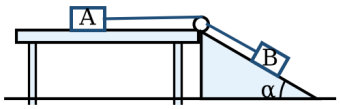
Day 237 **A Level Maths: S Tier 10-a-day**

1 Car P passes a point O travelling at a constant speed of 20 m s^{-1}. 10 s later, car Q leaves O from rest with constant acceleration 3 m s^{-2}, travelling in the same direction.
Q overtakes P at the point X. Find (a) the time Q takes to reach X, (b) the distance OX, (c) the speed of Q at X.

2 Solve $\cos 2\theta - 5\sin\theta - 3 = 0$
for $0 \leq \theta < 360°$.

3 Particle A (2 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 (3 kg) on a smooth slope, $\alpha = 30°$.
Released from rest, the string is cut when B has moved 3.5 m. Find the further distance A slides before stopping.



4 A is acute and B is acute. $\sin A = \frac{15}{17}$ and $\sin B = \frac{4}{5}$.
Find the exact values of $\cos(A + B)$ and $\sin(A + B)$.

5 Express $\frac{3x^3 - 15x^2 + 21x - 15}{(x-1)(x-3)}$ in the form $ax + b + \frac{C}{(x-1)} + \frac{D}{(x-3)}$.

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6 A bag has 3 green counters and some grey counters, n in total. Two are taken without replacement. P(at least one green) = $\frac{5}{11}$. Find n.	
7 $f(x) = x^3 + ax^2 + bx - 8$, where a and b are constants. $(x - 4)$ is a factor of f(x), and f(x) leaves remainder 0 when divided by $(x - 2)$. Find a and b, and hence solve $f(x) = 0$.	
8 Solve simultaneously, giving integer x and y: $8^x \times 2^y = 512$ $9^x \div 3^y = 3$	
9 Each bulb is faulty with probability 0.1, independently. Find the least number n of bulbs that must be tested so that the probability of finding at least one faulty is greater than 0.99.	
10 Two drones P and Q move so that, t seconds after launch, their position vectors in metres are $\mathbf{r}_P = \begin{pmatrix} 0 \\ -5 \\ -1 \end{pmatrix} + t\begin{pmatrix} 0 \\ -3 \\ -1 \end{pmatrix}$ and $\mathbf{r}_Q = \begin{pmatrix} -4 \\ -3 \\ 1 \end{pmatrix} + t\begin{pmatrix} 3 \\ -5 \\ -4 \end{pmatrix}$. Find the time at which they are closest and the exact minimum distance between them.	