Day 360 **A Level Maths: S Tier 10-a-day**

1 Solve simultaneously, giving integer x and y:

$16^x \times 2^y = 512$

$27^x \div 9^y = 81$

2 A colony of 1200 cells grows by 10% each day. Find the least whole number of days for the colony to exceed 3600 cells.

3 The table shows the times, t minutes, taken by some runners.
Using linear interpolation, the median is estimated as 25 minutes. Find the value of k.

t (min)	0-10	10-20	20-30	30-40	40-60
Frequency	3	k	7	7	5

4 The curve $y = ax^n$ passes through (9, 24) and (16, 32).
Find the values of a and n.

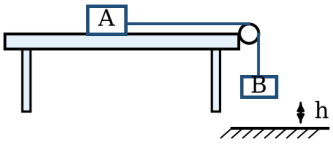
5 A circle passes through A(9, 0), B(−4, 13) and C(−9, −12). Find its equation.

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6 A car of mass 900 kg tows a trailer of mass 400 kg along a horizontal road, with driving force 1030 N. Resistances are 400 N on the car and 240 N on the trailer.
(a) Find the tension in the tow bar. At 3.6 m s^{-1} the tow bar breaks. (b) Find the distance between car and trailer when the trailer stops.

7 For events A and B, P(A) = 0.5, P(B) = 0.55 and P(A | B) = 0.25.
(a) Find $P(A \cap B)$.
(b) Find $P(A' \mid B')$.

8 Particles A (5 kg) and B (3 kg) are joined by a light string over a smooth pulley (see diagram). A lies on a rough table with $\mu = 0.4$, and B is 0.8 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 Find the coefficient of x^3 in the expansion of $(2x - 1)(1 - 3x)^7$.

10 The region bounded by $y = 3\sqrt{\sin x}$, the x-axis and the lines
$x = 0$ and $x = \pi$ is rotated through 2π about the x-axis.
Find the exact volume of the solid formed.