

ART OF PROBLEM SOLVING

Show your reasoning. Use graph paper for graphs and additional work.

1. A robot begins at $(-3, -5)$. Each move sends it 2 units right and 3 units up. List its first six positions, plot them, and determine an equation satisfied by every position.
2. Find five integer-coordinate solutions of $3x - y = 6$. Plot them and explain why the graph must be a line rather than a collection of isolated points.
3. The points $(-2, 7)$, $(1, 1)$, and $(4, -5)$ satisfy the same linear equation. Find the equation and use it to predict the solution point whose x-coordinate is 10.
4. Graph all solutions of $2x + 3y = 12$. Choose x-values strategically so that the corresponding y-values are integers. Identify both axis intercepts.

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5. A point (a, b) lies on $y = -2x + 7$. A second point is formed by increasing a by 4. How must b change so that the second point also lies on the line? Prove your answer algebraically.
6. Three points $A(-4, 9)$, $B(0, 1)$, and $C(k, -11)$ lie on one line. Determine k without first writing the equation of the line. Then verify your result using an equation.
7. A line contains every point $(t, 5 - 3t)$, where t is a real number. Explain why each choice of t produces a solution of one linear equation, identify that equation, and describe what happens as t increases by 1.
8. A student graphs $4x - 2y = 8$ using only the points $(0, -4)$ and $(2, 0)$. The student then claims that $(5, 6)$ is not a solution because it was not in the table. Diagnose the error and give a convincing correction.