

# Midpoint Ellipse Algorithm

```
In[6]:= FourWaySymmetry[pixelList_] := Module[{n = Length[pixelList], i, newPixelList = {}, x,
  For[i = 1, i ≤ n, i++,
    {x, y} = pixelList[[i]];
    AppendTo[newPixelList, {x, y}];
    AppendTo[newPixelList, {x, -y}];
    AppendTo[newPixelList, {-x, y}];
    AppendTo[newPixelList, {-x, -y}];
  ];
  Return[newPixelList];
]
```

```

In[74]:= DrawEllipse[origin_, a_, b_] := Module[{h, d1, d2, x, y, pixelList={}},
  h = 4b^2 + a^2 (1 - 4b);
  d1 = 12 b^2;
  d2 = -8 a^2 (b - 1);

  {x, y} = {0, b};
  AppendTo[pixelList, {x, y} + origin];

  While[b^2 x < a^2 y,
    x = x + 1;
    If[h > 0,
      y = y - 1;
      h = h + d1 + d2;
      d2 = d2 + 8 a^2;
      ,
      h = h + d1;
    ];
    d1 = d1 + 8 b^2;
    AppendTo[pixelList, {x, y} + origin];

  ];
  x = x + 1;
  While[y ≥ 0,
    y = y - 1;
    If[h > 0,
      h = h + d2;
      ,
      x = x + 1;
      h = h + d1 + d2;
      d1 = d1 + 8 b^2;
    ];
    d2 = d2 + 8 a^2;
    AppendTo[pixelList, {x, y} + origin];

  ];
  pixelList = FourWaySymmetry[pixelList];
  Return[pixelList];
]

```

```

In[78]:= DrawPixel[pointList_] := Module[{},
  Return[Table[{Black, Rectangle[pointList[[i]], pointList[[i]] + {1,1}]}, {i, Length[poin
]

```

In[79]:=

```
Show[
  Graphics[{Gray, Ellipsoid[{0.5, 0.5}, {50, 20}]}],
  Graphics[DrawPixel[DrawEllipse[{0,0}, 50, 20]]]
]
```

Out[79]=

