

NORTHERN ILLINOIS UNIVERSITY

"Learning to Manipulate Data Structures in PL/I"

A Report Submitted to the University
Honors Program in Partial Fulfillment of
the Requirements of the Baccalaureate Degree
With University Honors

Department of Computer Science

by

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May 1987

Learning to Manipulate Data Structures in PL/I

In my independent study proposal, I stated that my project objectives were to learn to program in the language of PL/I and to manipulate data structures (including lists, binary trees, and stacks) in PL/I. These objectives were to be accomplished through the study and program development in PL/I. In my study of PL/I, I read and outlined various PL/I and data structure texts, including Joan K. Hughes, PL/I Structured Programming; Joseph Shortt and Thomas G. Wilson, Problem Solving and the Computer: A Structured Concept with PL/I (PL/O); and Thomas A. Standish, Data Structure Techniques. I also designed, coded, and debugged several programs which will be summarized at the end of this paper.

I found the language of PL/I fairly easy to learn primarily because it is similar to COBOL. The texts that I used were complete and easy to understand. Despite the similarities between PL/I and COBOL, there are many different functions in PL/I that do not exist in COBOL. Learning how to use the various PL/I techniques was interesting and even entertaining at times.

My independent study in PL/I has been a good learning experience not only in the area of the PL/I language, but also in the areas of organization, time management, and creativity. I learned the importance of the aspects of organization, time management, and creativity in self-study.

In the independent study of a subject, one must be able to structure and organize both the learning and the material being learned. I found that proper organization of the material was crucial. I had to coordinate the material from the various texts from which I had read PL/I and data structure material. I had to coordinate and combine this material not only in order to understand the concepts of the language, but also in order to efficiently and effectively code and debug my programs.

I also learned the importance of time management through my independent work. Time had to be set aside for reading the textbooks and for developing the programs. Factors such as availability of computer time and availability for advisement had to be taken into consideration.

Creativity in my program development was another aspect of my independent study to which I had to adapt. In previous programming classes, program specifications and programming techniques were provided by the department or instructor; thus, there was really not much need for imagination or creativity in my programming. However, during my study of PL/I, I had to be creative in the design of the program problems. I had to use my imagination when trying to develop program specifications. For most of the programs, I used exercises from the PL/I texts and modified them to suit my own purposes. I designed the input and

output and coded the processing routines according to the standards that I learned in past programming courses.

Descriptions of the programs that I developed and the significance of their particular features are provided below.

Program 1: This program was an introductory program that allowed me to become familiar with the basic language and functions of PL/I. Stream I/O is used to print the report.

Program 2: This program used Program 1 as its basis. However, record I/O is used to print the report. This program provided me with exercise in the use of record I/O for printing the headers, page numbers, and body of the report.

Program 3: This program provided me with exercise in the use of arrays, subscripts, and sorting. The sorting of the arrays was done through "tag sorting." This form of sorting uses nested subscripts.

Program 4: This program provided me with exercise in building, processing, and printing circular lists. Along with the circular lists, I used based storage and locator qualified reference pointers.

Program 5: This program provided me with exercise in building and printing binary trees. Also, I used an external subroutine with parameters and the recursive function to print the tree in proper sequence.

Approved by: Lyle Domina
Department of: Computer Science
Date: May 8, 1987


```

00.45.13 JOB 5299 IEF1961 $ACF1137 T90ZWC1 LAST SYSTEM ACCESS 00.38-04/29/87 FROM R7.RD1
00.45.13 JOB 5299 $ACF1137 ET510483 T90ZWC1 LAST SYSTEM ACCESS 00.38-04/29/87 FROM R7.RD1
00.45.13 JOB 5299 $HASP001 ET510483 JOB PARMS - TIME=(0,5),LINES=2,CARDS=100,TAPES=0,ROOM=510
00.45.13 JOB 5299 $HASP373 ET510483 - STARTED - INIT 11 - CLASS A - SYS B1
00.45.13 JOB 5299 IEF4031 ET510483 - STARTED - TIME=00.45.13
00.45.18 JOB 5299 AMS0001: STEP END ET510483.PLI RC= 0000 CPU= 0.27 SEC. PGM=IELOAA
00.45.26 JOB 5299 AMS0001: STEP END ET510483.GO RC= 0000 CPU= 0.21 SEC. PGM=LOADER
00.45.26 JOB 5299 IEF4041 ET510483 - ENDED - TIME=00.45.26
00.45.26 JOB 5299 AMS0001: JOB END ET510483 CSCI 260B 8 DOMINA CPU= 0.48 SEC.
00.45.26 JOB 5299 $HASP395 ET510483 ENDED

