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1. BRESENHAM LINE DRAWING ALGORITHM

```
#include <graphics.h>
void main()
{
  float x,y,x1,y1,x2,y2,dx,dy,steps,p;
  int i=1, gd=DETECT, gm;
  printf("Enter (x1,y1):");
  scanf("%f %f", &x1, &y1);
  printf("Enter (x2,y2):");
  scanf("%f %f", &x2, &y2);
  initgraph(&gd, &gm, "");
  dx= x2-x1;
  dy= y2-y1;
  steps= dx-1;
  int pk= (2*dy)-dx;
  p= pk;
  x= x1;
  y= y1;
  while(i<=steps)
  {
    if(p<0)
    {
      putpixel(x,y,BLUE);
      x=x+1;
      y=y;
      p= p+(2*dy);
      delay(50);
    }
    else
```

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```
{
    putpixel (x, y, BLUE);
        x = x+1;
        y = y+1;
        p = p + (2*dy) - (2*dx)
            delay (50);
        }
        i++;
    }
    getch();
    closegraph();
}
```

ALGORITHM =>

Step 1: Start.

Step 2: Declare variable x1, x2, y1, y2, d, i1, i2, dx, dy;

Step 3: Enter value of x_1, y_1, x_2, y_2 where x_1, y_1 are coordinates of starting point and x_2, y_2 are co-ordinates of ending point.

Step 4: Calculate $dx = x_2 - x_1$
Calculate $i_1 = 2 * dy$
Calculate $i_2 = 2 * (dy - dx)$ and $d = i - dx$

Step 5: Consider (x, y) as starting point and x_{end} as maximum possible value of x.
if $dx < 0$, then $x = x2$
$y = y_2$, $x_{end} = x1$

If $dx > 0$, then $x = x1$

$y = y1$, $x_{end} = x_2$.

Step 6 ⇒ Generate point at (x,y) coordinates

Step 7 ⇒ Check if whole line is generated.

If $x > x_{end}$

stop.

Step 8 ⇒ Calculate co-ordinates of the next pixel.

if $d < 0$

then $d = d + 11$

If $a \geq 0$, then $d = d + i_2$

Increment $y = y + 1$

Step 9 ⇒ Increment $x = x + 1$

Step 10 ⇒ Draw a point of latest (x,y) coordinates.

Step 11 ⇒ Go to step 7.

Step 12 ⇒ End of Algorithm.

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Q2 Source Code

```
#include <stdio.h>
#include <graphics.h>
int main()
{
  int gd = DETECT, gm;
int r, x, y, p, xc = 200, yc = 200;
printf("Enter radius");
  scanf("%d", &r);
  initgraph(&gd, &gm, "");
   y = 0;
    y = r;
     p = 1 - r;
for(x=0; x<=y; x++)
{
   if(p<0)
   {
      y = y;
      p = p + (2*x) + 1;
   }
   else
   {
      y = y - 1;
      p = p + (2*x) - (2*y) + 1;
   }
putpixel(xc+x, yc+y, 7);
putpixel(xc+y, yc+x, 7);
putpixel(xc-x, yc+y, 7);
putpixel(xc-y, yc+x, 7);
putpixel(xc-x, yc-y, 7);
```

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```
putpixel(xc-y, yc-x, 7);
putpixel(xc+x, yc-y, 7);
putpixel(xc+y, yc-x, 7);
}
getch();
closegraph();
return 0;
}
```

ALGORITHM

Step 1 ⇒ Start

Step 2 ⇒ Allot the centre coordinates (p_0, q_0) as follows - $p_0 = 0, q_0 = r$.

Step 3 ⇒ Now, calculate the initial decision parameter
$d_0 = 1 - r$;

Step 4 ⇒ Assume the starting co-ordinates (p_k, q_k)
The next co-ordinates will be (p_{k+1}, q_{k+1}).
Find the next point of first octant according to d_k.

