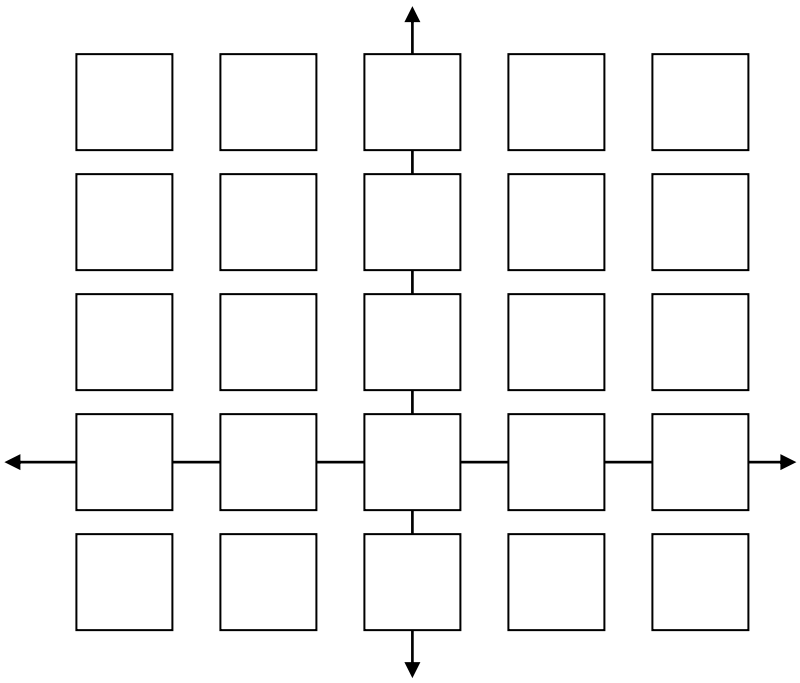
AP Calculus **Class, Take Your Seats #4** *by David Pleacher* Equations of Tangents and Normals

Can you fill in the first initial of each student in this math teacher's seating chart using only the clues below?



CLUES:

1. All students are located at integral coordinates in the xy-plane. The x-coordinates belong to the set {-2, -1, 0, 1, 2}, and the y-coordinates belong to the set {-1, 0, 1, 2, 3}.
2. Abel is seated on the line which is normal to the curve $f(x) = x^2 - 2x + 4$ at the point (1, 3).
3. Brahmagupta sits on the line normal to the curve $y = x^5 - x^4 + 1$ at x = 1.
4. Cantor is located on the line tangent to the curve $y = -x^2 + 10x - 25$ at the point (5, 0).
5. Descartes is seated on the line normal to $y = -x - x^2$ at $x = -1$.
6. Euclid sits on the line tangent to $y = x^3 + x^2$ at (3, 36).
7. Fermat is located on the line tangent to $y = \sqrt{x^2 + 5}$ at the point $(-2, 3)$.
8. The curve $y = ax^2 + bx + c$ passes through the point (2, 4) and is tangent to the line y = x + 1 at (0, 1). Determine values for a, b, and c. Gauss sits at the point $(-b - c, 4a)$.
9. Hardy sits at one of the points on the curve $y = 2x^3 - 3x^2 - 12x + 20$ where the tangent is parallel to the x-axis.
10. Jacobi is seated on the line tangent to the graph of $y = 2x^3 - 3x^2 - 12x + 21$ at x =2.
11. Klein is located on the tangent line to $y = 3x^2 - x$ at x = 1.
12. Leibniz sits on the line which is tangent to the curve $y = 4x^2 - 22x + 35$ at the point (3, 5).
13. Mandelbrot sits at the point on the curve $y = (x + 2)^2$ where the normal to that curve is parallel to the y-axis.
14. Newton's seat is collinear with those of Gauss and Cantor.
15. Determine the values of a, b, and c where the curves $y = x^2 + ax + b$ and $y = cx + x^2$ have a common tangent line at $(-1, 0)$. Pythagoras sits at the point (b, a+c).
16. Riemann sits on the line normal to the curve $y = x^2 - 3x + 2$ at x = 1.
17. The line tangent to a curve at a point (x_1, y_1) is y = 2x – 2. The normal to that curve at the same point passes through (11, -5). Taylor sits at the point (x_1, y_1).

18. Venn's seat is collinear with those of Brahmagupta and Zeno.
19. Wallis is seated on the line tangent to $y = 4 - 3x - x^2$ at the point (2, -6).
20. Zeno is located on the line tangent to $y = \frac{2x+5}{x^2-3}$ at x = 1.

CLUE Worksheet
For each problem, write down all possible answers from the given domain and range.

NAME	CLUE	Possible Ordered Pairs for the Seat				
	1	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Abel	2					
Brahmagupta	3					[redacted]
Cantor	4					
Descartes	5				[redacted]	[redacted]
Euclid	6		[redacted]	[redacted]	[redacted]	[redacted]
Fermat	7			[redacted]	[redacted]	[redacted]
Gauss	8		[redacted]	[redacted]	[redacted]	[redacted]
Hardy	9		[redacted]	[redacted]	[redacted]	[redacted]
Jacobi	10					
Klein	11		[redacted]	[redacted]	[redacted]	[redacted]
Leibniz	12				[redacted]	[redacted]
Mandelbrot	13		[redacted]	[redacted]	[redacted]	[redacted]
Newton	14			[redacted]	[redacted]	[redacted]
Pythagoras	15		[redacted]	[redacted]	[redacted]	[redacted]
Riemann	16				[redacted]	[redacted]
Taylor	17		[redacted]	[redacted]	[redacted]	[redacted]
Venn	18		[redacted]	[redacted]	[redacted]	[redacted]
Wallis	19		[redacted]	[redacted]	[redacted]	[redacted]
Zeno	20		[redacted]	[redacted]	[redacted]	[redacted]