```

----- JES2 JOB STATISTICS -----

29 APR 87 JOB EXECUTION DATE

172 CARDS READ

765 SYSOUT PRINT RECORDS

0 SYSOUT PUNCH RECORDS

0.20 MINUTES EXECUTION TIME

```

1 //ET510483 JOB , 'EILEEN THORSEN', TIME=(0,5), REGION=256K JOB 5299
  ***JOBPARM ROOM=510, COPIES=2
  ***ROUTE PRINT LOCAL
  ***ROUTE PUNCH LOCAL
  ***LOGONID T90ZWC1 $ACF1770 LOGONID SUCCESSFULLY SCANNED
  ***PASSWORD $ACF1770 PASSWORD(S) SUCCESSFULLY SCANNED
2 // EXEC PLIXCG, CPARM=GDSTMT
3 XXPLIXCG PROC CDISP=, 00001000
  XX CPARM=, 00002000
  XX CREGION=128K, 00003000
  XX GPARM=, 00004000
  XX GREGION=256K, 00005000
  XX LEVEL=SYS2, 00006000
  XX LKLBDSN=PLIBASE, 00007000
  XX LPARM=, 00008000
  XX VERSION=Y151, 00009000
  *****
  *** PLEASE CALL 3-1875 IF YOU HAVE PROBLEMS WITH THIS PROCEDURE. *
  *****
4 XXPLI EXEC PGM=IELOAA, REGION=&CREGION, PARM='&CPARM' 00013000
5 XXSTEPLIB DD DSN=&LEVEL..PLI.&VERSION..&LKLBDSN, DISP=SHR 00014000
6 XXSYSLIN DD DSN=&&OBJSET, UNIT=DISK, SPACE=(80, (500, 100)), 00015000
  XX DISP=(&CDISP, PASS, DELETE) 00016000
7 XXSYSPRINT DD SYSOUT=* 00017000
8 XXSYST1 DD DSN=&&SYST1, UNIT=DISK, DCB=BLKSIZE=1024, 00018000
  XX SPACE=(1024, (200, 50), , CONTIG, ROUND) 00019000
9 //PLI.SYSIN DD *
10 XXDD EXEC PGM=LOADER, PARM='&LPARM/&GPARM', REGION=&GREGION, 00020000
  XX COND=(9, LT, PLI) 00021000
11 XXSYSLIB DD DSN=&LEVEL..PLI.&VERSION..&LKLBDSN, DISP=SHR 00022000
12 XX DD DSN=&LEVEL..PLI.&VERSION..PLIBASE, DISP=SHR 00023000
13 XX DD DSN=SYS2.CALLIB, DISP=SHR 00024000
14 XXSYSLIN DD DSN=&&OBJSET, DISP=(OLD, DELETE) 00025000
15 XXSYSLOUT DD SYSOUT=* 00026000
16 XXSYSPRINT DD SYSOUT=* 00027000
  *** 00028000
  *** END OF PROCEDURE PLIXCG 00029000
17 //GO.SYSIN DD *
  //

