

File: recA.C

```
1 #include <iostream>
2
3 using namespace std;
4
5 void RecA(int);
6
7 int main()
8 {
9     int x;
10
11     cout << "Enter an integer value for x:" << endl;
12     cin >> x;
13     RecA(x);
14
15     return 0;
16 }
17
18 void RecA(int x)
19 {
20     cout << x << endl;
21     if (x > 0)
22         RecA(x - 1);
23 }
```

File: recA.script

```
1 2305/notes/algorithm-analysis-> make recA
2 g++ -g -Wall -c recA.C -I/usr/local/3341/include -I.
3 g++ -o recA recA.o -L/usr/local/3341/lib -lm
4 2305/notes/algorithm-analysis-> print 1 | recA
5 Enter an integer value for x:
6 1
7 0
8 2305/notes/algorithm-analysis-> print 2 | recA
9 Enter an integer value for x:
10 2
11 1
12 0
13 2305/notes/algorithm-analysis-> print 3 | recA
14 Enter an integer value for x:
15 3
16 2
17 1
18 0
19 2305/notes/algorithm-analysis-> print 4 | recA
20 Enter an integer value for x:
21 4
22 3
23 2
24 1
25 0
26 2305/notes/algorithm-analysis->
```

File: recB.C

```
1 #include <iostream>
2
3 using namespace std;
4
5 void RecB(int);
6
7 int main()
8 {
9     int x;
10
11     cout << "Enter an integer value for x:" << endl;
12     cin >> x;
13     RecB(x);
14
15     return 0;
16 }
17
18 void RecB(int x)
19 {
20     int i;
21
22     cout << "x = " << x << ": ";
23     for (i = 1; i <= x; ++i)
24         cout << i << ' ';
25     cout << endl;
26     if (x > 1)
27         RecB(x - 1);
28 }
```

File: recB.script

```
1 2305/notes/algorithm-analysis-> make recB
2 g++ -g -Wall -c recB.C -I/usr/local/3341/include -I.
3 g++ -o recB recB.o -L/usr/local/3341/lib -lm
4 2305/notes/algorithm-analysis-> print 1 | recB
5 Enter an integer value for x:
6 x = 1:  1
7 2305/notes/algorithm-analysis-> print 2 | recB
8 Enter an integer value for x:
9 x = 2:  1 2
10 x = 1:  1
11 2305/notes/algorithm-analysis-> print 3 | recB
12 Enter an integer value for x:
13 x = 3:  1 2 3
14 x = 2:  1 2
15 x = 1:  1
16 2305/notes/algorithm-analysis-> print 4 | recB
17 Enter an integer value for x:
18 x = 4:  1 2 3 4
19 x = 3:  1 2 3
20 x = 2:  1 2
21 x = 1:  1
22 2305/notes/algorithm-analysis->
```

File: recC.C

```
1 #include <iostream>
2
3 using namespace std;
4
5 void RecC(int);
6
7 int main()
8 {
9     int x;
10
11     cout << "Enter an integer value for x:" << endl;
12     cin >> x;
13     RecC(x);
14
15     return 0;
16 }
17
18 void RecC(int x)
19 {
20     int i;
21
22     cout << "x = " << x << ": ";
23     for (i = 1; i <= x; ++i)
24         cout << i << ' ';
25     cout << endl;
26     if (x > 1)
27         RecC(x / 2);
28 }
```

File: recC.script

```
1 2305/notes/algorithm-analysis-> make recC
2 g++ -g -Wall -c recC.C -I/usr/local/3341/include -I.
3 g++ -o recC recC.o -L/usr/local/3341/lib -lm
4 2305/notes/algorithm-analysis-> print 1 | recC
5 Enter an integer value for x:
6 x = 1: 1
7 2305/notes/algorithm-analysis-> print 2 | recC
8 Enter an integer value for x:
9 x = 2: 1 2
10 x = 1: 1
11 2305/notes/algorithm-analysis-> print 4 | recC
12 Enter an integer value for x:
13 x = 4: 1 2 3 4
14 x = 2: 1 2
15 x = 1: 1
16 2305/notes/algorithm-analysis-> print 8 | recC
17 Enter an integer value for x:
18 x = 8: 1 2 3 4 5 6 7 8
19 x = 4: 1 2 3 4
20 x = 2: 1 2
21 x = 1: 1
22 2305/notes/algorithm-analysis-> print 16 | recC
```

```

23 Enter an integer value for x:
24 x = 16:  1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
25 x = 8:   1 2 3 4 5 6 7 8
26 x = 4:   1 2 3 4
27 x = 2:   1 2
28 x = 1:   1
29 2305/notes/algorithm-analysis->

