

# DESIGN.pdf

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There are 4 steps to writing plot.sh: building the monte carlo executables, plotting figure 2, changing the PI estimates to the error values in the .dat files, and plotting figure 3.

## **build the monte carlo executables**

Firstly, we need to build 5 monte carlo executables and save the data from each executable into a new .dat file.

Pseudocode:

build the monte carlo executable with 16384 points, place the data into a .dat file and sleep for 1.1 seconds  
Repeat 5 times

## **for figure 2**

Now, we have to plot figure 2, which is all the points generated by 1 monte carlo executable. We need to color code the points so that the ones inside the circle,  $\text{square}(x) + \text{square}(y) = 1$ , are blue and the ones outside the circle are red. We will plot the values from the 3rd column of the .dat files on the x-axis and the values from the 4th column on the y-axis.

Pseudocode:

enter gnuplot  
set output to "figure2.pdf"  
label x-axis and y-axis  
set range for x-axis and y-axis to be 0 to 1  
 $f(x) = \text{equation for circle is } \text{square}(x) + \text{square}(y) = 1$

create a color palette with red and blue  
plot  $f(x)$  and the 3rd and 4th columns of the first .dat executable with the color palette  
exit gnuplot

## **change the PI estimate to the PI estimate minus PI**

The .dat files contain a column for the PI estimates after each point is created. We must change the values in this column (column 2) from the PI estimates to

the PI estimates minus PI, in order to get the error.

Pseudocode:

```
for every executable:
  extract the values for column 2
  then subtract PI from them
  then put that value back in column 2
```

### **for figure 3**

Figure 3 graphs the error between the PI estimates and actual PI. Each of the 5 executables are plotted. The values we are plotting are the number of points (which will go on the x-axis). These values are in the first column of the .dat files. On the y-axis, we will plot the PI errors, which are in the second column.

Pseudocode:

```
enter gnuplot
set output to "figure3.pdf"
Set title and label y-axis "error"
Set range for x-axis to be 1 to 16384 and range for y-axis to be -1 to 1
Set scale for x-axis to start at 1 and then increment by 4 to the nth power while
n is less than or equal to 7
plot each .dat executable with the values in column 1 on the x-axis and the
values in column 2 on the y-axis
exit gnuplot
```