```

```

* STMT NO. MESSAGE
4 IEF653I SUBSTITUTION JCL - PGM=IELOAA,REGION=128K,PARM='GOSTMT'
5 IEF653I SUBSTITUTION JCL - DSN=SYS2.PLI.V151.PLICOMP,DISP=SHR
6 IEF653I SUBSTITUTION JCL - DISP=(,PASS,DELETE)
10 IEF653I SUBSTITUTION JCL - PGM=LOADER,PARM='/' ,REGION=256K,
11 IEF653I SUBSTITUTION JCL - DSN=SYS2.PLI.V151.PLIBASE,DISP=SHR
12 IEF653I SUBSTITUTION JCL - DSN=SYS2.PLI.V151.PLIBASE,DISP=SHR
IEF236I ALLOC. FOR ET510483 PLI
IEF237I 8A3 ALLOCATED TO STEPLIB
IEF237I 8A3 ALLOCATED TO SYSO4093
IEF237I CA2 ALLOCATED TO SYSLIN
IEF237I JES2 ALLOCATED TO SYSPRINT
IEF237I 3A1 ALLOCATED TO SYSUT1
IEF237I JES2 ALLOCATED TO SYSIN
IEF142I ET510483 PLI - STEP WAS EXECUTED - COND CODE 0000
IEF285I SYS2.PLI.V151.PLICOMP KEPT
IEF285I VOL SER NOS= SYS102.
IEF285I ICFCAT.SUPPORT KEPT
IEF285I VOL SER NOS= SYS102.
IEF285I SYS87119.T004513.RA000.ET510483.OBJSET PASSED
IEF285I VOL SER NOS= STG102.
IEF285I JES2.JOB05299.S00103 SYSOUT
IEF285I SYS87119.T004513.RA000.ET510483.SYSUT1 DELETED
IEF285I VOL SER NOS= PUB101.
IEF285I JES2.JOB05299.S10101 SYSIN
IEF373I STEP /PLI / START 87119.0045
IEF374I STEP /PLI / STOP 87119.0045 CPU OMIN 00.27SEC SRB OMIN 00.02SEC VIRT 256K SYS 216K

```

KOMAND DATA ACQUISITION SYSTEM

```

* STEP NAME PLI START TIME 00.45.13.82 VIRT SVS USED 216K PAGE INS 0 STEP CPU 00.00.00.27
* PGM NAME IELOAA STOP TIME 00.45.18.89 VIRT CORE USED 256K PAGE OUTS 0 JOB CPU 00.00.00.27
* DISPATCH PRY 9 ELAP. TIME 00.00.04.77 SWAPS/PAGES 0/0 SRB TIME 00.00.00.02 CONDITION CODE 0000
* PERF. GROUP 20 SERV UNITS 3,925 TRANS ACT TIME 00.00.03.87

```

EXCP STATISTICS

UNIT	EXCP COUNT	UNIT	EXCP COUNT	UNIT	EXCP COUNT	UNIT	EXCP COUNT	UNIT	EXCP COUNT	UNIT	EXCP COUNT
8A3	40	8A3	0	EA2	60	3A1	0				
EXCP TOTAL	100	VIO PAGE INS	0	VIO PAGE OUTS	0	PAGES SWAPPED IN	0				

```

IEF236I ALLOC. FOR ET510483 GO
IEF237I 8A3 ALLOCATED TO SYSLIB
IEF237I 8A3 ALLOCATED TO
IEF237I CA3 ALLOCATED TO
IEF237I 8A3 ALLOCATED TO SYSO4095
IEF237I CA2 ALLOCATED TO SYSLIN
IEF237I JES2 ALLOCATED TO SYSLOUT
IEF237I JES2 ALLOCATED TO SYSPRINT
IEF237I JES2 ALLOCATED TO SYSIN
IEF142I ET510483 GO - STEP WAS EXECUTED - COND CODE 0000
IEF285I SYS2.PLI.V151.PLIBASE KEPT
IEF285I VOL SER NOS= SYS102.
IEF285I SYS2.PLI.V151.PLIBASE KEPT

