $\theta = 10 + Ae^{-kt}$, where θ °C is the temperature after t minutes. Initially $\theta = 95$, and after 10 minutes $\theta = 61$. Find A and k, then find when $\theta = 48$ (3 s.f.).	
8 The pdf of X is $f(x) = a + bx$ for $0 \leq x \leq 4$, and 0 otherwise, where a and b are constants. $E(X) = \frac{11}{5}$. (a) Find a and b. (b) Find $P(X < 2)$.	
9 A shell is projected from level ground with horizontal and vertical velocity components 34.3 and 44.1 m s^{-1}. Find (a) the two times at which it moves at 45° to the horizontal, (b) the horizontal distance between those two points. Take $g = 9.8$ m s^{-2}.	
10 Find the exact value of $\tan(\tan^{-1}(\frac{1}{8}) + \tan^{-1}(1))$.	