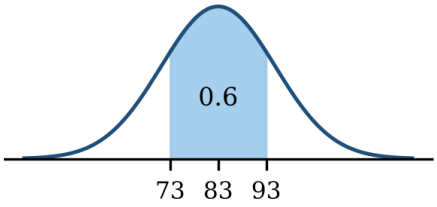
Day 41 **A Level Maths: S Tier 10-a-day**

1 θ is small and measured in radians. Use small angle approximations to find the value that $\frac{1 - \cos 5\theta}{\theta \tan 5\theta}$ approaches as $\theta \to 0$.

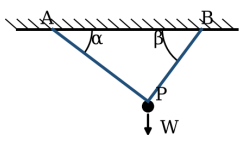
2 The pdf of $X \sim N(83, \sigma^2)$ is shown; the shaded area is symmetrical.
(a) Find σ. (b) Find $P(X > 99)$.

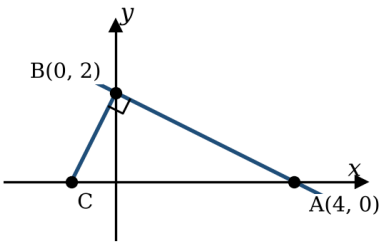


3 Find the remainder when x^7 is divided by $(x + 1)(x + 2)$.

4 A is acute and B is obtuse. $\sin A = \frac{24}{25}$ and $\cos B = -\frac{15}{17}$.
Find the exact values of $\sin(A + B)$ and $\cos(A - B)$.

5 A particle P of weight 30 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 68 N.



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6 Describe a sequence of two transformations that maps the curve $y = x^2$ onto the curve $y = -x^2 + 6x - 3$.	
7 A curve has parametric equations $x = t^2$, $y = 2t^3 - 36t$. Find the coordinates of the points on the curve where the gradient is -3.	
8 A rare allele is present in 5% of a population. A test is positive for 90% of those with it and for 5% of those without it. Find P(positive) and P(has it | positive).	
9 In the diagram, line l_1 passes through A and B. Line l_2 is perpendicular to l_1 at B and meets the x-axis at C. Find the coordinates of C and the area of triangle ABC. 	
10 A plank of mass 8 kg lies on a smooth horizontal table, with a block of mass 4 kg on it ($\mu = 0.4$ between them). A horizontal force P N acts on the block. (a) Find the greatest P for which the block does not slip. (b) Find the accelerations of block and plank when P = 29.4. Take g = 9.8 m s^{-2}.	