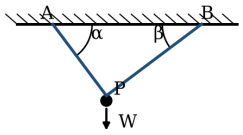
Day 152 **A Level Maths: S Tier 10-a-day**

1 θ is small and measured in radians. Use small angle approximations to find the value that $\frac{\theta \sin 3\theta}{1 - \cos 5\theta}$ approaches as $\theta \to 0$.

2 A particle P of weight 63 N hangs in equilibrium from two light strings AP and BP attached to a horizontal ceiling at A and B (see diagram), where $\tan \alpha = \frac{4}{3}$ and $\tan \beta = \frac{3}{4}$.

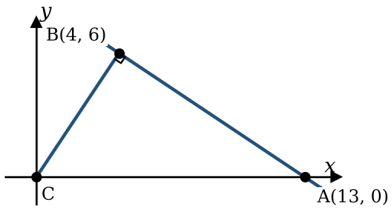
Find (a) the tension in each string, (b) the greatest weight P could have if neither tension may exceed 86.4 N.



3 Solve the simultaneous equations
$\lg x + \lg y = 1$
$x - y = 9$

4 The cdf of X is $F(x) = 0$ for $x < 0$, $F(x) = \frac{x^2}{25}$ for $0 \leq x \leq 5$, and $F(x) = 1$ for $x > 5$.
(a) Find the pdf of X.
(b) Find E(X).
(c) Find $P(1.25 < X < 2.5)$ and the median, to 3 significant figures.

5 Solve $\sqrt{x + 12} = x + 6$.

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6 A curve has parametric equations $x = 2t^2 - t$, $y = t^3 - 4t$. Find the equation of the tangent at the point where $t = 1$, in the form $y = mx + c$.	
7 $f(x) = \frac{kx + 9}{x - 3}$ for $x \neq 3$. Given that f is self-inverse, find k, and hence solve $f(x) = x$.	
8 A ball is projected from a point O on horizontal ground at 35 m s^{-1}, at angle θ above the horizontal. It passes through the point P, 70 m horizontally and 38 m vertically from O. Find the two possible values of $\tan\theta$, and the two possible values of θ to 1 d.p. Take $g = 9.8$ m s^{-2}.	
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 $X \sim N(98, 144^2)$. Find the value k such that $P(98 - k < X < 98 + k) = 0.70$. Give k to 3 significant figures.	