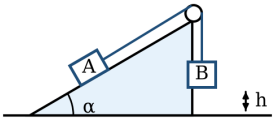
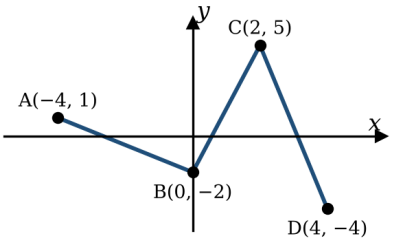
Day 12 **A Level Maths: S Tier 10-a-day**

1 A data set has lower quartile 30 and upper quartile 43. An outlier is a value more than 2 × IQR beyond the nearest quartile.
(a) Find the range of values that are not outliers.
(b) 8 observations have mean 38. The largest is 79, an outlier, and it is removed. Find the new mean.

2 Particles A (7 kg) and B (8 kg) are joined by a light string over a smooth pulley (see diagram). A lies on a smooth slope, $\alpha = 30°$, and B is 1.25 m above the ground.
Released from rest, find the further distance A moves up the slope after B lands (A does not reach the pulley).



3 The diagram shows y = f(x), made of three straight line segments. Find the coordinates of the images of A, B, C and D on the graph of $y = -f(\frac{1}{2}x - 1)$.



4 θ is small and measured in radians. Use small angle approximations to find the value that $\frac{\sin 1\theta \tan 3\theta}{1 - \cos 2\theta}$ approaches as $\theta \to 0$.

5 Solve $2x^3 - 6x - 4 \leq 0$.

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6 The curve $y = 3x^3\sqrt{112 - x}$, for $0 < x < 112$, has one stationary point. Find its exact coordinates and determine its nature.	
7 Express $\frac{2x^3 - 16x^2 + 40x - 20}{(x - 4)(x - 2)}$ in the form $ax + b + \frac{C}{(x - 4)} + \frac{D}{(x - 2)}$.	
8 Find the exact coordinates of the point of inflection of $y = (x - 2)e^{-x}$, justifying that it is a point of inflection.	
9 The fill volume of a bottle is $N(\mu, 4)$ with known variance 4. The mean was claimed to be 30 ml. A random sample of 36 has mean 29.25. Test at the 10% level whether the mean is greater than 30.	
10 A particle P of mass 2 kg moves under a single force F N, where $F = (12t + 8)\mathbf{i} + (12t^2 - 10)\mathbf{j}$ and t is the time in seconds. At $t = 0$, P is at the origin with velocity $(4\mathbf{i} - \mathbf{j})$ m s^{-1}. Find (a) the velocity of P at $t = 2$, (b) the position vector of P at $t = 2$.	