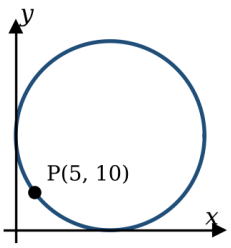
Day 293 **A Level Maths: S Tier 10-a-day**

1 Use the trapezium rule with 5 strips to estimate $\int_0^1 \frac{1}{\sqrt{1+x}}\,dx$, to 4 s.f.
Is it an overestimate or an underestimate? Explain.

2 For 50 observations x, $\Sigma(x - 60) = 100$ and $\Sigma(x - 60)^2 = 1100$.
(a) Find the mean of x.
(b) Find the standard deviation of x.
(c) Find the value of Σx^2.

3 $f(x) = e^x + 4x - 4$.
(a) Show that $f(x) = 0$ has a root α with $0 < \alpha < 1$.
(b) Use Newton-Raphson with $x_0 = 1$ to find x_1 and x_2
to 4 decimal places.

4 The circle in the diagram touches both axes and passes through P. Find the equation of the circle, giving it in the form $x^2 + y^2 + ax + by + c = 0$.



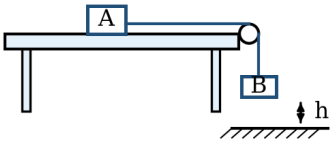
5 The mass of a apple is $N(93, 5^2)$ g. A apple is 'heavy' if it exceeds 101.
(a) Find the probability that a apple is heavy.
(b) 13 apples are chosen at random. Find the probability that at least 2 are heavy.

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6 A lift of mass 450 kg, carrying a passenger of mass 80 kg, is supported by a vertical cable. The lift is moving upwards and accelerating at 0.4 m s^{-2}.
Find (a) the force the floor exerts on the passenger, (b) the tension in the cable. Take g = 9.8 m s^{-2}.

7 Find the set of values of x for which both $x^2 - 3x + 2 > 0$ and $3x + 8 > 3$.

8 Particles A (8 kg) and B (7 kg) are joined by a light string over a smooth pulley (see diagram). A lies on a rough table with $\mu = 0.5$, and B is 0.5 m above the floor.
The system is released from rest. Find the total distance A moves before coming to rest (A does not reach the pulley).



9 (a) Express $\frac{4x + 7}{(x + 3)(x + 2)}$ in partial fractions.

(b) Hence find the exact value of $\int_0^3 \frac{4x + 7}{(x + 3)(x + 2)}\,dx$.

10 The curve C has equation $y = \frac{2x}{x + 1}$.

(a) Write down the equations of the asymptotes of C.
(b) The line $y = 2x + k$ is a tangent to C.
Find the possible values of k.