Step 5 ⇒ Follow these 2 cases -

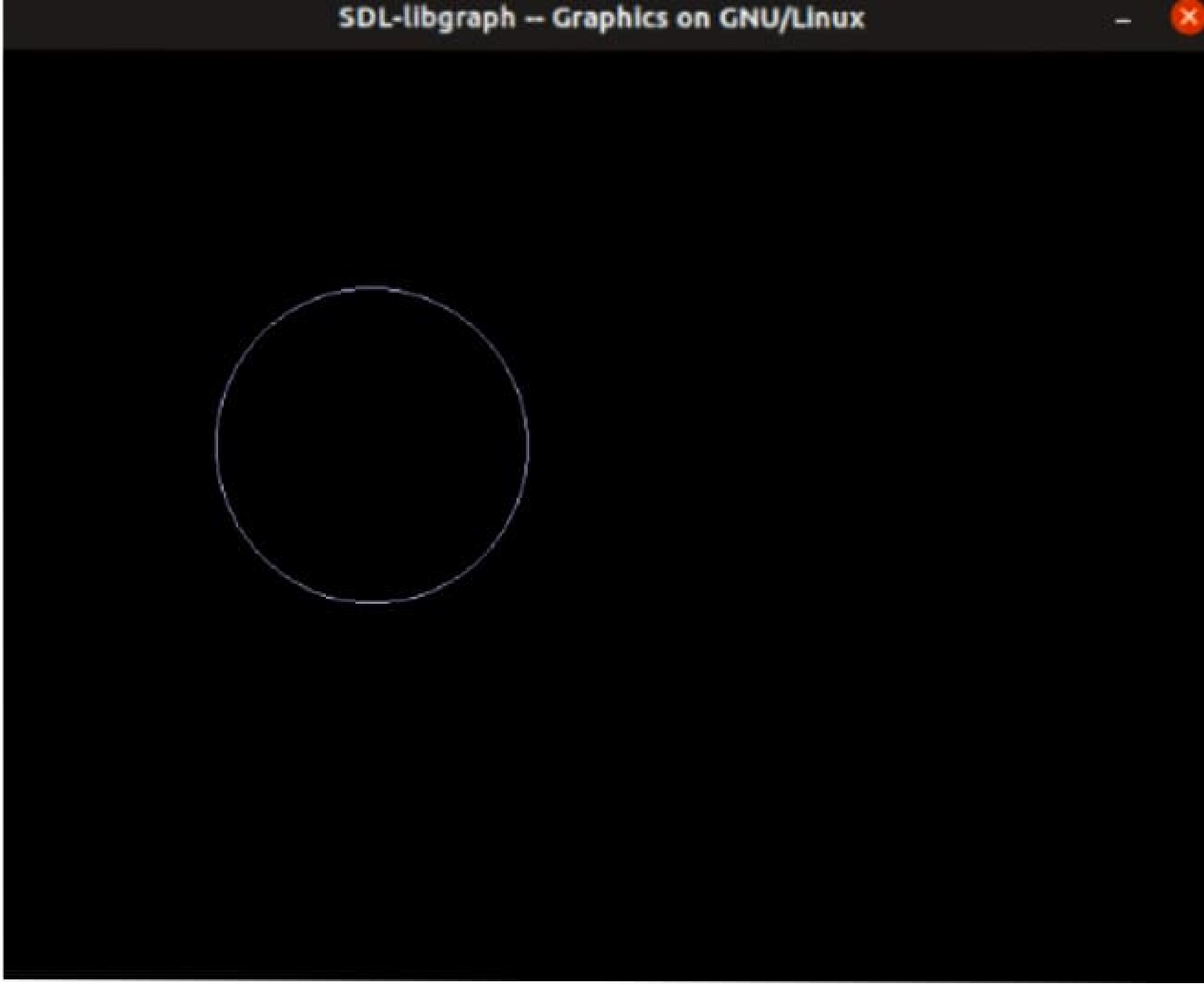
Case 1: If $d_k < 0$, then
$p_{k+1} = p_k + 1$
$q_{k+1} = q_k$
$d_{k+1} = d_k + 2p_{k+1} + 1$

Case 2: If $d_k >= 0$, then
$p_{k+1} = p_k + 1$
$q_{k+1} = q_k - 1$
$d_{k+1} = d_k - 2(q_k + 1 + 2p_{k+1}) + 1$

Step 6: If center not (0, 0) points will be
$x_{coordinate} = x_c + p_0$
$y_{coordinate} = y_c + q_0$

Step 7: Repeat step 5 & 6 until $x >= y$

Step 8: Stop


SDL-libgraph -- Graphics on GNU/Linux