

4. a) What is the efficiency of the two loops below in the Θ notation (1 p):

LOOP1 (p)

```

j := p
for i := 0 to 10 do
  j := j + i

```

LOOP2 (A, n)

```

i := 0
while i ≤ n
  print A[i]
  i := i + 1

```

- b) The C++ implementation of the dynamic programming activity selection algorithm is given below. What's the running time of the algorithms given in the O and Ω notations? Could the program be implemented more efficiently? Why/why not? (3 p)

Note! The function select continues on the 2nd column

```

1  struct Event {                23
2      int start;                24
3      int finish;              25
4      int proceeds;            26
5  };                             27
6
7  bool compare( const Event& e1, 29
8                const Event& e2 ) { 30
9      if( e1.start < e2.start ) 31
10         return true;           32
11     return false;              33
12 }                               34
13
14 int select( vector< Event >& v ) { 36
15     sort( v.begin(),           37
16           v.end(),             38
17           compare );           39
18
19     vector< int > r( MAX+1 );   41
20     r.at( MAX ) = 0;           42
21     r.at( MAX-1 ) =           43
22         v.at( MAX-1 ).proceeds; 44
23
24     for( int i = MAX-1; i >= 0; --i ) {
25         int j = MAX;
26
27         for( int idx = i+1;
28             idx < MAX-1; ++idx ) {
29             if( v.at(idx).start
30                 >= v.at(i).finish ) {
31                 j = idx;
32                 break;
33             }
34
35             if( v.at(i).proceeds + r.at(j)
36                 >= r.at( i+1 )) {
37                 r.at(i) = v.at(i).proceeds
38                     + r.at(j);
39             }
40             else {
41                 r.at(i) = r.at( i+1 );
42             }
43         }
44     }
45     return r.at( 0 );

```

- c) You have a shuffled deck of cards and it needs to be rearranged. Describe how you would arrange the cards so that the four suits are separated and the cards in each suit are sorted ace first, king last. What is the efficiency of your solution with the O and Ω notations? (2 p)