Day 348	A Level Maths: S Tier 10-a-day
1 Use the trapezium rule with 5 strips to estimate $\int_1^3 \frac{1}{1+x^2}\,dx$, to 4 s.f. Is it an overestimate or an underestimate? Explain.	
2 For 40 observations x, $\Sigma(x-40) = 160$ and $\Sigma(x-40)^2 = 1800$. (a) Find the mean of x. (b) Find the standard deviation of x. (c) Find the value of Σx^2.	
3 A stone is projected from a point O on horizontal ground with speed 24.5 m s^{-1} at an angle α above the horizontal, where $\tan\alpha = \frac{4}{3}$. Find (a) the time of flight, (b) the range, (c) the greatest height. Take g = 9.8 m s^{-2}.	
4 A data set has lower quartile 21 and upper quartile 37. An outlier is a value more than 2 × IQR beyond the nearest quartile. (a) Find the range of values that are not outliers. (b) 12 observations have mean 31. The largest is 79, an outlier, and it is removed. Find the new mean.	
5 The sum of the first n terms of a sequence is $S_n = n^2 + 4n$. (a) Find an expression for u_n. (b) Find the least n for which $u_n > 158$.	

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6 A is acute and B is acute. $\sin A = \frac{15}{17}$ and $\sin B = \frac{7}{25}$. Find the exact values of $\sin(A + B)$ and $\sin(A - B)$.	
7 Describe a sequence of two transformations that maps the curve $y = x^2$ onto the curve $y = 3x^2 + 6x + 7$.	
8 The region bounded by $y = \sin x + 2\cos x$, the x-axis and the lines $x = 0$ and $x = \pi/2$ is rotated through 2π about the x-axis. Find the exact volume of the solid formed.	
9 Solve simultaneously: $x + y = 4$ $2x^2 - 2xy - y^2 = 32$	
10 A ball is projected horizontally at 29.4 m s^{-1} from the top of a vertical cliff of height 19.6 m, and lands on horizontal ground. Find (a) the time of flight and the distance from the cliff, (b) the speed and direction on landing. Take $g = 9.8$ m s^{-2}.	