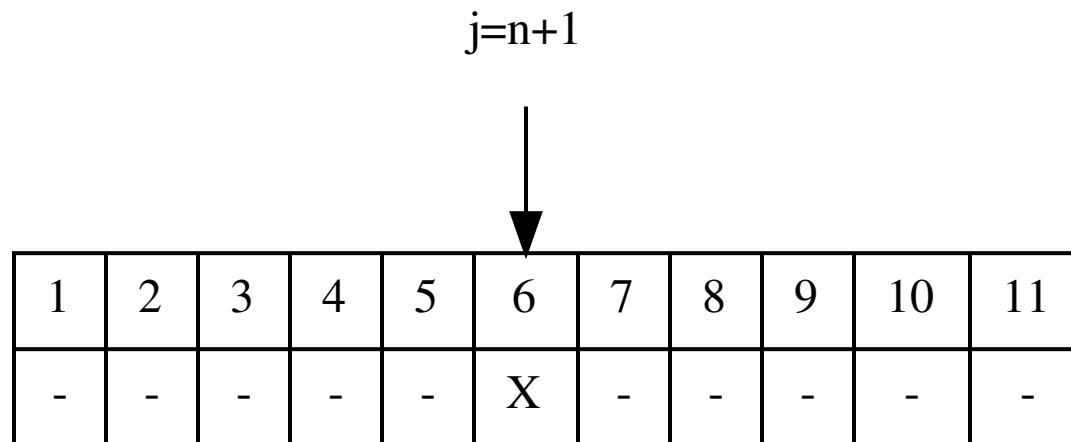


# Many Trials

September 2011

Question...

How does the average number of steps scale with  $n$ ?



## A Single Trial

```
#
steps=0
j=n+1
while 1<=j<=m:
    if random()<0.5:
        j+=1
    else:
        j-=1
    steps+=1
#
```

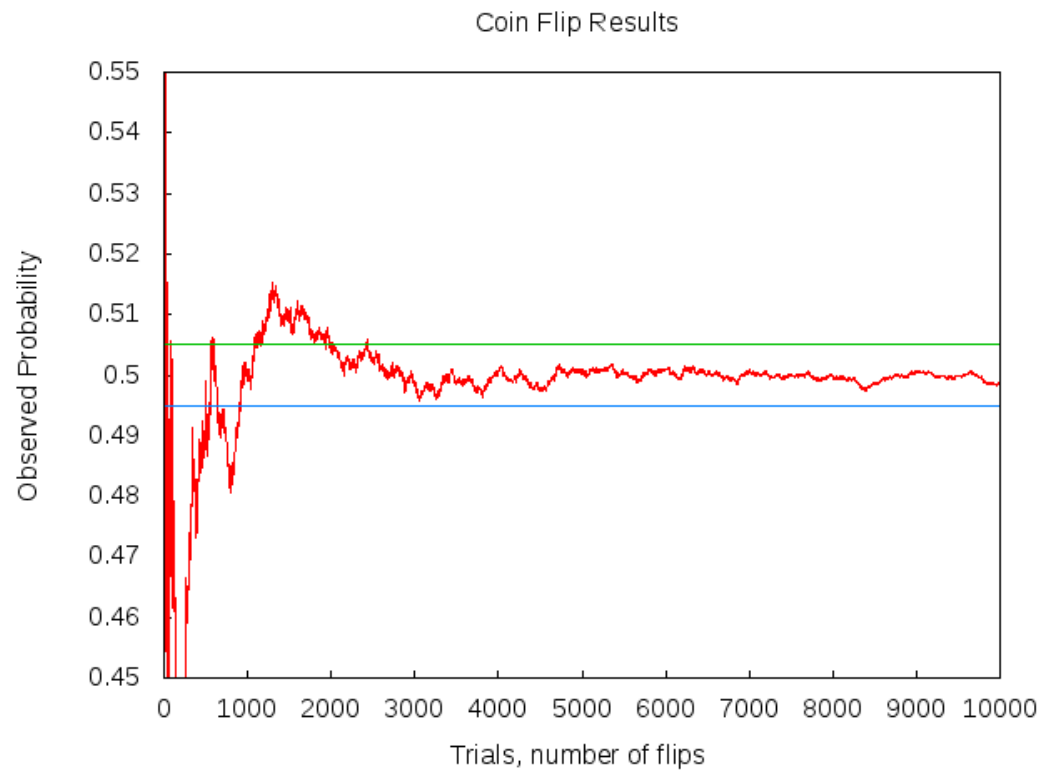
## Many Trials (1)

```
trial=1
while trial<=100:
    #
    steps=0
    j=n+1
    while 1<=j<=m:
        ...
    #
    trial+=1
```

## Many Trials (2)

```
#
totalsteps=0
#####
trial=1
while trial<=numtrials:
    ...
    trial+=1
#####
print 'avg', (1.0*totalsteps)/numtrials
#
```

How many trials?



## Source Code

```
count=0
trial=0
while trial<10000:
    #
    if random()<0.5:
        count+=1
    trial+=1
    #
    print trial,(1.0*count)/trial
```

Write the Results to a File

```
python coinflip.py > results.txt
```

*... or ...*

IDLE

- Highlight All and Copy
- Spreadsheet then Paste
- Text → Table



## Gnuplot Script

```
set terminal png
set output "coinflip.png"
set ylabel "Observed Probability"
set yrange[0.45:0.55]
plot "results.txt" with lines notitle
```

... *or* ...

## Spreadsheet

## Lab Assignment: Average Number of Steps

- Run 10,000 trials with  $n = 5$ .
- Report the average number of steps.
  - Then, change  $n$  so that  $n = 6$  and repeat.
  - Let  $n = 7, 8, 9$  and run 10,000 trials for each size.
- Report the average number of steps.
  - Write code to do a loop for  $n \leq 25$ .
  - Sketch a plot. What happens as  $n$  grows?
- The horizontal axis is  $n$ , the size, and the vertical axis is the average number of steps over 10,000 trials. Label these clearly.