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# File: ComparingLinearBinarySearch.py
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# Course Name: CS303E
#
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# Description: This program compares linear search and binary search for probes.
```

```
import math
import random
```

```
lst = [x for x in range(1000)]
random.shuffle(lst)
key = random.randint(0,999)
```

```
def linearSearch( lst, key ):
```

```
    for i in range( len(lst) ):
        if key == lst[i]:
            return i
    return -1
```

```
def testLinear(lst,n):
    totalProbes = 0
```

```
    for i in range(n):
        key = random.randint(0,999)
        res = linearSearch(lst, key)+1
        totalProbes += res
    totalProbes = totalProbes / n
    return totalProbes
```

```
print("Linear search:")
```

```
print("  Test: 10      Average Probes: " + str(testLinear(lst,10)))
print("  Test: 100     Average Probes: " + str(testLinear(lst,100)))
print("  Test: 1000    Average Probes: " + str(testLinear(lst,1000)))
print("  Test: 10000   Average Probes: " + str(testLinear(lst,10000)))
print("  Test: 100000  Average Probes: " + str(testLinear(lst,100000)))
```

```
lst = [x for x in range(1000)]
```

```
def binarySearch( lst, key ):
```

```
    count = 0
    low = 0
```

```
high = len(lst) - 1
while (high >= low):
    count += 1
    mid = (low + high) // 2
    if key < lst[mid]:
        high = mid - 1
    elif key == lst[mid]:
        return (mid, count)
    else:
        low = mid + 1

return (-low - 1, count)
```

```
def testBinary(lst,n):
    totalCount = 0

    for i in range(n):
        key = random.randint(0,999)
        _, count = binarySearch(lst, key)
        totalCount += count
    averageProbe = totalCount/1000
    return averageProbe

x = (math.log2(1000))- (testBinary(lst,1000))
print("Binary search:")
print("  Average number of probes: " + str(testBinary(lst,1000)))
print("  log2(1000): " + str(math.log2(1000)))
print("  Differs from log2(1000) by: " + str(x))
```