Day 19	A Level Maths: S Tier 10-a-day
1 Class R has 30 students with mean mark 37 and standard deviation 2. Class S has 40 students with mean mark 74 and standard deviation 2. (a) Find the mean mark of all 70 students. (b) Find the standard deviation of all 70 students.	
2 Express $\sqrt{21 + 8\sqrt{5}}$ in the form $a + b\sqrt{5}$, where a and b are positive integers.	
3 A data set has lower quartile 23 and upper quartile 40. An outlier is a value more than 1.5 × IQR beyond the nearest quartile. (a) Find the range of values that are not outliers. (b) 12 observations have mean 35. The largest is 74, an outlier, and it is removed. Find the new mean.	
4 (a) Express $8 \sin \theta + 6 \cos \theta$ in the form $R \sin(\theta + \alpha)$, where $R > 0$ and $0 < \alpha < 90°$. Give α to 1 d.p. (b) Hence solve $8 \sin \theta + 6 \cos \theta = -2$ for $0 \leq \theta < 360°$, giving answers to 1 d.p.	
5 Car P passes a point O travelling at a constant speed of 16 m s^{-1}. 4 s later, car Q leaves O from rest with constant acceleration 2.5 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.	

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6 Find the set of values of x for which both $x^2 - 5x - 14 \geq 0$ and $x + 5 \geq 1$.	
7 For $0 \leq x \leq \pi$, the curves $y = 3 \sin x$ and $y = 3 \sin 2x$ meet at the origin and at $x = \frac{\pi}{3}$. Find the exact area enclosed between them for $0 \leq x \leq \frac{\pi}{3}$.	
8 The curve C has equation $x^2 - xy + y^2 = 3$. Find the coordinates of the points on C where the tangent is parallel to the x-axis.	
9 A circle has its centre in the first quadrant and touches both the x-axis and the y-axis. It passes through the point (8, 1). Find the two possible equations of the circle.	
10 A uniform plank AB of length 8 m and mass 60 kg rests on supports at C and D, where AC = 3 m and DB = 3 m. A girl of mass 60 kg stands on it at distance x m from A. Find the range of x for which the plank stays in equilibrium on both supports.	