```

```

IEF285I VOL SER NOS= SYS102.
IEF285I SYS2.CALLIB KEPT
IEF285I VOL SER NOS= SYS103.
IEF285I ICFCAT.SUPPORT KEPT
IEF285I VOL SER NOS= SYS102.
IEF285I SYS87119.T004513.RA000.ET510483.OBJSET DELETED
IEF285I VOL SER NOS= STG102.
IEF285I JES2.JOB05299.S00104 SYSOUT
IEF285I JES2.JOB05299.S00105 SYSOUT
IEF285I JES2.JOB05299.S10102 SYSIN
IEF373I STEP /GO / START 87119.0045
IEF374I STEP /GO / STOP 87119.0045 CPU OMIN 00.21SEC SRB OMIN 00.05SEC VIRT 256K SYS 244K

```

KOMAND DATA ACQUISITION SYSTEM

```

* STEP NAME GO START TIME 00.45.18.79 VIRT SVS USED 244K PAGE INS 0 STEP CPU 00.00.00.21
* PGM NAME LOADER STOP TIME 00.45.26.00 VIRT CORE USED 256K PAGE OUTS 0 JOB CPU 00.00.00.48
* DISPATCH PRY 9 ELAP. TIME 00.00.07.21 SWAPS/PAGES 0/0 SRB TIME 00.00.00.05 CONDITION CODE 0000
* PERF. GROUP 20 SERV UNITS 3,774 TRANS ACT TIME 00.00.06.27

```

EXCP STATISTICS

UNIT	EXCP COUNT	UNIT	EXCP COUNT	UNIT	EXCP COUNT	UNIT	EXCP COUNT	UNIT	EXCP COUNT	UNIT	EXCP COUNT
8A3	114	8A3	0	CA3	2	8A3	0	EA2	61		
EXCP TOTAL	177	VIO PAGE INS	0	VIO PAGE OUTS	0	PAGES SWAPPED IN	0				

```

IEF375I JOB /ET510483/ START 87119.0045
IEF376I JOB /ET510483/ STOP 87119.0045 CPU OMIN 00.48SEC SRB OMIN 00.07SEC

```

KOMAND DATA ACQUISITION SYSTEM

```

* JOB LOG NUMBER - ET510483 87119 00.45.07.08 CPU TIME 00.00.00.48 SRB TIME 00.00.00.07
* PROGRAMMER CSC1.260B & DDMINA INIT. DATE 04/29/87 87.119 INITIATION TIME 00.45.13.82
* ACCTG DATA 0114290675,T904988ZWC1,T,T904988,CSCI 260B 8 TERM DATE 04/29/87 87.119 TERMINATION TIME 00.45.26.08
* OS-VS2.REL.SP.1.3 PGN/SERVICE 20/ 7.699 ELAPSED TIME 00.00.12.15
* SYSTEM ID B150 CLASS A COMPLETION STATUS COOOO

```


OPTIONS SPECIFIED

GOSTMT;

OPTIONS USED

GOSTMT	NOAGGREGATE	CHARSET(60,EBCDIC)
INSOURCE	NOATTRIBUTES	NOCOMPILE(S)
LMESSAGE	NOCOUNT	FLAG(I)
OBJECT	NODECK	LINECOUNT(80)
OPTIONS	NOESD	MARGINS(2,72,1)
SOURCE	NOFLOW	SEQUENCE(79,80)
STMT	NOGONUMBER	SIZE(252804)
	NOGRAPHIC	NOSYNTAX(S)
	NOIMPRECISE	
	NOINCLUDE	
	NOINTERRUPT	
	NOLIST	
	NOMACRO	
	NOMAP	
	NOMARGIN1	
	NOMDECK	
	NONEST	
	NONUMBER	
	NOOFFSET	
	NOOPTIMIZE	
	NOSTORAGE	
	NOTERMINAL	
	NOXREF	

