Math 45 How to Write the Equation of a Line

Step 1: Recognize if the line is vertical. Write equation $x = x - coordinate$.
           How to know if a line is vertical:
- It says "vertical".
- It says "slope undefined".
- It is parallel to another line with undefined slope (vertical).
- It is parallel to another line whose equation is $x = x - coordinate$ (vertical).
- It is perpendicular to a horizontal line, $y = y - coordinate$.
- It is perpendicular to a horizontal line, slope = 0.
- It is parallel to the y-axis.
- It is perpendicular to the x-axis.

Step 2: Recognize if the line is horizontal. Write equation $y = y - coordinate$.
           How to know if a line is horizontal?
- It says "horizontal".
- It says "slope 0".
- It is parallel to another line with zero slope (horizontal).
- It is parallel to another line whose equation is $y = y - coordinate$ (horizontal).
- It is perpendicular to a vertical line, $x = x - coordinate$.
- It is perpendicular to a vertical line, slope undefined.
- It is parallel to the x-axis.
- It is perpendicular to the y-axis.

Step 3: Given slope and a point:
        If the point is the y-intercept $(0, b)$, substitute into $y = mx + b$.
        If the point is not the y-intercept, substitute into the point-slope formula $y - y_1 = m(x - x_1)$

Step 4: Given two points:
        Find the slope using the slope formula: $m = \dfrac{y_2 - y_1}{x_2 - x_1}$
        Substitute into the point-slope formula: $y - y_1 = m(x - x_1)$

Step 5: Given "parallel to _____" and a point.
        Find the slope of the given line by writing in $y = mx + b$
        Use that same slope.
        Substitute slope and given point into the point-slope formula: $y - y_1 = m(x - x_1)$

Step 6: Given "perpendicular to _____" and a point.
        Find the slope of the given line by writing in $y = mx + b$
        Take the opposite and reciprocal of that slope to get the new slope.
        Substitute new slope and given point into the point-slope formula: $y - y_1 = m(x - x_1)$