

Introduction to Graphics in *Mathematica*

The Graphics function allows you to draw in two dimensions using basic shapes called “primitives.” You can change characteristics such as color and thickness using “directives.”

Set Up

To start a Graphics function, set it up as `Graphics[{ }]`.

Inside the list `{ }` we will put the primitives and directives for each object.

Each object gets grouped with its own directives as a list. For example: `{Red, Disk[]}`.

Options such as `Axes->True` may be included inside the last `]` and separated by commas.

For example:

```
Graphics[{Circle[ ]}]
```

```
Graphics[{Circle[{1,1},0.5]},Axes->True]
```

```
Graphics[{Circle[{1,1},0.5]},Axes->True,PlotRange->5]
```

```
More than one object: Graphics[{{Red,Disk[{1,1},0.5]}, {Blue,Circle[{0,3},1]}}]
```

Primitives

Remember to put them inside `Graphics[{ }]` and separate them with commas.

`Circle[{1,1},0.5]` The first entry is the center, the second is the radius.

`Disk[{1,1},0.5]` The first entry is the center, the second is the radius.

`Line[{{0,0},{1,1},{2,-3}}]` The input is a list of points. Points are connected in order.

`Polygon[{{0,0},{1,1},{2,-3}}]` The input is a list of points. Points are connected in order.

`Arrow[{{0,0},{1,1},{2,-3}}]` The input is a list of points. Points are connected in order.

`Point[{{0,0},{1,1},{2,-3}}]` The input is a list of points. Points are drawn in order.

`Rectangle[{-3,-2},{1,4}]` The input is two points. The points are diagonal corners of the rectangle.

`Text["Some Text",{1,1}]` The first entry is what you want to write, the second is its location.

Directives

Remember to group each one with its corresponding primitive in a list using `{ }` and separate with commas.

`Red, Purple, Green` and others work as color directives. You can combine colors using `Blend`. For example,

`Blend[{Blue,Green}]` or adjust colors with `Darker` and `Lighter`. For example, `Darker[Green,0.3]`.

`Opacity[0.5]` adjusts how transparent an object is, ranging in values from 0 to 1.

`Thick` and `Thin` work for lines. Thickness may also be explicitly specified. For example, `Thickness[0.05]`.

`Dashing[Small]` (or `Medium` or `Large`) also works for lines and circles.

`EdgeForm[Red]`, for example, adjusts the edge of objects that are filled in. You can combine directives with a list:

```
EdgeForm[{Red,Thick,Dashing[Medium]}].
```

Example

```
Graphics[{
  {EdgeForm[{Red,Thick}],Blend[{Blue,Green}],Disk[{1,1},0.5]},
  {Opacity[0.5],Polygon[{{0,0},{1,1},{0,1}}]},
  {Orange,PointSize[0.02],Point[{{1,0},{1,1/4}}]},
  {Thick,Arrowheads[Large],Arrow[{{1/2,0},{1,2}}]},
  {Text[Style["Example",20],{0.3,1.5}]}
},
Axes->True,Background->Lighter[Yellow,0.8]
]
```