SOURCE LISTING

STMT

```

1  PROG1:  PROC OPTIONS (MAIN);
   /*
   /******
   /*
   /*      PROG1
   /*
   /*      FUNCTION:  THIS PROGRAM CALCULATES INTEREST COMPOUNDED
   /*                  ANNUALLY AT 3.5% AND THE TOTAL PRINCIPAL AND
   /*                  INTEREST FOR MANHATTAN ISLAND STARTING WITH THE
   /*                  YEAR OF SALE (1627) (AND ORIGINAL PRICE OF $24)
   /*                  AND ENDING WITH 1986. THE PROGRAM PRODUCES A
   /*                  REPORT WHICH CONTAINS EACH YEAR WITH ITS
   /*                  RESPECTIVE INTEREST EARNED AND TOTAL PRINCIPAL
   /*                  AND INTEREST.
   /*
   /*      INPUT:      NONE
   /*
   /*      OUTPUT:     MANHATTAN ISLAND INTEREST CALCULATIONS REPORT
   /*
   /*      NOTES:      STREAM I/O IS USED TO PRINT THE REPORT.
   /*
   /******
   /*

```

STMT

2

DECLARE

```
SYSIN FILE STREAM INPUT ENV(F BLKSIZE(80)),
SYSPRINT FILE STREAM OUTPUT PRINT ENV(V BLKSIZE(129)),
ROUND BUILTIN,
PRINCIPAL FIXED DEC (15,2) INIT (24.00),
INT EARNED FIXED DEC (9,3) INIT (0.000),
RND INT EARNED FIXED DEC (9,2) INIT (0.00),
INT RATE FIXED DEC (3,3) INIT (.035),
YEAR FIXED DEC (5,0) INIT (1987),
# OF YRS FIXED DEC (3,0) INIT (0),
START YR FIXED DEC (5,0) INIT (1987),
CURR YR FIXED DEC (5,0) INIT (1987),
LINE CNT FIXED DEC (3,0) INIT (27),
PAGE NO FIXED DEC (3,0) INIT (1);
```

STMT

```
/*
/*****
/*
/*      MAIN ROUTINE
/*
/*      FUNCTION:  THE MAIN ROUTINE PRINTS THE FIRST SET OF HEADERS
/*                  BY CALLING THE HEADERS ROUTINE AND THEN CALLS
/*                  THE PROCESS ROUTINE.
/*
/*      INPUT:     NONE
/*
/*      OUTPUT:    NONE
/*
/*      NOTES:     NONE
/*
/*      PSEUDOCODE: IF LINE COUNT > 26
/*                  INVOKE HEADERS ROUTINE
/*                  ENDDIF
/*                  INVOKE PROCESS ROUTINE
/*
/*****
/*
```

STMT

```
3      IF LINE CNT > 26
      THEN
4         CALL HEADERS;
      ELSE;
5      /*      CALL PROCESS;      */
6      /*      RETURN;           */
      /*      */
```

STMT

```
7 HEADERS: PROC:
/*
*****
/*
/*      HEADERS ROUTINE
/*
/*      FUNCTION:  THE HEADERS ROUTINE PRINTS PAGE AND COLUMN
/*                  HEADERS FOR THE REPORT.
/*
/*      INPUT:     NONE
/*
/*      OUTPUT:    PAGE AND COLUMN HEADERS
/*
/*      NOTES:     NONE
/*
/*      PSEUDOCODE: GO TO TOP OF PAGE AND PRINT REPORT TITLE
/*                  PRINT COLUMN HEADERS
/*                  SET LINE COUNT TO 0
/*
*****
/*
```


STMT

```
13      PUT SKIP(3) LIST (' ' ' ' RND INT EARNED,PRINCIPAL);
14      # OF YRS = CURR YR - START YR;
15      DO WHILE (# OF YRS > 0);
16          IF LINE CNT > 26
              THEN
                  CALL HEADERS;
17          ELSE
18              INT EARNED = PRINCIPAL * INT RATE;
19              RND INT EARNED = ROUND (INT EARNED,2);
20              PRINCIPAL = PRINCIPAL + RND INT EARNED;
21              PUT SKIP(2) LIST
                  (' ' ,YEAR,RND INT EARNED,PRINCIPAL);
22              # OF YRS = # OF YRS - 1;
23              YEAR = YEAR + 1;
24              LINE CNT = LINE CNT + 1;
25          END;
26      END PROCESS;
27 /*      END PROG1;      */
```

