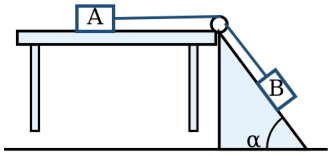
| Day 298 | A Level Maths: S Tier 10-a-day |
|---|---|
| **1** One root of $x^2 + kx - 8 = 0$ is the square of the other root. Find the possible values of k. | |
| **2** A bag has 6 green counters and some grey counters, n in total.<br>Two are taken without replacement. P(at least one green) = $\frac{9}{11}$. Find n. | |
| **3** Use the trapezium rule with 4 strips to estimate $\int_0^1 x\, e^{-x}\, dx$, to 4 s.f.<br>Is it an overestimate or an underestimate? Explain. | |
| **4** Express $\frac{-1 + 2\sqrt{7}}{1 - \sqrt{7}}$ in the form $p + q\sqrt{7}$, where p and q are rational numbers. | |
| **5** A drink cools according to $\theta = 15 + Ae^{-kt}$, where $\theta$ °C is the temperature after t minutes. Initially $\theta = 85$, and after 10 minutes $\theta = 50$.<br>Find A and k, then find when $\theta = 43$ (3 s.f.). | |

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**6** Particle A (4 kg) lies on a rough table with $\mu = 0.25$, and is joined by a light string over a smooth pulley (see diagram) to particle B (4 kg) on a smooth slope, $\sin\alpha = \frac{4}{5}$.

Released from rest, the string is cut when B has moved 1.5 m. Find the further distance A slides before stopping.




**7** The curve $y = x^3\sqrt{175 - x}$, for $0 < x < 175$, has one
stationary point. Find its exact coordinates and determine its nature.

**8** A particle P moves on a line. Its displacement from a fixed point O at time t seconds is s metres, where $s = 6\sin t + 8\cos t$.
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.).

**9** The first term of an arithmetic sequence is 4 and its common difference d is non-zero. The 3rd, 7th and 15th terms are the first three terms of a geometric sequence. Find d and the common ratio.

**10** The cdf of X is $F(x) = 0$ for $x < 0$, $F(x) = 1 - (1 - \frac{x}{4})^4$ for $0 \le x \le 4$, and $F(x) = 1$ for $x > 4$.

(a) Find the pdf of X.
(b) Find E(X).
(c) Find $P(1 < X < 2)$ and the median, to 3 significant figures.