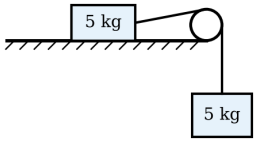
Day 161	A Level Maths: B Tier 10-a-day
1 Use the substitution $u = e^x + 3$ to find the exact value of $\int_0^{\ln 2} (e^x + 3)^2 e^x \, dx$.	
2 A particle of mass 4 kg is acted on by forces $(-3\mathbf{i} - \mathbf{j})$ N and $\mathbf{P}$ N only. Its acceleration is $(-\mathbf{i})$ m s^{-2}. Find $\mathbf{P}$, and its magnitude to 3 significant figures.	
3 A circle has equation $x^2 + y^2 - 12x + 6y + 18 = 0$. Find the coordinates of its centre and its radius.	
4 Points A, B and C have position vectors $\begin{pmatrix} 2 \\ -3 \\ -2 \end{pmatrix}$, $\begin{pmatrix} 4 \\ -4 \\ 1 \end{pmatrix}$ and $\begin{pmatrix} 0 \\ -2 \\ r \end{pmatrix}$ respectively. Given that A, B, C are collinear, find r.	
5 A is the point $(-2, 7)$ and B is the point $(4, -5)$. Find the perpendicular bisector of AB as $ax + by + c = 0$, with integer a, b, c.	

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6 A block of mass 5 kg lies on a rough horizontal table (coefficient of friction 0.2). It is joined by a light string over a smooth pulley to a particle of mass 5 kg hanging freely.
Take g = 9.8 m s^{-2}.
The system is released. Find the acceleration and the tension in the string.



7 X ~ B(6, 0.2) and Y ~ B(8, 0.1) are independent.
Find P(X = 1 and Y ≤ 2), to 3 significant figures.

8 (a) Write $\frac{4}{(x + 3)(x + 5)}$ in partial fractions.

(b) Hence evaluate $\int_0^3 \frac{4}{(x + 3)(x + 5)}\,dx$, giving the answer as a single logarithm.

9 The continuous random variable X has pdf f(x) = $\frac{2x}{100}$ for 0 ≤ x ≤ 10, and 0 otherwise.
(a) Find P(X > 1).
(b) Find the median of X, to 3 significant figures.

10 Evaluate $(\frac{9}{4})^{-\frac{1}{2}}$.