```

File: recD.C

```

1 #include <iostream>
2
3 using namespace std;
4
5 void RecD(int);
6
7 int main()
8 {
9     int x;
10
11     cout << "Enter an integer value for x:" << endl;
12     cin >> x;
13     RecD(x);
14
15     return 0;
16 }
17
18 void RecD(int x)
19 {
20     int i;
21
22     for (i = 1; i <= x; ++i) {
23         cout << "x = " << x << " i = " << i << endl;
24         if (x > 1)
25             RecD(x - 1);
26     }
27 }

```

File: recD.script

```

1 2305/notes/algorithm-analysis-> make recD
2 g++ -g -Wall -c recD.C -I/usr/local/3341/include -I.
3 g++ -o recD recD.o -L/usr/local/3341/lib -lm
4 2305/notes/algorithm-analysis-> print 1 | recD
5 Enter an integer value for x:
6 x = 1 i = 1
7 2305/notes/algorithm-analysis-> print 2 | recD
8 Enter an integer value for x:
9 x = 2 i = 1
10 x = 1 i = 1
11 x = 2 i = 2
12 x = 1 i = 1
13 2305/notes/algorithm-analysis-> print 3 | recD
14 Enter an integer value for x:
15 x = 3 i = 1

```

2 lines with x = 2 2 * 1 lines with x = 1
--

```

16 x = 2 i = 1
17 x = 1 i = 1
18 x = 2 i = 2
19 x = 1 i = 1
20 x = 3 i = 2
21 x = 2 i = 1
22 x = 1 i = 1
23 x = 2 i = 2
24 x = 1 i = 1
25 x = 3 i = 3
26 x = 2 i = 1
27 x = 1 i = 1
28 x = 2 i = 2
29 x = 1 i = 1
30 2305/notes/algorithm-analysis-> print 4 | recD
31 Enter an integer value for x:
32 x = 4 i = 1
33 x = 3 i = 1
34 x = 2 i = 1
35 x = 1 i = 1
36 x = 2 i = 2
37 x = 1 i = 1
38 x = 3 i = 2
39 x = 2 i = 1
40 x = 1 i = 1
41 x = 2 i = 2
42 x = 1 i = 1
43 x = 3 i = 3
44 x = 2 i = 1
45 x = 1 i = 1
46 x = 2 i = 2
47 x = 1 i = 1
48 x = 4 i = 2
49 x = 3 i = 1
50 x = 2 i = 1
51 x = 1 i = 1
52 x = 2 i = 2
53 x = 1 i = 1
54 x = 3 i = 2
55 x = 2 i = 1
56 x = 1 i = 1
57 x = 2 i = 2
58 x = 1 i = 1
59 x = 3 i = 3
60 x = 2 i = 1
61 x = 1 i = 1
62 x = 2 i = 2
63 x = 1 i = 1
64 x = 4 i = 3
65 x = 3 i = 1
66 x = 2 i = 1
67 x = 1 i = 1
68 x = 2 i = 2

```

3 lines with $x = 3$
 3 * 2 lines with $x = 2$
 3 * 2 * 1 lines with $x = 1$

4 lines with $x = 4$
 4 * 3 lines with $x = 3$
 4 * 3 * 2 lines with $x = 2$
 4 * 3 * 2 * 1 lines with $x = 1$

```
69 x = 1 i = 1
70 x = 3 i = 2
71 x = 2 i = 1
72 x = 1 i = 1
73 x = 2 i = 2
74 x = 1 i = 1
75 x = 3 i = 3
76 x = 2 i = 1
77 x = 1 i = 1
78 x = 2 i = 2
79 x = 1 i = 1
80 x = 4 i = 4
81 x = 3 i = 1
82 x = 2 i = 1
83 x = 1 i = 1
84 x = 2 i = 2
85 x = 1 i = 1
86 x = 3 i = 2
87 x = 2 i = 1
88 x = 1 i = 1
89 x = 2 i = 2
90 x = 1 i = 1
91 x = 3 i = 3
92 x = 2 i = 1
93 x = 1 i = 1
94 x = 2 i = 2
95 x = 1 i = 1
96 2305/notes/algorithm-analysis->
```