NO MESSAGES PRODUCED FOR THIS COMPILATION

COMPILE TIME 0.00 MINS SPILL FILE: 0 RECORDS, SIZE 4051

VS LOADER

OPTIONS USED - PRINT, NOMAP, NOLET, CALL, RES, NOTERM, SIZE=229376, NAME***GO

TOTAL LENGTH 4000
ENTRY ADDRESS 10C010

MANHATTAN ISLAND INTEREST CALCULATIONS

YEAR	INTEREST EARNED	INTEREST & PRINCIPAL
	0.00	24.00
1627	0.84	24.84
1628	0.87	25.71
1629	0.90	26.61
1630	0.93	27.54
1631	0.96	28.50
1632	1.00	29.50
1633	1.03	30.53
1634	1.07	31.60
1635	1.11	32.71
1636	1.14	33.85
1637	1.18	35.03
1638	1.23	36.26
1639	1.27	37.53
1640	1.31	38.84
1641	1.36	40.20
1642	1.41	41.61
1643	1.46	43.07
1644	1.51	44.58
1645	1.56	46.14
1646	1.61	47.75
1647	1.67	49.42
1648	1.73	51.15
1649	1.79	52.94
1650	1.85	54.79
1651	1.92	56.71
1652	1.98	58.69

MANHATTAN ISLAND INTEREST CALCULATIONS

YEAR	INTEREST EARNED	INTEREST & PRINCIPAL
1654	2.13	62.87
1655	2.20	65.07
1656	2.28	67.35
1657	2.36	69.71
1658	2.44	72.15
1659	2.53	74.68
1660	2.61	77.29
1661	2.71	80.00
1662	2.80	82.80
1663	2.90	85.70
1664	3.00	88.70
1665	3.10	91.80
1666	3.21	95.01
1667	3.33	98.34
1668	3.44	101.78
1669	3.56	105.34
1670	3.69	109.03
1671	3.82	112.85
1672	3.95	116.80
1673	4.08	120.89
1674	4.23	125.12
1675	4.38	129.50
1676	4.53	134.03
1677	4.69	138.72
1678	4.86	143.58
1679	5.03	148.61
1680	5.20	153.81

MANHATTAN ISLAND INTEREST CALCULATIONS

YEAR	INTEREST EARNED	INTEREST & PRINCIPAL
1681	5.38	159.19
1682	5.57	164.76
1683	5.77	170.53
1684	5.97	176.50
1685	6.18	182.68
1686	6.39	189.07
1687	6.62	195.69
1688	6.85	202.54
1689	7.09	209.63
1690	7.34	216.97
1691	7.59	224.56
1692	7.85	232.42
1693	8.13	240.55
1694	8.42	248.97
1695	8.71	257.68
1696	9.02	266.70
1697	9.33	276.03
1698	9.65	285.69
1699	10.00	295.69
1700	10.35	306.04
1701	10.71	316.75
1702	11.09	327.84
1703	11.47	339.31
1704	11.88	351.19
1705	12.29	363.48
1706	12.72	376.20
1707	13.17	389.37

MANHATTAN ISLAND INTEREST CALCULATIONS

YEAR	INTEREST EARNED	INTEREST & PRINCIPAL
1708	13.63	403.00
1709	14.11	417.11
1710	14.60	431.71
1711	15.11	446.82
1712	15.64	462.46
1713	16.18	478.65
1714	16.75	495.40
1715	17.34	512.74
1716	17.95	530.69
1717	18.57	549.26
1718	19.22	568.48
1719	19.89	588.38
1720	20.59	608.97
1721	21.31	630.28
1722	22.06	652.34
1723	22.83	675.17
1724	23.63	698.80
1725	24.45	723.26
1726	25.31	748.57
1727	26.20	774.77
1728	27.12	801.89
1729	28.07	829.96
1730	29.05	859.01
1731	30.07	889.08
1732	31.12	920.20
1733	32.21	952.41
1734	33.33	985.74

