In [1]:
```
def fib(n):
  if n <= 1:
    value = n
  else:
    value = fib(n-1) + fib(n-2)
  return(value)
```

In [2]:
```
def memofib(n,fibtable={}): # Why does this work? It is designed this way
  if n in fibtable.keys():
    return(fibtable[n])
  if n <= 1:
    value = n
  else:
    value = memofib(n-1) + memofib(n-2)
  fibtable[n] = value
  return(value)
```

In [3]:
```
import time
```

In [4]:
```
fiblist = list(range(10,45,5))
```

In [5]:
```
for i in fiblist:
    starttime = time.perf_counter()
    v = fib(i)
    elapsed = time.perf_counter() - starttime
    print(i,v,elapsed)
```

```
10 55 2.758900518529117e-05
15 610 0.00022909100516699255
20 6765 0.002509320998797193
25 75025 0.031475314986892045
30 832040 0.2548011970066
35 9227465 2.1574368279834744
40 102334155 23.80810795800062
```

In [6]:
```
for i in fiblist:
    starttime = time.perf_counter()
    v = memofib(i)
    elapsed = time.perf_counter() - starttime
    print(i,v,elapsed)
```

```
10 55 1.4365999959409237e-05
15 610 4.943984095007181e-06
20 6765 3.416993422433734e-06
25 75025 3.7619902286678553e-06
30 832040 2.7070054784417152e-06
35 9227465 3.681023372337222e-06
40 102334155 3.537978045642376e-06
```

In [7]:
```
fiblist = list(range(10,1000,50))
```

In [8]:
```
for i in fiblist:
    starttime = time.perf_counter()
    v = memofib(i)
    elapsed = time.perf_counter() - starttime
    print(i,v,elapsed)
```

```
10 55 4.108005668967962e-06
60 1548008755920 1.7762999050319195e-05
110 43566776258854844738105 3.9053993532434106e-05
160 12261325953941882930000174702095995 2.4064996978268027e-05
210 34507973060837282187130139035400899082304280 2.585301990620792e-05
260 97118387459933912954764998828959407281160873958417044 5 2.5386019842699
17e-05
310 27332759203762391000908267962175339332906872716290689783750745455 2.90
23998649790883e-05
360 76924642720109478508078797842239371309453488568897999504447628313150135520 3.2409996492788196e-05
410 21649481537897403506609107715822337285038973915379503528404929519011871658725122483505 2.7503992896527052e-05
460 60929766364353089279195197999021720669389417532925504644464121947359627086981590846538820960059 5 3.243001992814243e-05
510 17147923024004226122738827244577811616833011594238408929354842393259173960805130470788839689695398991424680 3.28199821524322e-05
560 48260691215978254290641975291430073961495779744485221290538753780513141626136502906221227101954142037517399975967504 5 3.124101203866303e-05
610 13582369791278266616906284494806735565776939502107183075612628409034209452901850178519363189834336113240870247715060398192490855 3.2014999305829406e-05
660 382258862231028574261100281936883758817863493280896798025390698127550201491037179836377303873609973810592211414348973275388364055795515120 3.579800250008702e-05
710 10758199047708937184349496107386074509501318192717122040102012754220284052477044258120122165446328847537283397282225827517813939685440914509701228905 8.046702714636922e-05
760 30277609804681402687666469893349214926922731677696233551287528919689205393382251952714985610143060301192603316732408287178514319174071240208899161073623610519 5 3.180501516908407e-05
810 85212557549747764690995798573856155081074489682311579500343564088518417827537999565157319618911610940265463800324324100283766488902726366450190754288933043003374365450 80 3.187899710610509e-05
860 23982011826595308803814543751123749704469958402028528719291646882214212468216626977711000354717145950657856147184068387801061579765856091902791470330474778493432206810867334417964 5 3.304597339592874e-05
910 67494382024056465660365283443301168785773676085103193312784873239230633951235379810359483344624940413482226965060725623561904730024738275425492479064203412563276399787924008293424004052361 55 4.0095008444041014e-05
960 18995452248744942165548495020455279315637865599162010356035149962135534275104213855576744358861329893278582364174508940577006930147437928674837319534996013006446884646105353682453864937307564386489472026 80 3.310901229269802e-05
```

In [9]:
```
fibtable[99]
```

```
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
Cell In[9], line 1
----> 1 fibtable[99]

NameError: name 'fibtable' is not defined
```