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Ans 1= Proof of Bresenham's line Algo

```
#include <stdio.h>
#include <graphics.h>
int main()
{
int gd= DETECT, gm , x0, y0, x1, y1, dx, dy, p, x, y;
printf("Co-ordinates of first points");
printf("\n Enter the value of x1: ");
scanf ("%d", &x0);
printf("Enter the value of y1:");
scanf("%d", &y0);
printf("Co-ordinates of second point:");
printf("\n Enter the value of x2: ");
scanf("%d", &x1);
printf("Enter the value of y2:");
scanf("%d", &y1);
initgraph(&gd, &gm, "");
dx=x1-x0;
dy= y1-y0;
x= x0;
y= y0;
```

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```
p = 2*dy - dx;
while (x<x1)
{
if (p>=0)
{
putpixel (x, y, 4);
y = y+1;
p = p + 2*dy - 2*dx;
}
else
{
putpixel (x, y, 4);
p = p + 2*dy;
}
x = x + 1;
}
getch();
return 0;
}
```

Algorithm

Given:

* Starting coordinates = (x_0, y_0)
* Ending coordinates = (x_n, y_n)

The points generation using Bresham line drawing Algo involves the following steps.

Step-01

Calculate Δx and Δy from the given input These parameters are calculated as -

$\Delta x = x_n - x_0$
$\Delta y = y_n - y_0$

Step-02:
Calculate the decision parameter P_k It is calculated as -
$P_k = 2\Delta y - \Delta x$.

Step-03: Suppose the current point is (x_k, y_k) and the next point is (x_{k+1}, y_{k+1}) Find the next point depending on the value of decision parameter P_k.
Follow the below two cases.

Step-04: Keep repeating step-03 until the end point is reached or number of iteration equals to $(\Delta x - 1)$ times.

Two cases -

Case-01
If $P_k < 0$
$P_{k+1} = P_k + 2\Delta y$
$x_{k+1} = x_k + 1$
$y_{k+1} = y_k$

Case-02
If $P_k \geq 0$
$P_{k+1} = P_k + 2\Delta y - 2\Delta x$
$x_{k+1} = x_{k+1}$
$y_{k+1} = y_{k+1}$

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