MANHATTAN ISLAND INTEREST CALCULATIONS

YEAR	INTEREST EARNED	INTEREST & PRINCIPAL
1735	34.50	1020.24
1736	35.71	1055.95
1737	36.96	1092.91
1738	38.25	1131.16
1739	39.59	1170.75
1740	40.98	1211.73
1741	42.41	1254.14
1742	43.89	1298.03
1743	45.43	1343.46
1744	47.02	1390.48
1745	48.67	1439.15
1746	50.37	1489.52
1747	52.13	1541.65
1748	53.96	1595.61
1749	55.85	1651.46
1750	57.80	1709.26
1751	59.82	1769.08
1752	61.92	1831.00
1753	64.09	1895.09
1754	66.33	1961.42
1755	68.65	2030.07
1756	71.05	2101.12
1757	73.54	2174.66
1758	76.11	2250.77
1759	78.78	2329.55
1760	81.53	2411.08
1761	84.39	2495.47

MANHATTAN ISLAND INTEREST CALCULATIONS

YEAR	INTEREST EARNED	INTEREST & PRINCIPAL
1762	87.34	2582.81
1763	90.40	2673.21
1764	93.56	2766.77
1765	96.84	2863.61
1766	100.23	2963.84
1767	103.73	3067.57
1768	107.36	3174.93
1769	111.12	3286.05
1770	115.01	3401.06
1771	119.04	3520.10
1772	123.20	3643.30
1773	127.52	3770.82
1774	131.98	3902.80
1775	136.60	4039.40
1776	141.38	4180.78
1777	146.33	4327.11
1778	151.45	4478.56
1779	156.75	4635.31
1780	162.24	4797.55
1781	167.91	4965.46
1782	173.79	5139.25
1783	179.87	5319.12
1784	186.17	5505.29
1785	192.69	5697.98
1786	199.43	5897.41
1787	206.41	6103.82
1788	213.63	6317.45

MANHATTAN ISLAND INTEREST CALCULATIONS

YEAR	INTEREST EARNED	INTEREST & PRINCIPAL
1789	221.11	6538.56
1790	228.85	6767.41
1791	236.86	7004.27
1792	245.15	7249.42
1793	253.73	7503.15
1794	262.61	7765.76
1795	271.80	8037.56
1796	281.31	8318.87
1797	291.16	8610.03
1798	301.35	8911.38
1799	311.90	9223.28
1800	322.81	9546.09
1801	334.11	9880.20
1802	345.81	10226.01
1803	357.91	10583.92
1804	370.44	10954.36
1805	383.40	11337.76
1806	396.82	11734.58
1807	410.71	12145.29
1808	425.09	12570.38
1809	439.96	13010.34
1810	455.36	13465.70
1811	471.30	13937.00
1812	487.80	14424.80
1813	504.87	14929.67
1814	522.54	15452.21
1815	540.83	15993.04

MANHATTAN ISLAND INTEREST CALCULATIONS

YEAR	INTEREST EARNED	INTEREST & PRINCIPAL
1816	559.76	16552.80
1817	579.35	17132.15
1818	599.63	17731.78
1819	620.61	18352.39
1820	642.33	18994.72
1821	664.82	19659.54
1822	688.08	20347.62
1823	712.17	21059.79
1824	737.09	21796.88
1825	762.89	22559.77
1826	789.59	23349.36
1827	817.23	24166.59
1828	845.83	25012.42
1829	875.43	25887.85
1830	906.07	26793.92
1831	937.79	27731.71
1832	970.61	28702.32
1833	1004.58	29706.90
1834	1039.74	30746.64
1835	1076.13	31822.77
1836	1113.80	32936.57
1837	1152.78	34089.35
1838	1193.13	35282.48
1839	1234.89	36517.37
1840	1278.11	37795.48
1841	1322.84	39118.32
1842	1369.14	40487.46