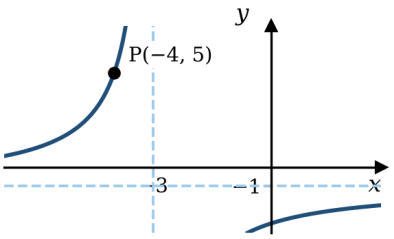
Day 286	A Level Maths: S Tier 10-a-day
1 A data set has lower quartile 30 and upper quartile 43. An outlier is a value more than 1.5 × IQR beyond the nearest quartile. (a) Find the range of values that are not outliers. (b) 12 observations have mean 33. The largest is 73, an outlier, and it is removed. Find the new mean.	
2 Ball A is projected vertically upwards from ground level with speed 30 m s^{-1}. At the same instant, ball B is released from rest 30 m directly above A. The balls collide. Find (a) the height above the ground at which they collide, (b) the velocity of A just before the collision. Take g = 9.8 m s^{-2}.	
3 Express $\frac{-x^2 + 7x - 16}{(x-4)(x-3)^2}$ in the form $\frac{A}{(x-4)} + \frac{B}{(x-3)} + \frac{C}{(x-3)^2}$.	
4 Solve $12\text{cosec}^2\theta - 11\cot\theta - 10 = 0$ for $0 \leq \theta < 360°$, giving answers to 1 d.p.	
5 For 10 pairs of values, $S_{xx} = 49$, $S_{yy} = 64$ and $S_{xy} = 23$. (a) Calculate the product moment correlation coefficient r. (b) The critical value for a one-tailed test at the 1% level with n = 10 is 0.7155. Carry out the test of H_0: $\rho = 0$ against H_1: $\rho > 0$.	

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6 The diagram shows the curve C, its asymptotes (dashed) and a point P. C has equation $y = \frac{a}{x + p} + q$. Find a, p and q.



7 $f(\theta) = \frac{2}{31 + 20 \sin \theta + 21 \cos \theta}$

(a) Write $20 \sin \theta + 21 \cos \theta$ as $R \sin(\theta + \alpha)$, $R > 0$, $0 < \alpha < 90°$.

(b) Find the greatest and least values of $f(\theta)$, and the smallest positive θ at which the greatest value occurs, to 1 d.p.

8 Particles A and B are projected from a point O at the same instant, with initial velocities $(13\mathbf{i} + 31\mathbf{j})$ m s^{-1} and $(17\mathbf{i} + 34\mathbf{j})$ m s^{-1} respectively (i horizontal, j vertically upwards).

Both are still in flight after 4 s. Find (a) the distance AB at this time, (b) the angle AB makes with the horizontal, to 1 d.p.

9 The curve C has equation $x^2 + xy + y^2 = 12$.

Find the coordinates of the points on C where the
tangent is parallel to the y-axis.

10 $f(x) = \frac{-12x + 1}{(1 - 2x)(1 + 3x)}$.

(a) Express f(x) in partial fractions.

(b) Hence expand f(x) in ascending powers of x up to x^3, stating the range of validity.