Bresenham's Line Algorithm For All Cases:

Input

- Start point (x_0,y_0) and end point (x_1, y_1)

Steps

1. Calculate Differences:

- $\Delta x = |x_1 - x_0|$
- $\Delta y = |y_1 - y_0|$

2. Determine the Dominant Axis:
    - If $\Delta x >= \Delta y$, the line has a shallow slope ($|m| <= 1$).
    - If $\Delta x < \Delta y$, the line has a sleep slope ($|m| > 1$).

3. Set step Directions:
    - $S_x = 1$ if $x_1 > x_0$, otherwise $S_x = -1$
    - $S_y = 1$ if $y_1 > y_0$, otherwise $S_y = -1$

4. Intialize Decision parameter:
    - For shallow slopes ($|m| <= 1$): $P_0 = 2\Delta y - \Delta x$
    - For steep slopes ($|m| > 1$): Swap role of x and y ,and set: $P_0 = 2\Delta x - \Delta y$

5. Plot the Initial point:
    - Plot (x_0 , y_0)

6. Separate until the end point is Reached:
    - For k=0 to the dominant axis length (Δx or Δy):
        - ➢ For shallow slopes ($|m| <= 1$):
            - ✓ Increment x_0 by S_x
            - ❖ If $P_k >= 0$:
            - ✓ Increment y_0 by S_y

- ✓ Update : $P_k + 1 = P_k + 2\Delta y - 2\Delta x$

  - ❖ Else:
- ✓ Update : $P_k + 1 = P_k + 2\Delta y$

➢ For steep slopes ($|m| > 1$):
- ✓ Increment y_0 by S_y
  - ❖ If $P_k >= 0$:
- ✓ Increment x_0 by S_x

- ✓ Update : $P_k + 1 = P_k + 2\Delta x - 2\Delta y$

  - ❖ Else:
- ✓ Update : $P_k + 1 = P_k + 2\Delta x$

➢ Plot the new point (x_0 , y_0).

7. Terminate:
   - Stop when the end-point (x_1 , y_1) is plotted.