Day 247 **A Level Maths: S Tier 10-a-day**

1 Find the exact value of

$$\int_0^1 \frac{10x + 20}{x^2 + 4x + 6}\,dx$$

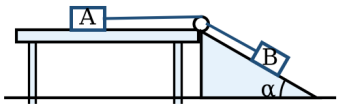
2 For 25 observations x, $\Sigma(x - 50) = 40$ and $\Sigma(x - 50)^2 = 489$.

(a) Find the mean of x.

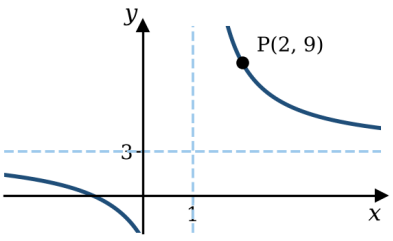
(b) Find the standard deviation of x.

(c) Find the value of Σx^2.

3 Particle A (4 kg) lies on a rough table with $\mu = 0.3$, and is joined by a light string over a smooth pulley (see diagram) to particle B (4 kg) on a smooth slope, $\alpha = 30°$.
Released from rest, the string is cut when B has moved 3.75 m. Find the further distance A slides before stopping.



4 The diagram shows the curve C, its asymptotes (dashed) and a point P. C has equation $y = \frac{a}{x + p} + q$. Find a, p and q.



5 The tangent to $y = \frac{24}{x^2 + 8}$ at the point where x = 1
meets the axes at A and B. Find the exact area of triangle OAB,
where O is the origin.

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6 (a) Expand $(25 - x)^{\frac{1}{2}}$ up to and including the term in x^2. (b) Use x = 0.02 to estimate $\sqrt{24.98}$ to 5 decimal places.	
7 A particle P moves on a line. Its displacement from a fixed point O at time t seconds is s metres, where $s = 5 \sin t + 12 \cos t$. Find (a) the greatest distance of P from O, (b) the greatest speed of P, (c) the first time P is at its greatest distance from O (3 s.f.).	
8 A and B are acute angles with $\tan A = \frac{1}{6}$ and $\tan B = \frac{5}{7}$. Find $\tan(A + B)$ and hence show that $A + B = \frac{\pi}{4}$.	
9 $X \sim B(11, p)$. It is given that $P(X = 2) = \frac{5}{3} \times P(X = 1)$. (a) Find the value of p. (b) Find P(X = 0), correct to 3 significant figures.	
10 Express $\frac{-14x^2 - 18x + 31}{(x + 4)(2x - 3)^2}$ in the form $\frac{A}{(x + 4)} + \frac{B}{(2x - 3)} + \frac{C}{(2x - 3)^2}$.	