Algorithm 1 Bresenham - Straight Line

Draw a line segment from (x_0, y_0) to (x_1, y_1), two points with integer coordinates.

Ensure: $x_0, y_0, x_1, y_1 \in \mathbb{Z}$, $x_0 < x_1$, $0 \leq y_1 - y_0 \leq x_1 - x_0$.

1: $x \leftarrow x_0$
2: $y \leftarrow y_0$
3: $a \leftarrow x_1 - x_0$
4: $b \leftarrow y_1 - y_0$ $\{0 \leq b \leq a\}$
5: $output(x, y)$
6: $d \leftarrow 0$ $\{d = a(y - y_0) - b(x - x_0)\}$
7: **while** $x \leq x_1$ **do**
8: $\quad x \leftarrow x + 1$
9: $\quad d \leftarrow d - b$
10: $\quad$ **if** $2 * d < a$ **then**
11: $\quad\quad y \leftarrow y + 1$
12: $\quad\quad d \leftarrow d + a$
13: $\quad$ **end if**
14: $\quad output(x, y)$
15: **end while**

Algorithm 2 Bresenham - Circle

Draw first quadrant of circle $x^2 + y^2 = r^2$, $0 \leq x \leq r$, $y \geq 0$.

Ensure: $r \in \mathbb{Z}$, $r \geq 1$.

1: $x \leftarrow r$
2: $y \leftarrow 0$
3: $d \leftarrow 0$ $\{d = x^2 + y^2 - r^2\}$
4: $output8(x, y)$
5: **while** $x < y$ **do**
6: $output(x, y)$
7: $x \leftarrow x + 1$
8: $d \leftarrow d + 2 * x + 1$
9: **if** $d > y$ **then**
10: $y \leftarrow y - 1$
11: $d \leftarrow d - 2 * y + 1$
12: **end if**
13: **end while**